



Constraints to Connecting Children with Nature—Survey of U.S. Fish and Wildlife Service Employees Sponsored by the National Conservation Training Center, Division of Education Outreach

By Joan M. Ratz and Rudy M. Schuster



*"I think connecting people with nature is important, but we have not clearly defined what that means, what success looks like and how we reach that success."
– Survey Respondent*

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Executive Summary

The U.S. Fish and Wildlife Service (FWS) names “connecting people with nature” as one of its top six priorities in the online Service Employee Pocket Guide (U.S. Fish and Wildlife Service, 2010). The National Conservation Training Center (NCTC) took the initiative to identify issues that impede greater progress in addressing the constraints to connecting children with nature. The Division of Education Outreach (DEO) at NCTC formed a working relation with the Policy Analysis and Science Assistance (PASA) branch of the U.S. Geological Survey (USGS) to conduct a study on these issues. To meet the objectives of the study, a survey of a sample of FWS employees was conducted. This report includes the description of how the survey was developed and administered, how the data were analyzed, and a discussion of the survey results.

The survey was developed based on published literature and incorporated input from two working groups of professionals focused on the issue of connecting children with nature. Although the objective as stated by the FWS is to connect people with nature, the survey primarily focused on connecting children, rather than all people, with nature. The four primary concepts included on the survey were interpretation of how the FWS defined “connection” as part of its mission, perceived success with outreach, constraints to connecting children with nature, and importance of connecting children with nature.

The survey was conducted online using KeySurvey© software. The survey was sent to 604 FWS employees. Responses were received from 320 employees. The respondents represented diversity in regions, tenure, wage/grade level, job series, supervisory status, and involvement with education and outreach activities.

The key findings of the survey are as follows:

- FWS employees believe they as individuals and the agency are successful now and will be more successful in the future in connecting children with nature.
- FWS employees believe that there are many outcomes that are relevant to the FWS objective to connect people with the environment.
- FWS employees believe that connecting children with nature is important.
- Constraints to connecting children with nature exist but are not perceived by respondents to be severe.
- The constraints of greatest concern are practical issues, competition from technology, funding issues and staffing issues.

Background

The children and nature movement is focused on strengthening the connection between children and the natural environment. The effects of a weak relation between children and nature are discussed in

the popular, nontechnical book *Last Child in the Woods* by Richard Louv (2005). The interest in connecting children with nature recently has been piqued by the popularity of Louv's writing but the concern regarding children's connection with nature has long been in existence. Liberty H. Bailey's revised book, *The Nature-Study Idea—An Interpretation of the New School-Movement to Put the Young into Relation and Sympathy with Nature*, was published in 1913, with an original publication date of 1903. Bailey commented on the growing disconnect between people and the natural environment and focused on children as being the segment of the population in which this disconnect should be addressed. "Of late years there has been a rapidly growing feeling that we must live closer to nature and make our nature-sentiment vital; and we must of course begin with the child" (Bailey, 1913, p. 28).

Bailey used the term nature-study and described its purpose as "...to put the pupil in a sympathetic attitude toward nature for the purpose of increasing his joy in living" (1913, p. 5). Bailey subsequently defines nature study as "Nature-study, then, is not science. It is not knowledge. It is not facts. It is spirit. It is an attitude of mind. It concerns itself with the child's outlook on the world" (1913, p. 6). These descriptions are consistent with the viewpoint expressed in the contemporary children and nature movement.

The U.S. Fish and Wildlife Service (FWS) names "connecting people with nature" as one of its priorities in the online Service Employee Pocket Guide (U.S. Fish and Wildlife Service, 2010). In September 2006, the FWS hosted "A National Dialogue on Children and Nature" conference at the National Conservation Training Center (NCTC) campus in Shepherdstown, W. Va. In 2007, the NCTC, specifically the Division of Education Outreach (DEO), took the initiative to identify issues that impede greater progress in addressing the constraints to connecting children with nature. The DEO formed a working relation with the Policy Analysis and Science Assistance (PASA) branch of the U.S. Geological Survey (USGS) to conduct a study on these issues. The initial intention was to address issues faced by all conservation and environmental education professionals including those outside the FWS. For practical reasons, the final decision was to limit the survey to FWS employees. This report includes the description of how the survey was developed, how the data were analyzed, and a discussion of the survey results. The frequencies of responses to the survey questions are provided in the report to respondents for the survey (Ratz and Schuster, 2011).

The purpose of this survey was to describe how FWS employees perceive the constraints that may impede greater success at connecting children with nature. In investigations of constraints—also called barriers—to connecting people with the environment, much research focuses on modeling the relations among the different constraining factors (Godbey and others, 2010; Nadirova and Jackson, 2000; Nyaupane and others 2004, Pennington-Gray and Kerstetter, 2002). Researchers address whether the constraints are intrapersonal, interpersonal, or structural (Godbey and others, 2010; Nyaupane and Andereck, 2008; Pennington-Gray and Kerstetter, 2002). Although this is a common perspective from which to understand participation or nonparticipation in outdoor leisure activities, this particular model is not appropriate for the goal of our survey. Instead, we adapted a model of task performance from the organizational psychology discipline. This model, which we will describe in more detail, is appropriate for this study because the primary question addressed relates to performing the task of connecting children and nature. The overall question we are trying to answer with this study is: What factors are impeding greater success in the efforts of FWS employees to connect children and nature?

To fully understand what may be impeding efforts to connect children with nature, we must address two categories of factors: situational constraints and perceived constraints. Situational constraints are characteristics of the work environment that impede effective task performance (Peters and O'Connor, 1980; Peters and others, 1985). Common situational constraints include job-relevant information, materials and tools, budgetary support, required help from others, and time availability (Peters and O'Connor, 1980; Peters and others, 1985). Some situational constraints are objectively defined and others are defined on the basis of perceptions. Objective constraints directly impair performance (Klein and

others, 2006). Examples of objective constraints include lack of necessary equipment and insufficient funding.

Perceived constraints have been defined as situations in the work environment that are believed to exist and thought to adversely affect progress (Klein and others, 2006). Even constraints that are objective in nature can vary in the effect they have based on how severe they are perceived to be (Lent, Brown and Hackett, 2000). Perceived constraints may not be based on objectively demonstrated evidence. However, these perceived constraints still can impede performance because the individuals who hold those perceptions choose their actions based on their perceptions that those constraints do exist and are problematic.

Peters and others (1985) suggested that actual performance is affected only when the constraints are severe. Further, they suggested that the constraints result in negative emotions such as frustration when the constraints are present but not severe. Other research has confirmed the relation between constraints and frustration (Fox and Spector, 1999). Perceived constraints affect attitudes such as motivation which in turn affect effort and action (Klein and others, 2006). For example, Mathieu and others (1992) found a negative relation between perceived constraints and training motivation.

Because of how they are interrelated, it is important to study constraints, perceived constraints, and attitudes together. In a study of the effect of situational constraints on performance in a field setting, Adkins and Naumann (2001) determined that attitudes affected the degree to which situational constraints affected performance. When constraints diminished, performance increased. Situational constraints also interacted with a measure of attitude—value of achievement—to affect performance, suggesting that for individuals with high value of achievement, the effect on performance was greater when situational constraints were eased.

In this study we measured attitudes regarding the extent to which varied outcomes were relevant to the FWS mission with respect to connecting children with nature, the perceived importance of connecting children with nature to the FWS, and attributions regarding the cause of the constraints. We used three measures of attributions or characteristics of constraints: stability, controllability, and locus of causality. Additional descriptions of these attributions are included in the Survey Development and Supporting Literature section of this report. It is important to understand the attributions that are made regarding the sources of these constraints to understand the potential effect on the work behavior of FWS employees. Attributions for on-the-job performance affect self-efficacy which in turn can affect future performance (Silver and others, 1995).

Method

Survey Development and Supporting Literature

We tried to balance survey length with adequate measurement of the characteristics of interest. Generally, measuring a characteristic with only one question—referred to as use of a single-item measure—is to be avoided in survey research. Using multiple questions to measure a characteristic usually results in a more reliable survey. However, in order to limit the burden placed on the FWS employees who participated in the survey, we did include single-item measures.

We also used an adaptive survey format. In an adaptive survey, the respondents are asked questions in the survey based on their responses to early questions in the survey. Specifically, this survey included introductory questions that asked about the respondents' involvement with conservation education, environmental education, or community outreach. The respondents who indicated they were not involved in these activities were asked the questions regarding the interpretation of the FWS mission, the importance to the FWS of connecting children with nature, and the demographic questions. They were not asked the questions regarding constraints to connecting children with nature. The benefits of using an

adaptive survey are increased efficiency for survey respondents and improved data quality, because the data is not affected by responses to questions from those who are unqualified or uninterested.

In this section of the report, we describe each section of questions included on the survey. The survey questions are provided in table 1-1 in Appendix 1.

Introductory Questions

The questions in the introductory section were used to introduce the topic of the survey; this was done to focus the attention of the respondents on relevant information. The introductory questions were also used as a basis for the adaptability of the survey. The set of questions each individual was asked was based on their answers to questions in the introductory section.

In order to be able to determine the degree to which the survey sample included respondents who were knowledgeable regarding the issues of connecting children with nature, the survey included questions that asked respondents to identify if they engaged in conservation education, environmental education, or community outreach activities targeted toward children as part of their job. If respondents indicated they did engage in these activities, they were directed to a question that asked them to approximate what percent of time is spent on these activities.

Respondents were asked whether these activities were part of their position description. For some FWS employees, participating in activities to connect children with nature may not be part of their formal job description. They may participate in these activities either because they are encouraged to do so, they feel compelled to do so, or they believe in the importance of facilitating a connection between children and the natural world.

Respondents were asked if they made decisions regarding education and outreach programming with respect to aspects of funding, staff time, program content, or program implementation. A separate question asked respondents if they supervised others who performed education or outreach programming activities. Finally, respondents were asked if they volunteered in conservation or environmental education related activities.

Definition of "Connection"

In order to understand how FWS employees define "connecting with nature," survey respondents were asked about their interpretation of what the FWS is trying to achieve through its mission to connect people with the environment. Survey respondents were presented with nine statements and asked to rate the relevance of each to the FWS' mission to connect people with nature. The content of the nine statements was derived from literature on the benefits of connecting people with nature. The statements address multiple types of outcomes including cognitive (knowledge about the environment), emotional (feeling appreciation for public lands), attitudinal (concern for preservation of public lands), physical (participation in outdoor activities), and behavioral (political action) outcomes.

Although the rest of the survey addresses connecting children—as a specific subpopulation—with nature, we formed the questions in this section of the survey to address connecting people with nature to be consistent with the terminology used in the priorities listed in the online Service Employee Pocket Guide (U.S. Fish and Wildlife Service, 2010).

Perceived Success with Outreach Efforts

In order to understand perceptions of success in connecting children with nature through education and outreach efforts, we included four questions regarding perceptions of success on the survey. Respondents were asked to rate how successful their own efforts and the agency's efforts have been in the past and will be in the future. It is important to know how successful the respondents believe their efforts

have been and will be in order to have a more complete understanding of the perception of and the effect of the constraints.

Perceived Constraints to Connecting Children with Nature

The first version of this survey was a list of 146 possible constraints to connecting people, including adults, with nature. This list of constraints is provided in table 1-2 in Appendix 1. The list was developed based on lists generated and shared by working groups—the Association of Fish and Wildlife Agencies (AFWA) Conservation Education Working Group and the Children and Nature Working Group (FWS)—and based on information regarding constraints to connecting people with nature in published literature. Review of literature has been used as a method to identify constraints in prior research on behavioral constraints (for example, Pennington-Gray and Kerstetter, 2002). Much of the available literature is devoted to the identification of constraints (or barriers) to outdoor recreation and to connecting children with nature. An annotated bibliography by Senauer (2007) reviewed indicators of “nature deficit” and we were able to derive some constraints from the literature summarized in that source. A study sponsored by Alberta Recreation and Parks identified constraints to recreation participation (Jackson and Blakely, 1983). We also reviewed the publications provided on the Web site of the Children & Nature Network (<http://www.childrenandnature.org/>). We pilot-tested this list of constraints with a small sample of individuals from the AFWA and FWS working groups. We received 10 responses. The individuals in the pilot-test sample were asked to indicate which of those constraints they encountered in their work and which constraints they knew were encountered by others, and to rank the 10 constraints that were most important to address. The list of constraints proved to be too lengthy to use as a survey. With such a small sample, there was lack of agreement regarding the 10 most important constraints. Based on the outcome of this preliminary survey, we condensed the list of constraints and revised the focus of the survey.

In conjunction with our cooperators at NCTC, we decided to limit the constraints to issues affecting the connection of children with nature and eliminated the constraints that addressed issues affecting adults. Although the FWS priority addresses connecting people with nature, we limited this study to issues specific to connecting children with nature because issues arising from connecting those in other age groups likely will differ. To address all of the age groups in one survey would have resulted in a lengthy survey.

While this revision did result in a survey of a more reasonable length, the selection of which constraints to combine was subjective. We based our list of constraints on available information and we are confident that the constraints we selected are appropriate for this survey. However, we cannot claim that this list of constraints is the most representative list of constraints or that even the most influential constraints to connecting children with nature are included. We could have asked respondents to state the constraint that created the most substantial obstacle to connecting children with nature for them. However this approach would have made it impossible to draw conclusions across respondents. In order to be able to summarize the effects of the constraints, we needed respondents to answer questions regarding the same set of constraints. The survey included the following 10 constraints:

- Children’s schedules (for example, school schedules, homework, other activities, lack of free time)
- Parents’ fears (for example, of strangers, or of wildlife)
- Parents’ attitudes (non-fear related) and lack of information about the outdoors
- Practical issues (for example, parents’ work schedules, distance to natural areas from children’s residences, and lack of transportation options)
- Children’s lack of interest and lack of comfort in the outdoors
- Competition from technology and technology-based activities
- Lack of information about the most effective techniques to connect children with nature
- State educational standards and lack of an environmental education curriculum

- Funding issues
- Staffing issues

In addition to selecting the list of constraints to include in the survey, we had to determine how to ask respondents to evaluate each of the constraints. In studies of constraints to participation in online learning, Berge and others (2002), and Muilenburg and Berge (2001, 2005) presented a list of constraints to survey participants and asked them to rate the constraints on a scale of 1 (no constraint) to 5 (a very strong constraint). Similarly, Pennington-Gray and Kerstetter (2002) used a 5-point scale for respondents to rate how much influence each of 11 constraints had on the decision to participate in nature-based tourism. The scale was anchored with 1 (no influence) and 5 (very strong influence). We decided to use two approaches to ask survey respondents to evaluate the difficulties caused by these constraints. First, the 10 constraints were listed and respondents were asked to select the constraint that created the biggest problem in trying to connect children with nature. We also provided an “other” response choice in case respondents believed that there was a different constraint not included on the survey that created the biggest problem. Second, respondents were asked to rate how big a problem was created by each constraint separately. The scale included the following five points: “no problem” (scale value 0), “only a small problem” (scale value 1), “it’s a problem” (scale value 2), “it’s a big problem” (scale value 3), and “this stops me from doing my job” (scale value 4). When respondents indicated that a constraint was a problem at the midpoint of the scale (“it’s a problem”) or higher, they were asked follow-up questions regarding their attributions about that constraint.

Attributions Regarding Constraints

We asked questions about the cause or source of each of the constraints. These questions were based on three dimensions of causality from attribution theory—stability, controllability, and locus of causality. If a respondent indicated that a particular constraint was a problem, they were then asked questions to determine their perception of the locus, stability, and controllability of the constraint. These three dimensions have been established as attributions that people make about causes (Anderson, 1991). The dimensions often are interpreted in conjunction with one another. For example, those who explain the cause of disappointing situations as arising outside themselves (external locus of causality) and likely to change (unstable) are described as having an optimistic style (Maher and Nordstrom, 1996).

We referred to published literature regarding attributions and based our questions on prior work. In an early study of scale development to measure attributions, Russell (1982) used semantic differential scales to measure each of the three dimensions. The structure of semantic differential scales was not appropriate for our survey, but we did adapt some of the terminology used by Russell to define our questions. Researchers (Weiner, 1983; Whitley and Frieze, 1986) have determined that the preferred approach to measuring these dimensions was to have survey respondents rate each.

Most studies that measure these attribution dimensions are conducted with the intent of defining attributional style as a personal characteristic of an individual. Studies of that type have traditionally used multiple questions to measure each attribution dimension. In this case, we were not interested in being able to draw conclusions regarding the individual-level characteristics of the survey respondents. Therefore, we believed that use of single-item measures that were derived from published studies would be adequate.

Stability

Stability refers to whether a cause—in this case, the originating source of a constraint—can be changed and is defined often as a time-related characteristic. Stable causes are those that will not change because of time or circumstance. Unstable causes are those that are possible to change over time or circumstance. To measure attributions regarding the stability of a cause researchers (Mone and Baker,

1992; Russell, 1982; Silver and others, 1995) used semantic differential scales with the anchors “permanent – temporary,” “variable over time – stable over time,” and “changeable – unchanging.” In our question to measure stability, we incorporated a directional component so that we could determine respondents’ perceptions regarding whether the constraint was likely to get better or worse.

Controllability

Much of the research on attributions measures controllability as a single characteristic. We followed the recommendation (McAuley and others, 1992; McAuley and Shaffer, 1993) to split controllability into personal control and external control. The distinction between personal and external control is whether the cause is controlled by the person or by other people (McAuley and Shaffer, 1993). While related, these attributions have been demonstrated to be distinct in empirical research (McAuley and Shaffer, 1993). In this survey, we created two questions to measure perceived personal control over the constraints. One question asked respondents to judge their direct influence on the cause and the second question asked respondents to judge their indirect influence on the cause.

Locus of Causality

Locus of causality—not to be confused with locus of control—refers to whether the source of a constraint originates within the respondent or not. Internal locus of causality is present when a respondent believes the constraint is caused by something within or about himself or herself. External locus of causality is present when a respondent believes the constraint is caused by others or by the situation. Russell (1982) used the anchors “reflects on you – reflects on your situation” and “something about you – something about others” with the semantic differential scales he used to measure locus of causality. Mone and Baker (1992) and Maher and Nordstrom (1996) used the phrases “is about you” or “is about others” to anchor the scale they used to measure locus of causality. Silver and others (1995) used similar wording, “something about you” or “something about others,” as anchors for their measure of locus of causality. We used “100 percent because of you” and “100 percent because of others” as anchors for our response scale with other specified percents (25, 50, and 75) at the other points on the response scale.

Attitudes Regarding Importance of Connecting Children with Nature

The attitude of primary focus in the survey was that of the perceived importance to the FWS of connecting children with nature. There were seven questions that addressed importance of connecting children with nature. There were four questions that addressed perceptions of the importance of connecting children with nature and of education and outreach activities. This set of questions included two questions that were worded negatively and that were reverse scored in data analysis process. One question asked respondents to indicate if this goal should be given higher priority within the FWS. Two additional questions asked respondents to assess tangible ways in which the FWS demonstrates the importance placed on connecting children with nature. One of those questions asked about allocation of adequate resources and the second question asked about recognition and rewards for efforts to connect children with nature.

Demographics

We included demographic questions on the survey. Respondents were asked to indicate their employment status (permanent, term, or temporary), tenure working with FWS, tenure at current duty station, tenure in current position, regional affiliation, wage grade (WG) or general series (GS) level, and their job series code. These demographic characteristics helped us to determine the degree to which our set of survey responses was representative of a range of FWS employees as opposed to a particular group of employees within the FWS. An additional reason underscored the importance of identifying the regional

affiliation of the respondents. Eight of the nine regions in the FWS are defined based on geography; region 9 is the FWS headquarters. Regions differ in the issues of greatest concern because of the varied characteristics of the ecosystems included in each region. Each region has its own leadership and culture. We also asked survey respondents to indicate their gender. Many studies indicate that women’s attitudes tend to be more proenvironment than do men’s attitudes (Dietz and others, 2002; Stern and others, 1993). Zelezny and others (2000) conclude that women report stronger environmental attitudes and more proenvironmental behavior than men. Other research also supports a gender difference in environmental behavior with women engaging in more frequent and diverse environmental behaviors (Hunter and others, 2004). Therefore, we believed that a check for gender differences was appropriate.

Sampling Strategy

We determined a sample size for each region that would maximize the likelihood of a sample that would be representative on the basis of regional affiliation. We stratified the survey sample so that the proportion of employees in the sample from a region was the same as the proportion of FWS employees in that region. For example, approximately 12 percent of FWS employees are in region 1. Therefore, we structured the survey sample so that 12 percent of employees in the sample were from region 1. We used the information regarding employment in each region from the U.S. Fish and Wildlife Service Servicewide EEOC MD 715 Plans FY 2008 accessed online (U.S. Fish and Wildlife Service, 2008) to calculate percentages for the sampling protocol. The percent of employees in each region and the corresponding number of employees included in the survey sample are provided in table 1.

Table 1. Stratification of survey sample by region.

Region	Percent of total FWS workforce	Number in sample
1 (Pacific)	12%	72
2 (Southwest)	10%	61
3 (Midwest)	11%	67
4 (Southeast)	15%	92
5 (Northeast)	9%	55
6 (Mountain-Prairie)	11%	67
7 (Alaska)	6%	37
8 (Pacific Southwest)	9%	55
9 (Headquarters)	16%	98

We were provided two lists of FWS employees from which we selected our sample for the survey. One list included email addresses of employees who were subscribed to the Visitor Outreach, Interpretation, Communications, and Education Services (VOICES) electronic distribution list; VOICES targets those who are interested in environmental education and is hosted by the DEO. The second list was generated from a report of employees who had taken training through NCTC during the time period from October 1, 2007 to June 24, 2009. To identify specific employees to include in the sample, we first included all those who subscribed to the VOICES electronic distribution list. We expected that those who subscribed to this distribution list were individuals who would be knowledgeable and active in outreach activities targeted towards children and particularly attuned to issues regarding the FWS mission to connect people with the environment. To complete the survey sample, we had to add more FWS employees in each region. We selected employees from the list of FWS employees who had taken training through NCTC.

The sample for this survey included 604 FWS employees. Based on information in the FWS EEOC FY2008 plan (U.S. Fish and Wildlife Service, 2008), a sample of 604 covers approximately 7 percent of the FWS workforce.

Data Collection Process

A letter written by Janet Carrier Ady that introduced the survey was emailed to the individuals in the survey sample. Even though the letter was from the DEO Chief, it was emailed by PASA personnel to keep confidential the identity of those in the survey sample. No NCTC personnel knew the names of those included in the survey sample. A few days after the introductory letter was emailed, we sent an email message including a link to the survey. The survey was administered online by using KeySurvey© software. We sent a reminder to those who had not yet completed the survey about one week after the initial survey distribution. A final reminder was sent to those who had not submitted a complete survey on the last day survey data were being collected. The data collection period lasted from February 25, 2010 to March 9, 2010.

Results

Response Rate

Of the 604 surveys initially sent, 19 were undeliverable because the individuals were no longer with the FWS. Two individuals were out of the office for the duration of the data collection process. This left us with a potential sample size of 583. Three hundred fifteen individuals submitted a completed survey in the survey software. Partial responses were received from 13 individuals who started but did not complete the survey online. Before exiting the survey, 5 of those 13 answered most of the survey questions. We included responses from those five respondents in our dataset. The eight other partial responses were from respondents who only answered the first few questions. We did not include those responses in the data. With the partial responses included, the survey results are based on the responses of a total of 320 respondents. Our adjusted response rate was 55 percent. Response rates for Web-based surveys often are below 50 percent (Vehovar and others, 2002). The response rate for each region is provided in table 2.

Table 2. Response rates for each region.

Region	Within-region response rate
1	47%
2	49%
3	61%
4	57%
5	70%
6	55%
7	47%
8	52%
9	55%

Quality of Survey

When using a survey to collect information, five characteristics must be considered to judge the quality of the survey and to determine to what extent the information from the survey can be used. The five characteristics are survey reliability, survey validity, statistical power, sample representativeness, and nonresponse bias. A detailed description of each of these five characteristics is provided in appendix 2.

Based on these quality checks for this survey, we concluded that the results of this survey can be used to understand the viewpoint of the employees of the FWS regarding the constraints they face in their efforts to connect children with nature. However, some of the evidence used to support the reliability and validity of the survey is at a level that would suggest exercise of caution in using survey results for

decisionmaking. The available evidence is not unsupportive of the quality of the survey; the available evidence is limited. In developing the survey, we chose to use an adaptive survey format so that not all questions were asked of all survey respondents. Many of the analyses for reliability and validity assessments require a set of data that includes responses on all questions. In those circumstances, if a respondent answered only some of the questions, then all of the data from that respondent would be dropped from the analyses. The result is that some of the analyses are based on small samples and reliability and validity estimates based on small samples can be unstable.

The statistical power and sample representativeness were acceptable. The dataset for this study was based on the responses of 320 respondents. A dataset of this size ensures sufficient power for our intended analyses. We believe that the data provided by the respondents to this survey likely include viewpoints from a variety of sectors of the FWS workforce. The respondents represented diversity in regional affiliation, tenure, wage/grade level, job series, and supervisory status. While response to the survey was related to interest in outreach issues, as defined by membership on the VOICES electronic distribution list, the effect was moderate in size and 56 percent of respondents indicated they did not subscribe to this list. We conclude that the results of this survey are sufficiently representative of the target population for the purposes of this survey.

Three questions demonstrated the potential for nonresponse bias. In order to estimate nonresponse bias, we compared the responses of early and late responders to the survey. However, the size of the differences between the early and late responders on these three questions was small. Given that the differences were small and were present for only three individual questions (Q9b, Q10d, and Q21), we concluded that the level of nonresponse bias would have a negligible effect on the overall results of the survey. The differences between these groups on the responses to these three questions are discussed in the Data Analysis section of this report.

Data Analysis

This survey was undertaken with the intention to identify the factors that impede the efforts of FWS employees in connecting children with nature. In this section, we describe the analyses pertinent to the primary goal of the project. All statistical analyses were conducted using PASW 18, a statistical software package from IBM SPSS Statistics.

A summary including the frequency of responses and averages for all questions on the survey is included in the report to respondents for this survey (Ratz and Schuster, 2011), and we do not repeat that information in this report. First, we summarize the characteristics of the respondents. Next, we synthesize the survey results within the four primary concepts included on the survey: interpretation of FWS mission, perceived success with outreach, constraints, and importance of connecting children with nature.

Characteristics of Respondents

The topic of this survey—connecting children with nature—is specific and may not be equally relevant to all employees of the FWS. As part of the interpretation of survey results, it is important to establish that the survey respondents were knowledgeable about the topic addressed on the survey. As part of our sampling strategy, we used the VOICES distribution list to help ensure that the sample would include FWS employees interested in environmental education and outreach activities. Several of the questions in the introductory section of the survey assessed the degree to which survey respondents were familiar with issues regarding connecting children with nature. We briefly summarize the responses to these questions in this section.

Sixty-eight percent of the respondents reported that they perform conservation education, environmental education, or community outreach activities targeted toward children as part of their job. If the respondents indicated they did perform these tasks, they were asked what percent of their time is spent on these activities. The response scale was segmented into 25 percent increments, and there were

responses at all levels on the response scale. The most frequent response was that between 1 and 25 percent of their time was spent on education and outreach activities. We did check if the percent of time spent on outreach activities differed based on gender, in other words, if female employees reported a higher percent of time on the job engaged in outreach activities than did male employees. We used Cramer's V, a nonparametric statistical test, to determine if gender was related to the percent of time on the job engaged in outreach. Gender was not related significantly to percent of time on the job spent performing these education and outreach activities.

Respondents were asked to select a category that described the presence or absence of education and outreach activities in their position description and whether they performed these activities. The category that stated education and outreach activities were included in the position description and that the respondent did in fact perform these activities was selected by 45 percent of the respondents. The second most frequently selected category described the situation as education and outreach activities were not part of the position description but that the respondent performed these activities anyway; this response was selected by 31 percent of the respondents. Nineteen percent of respondents indicated that education and outreach activities were not in their position description and that they did not perform those activities. A Cramer's V test indicated that there was no relation between gender and the responses to this question.

Respondents were provided with a list of four aspects of conservation or environmental education and were asked to indicate whether they made decisions regarding each of those aspects. Thirty-seven percent of respondents indicated they make decisions regarding allocation of funding; forty-four percent indicated they make decisions regarding allocation of staff time; sixty-four percent indicated they make decisions regarding the content of the programming; and sixty-four percent indicated they make decisions regarding the implementation of programming. Based on the results of a Cramer's V for each aspect of conservation education, there were no gender differences in whether or not respondents made decisions regarding any of the listed aspects of conservation or environmental education.

The responses to a question regarding supervision of one or more employees or volunteers who perform conservation or environmental education indicated that more than half of the respondents (53 percent) do not perform this supervision. Twenty-three percent of respondents supervise FWS employees only; thirteen percent supervise volunteers only; and twelve percent supervise both FWS employees and volunteers. In a separate question, respondents were asked if they volunteered in conservation or environmental education activities outside of their work with the FWS; sixty percent of respondents indicated that they do participate in these activities as a volunteer. Using Cramer's V tests, we concluded that there were no gender differences on the supervision or the volunteering questions.

Based on these introductory questions, we conclude that the survey sample included FWS employees who were sufficiently involved in activities directed toward connecting children with nature to be able to provide informed responses to the questions on the survey. Not all of the respondents were involved in education and outreach activities. We developed an involved/not involved variable based on respondents' answers to the introductory questions. We based the involved/not involved designation on the skip logic used in the survey. Respondents were directed to different question sets depending upon their responses to the questions in the introductory section of the survey. If the respondents indicated that they do not perform any conservation education or outreach activities targeted toward children, that outreach activities are not part of their job and that they do not do them, and that they do not supervise anyone who performs conservation education or outreach programming, then the survey software directed respondents to the section of questions on defining "connection" and then to the section of questions on attitudes regarding the importance to the FWS of connecting children with nature. These respondents were not asked the questions on success with outreach or the questions on constraints to achieving greater success with connecting children with nature. These respondents were designated as "not involved" in connecting children with nature. There were 91 respondents (28 percent) who were designated as "not

involved.” Based on their responses to the introductory questions, all other respondents were designated as “involved.”

We calculated measures of association to determine if the involved/not involved classification was related to the gender or regional affiliation of the respondents. Gender was not related to the involved/not involved variable. There was a significant association between region and the involved/not involved variable: Cramer’s $V = 0.27$, $p < 0.05$. The percent of respondents from each region who were classified as “involved” are provided in table 3.

Table 3. Percent of respondents from each region who were classified as “involved.”

Region	Percent “Involved”
1	75%
2	73%
3	83%
4	62%
5	80%
6	74%
7	69%
8	93%
9	51%

It is of primary importance that the survey sample included respondents who were knowledgeable regarding conservation and environmental education, and outreach activities. However, the inclusion in the dataset of responses from some individuals who are not involved in these types of activities is actually advantageous. The inclusion of some respondents who are not involved in connecting children with nature allowed us to make comparisons in the questions that address the definition of “connection” relating to the FWS mission and the importance to the FWS of connecting children with nature.

The demographic questions that were included at the end of survey were used in determining representativeness and nonresponse bias. The results of these analyses are discussed in Appendix 2. The frequencies of responses to the demographic questions are included in the report to respondents for this survey (Ratz and Schuster, 2011).

Definition of “Connection”

There were nine questions that addressed respondents’ perceptions of how “connection” is defined within the context of what the FWS is trying to achieve through its mission to connect people with the environment. Respondents were asked to use a 6-point scale to rate the level of relevance for nine statements regarding possible outcomes of connecting people with the environment. All survey respondents were asked these questions. Although these questions are provided in Appendix 1 to this report, we list them again in table 4 for the ease of the reader.

We conducted a repeated measures analysis of variance (ANOVA) to compare the ratings of relevance for these nine questions. We included the involved/not involved variable, gender, and region as between-subjects variables. Responses were included only if respondents answered all of the questions included in the analysis. In this case, the data from 303 respondents were included in the analysis. We used a conservative approach to the analysis by using the Bonferroni adjustment for post-hoc multiple comparisons and the Greenhouse-Geisser correction to degrees of freedom.

Table 4. Content of questions regarding definition of “connection.”

Question	Text
Q9a	The FWS wants young people to be interested in conservation and wildlife management careers.
Q9b	The FWS wants more people to participate in outdoor recreation activities such as fishing and hiking.
Q9c	The FWS wants people to have a feeling of appreciation for public lands.
Q9d	The FWS wants people to be concerned about the preservation of public lands.
Q9e	The FWS wants more people to participate in agency-sponsored outdoor education programming - for example, higher participation rates in fishing derbies.
Q9f	The FWS wants more people to politically support, through voting and lobbying, issues of importance to public lands.
Q9g	The FWS wants more people to be knowledgeable about the environment, including about issues such as climate change and about specific plant and animal species.
Q9h	The FWS wants people to have more health benefits, such as physical fitness, from outdoor activities.
Q9i	The FWS wants to provide more educational support to schools to improve environmental education.

The results indicated that the different outcomes described in the questions are rated at different levels of relevance to the FWS mission: $F(5.89, 1,577.93) = 50.11, p < 0.05$. The effect size—eta squared (η^2) is a measure of effect size used with ANOVA—was medium, $\eta^2 = 0.17$. The post-hoc analyses indicated numerous significant differences among the responses to these questions. All of the significant differences are reported in table 2-9 in Appendix 2. There are several notable findings from the post-hoc analysis. First, the questions regarding interest in conservation and wildlife management careers (Q9a), feeling of appreciation for public lands (Q9c), concern about the preservation of public lands (Q9d), and knowledge about the environment (Q9g) are not significantly different from each other. These are the questions that received the highest average ratings of relevance to the aspect of the mission of the FWS that relates to connecting people with nature. Question Q9h, regarding health benefits, is the question that received the lowest rating, and was significantly different from all but one other question (Q9e). The average responses and the 95 percent confidence intervals for these questions are provided in figure 1.

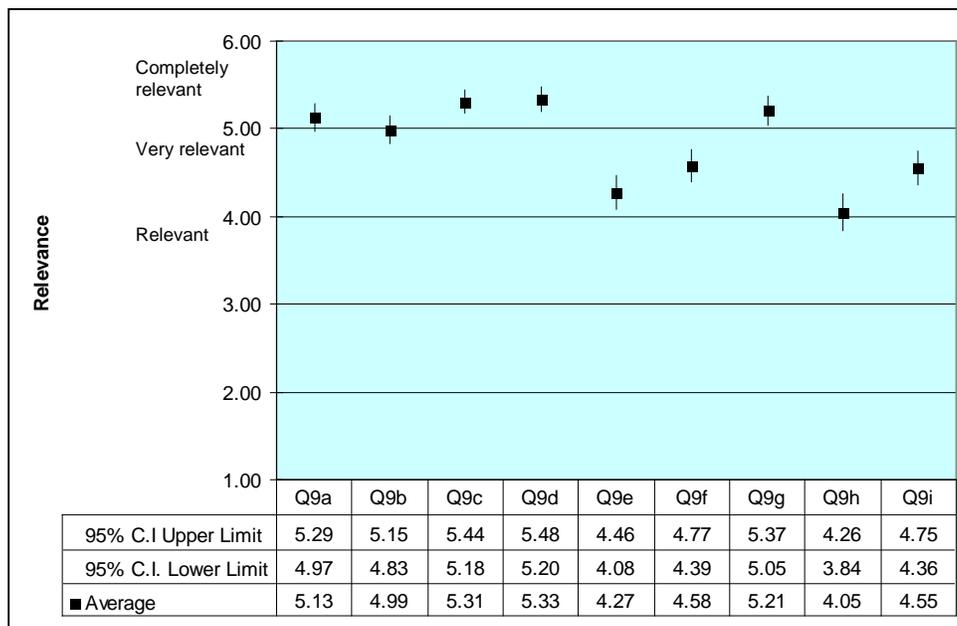


Figure 1. Average responses with 95-percent confidence intervals (C.I.) to questions regarding definition of “connection.”

The involved/not involved and gender variables did not have significant main effects or interactive effects on the responses to these questions. There was a significant main effect for regional affiliation: $F(8, 268) = 3.33, p < 0.05, \eta^2 = 0.08$. An eta-squared of this size is considered to be a medium effect (Morgan and others, 2001). The post-hoc analysis for the regional main effect indicated that the average rating for these questions was lower for respondents from region 1 (4.4) than respondents from region 9 (5.15).

As part of the nonresponse bias check that is discussed in Appendix 2, we conducted analyses to determine if there were differences in the responses to the questions between early and late responders to the survey. We did find a small effect between early and late responders for Q9b. The ANOVA for Q9b was significant: $n = 238, F(1, 237) = 6.07$. The effect size was small, $\eta^2 = 0.03$. The average response on this question for late responders was 4.9 and for early responders was 5.2.

Perceived Success with Outreach Efforts

There were four questions that asked respondents to rate the perceived success of past and future efforts at connecting children with nature. They were asked to make these ratings for themselves and for the FWS. We conducted a repeated measures ANOVA to compare the ratings of perceived success for these four questions. We included gender and region as between-subjects variables. The involved/not involved variable was not included in this analysis because those who were designated as “not involved” were not asked these questions. Responses were included only if respondents answered all four questions and provided an answer when asked to identify their gender and region. In this case, the data from 219 respondents were included in the analysis. We used a conservative approach to the analysis by using the Bonferroni adjustment for post-hoc multiple comparisons and the Greenhouse-Geisser correction to degrees of freedom.

The results indicated that there were significant differences in the ratings of success: $F(2.28, 458.29) = 55.84, p < 0.05, \eta^2 = 0.20$, with a medium effect size. The average responses and 95 percent confidence intervals for these four questions are depicted in figure 2. The response to the question regarding the success of the FWS in the past (Q10c) is significantly lower than the responses to the other three questions. In addition, the average responses to the questions about perceived future success for the self (Q10b) and for the FWS (Q10d) are significantly different from each other. One’s own future efforts at connecting children with nature were perceived to be more successful than the agency’s future efforts. The main effect for gender was also significant: $F(1, 201) = 4.0, p < 0.05$, but with a small effect size, $\eta^2 = 0.02$. Overall, the average responses provided to these questions were higher from females (3.96) than from males (3.71).

The interaction between regional affiliation and responses to these questions was significant: $F(18.24, 458.29) = 1.79, \eta^2 = 0.05$. An effect of this size is between the standard values of what is considered a small and a medium effect size (Morgan and others, 2001). This significant interaction suggests that the responses by region were different for different questions. We conducted follow-up analyses to determine the nature of this interaction. We conducted univariate ANOVAs for each question separately with region as a between-subjects variable. There were no significant regional differences for Q10a (self – past). There was a significant effect for region on the responses to Q10b (self – future): $F(8, 218) = 2.63, \eta^2 = 0.09$. Post-hoc comparisons determined that the average response to this question from respondents in region 9 (3.63) was significantly lower than the average response from respondents in regions 3 (4.72) and 4 (4.61). There was a significant effect for region on the responses to Q10c (FWS – past): $F(8, 218) = 2.43, \eta^2 = 0.08$. Post-hoc comparisons indicated that the average response to this question from respondents in region 9 (2.74) was significantly lower than the average response from respondents in region 5 (3.61). There was also a significant effect for region on the responses to Q10d

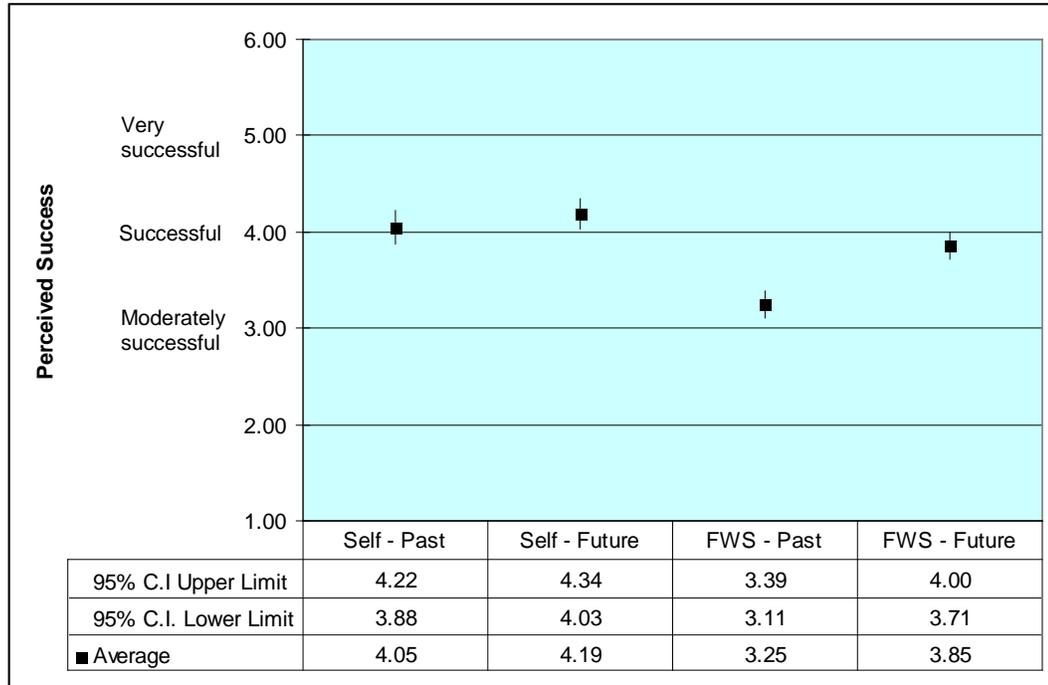


Figure 2. Average responses with 95-percent confidence intervals (C.I.) for ratings of perceived success with outreach efforts.

(FWS – future): $F(8, 218) = 2.50, \eta^2 = 0.08$. Post-hoc comparisons determined that the average response to this question from respondents in region 6 (3.38) was significantly lower than the average response from respondents in region 4 (4.39). The effect sizes for these three analyses are considered medium in size.

Similar to the difference between early and late responders that was found for the interpretation of FWS mission questions, there was a difference between early and late responders for Q10d. The ANOVA for Q10d was significant: $n = 170, F(1, 169) = 4.43, \eta^2 = 0.03$. The average response on this question for late responders was 3.8 and for early responders was 4.1. This effect is discussed in Appendix 2.

Constraints

Within the concept of constraints, we identified which constraints were perceived as creating problems in connecting children with nature and what attributions FWS employees made regarding these constraints. Only the respondents who were identified as “involved” in connecting children with nature based on their responses to questions in the introductory section of the survey were asked the questions regarding constraints.

The survey used two approaches to measure the severity of the difficulties created by constraints to connecting children with nature. First, respondents were asked to select the one constraint from the list of ten that created the biggest problem in trying to connect children with nature. Second, respondents were asked to rate “how big” a problem was created by each of the ten constraints.

When respondents were asked to indicate which one constraint created the biggest problem, 26 of them selected an “other” option. A total of 203 respondents selected one of the ten constraints on the list. If all of the constraints were equal in the extent of problem that they created, then we would expect that the constraints would have been selected as creating the biggest problem with equal frequencies. Given that there were 203 responses to this question and 10 possible response options, we would expect that each

constraint would have been chosen 20.3 times. We conducted a chi-square test to determine if the observed frequencies differed from the expected frequency (20.3). The chi-square test was significant ($X^2 = 64.34, 9 \text{ d.f.}, p < 0.05$) which indicated that the observed and expected frequencies were different. The observed and expected frequencies for the ten constraints are depicted in figure 3.

The analyses of the questions addressing the individual constraints were conducted in two phases. In the first phase, we analyzed the response to the question for each of the ten constraints that asked respondents to rate the extent to which the constraint created a problem. These questions were asked of all “involved” respondents. We compared the responses to this question across the ten constraints. In the second phase, we analyzed the attribution questions asked when respondents indicated that a constraint was a problem by selecting a response at the mid-point of the response scale or higher.

To compare the ratings of how big a problem was created by each constraint, we conducted a repeated measures ANOVA. We included gender and region as between-subjects variables. Responses were included only if respondents answered all ten questions and provided answers when asked to identify their gender and region. In this case, the data from 223 respondents were included in the analysis. We used a conservative approach to the analysis by using the Bonferroni adjustment for post-hoc multiple comparisons and the Greenhouse-Geisser correction to degrees of freedom.

The results of the analysis indicated a significant main effect for the difference in the rating of the extent of the problem across the different constraints: $F(6.83, 1,399.58) = 29.95, p < 0.05, \eta^2 = 0.12$. This is considered a medium effect size. Gender and region did not affect the responses to the ratings of the ten constraints. The average responses for the extent of each problem with a 95 percent confidence interval are provided in figure 4.

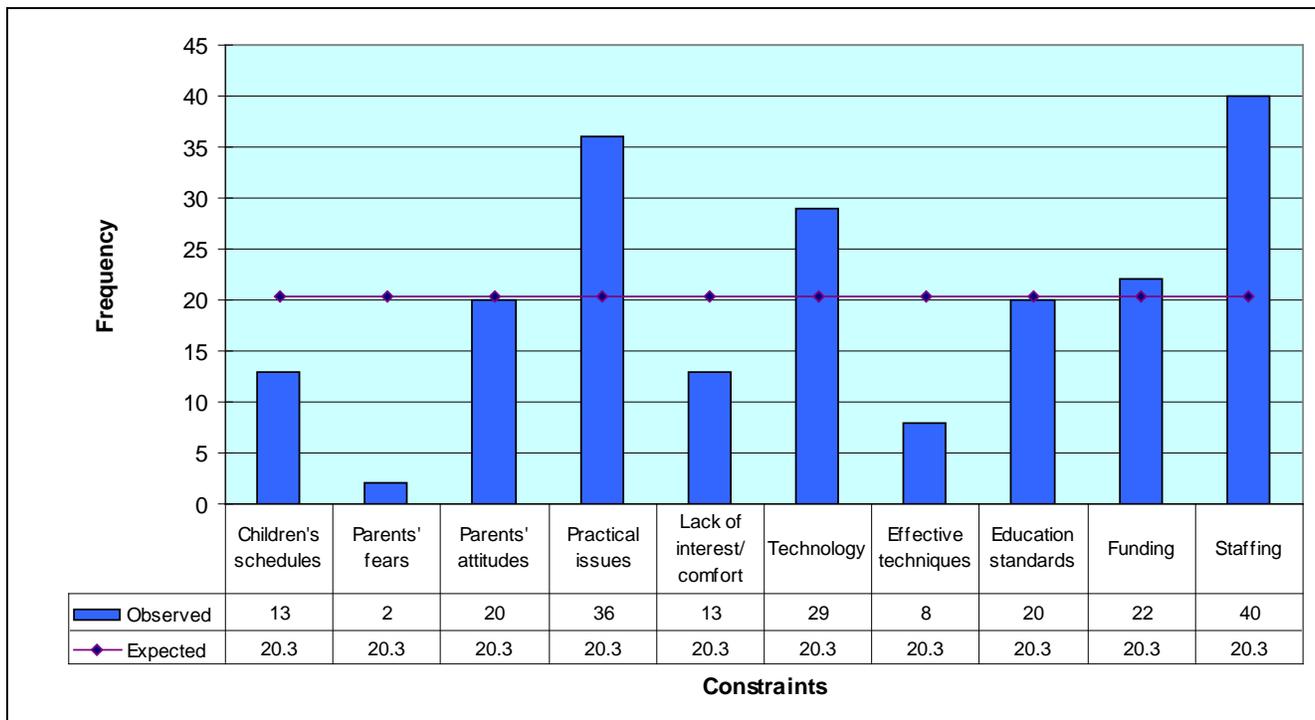


Figure 3. Observed and expected frequencies of the constraints creating the “biggest problem” in connecting children with nature.

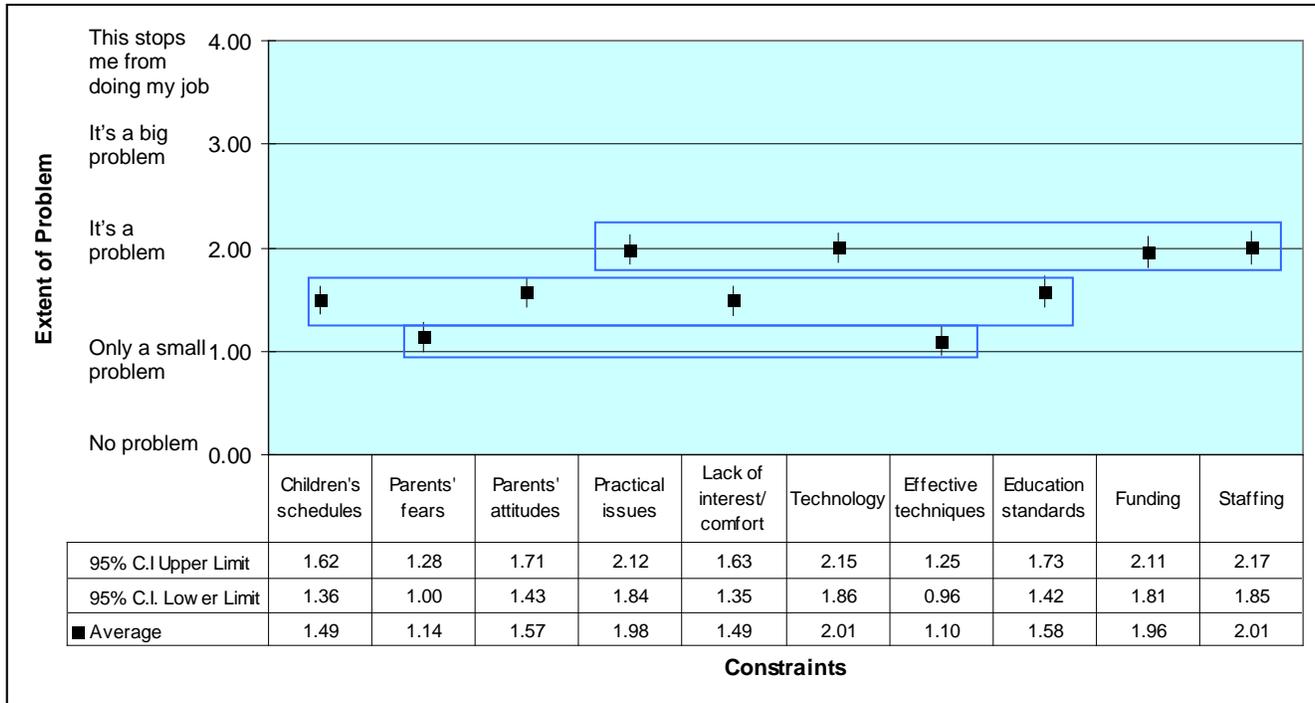


Figure 4. Average responses with 95-percent confidence intervals (C.I.) for ratings of problems caused by constraints. Boxes around averages indicate that those averages are not significantly different from each other.

Follow-up analyses to the main effect indicated the constraints fell into three hierarchical groups based on the significant differences between the averages of the “extent of problem” ratings of the constraints. These groups were comprised of constraints that were not significantly different from each other but that were significantly different from the constraints in the other groups. Practical issues, competition from technology, funding issues and staffing issues were the constraints that posed the biggest problems. Children’s schedules, parents’ attitudes, children’s lack of interest in and comfort with the outdoors, and state education standards and lack of environmental curriculum were the constraints included in the second group. Parents’ fears and lack of knowledge regarding effective techniques for connecting children with nature were the two constraints that were viewed as posing only a small problem.

The question asking respondents to rate the extent of the problem caused by staffing issues (Q21) demonstrated a difference in average response between the early and late responders. The ANOVA for Q21 was significant: $n = 171$, $F(1, 170) = 4.46$, $\eta^2 = 0.03$. Late responders perceived staffing problems as creating a larger problem than did the early responders. The average response on this question for late responders was 2.3 and for early responders was 1.9.

When respondents indicated that a constraint was a problem with a rating of at least “2 – It’s a problem” they were directed to a series of four follow-up questions that addressed their perceptions of the cause of those constraints. The questions addressed the attributional characteristics of stability, controllability, and locus of causality. The average responses for the attribution questions for all of the constraints are listed in table 5. Respondents were asked a single question regarding stability of each constraint; the response to this question was averaged across respondents. There were two questions that addressed controllability which were averaged to form a single measure of controllability for each respondent as described in Appendix 2. This measure of controllability was averaged across respondents. Respondents were asked a single question regarding locus of causality for each constraint; the response to this question was averaged across respondents.

Table 5. Descriptions and average responses for questions regarding stability, controllability, and locus of causality

Constraint	Stability	Controllability	Locus of Causality
Children's schedules	Likely to get worse average = -1.9 (n = 109)	Low average = 1.0 (n = 108)	External average = 0.8 (n = 108)
Parents' fears	Slightly likely to get worse average = -1.3 (n = 80)	Medium average = 2.0 (n = 80)	External average = 0.5 (n = 79)
Parents' attitudes	Slightly likely to get worse average = -0.7 (n = 125)	Medium average = 2.2 (n = 124)	External average = 0.8 (n = 124)
Practical issues	Slightly likely to get worse average = -1.2 (n = 164)	Low-Medium average = 1.5 (n = 164)	External average = 0.7 (n = 162)
Lack of interest/comfort	Slightly likely to get worse average = -1.4 (n = 99)	Medium average = 2.1 (n = 99)	External average = 0.7 (n = 98)
Technology	Will get worse average = -2.5 (n = 159)	Low average = 1.3 (n = 156)	External average = 0.6 (n = 156)
Effective techniques	Slightly likely to improve average = 0.6 (n = 86)	Medium average = 2.2 (n = 85)	External average = 1.3 (n = 85)
Education standards	Slightly likely to get worse average = -0.6 (n = 121)	Low average = 1.1 (n = 121)	External average = 0.5 (n = 119)
Funding	Slightly likely to get worse average = -1.3 (n = 157)	Low average = 1.2 (n = 156)	External average = 0.6 (n = 156)
Staffing	Slightly likely to get worse average = -1.2 (n = 156)	Low average = 0.8 (n = 153)	External average = 0.4 (n = 153)

Note: Cells within a column that are the same color indicate the value for those constraints are in the same category or level.

Because respondents were asked these questions only if they indicated the constraint was a problem, the number of respondents to these questions varied for each constraint. In addition, respondents did not necessarily answer all of the attribution questions that they were asked. The number of respondents on which the average is based (n) is provided in the table. We included a verbal description based on scale anchors to characterize the average responses.

A series of t-tests was conducted on the averages for the attribution questions. We compared the average responses to the questions regarding stability to a value of zero. These tests determined if the responses indicated that the constraints were stable (not different from zero) or unstable (different from zero). The results indicated that the averages for all the ratings of stability were different from zero at $p < 0.005$. We adjusted the level of significance to account for the multiple tests. The constraints were all perceived as being unstable.

A similar series of t-tests was conducted to compare the average response to the control questions for each constraint to a value of zero. These tests determined if the responses indicated that the constraints were controllable (not different from zero) or not controllable (different from zero). The results indicated that the averages for all the ratings of controllability were different from zero at $p < 0.005$. The constraints were all perceived as being controllable, but respondents perceived that they have only low to medium levels of control over these constraints.

Finally, we conducted two series of t-tests on the average ratings of locus of causality. In the first series, we compared the average response to the locus questions to a value of zero. This comparison

determined if the responses indicated that the constraints were completely external (not different from zero) or not completely external (different from zero). The results indicated that the averages for all the ratings of locus were different from zero at $p < 0.005$. All of the averages for ratings of locus were less than two (the mid-point of the scale). In the second series, we compared the average response to the locus questions to a value of two. This comparison determined if the responses indicated that the constraints were judged to be closer to the internal/external mid-point of the scale (not different from two) or closer to the external anchor (different from two). The results indicated that the averages for all the ratings of locus were different from two at $p < 0.005$. These results indicate that all of the constraints were perceived to be external in origin.

Importance to the FWS of Connecting Children with Nature

The questions regarding respondents' attitudes toward the importance to the FWS of connecting children with nature were combined into a subscale. The first five questions in that subscale were averaged to create a subscale score. The development of the subscale is discussed in Appendix 2. The last two questions in this section of survey questions were different in content than the five questions included on the subscale and were each treated separately in the data analyses. One of these questions addressed whether the FWS dedicated adequate resources to efforts to connect children with nature. The second question addressed whether the FWS recognizes and rewards efforts to connect children with nature. All survey respondents were asked these questions.

We conducted an ANOVA with gender, region, and the involved/not involved designation as between-subjects variables to identify any differences in the "importance" subscale based on these characteristics ($n = 257$). There were no significant effects for either gender or region. This indicates that the attitudes regarding the importance of connecting children with nature are consistent across regions and between females and males. There was a difference between those involved and not involved in outreach activities. The average perception of the importance to the FWS of connecting children with nature for those involved in outreach was higher (4.6) than for those not involved (4.3): $F(1, 222) = 11.32, p < 0.05, \eta^2 = 0.05$. This is a small difference between these two groups. The overall average subscale score was 4.5 on a 5-point scale. This average falls between the scale anchors of "slightly agree" (4) and "strongly agree" (5).

We conducted an ANOVA with gender, region, and the involved/not involved designation as between-subjects variables to identify any differences in the responses to the question regarding whether the FWS dedicated adequate resources to connecting children with nature (Q23f) based on these characteristics ($n = 311$). The overall average response to this question was 2.3 on a 5-point scale. This average is just above the scale anchor of "slightly disagree" (2). We used a conservative approach to comparing differences between groups based on either region or gender and used the Bonferroni adjustment to the degrees of freedom. The ANOVA indicated significant differences in the response to this question from respondents affiliated with different regions: $F(8, 276) = 2.12, p < 0.05, \eta^2 = 0.06$. This is considered a small effect size. However, given the conservative approach to multiple comparisons, none of the regional comparisons were statistically significant. The results also indicated significant differences in the response to this question between female and male respondents: $F(1, 276) = 4.45, p < 0.05, \eta^2 = 0.02$. The size of the difference is small. The average response to this question from females was 2.2 which is just above the "slightly disagree" scale anchor. The average response to this question from males was 2.6—between the scale anchors of "slightly disagree" and "neither agree nor disagree" (3). There were no differences in response to this question between the involved or not involved groups.

We used a similar approach to determine if there were any differences in the responses to the question regarding the FWS recognition and reward of efforts to connect children with nature. We conducted an ANOVA with gender, region, and the involved/not involved designation as between-subjects variables to identify any differences in the responses to this question (Q23g) based on these characteristics

(n = 311). There were no differences in responses between groups based on gender, region, or involved/not involved classification. The overall average response to this question was 3.1 on a 5-point scale. This average is just above the scale anchor of “neither agree nor disagree” (3).

Discussion

“The FWS needs to actually decide what its priorities are and then support them adequately. I think connecting people with nature is important, but we have not clearly defined what that means, what success looks like and how we reach that success.”—Survey Respondent. This quotation from a survey respondent highlights several of the key findings from this study. The results from the questions addressing what outcomes define connecting people with nature within the context of the FWS mission indicated that there are many different potential outcomes viewed as relevant to that mission. Although some of these outcomes were rated as more relevant than others, all of the nine outcomes—listed for reader convenience in table 4—were rated as relevant to the mission of the FWS. This could mean that the FWS is not clearly defining for its employees what is meant by the objective to connect people with nature as suggested by the survey respondent quoted. Alternatively, these responses could indicate that the FWS has embraced a multifaceted definition of connecting people with nature.

Connecting children with nature is viewed as important to the FWS both by those who are involved in education and outreach activities and those who are not involved in those activities. However, when importance is defined in tangible outcomes the overall results are less favorable. Respondents disagreed, albeit not strongly, that the FWS dedicates adequate resources (staffing, time, and materials) to efforts to connect children with nature.

The evidence regarding the extent of problems caused by the constraints consistently indicates that four of the ten identified constraints are more of a concern than the other six. Practical issues, competition from technology, funding issues and staffing issues were the constraints that posed the biggest problems. Two of these constraints—funding and staffing issues—are associated with adequate resources within the FWS. However, both of these constraints are themselves affected by forces outside the control of the FWS. For example, funding and staffing issues are affected by the FWS budget and the FWS budget is affected by the federal budget. The other two constraints—practical issues and competition from technology—are also dependent upon factors that originate outside of the FWS and are part of the contemporary culture of the U.S.

The constraint of practical issues includes cultural and societal forces that create barriers to connecting children with nature. Parents’ work schedules, distance to natural areas, and lack of transportation options are included in this constraint. The aspects of this constraint category originate outside the FWS and are issues over which the FWS has little control. Despite the lack of control, employees in the FWS are taking action to minimize the impact of practical issues in their endeavors to connect children with nature. For example, the Silvio O. Conte National Fish and Wildlife Refuge has created a mobile visitor center so that staff and partners can take their outreach and education efforts on the road (O’Brian, 2010).

Competition from technology is another constraint that the FWS is addressing. Recognizing that the use of technology is unlikely to decrease, the FWS has demonstrated through several programs that technology can be used as a tool to connect people with the environment. At the Montezuma National Wildlife Refuge, a cellphone audio tour has been created so that visitors can access interpretive and educational information via cellphones (Hodges, 2010). A geocaching program using small stuffed animals originated at Upper Mississippi National Wildlife and Fish Refuge and the online tracking indicates that the birds have been travelling across the country (Leggett, 2009).

When constraints are severe, performance decreases abruptly (Kane, 1997). None of the constraints were perceived by FWS employees to be severe. There are two indicators of this. First, the ratings of the extent of problems caused by the constraints indicate that none of the constraints were

perceived as creating substantial problems. The average ratings for all constraints were at the mid-point of the scale or lower. Second, the FWS employees believe their efforts at outreach have been successful and will be more successful in the future.

In addition to being viewed as posing mild problems, the constraints are viewed as unstable. This is positive because it indicates that the constraints can be changed. However, the controllability of the constraints by FWS employees is not high. Therefore, while the constraints can be changed, it may not be within the power of FWS employees to effect these changes.

The goal of this survey was to describe how FWS employees perceive the constraints that may impede greater success at connecting children with nature. The study provides the following contributions:

- The key findings based on the survey analyses indicate:
 - FWS employees believe they as individuals and the agency are successful now and will be more successful in the future in connecting children with nature.
 - FWS employees believe that multiple outcomes are relevant in different degrees to the FWS objective to connect people with the environment; these outcomes are varied and include appreciation for public lands, knowledge of the environment, and health benefits from outdoor activities.
 - FWS employees believe that connecting children with nature is important.
 - Constraints to connecting children with nature exist but are of low to moderate severity.
 - The constraints create a 3-level hierarchy based on the perceived severity of the constraints.
 - The constraints of greatest concern are practical issues (for example, parents' work schedules, distance to natural areas from children's residences, and lack of transportation options), competition from technology, funding issues and staffing issues.
 - The second tier of the hierarchy includes constraints of lesser concern: children's schedules (for example, school schedules, homework, other activities, lack of free time), parents' attitudes (non-fear related) and lack of information about the outdoors, children's lack of interest and lack of comfort in the outdoors, and state educational standards and lack of an environmental education curriculum.
 - The lowest tier of the hierarchy that includes the constraints of least concern contains parents' fears (for example, of strangers, or of wildlife) and lack of information about the most effective techniques to connect children with nature.
- The results of this survey provide baseline information for understanding progress in success and perceptions of constraints. Questions from this survey can be used again in future surveys to assess progress.

This survey was not sufficiently detailed to permit additional conclusions regarding the constraints. However, a hierarchy of constraints has been established with the evidence from this survey consistently indicating that four of the constraints were of greater concern than the others. These findings can be used to focus future information collection, discussion, and planning on the constraints of greater consequence.

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Appendix 1—Survey Questions

In table 1-1, we provide the subscales created in the survey development process with the text of the question and the question number. The questions are provided verbatim. In a separate report—the report to respondents for this survey project—we provide the response scales, frequency of responses and averages (Ratz and Schuster, 2011).

Table 1-1. Survey subscales, questions, and question numbers.

Subscale name	Question number	Question text
Screening and background		
	Q1	As part of your job, do you perform any conservation education, environmental education, or community outreach activities targeted toward children?
	Q2	In an average week, approximately what percentage of your time is spent doing these conservation education, environmental education, or community outreach activities? Please consider all aspects of accomplishing this task (including preparation time, report writing, travel, etc.)
	Q3	Which of the following statements best describes your current situation?
	Q4	What is the primary reason you do not perform education and outreach activities?
	Q5	What is the primary reason you perform education and outreach activities even though they are not required by your job?
	Q6	As part of your job, do you make decisions about the following aspects of conservation or environmental education or outreach programming:
	Q6a	Allocation of funding?
	Q6b	Allocation of staff time?
	Q6c	Content of programming?
	Q6d	Implementation of programming?
	Q6e	Other option not listed [open-ended response]
	Q7	In your job, do you supervise anyone (including employees, contractors, or volunteers) who performs conservation or environmental education or outreach programming?
	Q8	Outside of your job with the FWS, do you volunteer in conservation or environmental education related activities?
Definition of Connection		
	Q9a	The FWS wants young people to be interested in conservation and wildlife management careers.
	Q9b	The FWS wants more people to participate in outdoor recreation activities such as fishing and hiking.
	Q9c	The FWS wants people to have a feeling of appreciation for public lands.
	Q9d	The FWS wants people to be concerned about the preservation of public lands.
	Q9e	The FWS wants more people to participate in agency-sponsored outdoor education programming - for example, higher participation rates in fishing derbies.
	Q9f	The FWS wants more people to politically support, through voting and lobbying, issues of importance to public lands.
	Q9g	The FWS wants more people to be knowledgeable about the environment, including about issues such as climate change and about specific plant and animal species.

	Q9h	The FWS wants people to have more health benefits, such as physical fitness, from outdoor activities.
	Q9i	The FWS wants to provide more educational support to schools to improve environmental education.
Perceived success with outreach		
	Q10a	How successful have your past efforts been at connecting children with nature?
	Q10b	How successful do you believe your future efforts at connecting children with nature will be?
	Q10c	How successfully has the Service performed as an agency in their past efforts to connect children with nature?
	Q10d	How successful do you believe the agency's future efforts at connecting children with nature will be?
Perceptions of constraints		
	Q11	Which of the following creates the biggest problem in trying to connect children with nature? (select one)
Children's scheduling	Q12	How big a problem do children's scheduling issues (homework, other activities, lack of free time) create in your efforts to connect children with nature?
Children's scheduling Stability	Q12a	How will children's scheduling issues change over the next 5 years?
Children's scheduling Controllability	Q12b	How likely is it that you personally could do something to actually change children's schedules?
Children's scheduling Controllability	Q12c	How likely is it that you can indirectly influence the state of children's schedules?
Children's scheduling Locus	Q12d	How much of children's scheduling issues is because of you (internal) or because of others (external)? In other words, is the source of children's scheduling issues internal (a characteristic of you) or external (a characteristic of others)?
Parents' fears	Q13	How much of a problem do <u>parents' fears</u> create in your efforts to connect children with nature?
Parents' fears Stability	Q13a	How will parents' fears change over the next 5 years?
Parents' fears Controllability	Q13b	How likely is it that you personally could do something to directly change parents' fears?
Parents' fears Controllability	Q13c	How likely is it that you can indirectly influence the state of parents' fears?
Parents' fears Locus	Q13d	How much of parents' fears is because of you (internal) or because of others (external)? In other words, is the source of parents' fears internal (a characteristic of you) or external (a characteristic of others)?
Parents' attitudes	Q14	How much of a problem do <u>parents' attitudes (non-fear related) and lack of information</u> about the outdoors create in your efforts to connect children with nature?
Parents' attitudes Stability	Q14a	How will parents' attitudes and lack of information change over the next 5 years?
Parents' attitudes Controllability	Q14b	How likely is it that you personally could do something to directly change parents' attitudes and lack of information?
Parents' attitudes Controllability	Q14c	How likely is it that you can indirectly influence the state of parents' attitudes and lack of information?
Parents' attitudes Locus	Q14d	How much of parents' attitudes and lack of information is because of you (internal) or because of others (external)? In other words, is the source of parents' attitudes and lack of information internal (a characteristic of you) or external (a characteristic of others)?

Practical issues	Q15	How much of a problem do <u>practical issues</u> (for example, parents' work schedules, distance to natural areas from children's residences, and lack of transportation options) create in your efforts to connect children with nature?
Practical issues Stability	Q15a	How will practical issues change over the next 5 years?
Practical issues Controllability	Q15b	How likely is it that you personally could do something to directly change these practical issues?
Practical issues Controllability	Q15c	How likely is it that you can indirectly influence the state of these practical issues?
Practical issues Locus	Q15d	How much of practical issues as defined above are a because of you (internal) or because of others (external)? In other words, is the source of practical issues internal (a characteristic of you) or external (a characteristic of others)?
Children's lack of interest/comfort	Q16	How much of a problem do <u>children's lack of interest and lack of comfort</u> in the outdoors create in your efforts to connect children with nature?
Children's lack of interest/comfort Stability	Q16a	How will children's lack of interest and lack of comfort in the outdoors change over the next 5 years?
Children's lack of interest/comfort Controllability	Q16b	How likely is it that you personally could do something to directly change children's lack of interest and lack of comfort in the outdoors?
Children's lack of interest/comfort Controllability	Q16c	How likely is it that you can indirectly influence the state of children's lack of interest and lack of comfort in the outdoors?
Children's lack of interest/comfort Locus	Q16d	How much of children's lack of interest and lack of comfort in the outdoors is because of you (internal) or because of others (external)? In other words, is the source of children's lack of interest and lack of comfort in the outdoors internal (a characteristic of you) or external (a characteristic of others)?
Competition from technology	Q17	How much of a problem does <u>competition from technology and technology-based activities</u> create in your efforts to connect children with nature?
Competition from technology Stability	Q17a	How will competition from technology change over the next 5 years?
Competition from technology Controllability	Q17b	How likely is it that you personally could do something to directly change competition from technology?
Competition from technology Controllability	Q17c	How likely is it that you can indirectly influence the state of competition from technology?
Competition from technology Locus	Q17d	How much of competition from technology is because of you (internal) or because of others (external)? In other words, is the source of competition from technology internal (a characteristic of you) or external (a characteristic of others)?
Effective techniques	Q18	How much of a problem does <u>lack of information about the most effective techniques</u> to connect children with nature create in your efforts to connect children with nature?
Effective techniques Stability	Q18a	How will lack of information about the most effective techniques change over the next 5 years?
Effective techniques Controllability	Q18b	How likely is it that you personally could do something to directly change lack of information about the most effective techniques?
Effective techniques Controllability	Q18c	How likely is it that you can indirectly influence the state of lack of information about the most effective techniques?
Effective techniques Locus	Q18d	How much of lack of information about the most effective techniques is because of you (internal) or because of others (external)? In other words, is the source of lack of information about the most effective techniques internal (a characteristic of you) or external (a characteristic of others)?

State educational standards	Q19	How much of a problem do <u>state educational standards and environmental curriculum</u> create in your efforts to connect children with nature?
State educational standards Stability	Q19a	How will state educational standards and environmental curriculum change over the next 5 years?
State educational standards Controllability	Q19b	How likely is it that you personally could do something to directly change state educational standards and environmental curriculum?
State educational standards Controllability	Q19c	How likely is it that you can indirectly influence the state of state educational standards and environmental curriculum?
State educational standards Locus	Q19d	How much of state educational standards and environmental curriculum is because of you (internal) or because of others (external)? In other words, is the source of state educational standards and environmental curriculum internal (a characteristic of you) or external (a characteristic of others)?
Funding	Q20	How much of a problem does <u>funding</u> for programs create in your efforts to connect children with nature?
Funding Stability	Q20a	How will funding for programs change over the next 5 years?
Funding Controllability	Q20b	How likely is it that you personally could do something to directly change funding for programs?
Funding Controllability	Q20c	How likely is it that you can indirectly influence the state of funding for programs?
Funding Locus	Q20d	How much of funding is because of you (internal) or because of others (external)? In other words, is the source of funding internal (a characteristic of you) or external (a characteristic of others)?
Lack of staffing	Q21	How much of a problem does <u>lack of staffing</u> create in your efforts to connect children with nature?
Lack of staffing Stability	Q21a	How will lack of staffing change over the next 5 years?
Lack of staffing Controllability	Q21b	How likely is it that you personally could do something to directly change lack of staffing?
Lack of staffing Controllability	Q21c	How likely is it that you can indirectly influence the state of lack of staffing?
Lack of staffing Locus	Q21d	How much of lack of staffing is because of you (internal) or because of others (external)? In other words, is the source of lack of staffing internal (a characteristic of you) or external (a characteristic of others)?
	Q22	If there are other <u>major</u> factors not addressed in this survey that have a large effect on preventing greater success at connecting children with nature, please name them here: [open-ended response]
Attitudes		
	Q23a	Connecting children with nature is important to the future of the Fish and Wildlife Service.
	Q23b	Conservation and environmental education outreach activities are important to achieving the overall mission of the FWS.
	Q23c	Emphasis on connecting children with nature is not consistent with the position of "Wildlife first." (R)
	Q23d	Connecting children with nature should not be a concern of the Fish and Wildlife Service. (R)
	Q23e	The goal of connecting children with nature should be given higher priority within the Fish and Wildlife Service.
	Q23f	The Fish and Wildlife Service dedicates adequate resources (staffing, time, materials) to efforts to connect children with nature.
	Q23g	The Fish and Wildlife Service recognizes and rewards efforts to connect children with nature.

Demographics		
Q24	What is your employment status with the Fish and Wildlife Service?	
Q25	What is your gender?	
Q26	How long have you worked for the U.S. Fish and Wildlife Service?	
Q27	How long have you worked at your current duty station?	
Q28	How long have you worked in your current position?	
Q29	In which region is your duty station?	
Q30	What is your WG/GS/GM level?	
Q31	Do you subscribe to the VOICES listserv?	
Q32	What is the numerical code for your Job Series? (examples: 401, 023, 1713)	

Note: (R) indicates a response that was reverse-scored when combined with other responses to create a scale.

The list of 146 constraints to connecting people with nature are listed in table 1-2.

Table 1-2. Original list of constraints to connecting people with nature.

Barrier to adult participation - Lack of companionship for outdoor activities
Barrier to adult participation - Lack of energy after work and other responsibilities
Barrier to adult participation - Lack of experience
Barrier to adult participation - Lack of free time
Barrier to adult participation - Lack of interest; Some outdoor activities distasteful, such as killing fish or animals (fishing/hunting)
Barrier to adult participation - Lack of knowledge, don't know what the rules are (for example, fishing regulations etc.)
Barrier to adult participation - Lack of proper equipment
Barrier to adult participation - Lack of value for outdoor experiences.
Barrier to child participation - Amount of homework
Barrier to child participation - Transportation issues, Distance to travel to reach natural location, and lack of transportation options.
Barrier to child participation - Lack of comfort outdoors
Barrier to child participation - Lack of companionship for outdoor activities
Barrier to child participation - Lack of free play
Barrier to child participation - Lack of free time
Barrier to child participation - Parents' desire to have children in structured, supervised activities
Barrier to child participation - Parents don't know how to overcome barriers they face in connecting their children to the environment.
Barrier to child participation - Parents' fear of the unknown; the outdoors is unpredictable
Barrier to child participation - Parents' fears - health issues caused by pollution
Barrier to child participation - Parents' fears - if outdoor activities are part of school day, sick kids sent to school will get sicker
Barrier to child participation - Parents' fears - lack of supervision for children outdoors
Barrier to child participation - Parents' fears - safety - crime
Barrier to child participation - Parents' fears - safety - getting lost
Barrier to child participation - Parents' fears - safety - stranger danger
Barrier to child participation - Parents' fears - safety - the built environment (traffic, lack of sidewalks on way to parks)
Barrier to child participation - Parents' fears - safety - weather (sunburn, storms, etc.)
Barrier to child participation - Parents' fears - safety - wildlife (ticks, West Nile, animal attacks, etc.)
Barrier to child participation - Parents give in to children's wishes for other activities
Barrier to child participation - Parent's ignorance of outdoors (for example don't know bird names etc.)
Barrier to child participation - Parents think kids won't have fun.
Barrier to child participation - Parents want guarantees of child safety in program
Barrier to child participation - Parents' work schedule/ lack of parents' free time
Barrier to child participation - Peer pressure.
Barrier to child participation - Pressure to achieve affects activity choices

Barrier to child participation - Schedule of structured activities/ organized sports

Barrier to child participation - Use of and preference for technology (television, computer, video games etc.)

Community issue - Built environment - Lack of knowledge among community officials regarding importance of and how to achieve smart growth communities

Community issue - Built environment - Lack of physical connectivity or transportation between residential areas and outdoor spaces; Community design and infrastructure do not facilitate connections with nature

Community issue - Built environment - Light pollution means you can't see the night sky.

Community issue - Built environment - Patterns of development

Community issue - Built environment - Zoning issues and community planning; Zoning ordinances and development that encourage sprawl

Community issue - Lack of funding for community infrastructure (bikeways, pedestrian walkways) and equipment

Community issue - Lack of information for newcomers to a community on where to go for a walk etc.

Community issue - Built environment - Lack of understanding of environmental issues by residential and commercial builders.

Community issue - Built environment - Loss of open space; Planning requirements restrict open space; Some vacant, open spaces are not usable and not interesting

Community issue - Built environment - Places in urban areas are underutilized

Community issue - School system - Lack of adult volunteers for outdoor field trips

Community issue - School system - Lack of community based outdoor classrooms for schools and teachers to utilize

Community issue - School system - Lack of funding for environmental programming (buses, program costs) and equipment

Community issue - School system - Less funding for school playgrounds and field trips

Community issue - School system - Perception that going outside is unhealthy - temperature (cutoff is higher for keeping kids inside at school)

Community issue - School system - Schools put restrictions on field trips, cost, insurance, transportation and locations

Concerned Professionals/ Movement - A one-time experience will not have an effect; interaction with nature is difficult to sustain.

Concerned Professionals/ Movement - Multiple audiences to address in programming (children, parents, educators, communities, health professionals), Different programs appropriate for different age groups; time and effort required to customize for each group

Concerned Professionals/ Movement - Difficulty communicating how benefits to being outdoors outweigh the risks; includes difficulty in communicating to multiple audiences.

Concerned Professionals/ Movement - Difficulty in coordinating within and between agencies and organizations; Lack of collaboration among environmental groups and government agencies; lack of communication with other groups working toward same goal

Concerned Professionals/ Movement - Difficulty in organizations finding their niche in addressing the issues of connecting children and the environment

Concerned Professionals/ Movement - Divisions within the Environmental/Natural Resource community

Concerned Professionals/ Movement - Easier to talk about connecting children with nature than to actually do it.

Concerned Professionals/ Movement - Focus on barriers is wrong focus, we should focus on solutions.

Concerned Professionals/ Movement - Focus on children, parents are included incidentally. Should be a focus on adults (parents, grandparents) too.

Concerned Professionals/ Movement - Focus on urban kids caused by assumption that rural kids don't face the same barriers to accessing the outdoors.

Concerned Professionals/ Movement - Funding of programs is based on academic improvement being a component

Concerned Professionals/ Movement - Lack of agency branding.

Concerned Professionals/ Movement - Lack of agreement about what counts as an outdoor activity (organized sports, or unstructured play only)

Concerned Professionals/ Movement - Lack of agreement about what indicators are most appropriate measures of success for connecting children and nature; Lack of understanding of what outcomes can actually be measured to determine success

Concerned Professionals/ Movement - Lack of agreement about what it means to connect children and nature.

Concerned Professionals/ Movement - Lack of collaboration/cooperation with health care community

Concerned Professionals/ Movement - Lack of connection between science education and nature.

Concerned Professionals/ Movement - Lack of environmental education volunteers; Drop in mentor participation

Concerned Professionals/ Movement - Lack of funding and staff support for programming.

Concerned Professionals/ Movement - Lack of infrastructure in movement

Concerned Professionals/ Movement - Lack of knowledge about how to make nature cool

Concerned Professionals/ Movement - Lack of knowledge of how to measure outcomes at community level.

Concerned Professionals/ Movement - Lack of mass communication strategy; Need for a marketing campaign about children and nature.

Concerned Professionals/ Movement - Lack of sufficient skills in employees to network effectively within and outside of their own organization - training needed.

Concerned Professionals/ Movement - Lack of understanding of how to get information out there about opportunities for outdoor activity

Concerned Professionals/ Movement - Multiple audiences to address in programming - English is not always 1st or most dominant language

Concerned Professionals/ Movement - Need for better political skills among environmental educators/advocates to address policy issues

Concerned Professionals/ Movement - Need for more information about what others are doing to avoid reinventing the wheel.

Concerned Professionals/ Movement - Need to educate community planners and designers

Concerned Professionals/ Movement - Need to identify policy barriers for agencies

Concerned Professionals/ Movement - Organization agendas and different levels and types of community power interfere with effective partnerships.

Concerned Professionals/ Movement - Outdoor experiences don't link with an understanding of how nature works

Concerned Professionals/ Movement - Research need: Lack of economic data about the "value" of play

Concerned Professionals/ Movement - Research need: Lack of knowledge about the dollar value and other benefits of open unmanaged space in developed areas; therefore difficulty in communicating this information

Concerned Professionals/ Movement - Research need: Lack of knowledge about how to determine if programming is having effect

Concerned Professionals/ Movement - Research need: Lack of knowledge/research on the child-nature connection.

Concerned Professionals/ Movement - Research need: Lack of research regarding comparative risk of outdoor activities and other everyday risks (riding in a car)

Concerned Professionals/ Movement - Research need: Lack of understanding of how cultural identities affect how children connect with nature; Lack of knowledge about how barriers vary among subpopulations (socioeconomic groups, racial/ethnic minority etc.)

Concerned Professionals/ Movement - Research need: Need for longitudinal studies to verify approaches

Concerned Professionals/ Movement - Research need: Need for more data connecting costs/benefits of outdoor activities

Concerned Professionals/ Movement - Research need: Need to identify gaps in research - what don't we understand?

Concerned Professionals/ Movement - Research need: What type of exposure to nature is needed to create minimum benefit?

Concerned Professionals/ Movement - We'd like to share best practices but we don't know what they are.

Cultural issue - Changing demographics - do current facilities meet the needs/ interests of emerging groups

Cultural issue - Children are not given responsibilities early enough and are therefore not learning to be responsible for their environment (indoors as well as outdoors)

Cultural issue - Kids are not observant in nature.

Cultural issue - Lack of parental concern that their children are not connecting with nature or spending time outdoors

Cultural issue - Lack of teaching the "sense of discovery" to children and adults

Cultural issue - Lack of understanding among general public about the importance of ecosystems to our health.

Cultural issue - Liability concerns on the part of parties legally responsible for parks and open space.

Cultural issue - Mobility limitations (use of crutches or wheelchairs) by children or parents reduce the accessibility of outdoor spaces.

Cultural issue - News media feeds fears.

Cultural issue - Outdoor access is restricted - stay on the trail; message is to be a part of the environment but be separate from it.

Cultural issue - Outdoor activities are goal-oriented (i.e., catch more fish) rather than experience oriented (enjoy fishing).

Cultural issue - Parents don't view themselves as competent and therefore they want society to be responsible for raising their children for example, schools are responsible for discipline

Cultural issue - Parents have unrealistic picture of actual risks of children being outside; unreasonable expectation that everything is preventable; Low tolerance for any risk by general public

Cultural issue - People who do participate in outdoor activities don't share resources nicely (bikers vs. hikers)

Cultural issue - Perception created by environmental organizations that the environment is on the verge of disaster makes outdoors less appealing.

Cultural issue - Perception that nature is a problem to be controlled.

Cultural issue - Perception that special equipment is needed to participate in outdoor activities

Cultural issue - Perception that you have to "go" to the environment, backyard doesn't count; Attitude that getting outdoors is not convenient.

Cultural issue - Presence of air conditioning affects choice of leisure activities.

Cultural issue - Respiratory illnesses such as asthma and allergies prevent children and adults from seeking and participating in outdoor experiences.

Cultural issue - Shift in culture - loss of farm/ranch culture

Cultural issue - Shift in culture - perceived fragility of children

Cultural issue - Television programming, for example, Animal Planet and Discovery Channel, are experienced as an alternative to going outdoors

Cultural issue - Those who do have outdoor experience are environmental elitists, snobs, purists.

Cultural issue - Values - Being outside isn't cool

Cultural issue - Values - Competitive nature of culture- emphasis on grades, class rank; how we define success

Cultural issue - Values - Current educational standards (which are limited).

Cultural issue - Values - Current society uncomfortable with solitude, silence and self-reflection.

Cultural issue - Values - Educational emphasis on standardized test achievement

Cultural issue - Values - Emphasis on satisfaction in the here and now; it's about "me today" not "us tomorrow"; Instant gratification

Cultural Issue - Values - Less family time spent together; Disconnect between children and parents

Cultural issue - Values - Materialistic society - people stay inside to enjoy the stuff they buy.

Educators - Lack of understanding of the importance of outdoor activity - recess is removed as punishment for bad behavior

Educators - Need to incorporate environmental education into teacher education programs and certifications; more education on connecting children with nature.

Educators - Reluctance to do outdoor programming because of difficulty in supervising children who are dispersed throughout an area

Educators - Teachers lack confidence and comfort in nature and being outdoors

Educators - Focused on teaching to the test

Environmental education in schools - curriculum does not focus on local environment (i.e., focus on Amazon rainforest and polar ice caps)

Environmental education in schools - Not integrated across curriculum or grade levels

Environmental education in schools - Perception that env. ed. is part of school, not part of life.

Environmental education in schools - Programs focus on how to connect with schools, not with children.

General environment - Backyards are not as interesting as they used to be.

Natural Resource professionals - Attitudes - I'm here to work with natural resources, not children.

Natural Resource professionals - Attitudes - It takes too much time to work with volunteers who could do programming.

Natural Resource professionals - Concern that more people in nature will harm nature (greater environmental impact); Fear of vandalism to footbridges/trails

Natural Resource professionals - Difficulty in seeing things from others' perspectives; skill in communicating with different audiences.

Natural Resource Professionals - Information overload for natural resource workers - a knowledge management issue; they need to know their area of natural resources plus about how to connect children and nature.

Natural Resource Professionals - Lack of funding for programming and for staff time to work on programming.

Natural Resource Professionals - Lack of sufficient skills in employees to implement programs; Lack of training on how to work with children and how to connect children with nature.

Natural Resource Professionals - Lack of time for natural resource workers to add in the task of working on connecting children with nature.

Natural Resource Professionals - Need more involvement of land management agencies in schools

Practical issues - Cost issues (fishing licenses, park fees, etc.)

Appendix 2—Survey Analyses

Survey Quality

When using a survey to collect information, five characteristics of the survey research project must be considered to judge the quality of the survey and determine to what extent the information from the survey can be used. The five characteristics are survey reliability, survey validity, statistical power, sample representativeness, and nonresponse bias. A detailed description of each of these characteristics is provided in this appendix.

Reliability

Reliability indicates the consistency of measurement (for more detail, see Murphy and Davidshofer, 1998). For any measurement instrument—such as a survey—to be useful, it must be reliable. Reliability is a necessary but not sufficient condition for validity, which is discussed in a subsequent section. For surveys, a common method to determine reliability is to calculate the internal consistency of the survey subscales. Internal consistency indicates whether all of the questions included on a subscale are measuring the same underlying characteristic. Before the internal consistency estimates can be calculated, the questions must be combined into their respective subscales.

Data Reduction and Scale Formation

As a starting point, we used the subscales as they were defined in the survey development process (provided in table 1-1 in Appendix 1). We calculated the internal consistency (Cronbach's alpha) and correlations between questions (interitem correlation) for each predetermined subscale. Using this information we determined whether the questions were appropriately grouped together as subscales. When necessary, we adjusted the subscales to create more reliable and coherent subscales. The revised subscales based on the data analysis are provided in this appendix, in table 2-1, with the list of survey questions included in each subscale. The final subscales assess: the interpretation of FWS mission with respect to connecting children and nature, perceived success with outreach efforts, the extent of the problems created by the constraints, the stability of the constraints, the controllability of the constraints, the locus of causality for the constraints, attitudes regarding the importance of connecting children and nature to the FWS, and attitudes regarding the material support the FWS commits to efforts to connect children and nature.

The questions included on the subscale measuring the interpretation of FWS mission asked respondents to indicate the relevance of nine statements with respect to how relevant each was to the FWS mission to connect people with the environment. All questions on the original subscale were retained. The level of internal consistency for this set of questions was acceptable. However, the value of the internal consistency estimate was less than 0.90 which indicates that, although these questions address similar issues, there is sufficient variability to indicate that the questions are not measuring a single aspect of the FWS mission.

Table 2-1. Description of final survey subscales.

Final subscale	Questions included	Internal Consistency (alpha)	How questions were combined
Interpretation of FWS mission	Q9a, Q9b, Q9c, Q9d, Q9e, Q9f, Q9g, Q9h, Q9i	.89	Not combined
Perceived success with outreach	Q10a, Q10b, Q10c, Q10d	.81	Not combined
Problem caused by constraint	Q12, Q13, Q14, Q15, Q16, Q17, Q18, Q19, Q20, Q21	.76	Not combined
Stability of constraint	Q12a, Q13a, Q14a, Q15a, Q16a, Q17a, Q18a, Q19a, Q20a, Q21a	.90	Not combined
Controllability of constraint	Q12b, Q12c, Q13b, Q13c, Q14b, Q14c, Q15b, Q15c, Q16b, Q16c, Q17b, Q17c, Q18b, Q18c, Q19b, Q19c, Q20b, Q20c, Q21b, Q21c	.93	Qb and Qc averaged within constraint
Locus of causality	Q12, Q13, Q14, Q15, Q16, Q17, Q18, Q19, Q20, Q21	.94	Not combined
Attitudes – Importance to FWS	Q23a, Q23b, Q23c, Q23d, Q23e	.70	Averaged

The “perceived success with outreach” scale includes only four questions. Two questions ask the survey respondent to provide a self-assessment of success with outreach; two questions ask the respondent to provide an assessment of the FWS' success with outreach. Two of the questions ask about past success and two questions ask about future success in outreach efforts. The four questions all measure perceptions of success with outreach, but each question addresses a different source of success. The internal consistency of this scale was 0.81 which is within the range of values considered acceptable for survey research. It is at the lower range of what is considered acceptable. However, the lower value is likely due to the variability in the sources of success that respondents were asked to rate.

There were two possible methods to combine the questions regarding the ten constraints. For each of the ten constraints, respondents were asked to indicate the level of problem posed by the constraint. If and only if respondents indicated that the constraint posed a “problem”—selecting a value at the midpoint or higher on the 5-point scale—were they asked for their opinion on the stability, the controllability, and the locus of the constraint. One possibility was to combine questions based on the constraint. For example, the questions asking about the level of problem, the stability, the controllability, and the locus for children's scheduling would be combined into a subscale. This option did not yield acceptable reliability estimates. Because the theory and research underlying the characteristics of stability, controllability, and locus indicate that these three concepts are related but distinct, we would expect that a scale combining these items would have lower internal consistency. The second option was to combine questions on the same characteristic across the different constraints. For example, all of the questions that asked respondents to rate the level of problem posed by the constraint would be combined into a subscale. This approach is conceptually more appropriate and did result in reliability estimates that are within the range of acceptable values. The internal consistency estimate of 0.76 for the “problem caused by constraint” subscale reflects a moderate level of reliability (Murphy and Davidshofer, 1998), but is sufficient. The internal consistency estimates for stability (0.90), controllability (0.93), and locus (0.94) were well within the range of acceptable levels of reliability. A caveat regarding the reliability estimates for stability, controllability, and locus is in order. In order for their responses to be included in the calculation of the reliability estimate for each of these subscales, a respondent would have had to answer those questions for all of the constraints. However, these questions were only asked of those respondents who indicated that the constraint was a problem. Not many respondents indicated that all ten constraints posed a problem. Therefore, the reliability estimates for these three subscales are based on small sample sizes.

There were seven questions that addressed respondents' attitudes regarding the importance of connecting children with nature to the FWS. Two of the questions (Q23c and Q23d) had to be reverse scored prior to scale reduction. The internal consistency for a subscale including all seven questions (0.26) was unacceptably low. An internal consistency estimate this low indicated that multiple attitudes were being measured by the questions on this subscale and that all seven questions could not be combined into a single subscale. Therefore, we used principal components analysis to group the questions into separate subscales. Two components were extracted. A factor loading of 0.6 was required for a question to be included on a component. Five questions grouped together into a subscale with an internal consistency estimate of 0.70. The last two questions created a subscale but the internal consistency was still low enough (0.63) that the two questions were treated as single-item measures. The first component accounts for 41 percent of variance in the responses to these questions. The second factor accounts for an additional 20 percent of variance. The factor loadings, communalities, and eigenvalues are provided in table 2-2.

Table 2-2. Factor loadings, communalities, and eigenvalues for scale reduction of questions Q23a through Q23f.

Question	Component 1 Factor Loading	Component 2 Factor Loading	Communality
Q23a	.76		.80
Q23b	.66		.70
Q23c (r)	.63		.41
Q23d (r)	.76		.58
Q23e	.64		.41
Q23f		.63	.69
Q23g		.73	.68
Eigenvalue	2.9	1.4	

(r) indicates that the question was reverse-scored prior to analysis.

Internal Consistency for Final Subscales

The final subscales are provided in table 2-1 with the calculated internal consistency estimates. The values of the internal consistency estimates for the subscales range from .70 to .93. These internal consistency estimates fall within the range of acceptable levels of reliability for surveys, although the reliabilities for the subscales measuring the extent of problems caused by constraints and measuring the attitudes regarding the importance to the FWS of connecting children with nature are in the lower range of acceptable reliability levels.

We cannot determine the reliability of the single-item measures. The single-item measures on this survey included the screening questions regarding conservation education and outreach on the job and supervision of those conducting these types of activities, and volunteering in conservation or environmental related activities. Two of the questions that were initially included as part of the attitudes scales (Q23f and Q23g) were eliminated from the attitudes subscale and were subsequently treated as separate questions. Question 11 asked respondents to select the constraint that posed the biggest problem. This question was formatted as a checklist and questions of this type are not amenable to internal consistency estimates. This question was treated as a single-item measure.

Validity

When evaluating the validity of a survey, we are interested in evidence that the survey is measuring the characteristics that we intended it to measure. In this case, our task was to demonstrate that this survey measured attitudes regarding the interpretation of the FWS' mission to connect children with nature, perceptions of outreach success, perceptions of constraints, and attitudes regarding the importance of connecting children with nature to the FWS. There are multiple approaches to establishing survey

validity (see Murphy and Davidshofer, 1998). Our efforts focused on establishing a survey that would have face and construct validity.

Face validity is the appearance that the survey questions measure what they are intended to measure (Anastasi and Urbina, 1997; Murphy and Davidshofer, 1998). Even though face validity is not considered evidence of “true” validity, it is important because it can affect how people respond to the questions. To this end, we asked staff at DEO to review the survey questions prior to finalizing and distributing the survey.

Construct validity addresses whether a survey measures a specific characteristic of interest (Anastasi and Urbina, 1997; Ghiselli and others, 1981; Murphy and Davidshofer, 1998). In order to demonstrate the evidence for construct validity, there must be known relationships among the characteristics being measured. When we developed the survey, we relied on published literature regarding the characteristics of interest when possible. We can use the information published about the way that these characteristics relate to each other to demonstrate the validity of our subscales. If our subscales relate to each other in the way expected based on available literature, then we have evidence substantiating the construct validity of our subscales (Anastasi and Urbina, 1997; Ghiselli and others, 1981; Murphy and Davidshofer, 1998). In the case of this survey, we were measuring multiple characteristics and therefore, evaluated the validity evidence for each characteristic separately. We did not evaluate the validity of the survey as if it were a measure of one overall characteristic.

Definition of “Connection”

One approach to demonstrating construct validity evidence is to examine the pattern of correlations among subscales or questions measuring related characteristics and unrelated characteristics (Murphy and Davidshofer, 1998). We calculated the interitem correlations among all questions that addressed the interpretation of the FWS mission—survey questions 9a through 9i. These correlations are provided in table 2-3. All 36 correlations were statistically significant at $p < 0.01$.

Table 2-3. Interitem correlations among questions regarding FWS mission.

All correlations are significant at the 0.01 level for a 2-tailed test. Correlations including Q9a are based on 317 responses; all other correlations are based on 316 responses.

	Q9a	Q9b	Q9c	Q9d	Q9e	Q9f	Q9g	Q9h
Q9b	0.63	-	-	-	-	-	-	-
Q9c	0.49	0.62	-	-	-	-	-	-
Q9d	0.44	0.51	0.81	-	-	-	-	-
Q9e	0.54	0.65	0.45	0.42	-	-	-	-
Q9f	0.30	0.41	0.57	0.60	0.46	-	-	-
Q9g	0.38	0.38	0.47	0.50	0.34	0.58	-	-
Q9h	0.45	0.47	0.39	0.37	0.48	0.38	0.45	-
Q9i	0.48	0.45	0.45	0.46	0.45	0.39	0.46	0.58

We correlated the responses to the questions regarding interpretation of the FWS mission with the responses to the questions regarding the importance of connecting children with nature to the FWS—questions 23a through 23g. We expected that there may be some relationship between the questions from the two different subscales, but that questions from the same subscale would have higher correlations than questions from different subscales. There were 63 correlations calculated between questions from the different subscales. Of these 63 correlations, 35 correlations—56 percent—were significant. As expected, questions from the interpretation of FWS mission subscale correlated more strongly with questions from the same subscale than from the “importance” subscale. We calculated the average interitem correlation among the “FWS mission” subscale questions and the average interitem correlations among the “FWS mission” subscale and the “importance” subscale. If these two subscales were measuring different characteristics, we expected the average interitem correlation for questions from the same subscale to be

greater than the average interitem correlation for questions from different subscales. The average interitem correlation among questions from the “FWS mission” was greater ($r = 0.49$) than the average interitem correlation among questions from the different subscales ($r = 0.21$, corrected for negative values). The interitem correlations among questions from the “FWS mission” are provided in table 2-3. The correlations among the “FWS mission” and the “importance” questions are provided in table 2-4.

Table 2-4. Correlations among questions on the “FWS mission” and “importance” subscales.
Number of responses on which each correlation is based is provided in parentheses.

	Q23a	Q23b	Q23c (r)	Q23d (r)	Q23e	Q23f	Q23g
Q9a	0.38** (313)	0.34** (312)	0.21** (272)	0.22** (298)	0.26** (311)	-0.05 (313)	0.08 (313)
Q9b	0.45** (312)	0.36** (311)	0.18** (271)	0.21** (297)	0.22 (310)	-0.002 (312)	0.09 (312)
Q9c	0.36** (312)	0.37** (311)	0.17** (272)	0.15** (297)	0.19** (310)	-0.05 (312)	0.11* (312)
Q9d	0.26** (312)	0.30** (311)	0.11 (271)	0.08 (297)	0.10 (310)	0.03 (312)	0.18** (312)
Q9e	0.28** (312)	0.33** (311)	0.09 (271)	0.10 (298)	0.24** (310)	0.03 (312)	0.16** (312)
Q9f	0.15** (312)	0.22** (311)	0.04 (271)	0.04 (297)	0.11 (310)	-0.001 (312)	0.14* (312)
Q9g	0.24** (312)	0.29** (311)	0.14* (271)	0.08 (297)	0.14* (310)	-0.003 (312)	0.17** (312)
Q9h	0.25** (314)	0.22** (313)	0.01 (273)	0.12* (299)	0.27** (312)	0.03 (314)	0.10 (314)
Q9i	0.35** (312)	0.34** (311)	0.18** (271)	0.17** (297)	0.30** (310)	-0.02 (312)	0.10 (312)

(r) indicates that the question was reverse-scored prior to analysis.

* Correlation is significant at the 0.05 level for a 2-tailed test.

** Correlation is significant at the 0.01 level for a 2-tailed test.

Perceived Success with Outreach Efforts

We used a similar approach to examine the validity evidence for the questions on the perceived success with outreach subscale. This subscale could be used as one measure of perceived success or each of the four questions could be used separately. We combined the four questions into a subscale for the purposes of this analysis. We expected that perceived success in connecting children with nature would not be related to tenure with the FWS (Q26) or with volunteering in conservation and environmental education (Q8). We calculated two ANOVAs using the score on the perceived success subscale as the dependent variable and tenure with the FWS and volunteering as the factors. Neither of the ANOVAs were statistically significant.

To establish the validity evidence of the questions as separate measures of perceived success, we examined the intercorrelations among the items. We expected that the correlation between the two questions that asked respondents to rate their own success would be higher and that the correlation between the two questions that asked respondents to rate the agency's success would be higher than a correlation between one question asking about own success and one question asking about agency success. Analysis of the data yielded the pattern of results that we expected. The correlations between the questions asking respondents to rate their own past and expected future success ($r = 0.75$) and between the questions asking respondents to rate the agency's past and expected future success ($r = 0.62$) were higher than the other correlations—self past success and past agency success correlated at $r = 0.40$, self past success and agency future success correlated at $r = 0.41$, self expected future success and agency past success

correlated at 0.39, and self and agency expected future success correlated at 0.58. All correlations were statistically significant at $p < 0.01$.

Constraints

The survey questions that addressed the ten constraints included questions asking the extent to which the constraint was a problem, and asking about the characteristics of the constraint (stability, controllability, and locus of causality). Respondents were only asked the questions regarding the characteristics of the constraint if they had responded that the constraint posed a problem at least at the midpoint value on the 5-point scale.

First, we demonstrate the validity of the questions asking the extent to which the constraint was a problem. One question on the survey (Q11) was a checklist asking respondents to indicate which of the constraints created the biggest problem in connecting children with nature. Respondents were allowed to make only one selection. If the questions asking respondents to rate the extent to which each of the constraints was a problem were valid measures of the perceived problems caused by these constraints, there should be a relationship between these questions and the checklist responses. For example, those who selected children’s schedules as creating the biggest problem should also rate the extent of the problem caused by children’s schedules higher than those who did not select children’s schedules on the checklist. To determine if the question responses related to each other in this way, we separated respondents into two groups based on whether they selected a particular constraint as creating the biggest problem (their checklist response). We then compared the average ratings on the question asking the extent to which that constraint was a problem for the two groups. We did this analysis separately for each constraint. The average ratings of the extent of a problem posed by each constraint for those who selected the constraint on the checklist and those who did not are presented in table 2-5.

Table 2-5. Average ratings of extent of problem for respondents who did and did not perceive the constraint as the “biggest problem.”

Constraint	Selected constraint as “Biggest Problem” on checklist?	
	Yes	No
Children’s schedules	2.31	1.44
Parents’ fears	2.50	1.15
Parents’ attitudes	2.80	1.48
Practical issues	2.61	1.89
Children’s lack of interest and comfort	2.46	1.42
Competition from technology	2.86	1.89
Lack of information about effective techniques	2.25	1.13
State education standards	2.90	1.47
Funding issues	3.10	1.94
Staffing issues	3.15	1.86

We conducted a series of ANOVAs to determine if the differences between the groups were significantly different. All of the group differences were statistically significant at $p < .05$. This outcome indicates that those who selected a constraint as presenting the biggest problem on the checklist did rate the constraint as a bigger problem than those who did not select that constraint on the checklist. These results underscore the validity of the questions used on the survey to determine the extent of problem created by the constraints. One caution is necessary. Some of the constraints were selected on the checklist by few respondents. For example, “parents’ fears” was selected from the checklist as representing the biggest problem by only two respondents. The results may be somewhat unstable for those constraints selected from the checklist by only few individuals. However, the pattern of results is as expected and we believe this demonstrates a level of validity that is sufficient for the purposes of this survey.

Similar to the approach we used with establishing validity evidence for the subscale that measured perceived success, we examined the interitem correlations. The literature on attributions indicates that stability, controllability and locus of causality are related but distinct characteristics. Therefore, we expected that measures of these characteristics would be related but not highly related. We expected that measures of these characteristics would have a stronger relation across constraints than with measures of other characteristics within constraints. For example, we would expect that the measure of stability for the constraint “parents’ fears” would correlate more highly with the measure of stability for the constraint “children’s schedules” than it would correlate with the measure of controllability for the constraint “parents’ fears”. We calculated the average interitem correlation for the stability questions, the controllability subscale—the two controllability questions averaged together, and the locus questions. We also calculated the average interitem correlation among the attribution characteristics (stability, controllability, and locus) within each constraint. These correlations are reported in table 2-6.

Table 2-6. Average interitem correlations for attribution characteristic questions across and within constraints.

Characteristic	Average Interitem Correlation
Stability across constraints	0.43
Controllability across constraints	0.46
Locus across constraints	0.43
Characteristics within “Children’s schedules”	0.21
Characteristics within “Parents’ fears”	0.13
Characteristics within “Parents’ attitudes”	0.22
Characteristics within “Practical issues”	0.30
Characteristics within “Children’s lack of interest/comfort”	0.18
Characteristics within “Competition from technology”	0.18
Characteristics within “Lack of information about effective techniques”	0.22
Characteristics within “State education standards”	0.37
Characteristics within “Funding issues”	0.32
Characteristics within “Staffing issues”	0.35

The pattern of correlations is what we expected. The correlations between measures of the same characteristic across constraints are higher than correlations between measures of different characteristics within the same constraint. Based on the facts that we based our questions on existing research and that the correlations meet the anticipated pattern in our data, we conclude that the questions on this survey are adequately measuring the characteristics of attributions related to the ten constraints to connecting children with nature.

Attitudes Regarding Importance to FWS

Based on the results of the reliability analyses for the questions measuring attitudes regarding the importance to the FWS of connecting children with nature, a subscale was created from five of the questions with two questions being used as single-item measures. The two questions (23f and 23g) that were separated from the other attitude measures were different in that they addressed tangible support provided by FWS toward efforts to connect children with nature. The other five questions measured respondents’ opinions regarding how important connecting children with nature should be to the FWS. We used the average of these five questions to form a measure of importance. To demonstrate the validity of this measure, we used an approach similar to the one we used to evaluate the validity evidence for the questions addressing the interpretation of the FWS mission pertaining to connecting children with nature. We examined the pattern of correlations among subscales or questions measuring related characteristics and unrelated characteristics (Murphy and Davidshofer, 1998). We expected that subscales that measured other characteristics would not correlate as strongly to the subscale score on the “importance” subscale as the questions on the subscale related to each other. First, we calculated the average interitem correlation

among the five questions included on the “importance” subscale. The interitem correlations for these five questions are reported in table 2-7. The average interitem correlation was 0.38.

Table 2-7. Interitem correlations for questions on the “importance” subscale.

All correlations are significant at the 0.01 level for a 2-tailed test. Number of responses on which each correlation is based is provided in parentheses.

	Q23a	Q23b	Q23c (r)	Q23d (r)
Q23b	0.66 (313)	-	-	-
Q23c (r)	0.32 (273)	0.25 (272)	-	-
Q23d (r)	0.50 (299)	0.31 (298)	0.50 (262)	-
Q23e	0.42 (312)	0.33 (311)	0.21 (271)	0.31 (297)

(r) indicates that the question was reverse-scored prior to analysis.

Second, we calculated the correlations between the measure of importance (average of the five questions on the subscale) and each of the questions regarding the interpretation of the FWS mission regarding connecting children with nature (Q9a–Q9i). The average of these correlations was 0.27. Third, we calculated the correlations between the measure of importance and each of the questions measuring perceived success (Q10a–Q10d). The average of these correlations was 0.11. This evidence indicated that the “importance” subscale is measuring a concept that has a moderate relation to the interpretation of the FWS mission regarding connecting children with nature and only a small relation to respondents’ perceived success at connecting children with nature. The correlations between the measure of importance and Q9a–Q9i and Q10a–Q10d are reported in table 2-8.

Table 2-8. Correlations between the measure of “importance” and questions regarding FWS mission and perceived success.

Number of responses on which each correlation is based is provided in parentheses.

FWS Mission	Importance	
Q9a	0.37**	(258)
Q9b	0.38**	(257)
Q9c	0.31**	(258)
Q9d	0.19**	(257)
Q9e	0.25**	(258)
Q9f	0.12	(257)
Q9g	0.22**	(257)
Q9h	0.24**	(259)
Q9i	0.36**	(257)
Perceived Success		
Q10a	0.17*	(182)
Q10b	0.13	(182)
Q10c	0.05	(182)
Q10d	0.41**	(226)

* Correlation is significant at the 0.05 level for a 2-tailed test.

** Correlation is significant at the 0.01 level for a 2-tailed test.

We conclude that the available evidence supports that this survey measures several distinct and related concepts. We are confident that the survey is adequately measuring the concepts we intended it to measure and that the results of this survey can be used for informational purposes.

Statistical Power

Statistical power is a characteristic of individual statistical tests and is highly influenced by how a survey research project is conducted. Statistical power is essentially the probability that a statistical test will lead to a correct conclusion (Murphy and Myers, 1998). Sufficient power is important because if power is too low the results from a study cannot be used reliably for decisionmaking. The power of a statistical test is affected by the size of the effect anticipated in the population of interest. For example, if there was a strong relationship between gender and perceived success in outreach—in other words, the level of perceived success would differ between male and female respondents—then that relationship would be described as a strong effect. If perceived success in outreach shows a negligible difference between the genders, the relationship between perceived success and gender would be described as a very small effect. We expected that the effects we were evaluating with this study would be at least moderate in size.

The size of the effect in the population cannot be altered to increase the power of statistical tests in the study. One of the primary methods to influence statistical power is through the size of the dataset. More data mean more powerful analyses. The dataset for this study is based on the responses of 320 respondents. A dataset of this size ensures sufficient power for our intended analyses.

Representativeness

In addition to needing a sufficient number of respondents to provide adequate statistical power, the respondents need to be representative of the population of interest. The representativeness of a sample is a significant concern in conducting survey research (for more information on the topic of sampling, see Jones, 1985). Representativeness means that the sample is similar in type and distribution of characteristics to the population of interest. For example, we could probably have obtained a sufficient sample size for this survey if we sent the survey to all FWS employees in region 9. However the characteristics of the work conducted and the types of positions in region 9—the headquarters region—are unlikely to adequately represent the work conducted and the types of positions in the entire FWS. In this example, we would have adequate power, but inadequate representation. We would not be able to generalize from the survey results based on that sample to the other parts of the FWS.

The primary approach to achieving data from a representative sample is a careful sampling strategy. We designed our stratified sampling strategy to include individuals from each region proportional to the number of employees in each region. We believed it was important to ensure input from all regions because issues could potentially vary across these geographically defined groups. To determine if the set of respondents from whom we received data were representative of our target population, we compared the regional affiliation for the respondents with the expected regional affiliations for a representative sample. We used the same percentages for each region that we used in the sample design procedure. For example, region 1 comprises about 12 percent of the FWS workforce according to the FWS EEOC FY2008 plan (U. S. Fish and Wildlife Service, 2008). Considering that we had 320 respondents, we would expect approximately 38 of them to be from region 1 if the set of respondents was representative on the basis of regional affiliation. We used a chi-square test to compare the sample and population distributions. The result of this test was not significant; there is not a detectable difference between the actual and expected regional distribution of respondents ($X^2 = 4.19$, 8 d.f.). This result indicates that the percent of respondents from each region is close to the percent of employees in each region.

The demographic questions on the survey help us understand to what extent the survey respondents are representative of employees in the FWS and, in particular, representative of those who actively engage in conservation and outdoor education and outreach activities. We summarize the responses to the demographic questions here. More detail on all the survey questions and responses is provided in the report to respondents for this survey (Ratz and Schuster, 2011). We asked respondents to indicate their

employment status with the FWS. The majority of respondents (96 percent) were permanent federal employees. We asked three questions about organizational tenure: length of service with the FWS, length of service at current duty station, and length of service in current position. Respondents indicated their length of service for these questions by indicating a category reflecting years in service. All respondents had a minimum of 1 year working with the FWS and 33 percent of the respondents had been with the FWS for 18 or more years. There were responses at all levels of the response scale for the questions regarding length of service at current duty station and in current position. The most frequent responses to the tenure questions were 18 or more years in service to FWS, 4–8 years of service at the current duty station, and 4–8 years of service in the current position. We asked respondents to indicate their wage grade (WG) or general series (GS) level. Responses ranged from 4 to 15 with 12 being the most frequent response. We asked respondents to provide the numerical code for their job series. The response format was open-ended. There were 47 different job series codes provided. The most frequently provided code was 0401 for General Biological Science; 24 percent of respondents to this question provided this answer. We asked respondents to indicate their gender because some research indicates that proenvironmental attitudes are stronger among females than males. In our sample, 59 percent of the respondents were female.

We do not have data on the distribution of these demographic characteristics among the population of all FWS employees that would allow us to make comparisons as we did for regional affiliation. Based on the demographic data collected it appears that the respondents to this survey were not limited to any particular group. The responses are from FWS employees with varied tenure, job level, and job series classifications. Based on the information in the FWS EEOC FY2008 plan (U. S. Fish and Wildlife Service, 2008), the FWS workforce was 60 percent male and 40 percent female. The respondents to our survey were 59 percent female. To the extent that gender is related to the concepts addressed in this survey, the survey may not represent the viewpoint of the FWS workforce in its entirety but may be more representative of the viewpoint of female FWS employees. We cannot state with certainty the reason for the higher than expected response from females (or lower than expected response from males). One possible explanation is that the issues addressed on the survey are of greater interest to females than males. Another possible explanation is that there may be a gender imbalance in the types of positions in the FWS that focus on connecting children with nature, and outreach efforts such as conservation and environmental education.

As part of our sampling strategy, we relied on a list of subscribers to the VOICES electronic distribution list. We expected that due to the content of the survey those with more interest in conservation and environmental education and outreach programming might be more likely to respond to the survey. We determined that there was a significant relationship between being a subscriber to the VOICES list and responding to the survey: $\phi = 0.20$, $p < 0.01$. This relation is moderate in size. The response rate for those in the sample who subscribe to the VOICES list was 65 percent. The response rate for those in the sample who did not subscribe to the VOICES list was 45 percent. We expected that this survey would be of more interest to those who are involved in conservation and environmental education and outreach activities. VOICES is targeted to those who are interested in environmental education. Therefore, it is not surprising that those who subscribed to VOICES would be more likely to respond to a survey on this topic.

We asked respondents “Do you supervise one or more employees or volunteers who perform conservation or environmental education, or outreach programming?” Fifty-three percent of respondents indicated they did not supervise anyone who performed these activities. Of those who indicated they did supervise someone who performed these activities, 23 percent supervise FWS employees only, 13 percent supervise volunteers only, and 12 percent supervise FWS employees and volunteers. We did not know the formal supervisory status for all of the FWS employees included in the survey sample. We did know the formal supervisory status for some of the employees in the sample because that information was included

in the training database we used to select individuals to include in the sample. We calculated a chi-square to evaluate whether supervisory status was related to survey response. The chi-square value (0.41, d.f. = 1) was not significant indicating that individuals with formal supervisory status were not more or less likely to respond to the survey than were individuals who were not supervisors.

Based on this evidence, we believe that the data provided by the respondents to this survey are likely to include viewpoints from a variety of sectors of the FWS workforce. The respondents represent diversity in regions, tenure, wage/grade level, job series, and supervisory status. While response to the survey was related to interest in outreach issues, as defined by membership on the VOICES electronic distribution list, the effect was moderate and 56 percent of respondents indicated they did not subscribe to this list. The perspectives of both supervisors and nonsupervisors are represented in these responses. We conclude that the results of this survey are sufficiently representative of the target population for the purposes of this survey.

Nonresponse Bias

Nonresponse occurs when individuals to whom the survey is sent do not respond to the survey (Burkell, 2003; Dillman and others, 2002). Nonresponse bias refers to bias in survey results because of differences in demographics or attitudes between those who do and do not respond to a survey (Burkell, 2003; Hudson and others, 2004; Sax and others, 2003). The critical issue to address is whether nonresponse influences the outcome and interpretation of survey results.

While a high response rate can minimize the likelihood of nonresponse bias, it does not guarantee the absence of bias (Groves and Peytcheva, 2008). Nonresponse is not necessarily an indicator of bias (Burkell, 2003; Rogelberg and Luong, 1998; Sax and others 2003). According to Moore and Tarnai (2002, p. 198), "...if there are no differences between respondents and nonrespondents, then there is no nonresponse error [bias] regardless of the response rate." Hudson and others (2004) concluded that use of the Internet to collect data did not lead to increased response bias even though the response rates were lower. Different methods of estimating nonresponse bias produce different estimates. When the full sample has had previous contact with the survey sponsor, nonresponse bias tends to be lower (Groves and Peytcheva, 2008). Because we selected our survey sample from a list of FWS employees who had enrolled in training through the NCTC or who participated in the VOICES distribution list which is hosted by the NCTC, we know that the individuals in the survey sample have had prior contact with the NCTC, the sponsor of the survey. Research on level of interest in survey topic yields inconsistent results with some studies concluding that interest does not seem to affect nonresponse bias (Groves and Peytcheva, 2008) and others concluding that it does (Burkell, 2003).

Nonresponse bias can be evaluated by comparing the respondents to a group used to represent the nonrespondent group (Burkell, 2003). One way to assess nonresponse bias is to compare the demographics of the respondents to the demographics of the known population (for example, Barclay and others, 2002; Cartwright, 1978). This is done to determine if those who responded to the survey differ in a systematic way from those in the population. In this case, we would compare the demographic characteristics of survey respondents to those of the entire population of FWS employees. Another approach is to compare respondents to nonrespondents on information that is available for both groups, such as demographic information. In this case, we would compare the demographic characteristics of survey respondents to those of the FWS employees who received a survey but did not respond to it. A third approach is to compare the responses of early responders with the responses of late responders within a survey (Burkell, 2003; Sax and others, 2003). Finally, one way to assess nonresponse bias is to select a sample from the nonrespondents and contact them again to obtain their responses on either the entire survey or a shortened version of the survey (Burkell, 2003). This option can be costly in terms of resources and time. Additionally, this approach raises the question of whether the nonrespondents who do provide responses

to the survey questions—known as converted refusals—are different from those who decline to provide responses even when contacted again (Lynn and others, 2002).

We were limited in our ability to use the first approach to evaluating nonresponse bias—comparing demographics of respondents and the known population. The only demographic information that we have for both our survey respondents and the FWS population is regional affiliation. In the representativeness section in this appendix, we reported the results for the comparison of the regional affiliation for the respondents with the expected regional affiliations based on the distribution of FWS employees. The result of this test was not significant which indicated a lack of bias based on regional affiliation between the respondents and the FWS at large.

We faced a similar limitation—lack of demographic information—that affected use of the second approach to evaluating nonresponse bias. We could only compare respondents to nonrespondents on the limited demographic information we had for our sample. We made comparisons between respondents and nonrespondents on the characteristics of supervisory status and region. As described in the representativeness section in this appendix, we tested if supervisory status was related to survey response. The results indicated no significant relationship. Supervisors were not more or less likely to respond to the survey than nonsupervisors. We compared respondents and nonrespondents on the basis of regional affiliation, and the results were not significant (Cramer's $V = 0.14$, d.f. = 8). As described in the prior section on representativeness in this appendix, we also compared the distribution across regions within the sample to the distribution of employees across regions in the FWS and found no significant difference.

We were able to assess the potential for nonresponse bias more thoroughly using the third approach—comparison of early and late responders. The survey software package we used, KeySurvey®, included a feature that marked the time of survey completion as well as assigned a number to each survey respondent. We defined early responders as those who responded to the survey in the first 24 hours after the survey opened. There were 121 early responders. We selected an equal number of late responders. We used the last 121 responses to the survey for the late responder group. All of these respondents completed the survey only after a reminder had been sent. We used a technique recommended to evaluate potential differences between early and late responders (Dillman and others, 2002). First, we calculated a chi-square between the early/late variable and the involved/not involved variable created to identify the respondents who were involved in connecting children with nature and those who were not. The development of the involved/not involved variable is described in the data analysis section of the body of this report. This statistical test would tell us if those who were not involved in connecting children with nature were more likely to be late responders. The chi-square statistic was not significant which indicated that whether a respondent was early or late in responding was not related to whether the respondent was involved in connecting children with nature.

Second, we used binary logistic regression to regress the early/late response variable on regional affiliation and the questions for the “interpretation of FWS mission”, “perceived success with outreach”, “problem caused by constraint” subscales, and the average of the “importance to FWS” subscale. The omnibus analysis, including all variables, indicated that six variables predicted early or late responder status at a level of statistical significance at $p < 0.05$. The six variables that predicted early or later responder status were region, the question regarding interpretation of FWS mission that pertained to increased participation in outdoor recreation (Q9b), the question regarding interpretation of FWS mission that pertained to political support of public lands (Q9f), the question regarding perceived success of own past outreach efforts (Q10a), the question regarding perceived success of own future outreach efforts (Q10b), the question regarding the extent of the problem created by practical issues (Q15), and the question regarding the extent of the problem created by staffing issues (Q21). When multiple variables are included in an analysis, responses are only included if an individual answered all of the questions. For this binary logistic regression with regional affiliation and the subscale questions, the actual sample size for the analysis was $n = 130$. This is a relatively small sample size for an analysis that included so many

variables. This analysis may not have correctly identified significant differences between early and late responders.

To increase the sample size for the analyses and to verify the differences identified in the omnibus analysis, we calculated four binary logistic regressions for regional affiliation ($n = 242$), the questions on the subscale measuring interpretation of FWS mission (Q9a – Q9i, $n = 232$), the questions on the subscale measuring perceived success of outreach efforts (Q10a – Q10d, $n = 169$), and the questions on the subscale measuring the extent to which each of the constraints created a problem in connecting children with nature ($n = 172$). We used $p < 0.05$ as the significance level cutoff for all these analyses. The regression that included regional affiliation did not indicate any differences between early and late responders. The regression that included the questions from the interpretation subscale indicated that the question regarding increased participation in outdoor recreation (Q9b) significantly predicted early or late responder status. The regression that included the questions from the perceived success subscale indicated that the questions regarding future success for both self (Q10b) and the FWS (Q10d) significantly predicted early or late responder status. Finally, the regression that included the questions assessing the extent of the problem created by each of the constraints indicated that the question regarding the problem caused by staffing issues (Q21) significantly predicted early or late responder status.

The effect size statistic most commonly associated with regression, R^2 , is not calculated for logistic regression, so we used ANOVA to determine the size of the difference between early and late responders on each of the variables that had demonstrated a statistically significant effect in the logistic regression analyses. Again, we used a significance criterion of $p < 0.05$. The ANOVA for Q9b was significant: $n = 238$, $F(1, 237) = 6.07$. The effect size—eta squared (η^2) is a measure of effect size used with ANOVA—was small, $\eta^2 = 0.03$. The average response on this question for late responders was 4.9 and for early responders was 5.2. The ANOVA for Q10d was significant: $n = 170$, $F(1, 169) = 4.43$, $\eta^2 = 0.03$. The average response on this question for late responders was 3.8 and for early responders was 4.1. The ANOVA for Q21 was significant: $n = 171$, $F(1, 170) = 4.46$, $\eta^2 = 0.03$. The average response on this question for late responders was 2.3 and for early responders was 1.9. The ANOVA for Q10b was not significant. These were all small effect sizes indicating that while there were differences in how the early and late responders answered these questions, the differences were small. Given that the differences were small and were present for only three individual questions, we concluded that the level of nonresponse bias would have a negligible effect on the overall results of the survey. We did not complete the fourth method for evaluating nonresponse bias—contacting a sample of nonrespondents. It is an expensive and time consuming method that did not seem warranted in this case.

Additional Notes on Statistical Analyses

This section of the appendix includes supporting detail for analyses reported in the body of this report. These details are provided to ensure complete reporting of the analyses. The information is provided in the appendix rather than in the body of the report to enhance readability.

Definition of “Connection”

Table 2-9 includes all the statistically significant differences from comparing the average rating of relevance for the nine statements regarding interpretation of the definition of “connection” within the context of the FWS mission.

Table 2-9. Significant differences among the average response to questions regarding the definition of “connection.”

Question	Significantly greater than...	Equal to...	Significantly lower than...
Q9a	e, f, h	b, c, d, g, i	
Q9b	e, f, h, i	a, g	c, d
Q9c	b, e, f, h, i	a, d, g	
Q9d	b, e, f, h, i	a, c, g	
Q9e		a, f, h, i	b, c, d, g
Q9f	h	e, i	a, b, c, d, g
Q9g	e, f, h, i	a, b, c, d	
Q9h		e	a, b, c, d, f, g, i
Q9i	h	e, f	a, b, c, d, g

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