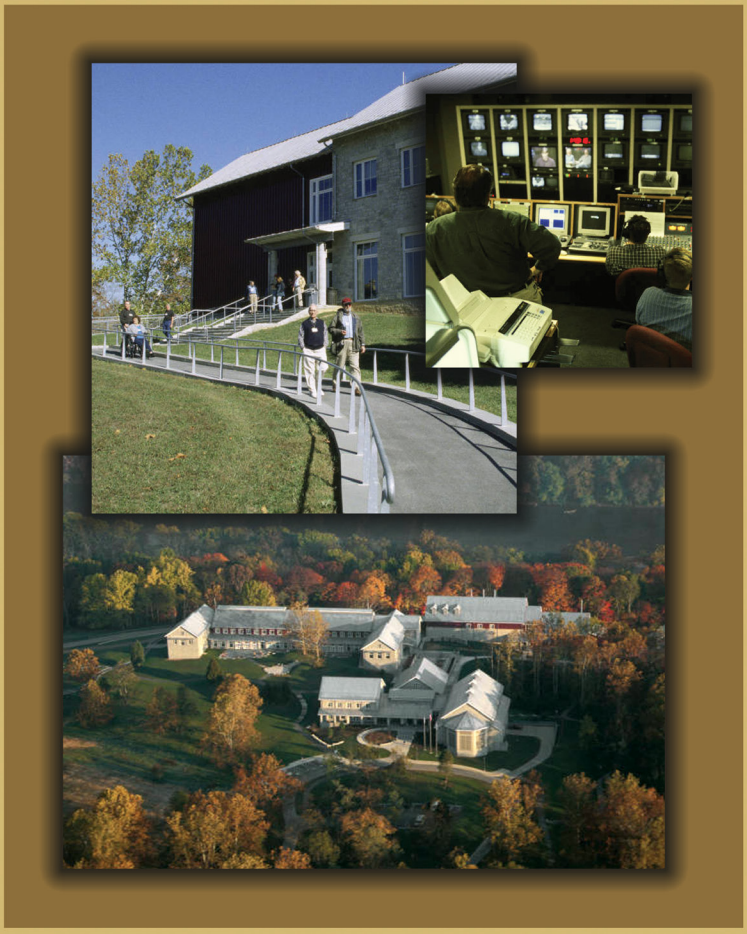
USGS
science for a changing world

A Study of Topics for Distance Education—A Survey of U.S. Fish and Wildlife Service Employees

By Joan M. Ratz, Rudy M. Schuster, and Ann H. Marcy



Open-File Report 2011–1075

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
KEN SALAZAR, Secretary

U.S. Geological Survey
Marcia K. McNutt, Director

U.S. Geological Survey, Reston, Virginia 2011

For product and ordering information:
World Wide Web: http://www.usgs.gov/pubprod
Telephone: 1-888-ASK-USGS

For more information on the USGS—the Federal source for science about the Earth,
its natural and living resources, natural hazards, and the environment:
World Wide Web: http://www.usgs.gov
Telephone: 1-888-ASK-USGS

Suggested citation:
Ratz, J.M., Schuster, R.M., Marcy, A.H., 2011, A study of topics for distance education—A survey of U.S. Fish and Wildlife Service employees: U.S. Geological Survey Open-File Report 2011–1075, 66 p.

Contents

Executive Summary 1
Training Content Areas 1
Distance Education Options 2
Onsite versus Distance Education 2
Preferences for Mode of Training and Type of Information 2
Background 3
Benefits of Distance Education 4
Planning for Distance Education 4
Definition of Terms 5
Survey I: Content Areas for Training Topics 6
Method 6
Survey Development 6
Sampling Strategy 6
Data Collection Process 6
Results 7
Survey Respondents 7
Topics 8
Discussion 7
Definition of Topics 9
Survey II: Training Topics and Distance Education 10
Method 10
Survey Development and Supporting Literature 10
Content of Training Program 11
Technology 11
Experience with Technology 11
Access to Distance Education Technologies and Support 12
Perceived Ease of Use 12
Preference of Distribution Modes for Content Areas 13
General Distance Education Preferences 14
Attitudes about Training 14
Additional Questions—Enrollment Study 15
Demographics 15
Sampling Strategy 16
Data Collection Process 17
Results 17
Response Rate 17
Quality of Survey 18
Data Analysis 18
Training Content Areas 18
Distance Education Options 23
Onsite versus Distance Education 28
Preferences for Mode of Training and Type of Information by Content Area 30
Summary and Discussion 31
Training Content Areas (Topics) 32
Mode of Training 33

Acknowledgments 36
References Cited 36

Appendixes

Appendix 1. Survey I: Content Areas for Training Topics 43
Survey Text 43
Results from Survey I 44
Appendix 2. Survey II: Training Topics and Distance Education—Survey Development 46
Survey Questions 46
Appendix 3. Survey II: Training Topics and Distance Education—Survey Analyses 51
Survey Quality 51
Reliability 51
Data Reduction and Scale Formation 51
Internal Consistency for Final Subscales 53
Validity 53
Content of Training 54
Usability and Access to Distance Education Technologies 54
Attitudes about Training 57
Statistical Power 57
Representativeness 58
Nonresponse Bias 59
Data Analyses 61

Figures

1. Distribution of respondents according to percent of time on job spent involved in outreach categories. 8
2. Averages and confidence intervals (C.I.) for value of training topics 19
3. Averages for value of training topics according to percent of time spent in outreach 21
4. Averages and confidence intervals (C.I.) for training desirability 22
5. Averages for desire for training on topics according to percent of time spent in outreach 23
6. Averages and confidence intervals (C.I.) for technology usability/access for all regions 24
7. Averages and confidence intervals (C.I.) for technology usability/access for regions 1–8 25
8. Averages and confidence intervals (C.I.) for ease of obtaining technical support 27
9. Regional averages for ease of obtaining technical support for satellite television, video conferencing, and audio conferencing 29

Tables

1. Stratification of survey sample by region 16
2. Survey response rates for each region 18
3. Ten most frequent reasons for selecting a given mode of training 30
4. Combined preferences for mode of training and type of information by training content area 31
1–1. Topical themes volunteered by Survey I respondents and frequencies of themes 44
1–2. General comments from Survey I 45
2–1. Survey subscales, questions, and question numbers 46
3–1. Description of final survey subscales 52
3–2. Correlations between component subscales and the combined subscale for usability/access to technology 55

3–3. Correlations among component subscales 56
3–4. Correlations between usability/access subscales and external measures. 56
3–5. Preferences for the partnerships training content area..... 62
3–6. Preferences for the technology training content area..... 63
3–7. Preferences for the program planning training content area 64
3–8. Preferences for the outreach methods training content area..... 65
3–9. Preferences for the evaluation methods training content area 66

A Study of Topics for Distance Education—A Survey of U.S. Fish and Wildlife Service Employees

By Joan M. Ratz, Rudy M. Schuster, and Ann H. Marcy

Executive Summary

The Division of Education Outreach (DEO) at the National Conservation Training Center (NCTC) of the U.S. Fish and Wildlife Service (FWS) commissioned this study. The objective of the study was to identify the training topics and distance education technologies preferred by potential training participants prior to planning and implementing a distance education strategy. The focus was on positions involving conservation and environmental education and outreach programming rather than on all positions in FWS. This limitation was enacted in order to frame the study such that it could be conducted in a feasible manner and meet the informational and planning needs of the study sponsor. We conducted the study in two phases. Each phase included a survey.

In the first phase, we used a survey with primarily open-ended questions to solicit responses that would indicate areas in which training would be useful. We sent the survey to 72 FWS employees—four supervisors and four nonsupervisors from each region. The response rate to the survey was 61 percent; all regions were represented. The responses were qualitatively analyzed and yielded five thematic content areas for training: creating and maintaining partnerships (partnerships), technology, program planning and development (program planning), outreach methods to engage the community (outreach methods), and evaluation methods.

The second phase of the study involved the development of a survey to assess preferences for training on the five topics identified in the first survey and preferences for six distance education technologies. The distance education technologies included satellite television, video conferencing, audio conferencing, computer mediated training, written resources, and audio resources. A section of the survey included instructor-led training (ILT), both onsite at the NCTC campus and offsite at other locations, in comparison to the distance education options. The survey included a section in which respondents indicated what level of information was needed for training in the five topics. The second survey was sent to a sample of 1,488 FWS employees. The adjusted response rate to this survey was 64 percent. The results indicated the respondents had clear preferences among training topics and distance education technologies.

The statements in the four sections below summarize the results of the study.

Training Content Areas

- All five content areas are valued.
- The topics of partnerships and technology are equally valued and are valued more than the other three topics.
- The topics of program planning and outreach methods are equally valued and are valued more than the topic of evaluation methods.

- The value of four training topics—partnerships, program planning, outreach methods, and evaluation methods—differed based on percent of time on the job spent involved in education and outreach activities. Generally, training topics were valued more highly by respondents reporting a higher percent of time on education and outreach activities. Value of technology training did not differ based on this characteristic.
- Training is desired on the topics of partnerships, technology, program planning, and outreach methods. Overall, desire for training on evaluation methods was low except for among region 9 employees.
- The desire for training differed based on percent of time on the job spent involved in education and outreach; lower percent values were associated with lower desire for training on these topics.

Distance Education Options

- Respondents indicated distinct differences in the usability of and access to the six technologies.
- Audio conferencing and written resources were reported to be most usable and accessible. These two technologies did not differ from each other on ratings of usability and access.
- The other technologies were rated on usability/access in the following descending order: computer mediated training, audio resources, video conferencing, and satellite television.
- The ratings of technology usability/access differed based on region; generally respondents in region 9 rated the technologies higher on usability/access.
- Excluding the data from respondents in region 9, the only technology that still demonstrated a regional difference was video conferencing. Region 7 respondents rated video conferencing higher on usability/access than respondents from other regions.
- Respondents reported that it was easier to obtain technical support for audio conferencing, computer mediated training, written resources, and audio resources. Respondents reported it was less easy to obtain technical support for satellite television and video conferencing.
- There were multiple regional differences in ease of obtaining technical support for satellite television, video conferencing, and audio conferencing.

Onsite versus Distance Education

- Respondents indicated that aspects of onsite training were important and aspects of distance education were slightly less important.
- Reasons for taking distance education instead of onsite training appear to be practical in nature and include scheduling, cost, and travel issues. Reasons for taking onsite training instead of distance education include aspects of face-to-face classroom instruction such as interactions with the instructor and other students.

Preferences for Mode of Training and Type of Information

- For each training topic, our analyses included only responses from those who indicated they were interested in receiving training on the topic.
- Respondents would like training on the topic of partnerships to be provided via ILT either onsite or offsite. The preferred content of the training includes processes and procedures, interpersonal skills, problem solving methods, and strategy development.
- Respondents would like training on technology to provide them with technical hands-on skills and be delivered through ILT onsite, ILT offsite, or computer mediated training.

- Respondents would like training on program planning to include information on processes and procedures provided through ILT onsite, and information on strategy development provided through ILT onsite or computer mediated training.
- Respondents would like training on outreach methods provided through ILT onsite to cover basic facts, processes and procedures, and strategy development and training provided through computer mediated training to cover strategy development.
- Respondents would like training on evaluation methods that includes basic facts and processes and procedures to be provided through ILT onsite or computer mediated training. Respondents prefer technical hands-on skills for evaluation methods to be provided with ILT onsite training.

Background

To inform the expansion of their distance education offerings, the Division of Education Outreach (DEO) of the U.S. Fish and Wildlife Service's National Conservation Training Center (NCTC) sought to identify topics of interest to U.S. Fish and Wildlife Service (FWS) employees, specific to outreach and conservation and environmental education activities. Although some amount of outreach to the public may be expected from all FWS employees, the scope of the study was limited to FWS employees whose positions involved conservation and environmental education and outreach programming. There were two reasons for this restricted focus. First, the positions in the FWS are many and varied. To conduct a survey that would identify topics of interest to employees in so many different positions would be impractical. Second, there is increasing emphasis within the Department of the Interior and its agencies on connecting people, especially children, with the environment. In order to support this effort, the DEO is actively seeking methods to facilitate the efforts of FWS employees engaged in conservation and environmental education and outreach programming.

The NCTC entered into an agreement with the Policy Analysis and Science Assistance Branch (PASA) of the U.S. Geological Survey (USGS) to conduct a study to identify the topics of interest and preferred distance education options for this segment of FWS employees.

To develop the most effective distance education offerings, it was important to conduct a study such as this to determine preferred training topics and preferred distance education technology prior to the development of the instructional courses. An assessment of the characteristics and preferences of the potential trainee population—in this case FWS employees—is part of a formative evaluation and a particularly important component of the process to develop technologically-based distance education (Brown and Ford, 2002; Cho and Berge, 2002; Frydenberg, 2002; Kraiger, 2003; DeRouin and others, 2004). The training offered should be useful to FWS employees and the agency at large; conducting an assessment such as this should be the first step for DEO to plan what training to offer (Burton and Merrill, 1991). Results of formative evaluation studies are commonly used for strategic decisionmaking, prioritization, and resource allocation (Witkin and Altschuld, 1995; Thompson and Irele, 2007; Watkins and Kaufman, 2007). The information collected in this study will support the DEO in setting priorities for distance education offerings and allocating resources for development of distance education programming.

We conducted two surveys to accomplish the goals of this study. First, a survey consisting primarily of open-ended questions was used to collect information about challenges to conducting environmental education and outreach programming. The results of the first survey were used to create a set of potential training topics to be used in the second survey. The second survey used mostly closed-ended rating questions to collect information about preferences for training content and modes of distance education.

The results of this study provided the DEO with information regarding the topics of importance to its constituents and also regarding their preferred mode of training delivery. In designing training programs, both the method and mode should be considered with respect to the training content delivered (Arthur and others, 2003). While the term "method" is often used to refer to distance education, such use is misleading. "Mode" is the appropriate term to refer to the technological system used to deliver training content (Head and others, 2002). The term "method" is more appropriately used to refer to instructional design and could include components of interaction among training participants or interaction between participants and the instructor. Some methods and modes of instruction may affect the effectiveness of a training program differentially depending upon the content of the training.

Benefits of Distance Education

Training can be conducted effectively using distance education technology. Several studies (Hollister and McGee, 2000; Machtmes and Asher, 2000; Breslow, 2005; Zhao and others, 2005) comparing the effectiveness of distance education with traditional educational or training modes conclude that there is often little difference in outcomes. However, there is evidence of wide variation in the effectiveness of both traditional-education and distance-education courses. There are low-quality and high-quality courses provided through both traditional classroom settings and distance education technologies. Researchers conclude that this information may indicate that the quality and design of a course is more important than the mode through which it is distributed (Salas and others, 2002).

The benefits to an organization of providing training from a distance via technology include increased consistency in training, efficiency in providing training to large numbers of people, increased learner convenience (employees can fit training in among other job obligations), and reduction in information overload by providing information in segments (Kosarzycki and others, 2003; Welsh and others, 2003). Although technologically delivered training tends to have high development and start-up costs, distance training is viewed as less costly over time and saves on travel costs and time away from the job (Kosarzycki and others, 2003; Welsh and others, 2003).

A basic requirement for effective use of distance education technology is an audience of a sufficient size that is interested in the topics for which distance courses are developed (Savenye and others, 2001). This audience must also be able and willing to study those topics through distance education.

Planning for Distance Education

Training must be well designed and effectively conducted in order to produce beneficial results. Part of an organization-level needs analysis is identifying available resources and determining potential system-wide constraints that may affect implementation of a training program (Salas and Cannon-Bowers, 2001). Potential system-wide constraints include whether employees have access to the technology and whether they can use the technology (Welsh and others, 2003). An assessment conducted prior to implementing distance education should include evaluation of the learner population's computer skills, available resources, and prior learning experiences (Bourdeau and Bates, 1997; Dupin-Bryant and DuCharme-Hansen, 2005). At a minimum, organizations should know what technology is available and how proficient the learners are with that technology prior to implementing distance education (Bourdeau and Bates, 1997; Kosarzycki and others, 2003).

The relevance of the training to the job is a very important consideration in training design (Rabak and Cleveland-Innes, 2006). In their discussion of using computer technology in training, Brown and Ford (2002) note that the more employees believe the training is relevant to their job the more likely they are to be motivated to engage in the training. As part of a study on distance education

within organizations by Berge and Kearsley (2003), the surveyed organizations acknowledged that a barrier to effective distance education programs was a lack of knowledge about what training needs were best suited to that mode. The results of this USGS study provide the information needed by the NCTC to determine the accessibility and usability of technology for FWS employees and which training needs are best met through distance education.

Definition of Terms

Technology-mediated distance learning, as defined by Webster and Hackley (1997), is the use of technology applications for learning in more than one location. The terms e-learning, online learning, and Web-based learning are used to describe different approaches to using technology to deliver training or education (Rabak and Cleveland-Innes, 2006). E-learning is the term used to describe courses that are conducted on an individual basis and are self-paced; online learning refers to courses that are group based; Web-based learning is a more general term describing characteristics of both e-learning and online learning. Different authors may use the same term but with a different definition or will use different terms to refer to the same concept (Salas and others, 2002). For example, the terms distance learning and distance education can be used to refer to the same concept, but sometimes they are used to refer to different phases of the process—learning is the outcome that results from education (Kosarzycki and others, 2003). Therefore, it is important that we define the terms as we mean to use them.

We use the term ***distance education*** as a broad term referring to all modes of training provided by NCTC other than its onsite courses. ***Instructor-led training*** (ILT), sometimes called face-to-face, refers to a traditional classroom format with the instructor and training participants in the same location at the same time. This type of training can occur on- or offsite at NCTC. In our case, we consider offsite ILT to be a form of distance education. Technically, courses delivered online can also be instructor-led, but for our purposes, we restrict use of this term to traditional classroom settings. ***Satellite television*** involves transmission of a live presentation to select locations with appropriate receptive technology. Participants in different locations can interact with the presenter via audio transmission. ***Video conferencing*** can take place through Webcams or other online technology; the instructor and participants are able to see and hear each other simultaneously. ***Audio conferencing*** includes audio interaction only and is most commonly in the form of conference calls. ***Computer mediated training*** involves use of computers for training, although the instructor and participants do not necessarily need to be online at the same time. Examples include training via Webcast, WebEx, bulletin boards, discussion lists, video podcast, interactive gaming, and group shareware such as wikis. The final modes of distance education we include in our study are essentially resource provision that can happen at any time. ***Written resource provision*** provides documents via CD-ROM, online PDF, or Website. We also include ***audio resource provision*** via podcast or other audio file download to a computer or handheld device such as an iPod™.

We included these modes of distance education on the second survey in order to determine the accessibility to and preference for these modes among FWS employees. We conducted the first survey to identify the content areas in which training would be useful for FWS employees.

Survey I: Content Areas for Training Topics

Method

Survey Development

We conducted a preliminary survey for the purpose of identifying areas of training that potentially would be most valued by FWS employees. We asked open-ended questions about the challenges they face in performing the aspects of their jobs involving conservation and (or) environmental education, outreach programming, visitor services, and partnership activities. Respondents were asked to provide their most significant challenges at the time of the survey, in the previous 6 months, and expected in the next 12 months. Supervisors were asked what the challenges were for those they supervise. All respondents were asked what training they have had that was most helpful to them and what training they would like to have. The goal of a preliminary survey such as this is to identify issues that could be addressed through future training (Witkin and Altschuld, 1995). The questions included in this preliminary survey are provided in appendix 1 of this report.

Sampling Strategy

In a survey to identify topics for training, the sample should include those affected by the training system (Burton and Merrill, 1991) and knowledgeable about what training topics would be useful (Witkin and Altschuld, 1995). In this case, we included FWS employees, some of whom are supervisors. It is important to include supervisors in the process of identifying training content because the performance management function performed by supervisors provides them with a unique and valuable perspective on training needs.

We did not intend nor did we assume that the sample for this survey would be a random sample of the FWS workforce. The NCTC strives to meet the needs of a broad range of FWS employees and other natural resource professionals; however, the programming offered by the DEO may not be of equal interest to all FWS employees. Therefore, a random sample of FWS employees would not necessarily represent the target population of the DEO.

We were provided two lists of FWS employees from which we selected our sample for the distance education content 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 is targeted to 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 the NCTC from October 1, 2007, to June 24, 2009. Supervisory status was provided as a data field in the second list. In selecting the sample, we selected 4 supervisors and 4 nonsupervisors from each region, giving preference to those on the VOICES distribution list. Issues can vary across regions because each region is unique; therefore, we made certain to include employees from each region in the survey sample. The survey was sent to 72 FWS employees in August 2009.

Data Collection Process

A letter written by Janet Carrier Ady, the Chief of the DEO, was emailed to the individuals in the survey sample to introduce the survey. Even though the letter was from the DEO Chief, it was sent by PASA personnel to keep confidential the identity of those in the survey sample. No personnel at NCTC 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 to the FWS employees in the

survey sample. The survey was administered online by using KeySurvey© software. We sent a reminder to those who had not yet completed the survey about 1 week after the initial survey distribution.

Results

Survey Respondents

Of the 72 employees who initially received the survey, 44 completed the survey during the data collection period for an overall response rate of 61 percent. All regions were represented among the responses. Four individuals did not report their region. The within-region response rate ranged from 38 percent (regions 1, 6, and 8) to 75 percent (regions 7 and 9). Twenty-seven supervisors (75 percent response rate) and 17 nonsupervisors (47 percent response rate) responded to the survey. We received responses from supervisors and nonsupervisors within each of the 9 regions. We believe this is a good representation of our original sample.

We did not sample based on job level; the wage grade or grade series level of respondents ranged from 7 to 15. Thirty-nine of the respondents reported they were permanent Federal employees, one reported being a term or temporary Federal employee, and four did not indicate their employment status. We did not sample on job series; we did ask survey respondents to indicate the numerical code for their job series. The majority of respondents, though not all, reported their job series. There were 14 different job series represented by the respondents to the survey. We believe the responses were not limited to the perspective of a single group within FWS employees.

The focus of topics for training in this study was conservation education and outreach. We asked respondents to indicate the percent of their job duties that involves conservation and (or) environmental education or outreach programming. One respondent did not answer this question; one respondent indicated 0 percent. The number of respondents per level of percent of time on the job spent on outreach activities is provided in figure 1. The sample of survey respondents covered a range of time committed to education and outreach activities. The respondents were clearly involved in outreach activities and were qualified to provide input on outreach training from an informed perspective.

Topics

Although we asked about current, past, and future challenges, the timeframe was not a factor in analyzing the responses. We asked the questions in that manner to encourage respondents to think about the job and the challenges faced in outreach programming from a broader perspective. The responses were reviewed and condensed into topical themes. Each theme was counted only once for each respondent; if workload management was mentioned in each question by one respondent, we counted that as one response for workload management. A theme had to be mentioned by more than one individual to be included. Seventeen topical themes emerged from the responses; the themes and the frequencies with which each were reported are provided in table 1–1 in appendix 1.

The last question on the survey was an open-ended option to allow for any comments about the survey or about training content. The responses to this question were not analyzed and are provided in table 1–2 in appendix 1.

Discussion

Several of the themes that emerged from this survey relate to externally imposed constraints on conducting environmental education and outreach activities. Examples of these external constraints include workload, time, and funding. Training can provide some skills for managing workload, funding,

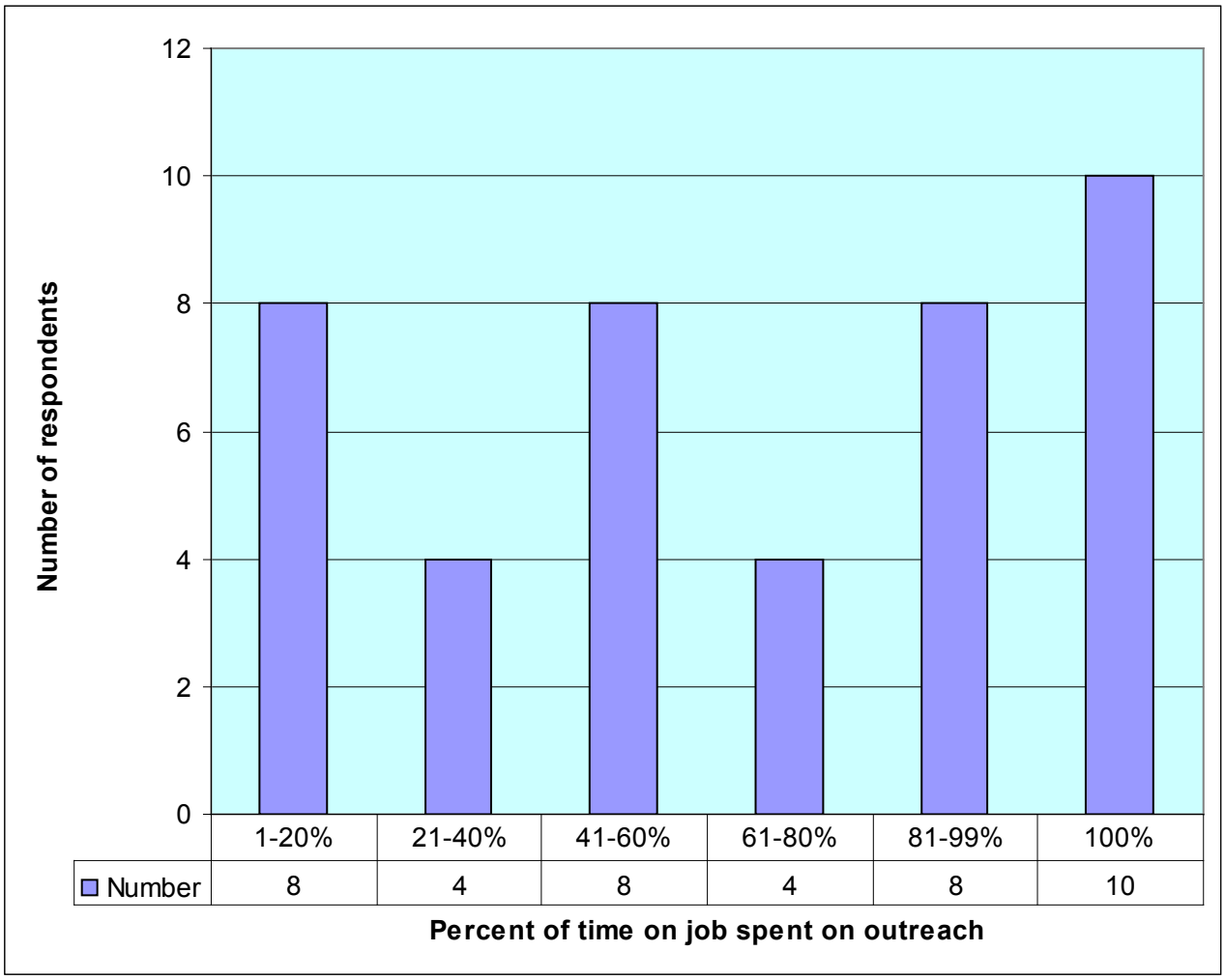


Figure 1. Distribution of respondents according to percent of time on job spent involved in outreach categories.

and time, but time and budget are external constraints that limit the effect that such training can have. The theme of workload management included comments about not having enough person-hours to cover the workload; this situation can arise from either being short staffed or having an inappropriate workload for an individual. Workload management issues were mentioned by 59 percent of survey respondents. Having a minimum amount of time for outreach, and therefore needing to be efficient with this time, was mentioned by 45 percent of respondents. Insufficient funding—having to conduct outreach programming on a shoestring budget—was mentioned by 25 percent of respondents. Administrative management issues including paperwork requirements were mentioned as a challenge by 14 percent of respondents. Seven percent of respondents mentioned the challenges of not having time for training or the need for training to be available at certain times of the year.

For the second survey, we focused on topics that would be more amenable to training. Several issues relating to partnerships were mentioned. Effective partnership management can help offset the limitations caused by the funding and workload issues. Project management with partners, including comments about funding, agreements about responsibility, and volunteer management, was a theme mentioned by 16 percent of survey respondents. Effective communication with partners was mentioned by 14 percent of respondents. Fourteen percent of respondents mentioned issues with working with

internal partners—such as getting buy-in from and communicating with FWS staff. Comments with a theme of creating and maintaining community partnerships were included in 11 percent of the surveys.

Another set of topics related to technology. Eleven percent of respondents indicated a need to be more competent with emerging technologies. Leveraging current technology to more effectively connect with the public in an active rather than passive manner was mentioned by 7 percent of survey respondents.

Several of the identified topics related to program planning and development. Eleven percent of respondents indicated that it was a challenge to develop innovative and creative programs and materials that were current and relevant. Of particular concern was the development of programs for topics involving some uncertainty, such as climate change. Maintaining the relevance of program materials, particularly in light of ever-changing State educational standards, was a challenge identified by 9 percent of respondents. Nine percent of respondents described the issue of trying to plan outreach content to coordinate with other FWS priorities and needs and the need to plan proactively rather than reactively.

The need for more effective outreach methods to increase community participation in programs was mentioned by 9 percent of respondents. Nine percent of respondents indicated that knowing what worked was a challenge; they expressed a lack of knowledge regarding how to measure the success of environmental education in terms of change in attitudes and behavior beyond just measuring program participation. Finally, 5 percent of respondents identified adjusting to change as a challenge; change was identified as change in administration, reorganization, and shifting priorities.

Definition of Topics

Based on the Phase I survey, the following themes were used in the second survey on possible distance education topics: creating and maintaining partnerships, technology, program planning and development, outreach methods to engage the community, and evaluation methods. The definitions for these topics follow.

Creating and maintaining partnerships (partnerships): Creating and maintaining community partnerships; working with internal partners; project management with partners—including managing funding, agreements about responsibility, and volunteer management; and effective communication with partners.

Technology: Need to be more competent with emerging technologies; leveraging current technology to more effectively connect with the public in an active rather than passive manner.

Program planning and development (program planning): Developing innovative and creative programs and materials that are current and relevant; developing programs for topics involving some uncertainty such as climate change; maintaining the relevance of program materials particularly with respect to maintaining currency with State educational standards; and planning outreach content to coordinate with other FWS priorities and needs.

Outreach methods to engage the community (outreach methods): Effective outreach methods to encourage more community participation in programs.

Evaluation methods: Methods for measuring the success of environmental education in terms of change in attitudes and behavior and not just measuring program participation.

Survey II: Training Topics and Distance Education

Method

Survey Development and Supporting Literature

We reviewed the publicly-available published literature on distance education technologies and training to determine relevant variables to include in the survey. There are internal and external factors that can influence the effectiveness of a training program. Internal factors include attitudes, educational level (Zhao and others, 2005), personality (Colquitt and others, 2000), and commitment of the individual to the organization (Colquitt and others, 2000). External factors include relevance of training to job performance (Rabak and Cleveland-Innes, 2006) and content of training program (Zhao and others, 2005). External factors, also sometimes referred to as situational factors, can constrain an individual's ability or can adversely affect motivation to participate in training (Colquitt and others, 2000). Our focus was on the external factors that are under the control of the agency rather than internal factors—individual characteristics of employees. Because internal factors do have an effect on training, we did not completely eliminate them, but we limited the number of questions on the survey addressing internal factors. When possible, we used questions used in previous research rather than create new questions with unknown reliability and validity. However, many studies of distance education are conducted after the introduction of a technologically distributed course. We had to be selective in choosing questions for the survey that were relevant to a pre-introduction planning situation.

We were interested in the specific technologies as well as the manner in which they could be used. Lemak and others (2005) noted that the technology itself is separate from the type of distance education that is transmitted via the technology. For example, listening to a podcast can be done on a computer or a handheld device. Distance education can be delivered in asynchronous or synchronous formats. Asynchronous learning is available at any time (Welsh and others, 2003; Bernard and others, 2004) and can provide information, access to resources, and opportunities for interaction and collaboration without the restriction of a specific timeframe (Miller, 2000). Synchronous learning demands that all learners and the instructor be present at the same time, whether in the same place or via technology (Welsh and others, 2003; Bernard and others, 2004). We included technologies that can accommodate either asynchronous or synchronous instruction.

Our goal was to provide sufficient information to assist the NCTC in deciding which courses to offer via distance education and in which distance education modality. We had to be selective in our questions and in the number of characteristics we addressed on the survey in order to develop a survey of reasonable length. For the quality of the survey, it was important to minimize the number of characteristics that were measured with just one question (these are referred to in the survey research literature as single-item measures). Research surveys on distance education can be lengthy; for example, the survey used by Sun and others (2008) included 73 questions.

The survey we designed included multiple subscales. Subscales are groups of questions that measure a common characteristic. Several of the subscales we incorporated into our survey address factors that affect an individual's satisfaction with distance education. Employees' satisfaction with training is important to consider because satisfaction can affect persistence in training (Levy, 2007). We included the following external factors in our study: content of training program (relevance, importance, desirability), technology (experience, access to technology and technical support, and perceived ease of use), and preferred mode of training for each content area. The internal factors we included are general distance education preferences and attitudes about training. We describe the development and selection of the survey questions for each of the subscales in the following sections of this report. The survey

questions are provided in appendix 2. The survey questions, the corresponding response scales, and frequency data are provided in a separate report to respondents generated as part of this survey project (Ratz and others, 2011).

Content of Training Program

Knowing which content areas were most preferred and most needed and would have the most effect enables the NCTC to make the most effective use of their training resources. Lim and others (2007) demonstrated that higher training performance occurred when training content was more relevant to job tasks. When training is relevant to a job, individuals are more motivated to participate in training (Kraiger, 2003) and are more likely to be satisfied with the training (Giancreco and others, 2009). For each content area, we asked respondents to rate the relevance of the content to their job, the importance of the content to their job, and the desirability of training in this content area. These questions were included in a subscale measuring the value of the training topics.

It is possible that individuals prefer different distance education technologies based upon the goal of the training, for example, whether the goal was to develop a skill or learn factual information. Sitzmann and others (2006) concluded that Web-based instruction was more effective than classroom instruction for teaching facts, but that both instructional modes were equally effective for teaching procedures. We asked respondents to indicate what type of information they most needed from each topic area.

Technology

In the introductory section of the survey, we asked respondents about their experience with distance education. For each of the distance education modes included in this study, we asked respondents to rate their experience with the technology, their access to the technology, access to technology support, and their perceived ease of use.

Experience with Technology

Previous experience with computers has been identified as a critical factor for the success of a distance learning program (Selim, 2007). Lack of computer skills and lack of comfort with computers are barriers to participation in distance education (Childs and others, 2005). Familiarity with technology relates to positive attitudes toward distance learning (Christensen and others, 2001) and to perceived ease of use of distance learning technology (Venkatesh and Davis, 1996; Martins and Kellermanns, 2004). Individuals who are more comfortable with computers in general are more likely to use distance education technology such as electronic bulletin boards (Clawson and Choate, 1999) and are more likely to positively evaluate a Web-based course (Thompson and Lynch, 2003). Prior experience with computers and Web-based distance education relates to confidence in using computers, which in turn relates to satisfaction with distance education and a likelihood of participation in future distance education (Venkatesh and Davis, 1996; Lim, 2001). Sun and others (2008) suggest that computer literacy is so widespread among current college educated populations that computer experience and skill do not need to be considered in planning distance education. However, their conclusions may be valid only for recent college graduates. Given that the FWS employs individuals spanning a broad range of ages and makes training available to all employees, not just younger or more recently hired ones, we believed that experience with computers was an important characteristic to consider in planning distance education.

Experience with distance education technologies can be measured by the number of courses previously taken through each type of distance education technology (DeBourgh, 2003; Arbaugh, 2005).

Individuals who have taken distance education in the past are more likely to be comfortable with distance education (Jedlicka and others, 2002) and report a preference for distance education (Harris and Gibson, 2006). Muilenburg and Berge (2005) determined that individuals with no prior online learning experience evaluated barriers to online learning as more severe than did individuals who had prior experience with online courses. To obtain this information, we asked respondents about their previous experience with distance education.

The technologies used for distance education are not used solely for distance education and can be used for other purposes. For example, Christensen and others (2001) measured daily use of seven different technologies to determine technological familiarity. Cragg and others (1999) asked survey participants to indicate their level of familiarity with nine distance education technologies. Because comfort with the technology itself may affect comfort with and preference for distance education, we asked about current usage of different technologies. The scale we used was adapted from Davis (1989) and is similar to a scale used by Benckendorff and others (2005) to study experience with technology. Because some research indicates that it may be comfort level rather than amount of experience with a specific technology that is predictive of participation in distance education (Clawson and Choate, 1999), we added a question about comfort with computers.

Access to Distance Education Technologies and Support

In the review of e-learning conducted by Welsh and others (2003), the authors included access to technology as an important issue to consider in designing an e-learning program. Lack of access to necessary equipment and lack of adequate Internet connectivity have been cited as barriers to distance education (Thiele and others, 1999; Muilenburg and Berge, 2001; Childs and others, 2005). In a survey of U.S. Department of the Interior employees conducted in the mid-1990s, the lack of access to technology, rather than computer knowledge or desire to use computers, affected actual computer use (Biddle and others, 1995). Huddlestone and Pike (2008) suggested that, as part of the process for selecting a delivery system for distance education, an assessment of practical constraints in the learning situation should be conducted. Lack of access to technology would be a practical constraint. Christensen and others (2001) suggested that technology accessibility acts as a threshold variable. Access to technology is a threshold that must be met in order for use of the technology to occur. Lack of access could be a situational constraint—a characteristic of the work situation—that could have a negative impact on training motivation (Mathieu and others, 1992). Questions on this subscale of the survey addressed access to distance education technologies.

We added questions about access to technical support because technical support may affect an individual's ability to use the technology for distance education. The availability of technical support for distance education is related to perceived ease of use, which is in turn related to acceptance of distance education technology (Martins and Kellermanns, 2004). Additionally, among employees who intend to use distance education technology, technical issues with the technology affect whether or not they actually do use it (Luor and others, 2009). The reliability of technology in distance education affects satisfaction with the course as well as training performance (Johnson and others, 2009). The provision of computing support within and outside of the organization is related to perceived ease of use (Lee, 2008).

Perceived Ease of Use

The Technology Acceptance Model (TAM) has been used to explain the attitudes underlying acceptance of an introduced technology (Taylor and Todd, 1995; Jackson and others, 1997; Venkatesh and Davis, 2000; Martins and Kellermanns, 2004; Burton-Jones and Hubona, 2006; Lee, 2008;

Chatzoglou and others, 2009). Two attitudes, perceived usefulness and perceived ease of use, have been posited to be the primary predictors of intention to use and actual use of a technology system. Davis (1989, p. 320) defined perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance" and defined perceived ease of use as "the degree to which a person believes that using a particular system would be free of effort." Many research studies (for examples, see Taylor and Todd, 1995; Venkatesh and Davis, 1996, 2000; King and He, 2006) have been conducted to determine the antecedents of perceived usefulness and perceived ease of use and to evaluate the strength of the relationship between these two attitudes and technology acceptance. Access to technology as well as to supportive resources affect an individual's belief that the technology is easy to use (Lee, 2008).

In order to keep the survey to a reasonable length while still collecting sufficient information, we decided to include only perceived ease of use on our survey. Perceived ease of use may have a larger effect on perceptions of distance education prior to its implementation. Many studies utilizing TAM as an underlying framework and studies of distance education technology collect data from individuals who were recently exposed to a particular technology. The attitude data were collected after use. In our case, we are collecting data about perceptions of using technology for distance education from individuals who may or may not have used the technology in question. Therefore, we had to revise and reword questions from other studies to fit this survey.

Perceived ease of use of a distance education technology affects the attitudes of potential users (Jackson and others, 1997; Martins and Kellermanns, 2004; Arbaugh, 2005), their intentions to use an e-learning system (Venkatesh and Davis, 1996; Martins and Kellermanns, 2004; Pituch and Lee, 2006; Chatzoglou and others, 2009), training performance (Lim and others, 2007), and their satisfaction with the experience of learning via distance education (Sun and others, 2008). As explained by Venkatesh and Davis (2000), a technology that is easier to use is also likely to be more useful.

A literature review conducted by Welsh and others (2003) indicated that an important aspect of planning distance education is whether potential learners can use the technology. Lower levels of perceived self-efficacy with computers may be related to reduced learning when the learning is technologically mediated (Welsh and others, 2003). Self-efficacy is related to perceived ease of use (Shih, 2006).

The questions we used to measure perceived ease of use were adapted from other research (Davis, 1989; Venkatesh and Davis, 2000; Lau and Woods, 2008).

Preference for Distribution Modes for Content Areas

Distance education technology can be used to provide training for a wide variety of topics from information technology skills to "soft" skills such as communication and leadership (DeRouin and others, 2005), although learners may prefer to learn certain skills in a face-to-face classroom environment (Roblyer, 1999; Kosarzycki and others, 2003). However, distance education technologies may be differentially effective based on the content of the course (Ahern, 1996; Allen and others, 2004; Zhao and others, 2005). In their review of distance learning in organizations, Kosarzycki and others (2003) cite evidence that matching the content to the mode of learning distribution is important to maximize the effectiveness of distance learning.

Welsh and others (2003) found that when learners did not have a compelling reason to complete a distance education course, completion rates were lower for those courses than for similar instructor-led courses. Denton (1982, as cited by Machtmes and Asher, 2000) noted that individuals were more motivated to achieve in a distance education course when the course was related to job outcomes such as promotion. Therefore, to maximize completion rates for distance education, courses that are more

compelling to employees are better candidates for distance education than less compelling courses. Because research is lacking on the factors that may make the training compelling for learners, we used preference as a proxy measure. We used the list of the content areas for training generated from the first survey (content survey) and asked survey respondents to indicate a preferred distance education technology for each. We included instructor-led training onsite at NCTC and offsite as preferred options because distance education is not always the best solution for each training need (Watkins and Kaufman, 2007). The structure of this question is similar to the method used by Cragg and others (1999).

General Distance Education Preferences

Several of the learning models that have been proposed to explain attitudes and behavior toward online learning note that the learners' beliefs and attitudes relate to their intent to use and actual usage of online technology for learning (Saade and others, 2007). Research studies have found support for the link between attitudes toward technology and learning outcomes when using technology (Daley and others, 2001; Klein and others, 2006). Klein and others (2006) demonstrated that those who participated in a course including distance education technology and who also held the view that features of technology enabled their learning had higher motivation and higher performance in the course. Attitudes about technology affect motivation to learn which in turn affects learning—the intended outcome of training.

Thompson and Lynch (2003) and Harris and Gibson (2006) conducted studies of preferences for distance education compared to face-to-face courses. These studies provided example questions that we adapted for our questionnaire on general distance education preferences.

Attitudes about Training

Attitudes about training in general may affect attitudes toward distance education training specifically. A concern often expressed regarding training is the time it takes to attend and complete training. Welsh and others (2003) note that one of the commonly identified benefits of Web-based instruction is that training can be delivered "just in time", which means that the training can be delivered on demand when the information is most needed. Sitzmann and others (2006) reviewed the extent to which trainee control over content and pace of training affected knowledge gained from training. They concluded that, although Web-based instruction provides learners with more control, control did not substantially affect learning. After meta-analyzing studies of learner control and training outcomes, Kraiger and Jerden (2007) concluded that the effect of learner control is small. Providing too much learner control can create a high decisionmaking load that may decrease the effectiveness of learning (DeRouin and others, 2005). However, learners may still have a preference for control, and preferences may affect motivation; therefore, we included a few questions regarding learner control.

Interaction with others is another aspect of training that has been studied for its influence on the effectiveness of training (Sitzmann and others, 2006). A common concern was that distance education would compromise the amount and quality of personal interaction, particularly in the case of early distance education technology, but newer forms of technology enable more interaction in technologically delivered training. However, some research indicates that people learn the same amount in Web-based instruction whether there are high or low levels of interaction incorporated into the course (Sitzmann and others, 2006).

We included a few questions adapted from research by Rabak and Cleveland-Innes (2006). We created additional questions based on other research on instructional characteristics (Klein and others, 2006; Sitzmann and others, 2006). We asked respondents to indicate how important various aspects of

training were to them, including time demands, timing, learner choice and control, and interaction with others.

Employees can choose distance education or onsite training for different reasons. We created a list of reasons, based on literature and on characteristics of the FWS, that could influence the type of training chosen by employees. We asked respondents to indicate all of the reasons on the list that would influence them to take training via distance education instead of onsite and indicate all reasons that would influence them to take onsite training rather than distance education. Data derived from checklists such as these can be difficult to analyze statistically (Bilder and Loughin, 2004), so we treated these questions as qualitative rather than quantitative.

Additional Questions—Enrollment Study

We conducted an additional study on behalf of the DEO and the NCTC that focused on the relationship between distance education and onsite course enrollments—we refer to this as the enrollment study. A small survey was planned as part of the enrollment study. Because of the similarity of the enrollment study to the distance education study, it was apparent that we would be able to include the smaller survey within the distance education survey. Combining the surveys limited the time demanded from FWS employee respondents because questions common to both surveys would not have to be asked twice. From a survey research viewpoint, combining the surveys was beneficial because the questions that were specific to the enrollment study can be used in the validation process for the distance education survey. The questions that were specific to the enrollment study are identified with the subscale name "Enrollment Survey" in table 2–1 in appendix 2.

Demographics

We split the demographic questions into two sections, one at the beginning and one at the end of the survey. At the beginning of the survey we asked respondents to identify the percentage of their job that involves environmental or conservation education or outreach programming and whether they supervise anyone whose job involves that type of task. We included some general questions about past training at NCTC. We incorporated more specific questions regarding respondents' experience with distance education at NCTC with the questions regarding preferences for distance education technology so that the definitions of the technologies would be available to the respondents immediately before they answered the question about their experience with that technology.

We did not ask for respondents' gender because previous research demonstrates that gender does not have an effect on preferences regarding distance education (Christensen and others, 2001) or comfort with computers (Clawson and Choate, 1999). Though Harris and Gibson (2006) did find that gender predicted enrollment in distance education courses and preference for distance education—women were more likely to enroll in and show a preference for distance education—the predictive effect of gender was small.

However, attitudes toward distance learning (Christensen and others, 2001), technology acceptance (Burton-Jones and Hubona, 2006), and effectiveness of distance learning (Sitzmann and others, 2006) are related to age. Christensen and others (2001) found that older individuals had less favorable attitudes toward distance learning. Older employees may view themselves at a disadvantage compared to younger employees when using technology (McMullin and others, 2007). Age may affect the desire to participate in learning activities (Wang and Wang, 2004) and persistence in a distance education program (Fjortoft, 1996). However, Sitzmann and others (2006) determined that older employees seemed to learn more effectively from Web-based instruction. Therefore, we did ask respondents to indicate their age in years. There is some controversy regarding the most appropriate

manner in which to measure age when the primary focus is a technology-related topic. Age groupings can be based on sociocultural generations or on technology-based generations. We chose to measure age in the manner that would be most useful in our analyses.

We asked respondents to indicate their organizational tenure: how long they had been with the FWS, how long they had been at their current duty station, and how long they had been in their particular position. Existing research indicates that organizational and job tenure relate to training participation (Wang and Wang, 2004). We used the 6-point response scale used by Noe and Wilk (1993) to measure organizational tenure.

To help us determine the representativeness of our sample, we asked respondents about their employment status with FWS (permanent or term/temporary), the region in which their duty station is located, their WG/GS/GM (wage grade/general schedule/general manager) level, and the numerical code for their Job Series.

Sampling Strategy

We designed our stratified sampling strategy to include individuals from each region in proportion to the total number of employees in each region. We believed it was important to ensure input from all regions because issues can vary across regions. We used the information regarding employment in each region from the U.S. Fish and Wildlife Service's Management Directive 715 (an online service-wide plans report for fiscal year [FY] 2008 for the Equal Employment Opportunity Commission [EEOC]; U.S. Fish and Wildlife Service, 2008) to calculate percentages for the sampling protocol. To determine the total number of employees to sample and the number within each region to sample, we identified the smallest region (region 7) and determined the minimum number of responses from that region necessary for a sufficient regional sample size. Based upon that number, we then extrapolated sample sizes for the remaining regions. According to the FWS EEOC FY2008 plan (U.S. Fish and Wildlife Service, 2008), the employees in region 7 represent 6 percent of the FWS workforce. We aimed for a minimum of 45 respondents within region 7, and we assumed that our survey would have a minimum 50 percent response rate; therefore, in order to have 45 respondents from region 7, we needed to send the survey to 90 employees in region 7. The 90 employees in the sample from region 7 should comprise 6 percent of the total survey sample. We determined that our overall sample size should be 1,488 employees. Given the data in the FY08 report (U.S. Fish and Wildlife Service, 2008), a sample of 1,488 is approximately 18 percent of the employees of the FWS. 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.
[FWS, U.S. Fish and Wildlife Service]

Region	Percent of total FWS workforce	Number in sample
1 (Pacific)	12 %	180
2 (Southwest)	10 %	150
3 (Midwest)	11 %	165
4 (Southeast)	15 %	225
5 (Northeast)	9 %	138
6 (Mountain–Prairie)	11 %	165
7 (Alaska)	6 %	90
8 (Pacific Southwest)	9 %	135
9 (Headquarters)	16 %	240

As with the content survey—survey I in this study—it was important to ensure that the perspectives of supervisors and nonsupervisors were represented in the survey results. Therefore, within the sample for each region, approximately 20 percent of the employees were supervisors.

To identify specific employees to include in the sample, we first included all those to whom the content survey had been sent. We knew that they were individuals who would be in the target population of DEO and NCTC. To complete the survey sample, we had to add more FWS employees in each region. We selected employees from the same lists used to select our sample for the content survey: FWS employees subscribed to the VOICES electronic distribution list and FWS employees who had taken training through NCTC during the time period from October 1, 2007, to June 24, 2009. The list of past training participants included individuals' supervisory status. In selecting the sample for this survey, we gave preference to those on the VOICES distribution list.

We used a convenience sample stratified by region and supervisory status. While, in theory, all FWS employees who might be interested in these training topics would be included in the population, it is more realistic to consider that some FWS employees will be more interested than others in the specific training topics offered by the DEO. Our goal was to identify and include in the survey individuals who would be in the population of potential trainees for the identified topics—those who engage in conservation and environmental education and outreach activities.

Data Collection Process

A letter written by Janet Carrier Ady introducing 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 1 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.

Results

Response Rate

Of the 1,488 surveys initially sent, 48 were undeliverable because either the individual was no longer with the FWS or the recipient's mail box was filled over its quota. Four individuals requested to be removed from the survey sample. There were 98 individuals in the survey sample who were out of the office at some point during data collection. Of those 98 individuals, 8 of those individuals were out of the office for the duration of the data collection period. Thirty-eight of the 98 individuals who were out of the office at some time during data collection did complete the survey by the time the data collection closed. This circumstance left us with a potential sample size of 1,428. Eight hundred sixty-four individuals submitted a completed survey in the survey software. Partial responses were received from 47 individuals who started but did not finish the survey online. We reviewed their responses and determined that most of them had answered more than half of the survey questions when they exited the survey. We included the partial responses for a total of 911 respondents. Our overall adjusted response rate was 64 percent. Every region had a regional response rate of at least 50 percent. The response rate for each region is provided in table 2. The response rate for this survey is above what is typically

expected for email-solicited Web surveys; response rates for Web surveys are often below 50 percent (Vehovar and others, 2002).

Table 2. Survey response rates for each region.

Region	Within region response rate
1	74 %
2	62 %
3	72 %
4	61 %
5	68 %
6	63 %
7	56 %
8	61 %
9	56 %

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: survey reliability, survey validity, statistical power, sample representativeness, and nonresponse bias. A detailed description of each of these five characteristics is provided in appendix 3.

Based upon these quality checks for this survey, we concluded that the results of this survey can be used for decisionmaking by the DEO and the NCTC regarding distance education course planning.

Data Analysis

This survey was undertaken with the intention of providing synthesized information regarding specific training content areas and distance education technologies to support course planning by the DEO. 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.

The results of these analyses are relevant to prioritizing topics for training, selecting distance education modes, and determining the overlap among training topics and technologies. A summary of these results, including the frequency of responses and averages, is included in the report to respondents for this survey (Ratz and others, 2011).

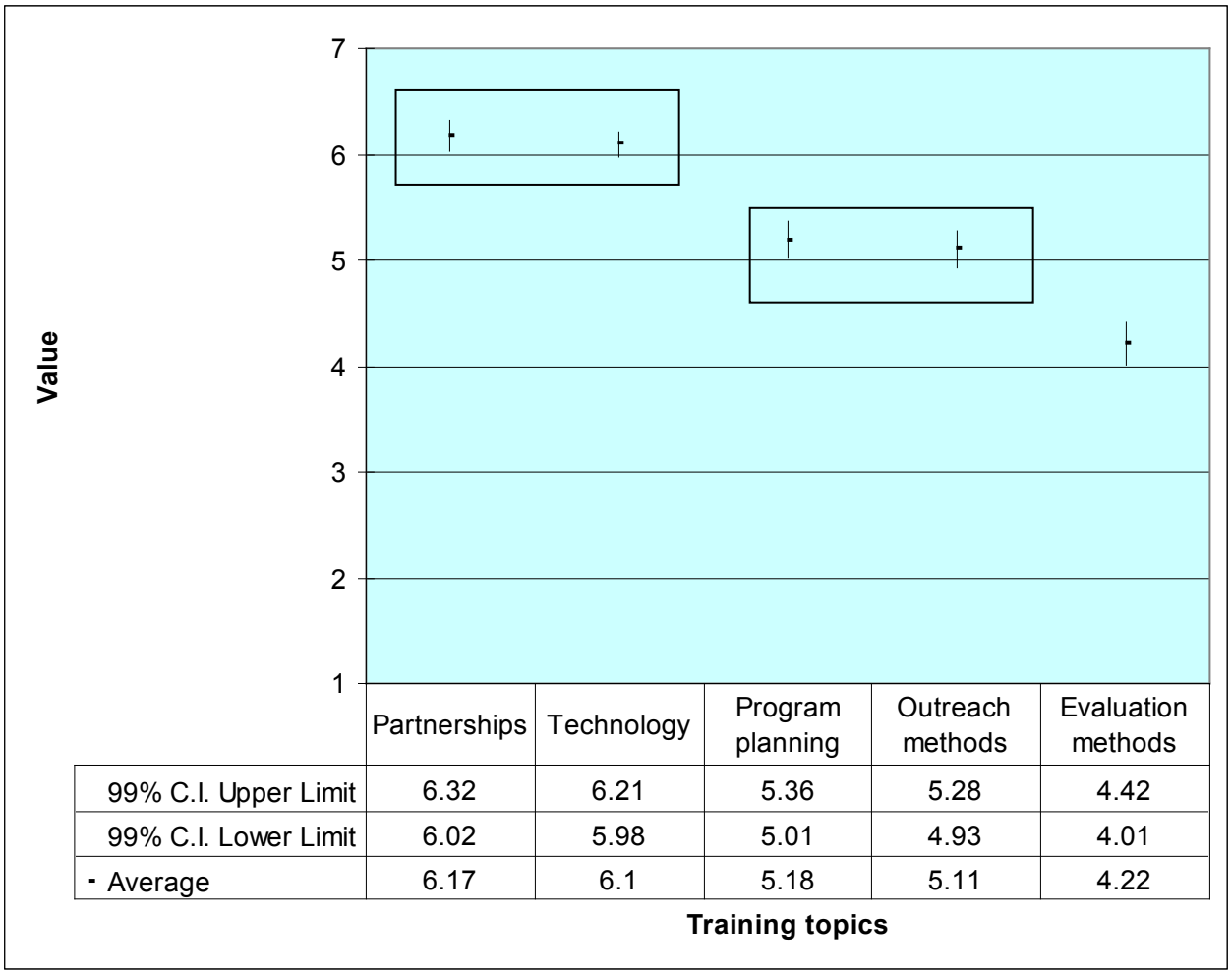
Training Content Areas

We compared the perceived value of the training topics relative to each other. The appropriate analytic technique to use was a repeated measures analysis of variance (ANOVA). We used a conservative approach to conduct the analyses by setting the significance cutoff equal to 0.01, using a Bonferroni adjustment for multiple comparisons, and using the Greenhouse-Geisser correction to degrees of freedom. This conservative approach was warranted by the high statistical power generated by the large size of the dataset. Responses were included in this analysis only if respondents had answered both of the value questions for all of the topics. Because it was possible for respondents' answers to the value subscales to be related to their age, their responses to question 3 (Q3; What percentage of your job involves conservation and (or) environmental education or outreach programming?), and their region, we included these variables in our analysis process. In other words, we evaluated whether these variables interacted with the value of the training topics. For example, if age

interacts with value of training topics, we would expect to see that younger respondents value some of the training topics differently than older respondents value them. If there was a consistent difference between younger and older respondents on all measures of value of training topics, we would conclude there is a main effect for age.

First, because both age and the subscale scores were continuous variables, we calculated the correlation between age and value subscale scores to determine if age should be included in the repeated measures ANOVA. Age was not significantly related to value of partnerships (n=798), value of technology (n=798), value of program planning (n=796), value of outreach methods (n=797), or value of evaluation methods (n=792), so we did not include age in the repeated measures ANOVA. We conducted the repeated measures ANOVA to compare differences in value across training topics and included region and Q3 as between-subjects variables.

The analysis for value of training topics indicated that the topics are valued differently: n=838, $F(3.66, 2{,}866.72) = 244.04$, $p < 0.01$, $\eta^2=0.22$ (eta squared [η^2] is a measure of effect size used with ANOVA). According to interpretation standards (Murphy and Myors, 1998; Morgan and others, 2001), this η^2 value is considered a large effect size. The averages and 99-percent confidence intervals are shown in figure 2.



	Partnerships	Technology	Program planning	Outreach methods	Evaluation methods
99% C.I. Upper Limit	6.32	6.21	5.36	5.28	4.42
99% C.I. Lower Limit	6.02	5.98	5.01	4.93	4.01
Average	6.17	6.1	5.18	5.11	4.22

Figure 2. Averages and confidence intervals (C.I.) for value of training topics. Boxes around values indicate that the included values are not significantly different from each other.

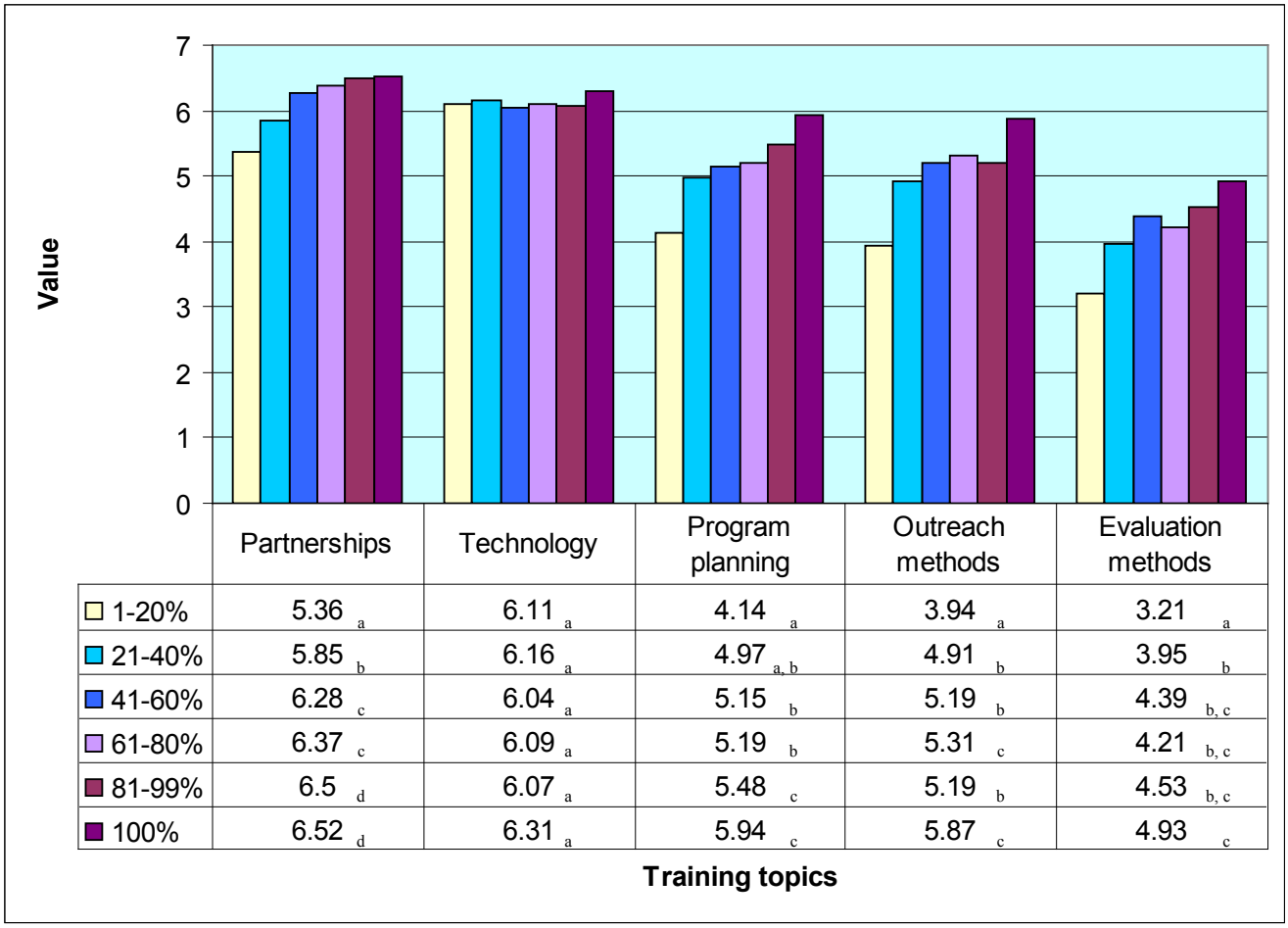
The value subscale is a composite scale including questions about relevance and importance of the topic. Values of 5, 6, or 7 are positive, 4 is neutral, and values 1, 2, or 3 are negative in meaning. The post-hoc comparisons indicated that the averages for the partnerships and technology topics are not different from each other. The averages for the program planning and outreach methods topics are not different from each other.

In this analysis the interaction between region and value of training topics was significant: $F(29.25, 2{,}866.72) = 2.54$, $p < 0.01$, $\eta^2=0.02$. Although this η^2 value is a small effect size, we conducted a series of follow up ANOVAs for the value subscales to understand the interaction. None of the ANOVAs indicated a significant regional effect at our stated $p < 0.01$ criterion. The significance of the regional interaction in the initial analysis was likely an example of significance resulting from the high statistical power generated by the large dataset.

In the repeated measures ANOVA, the interaction between Q3 (percent of time on the job engaged in outreach activities) and value of training topics was significant: $F(18.28, 2{,}866.72) = 8.01$, $p < 0.01$, $\eta^2=0.04$. This interaction indicates that the value of training topics differs based on the percent of time on the job spent on education and outreach activities and that the effect is different across training topics. The follow up ANOVAs were significant for value of partnerships: $F(5, 848) = 21.28$, $p < 0.01$, $n=854$, $\eta^2=0.11$; value of program planning: $F(5, 844) = 19.99$, $p < 0.01$, $n=853$, $\eta^2=0.11$; value of outreach methods: $F(5, 842) = 33.20$, $p < 0.01$, $n=848$, $\eta^2=0.16$; and value of evaluation methods: $F(5, 835) = 20.71$, $p < 0.01$, $n=848$, $\eta^2=0.11$. These η^2 values are medium effect sizes. The result for the value of technology subscale was not significant, $n=853$. Post-hoc analyses were conducted. We present the average for each level of Q3 for each value subscale in a bar graph in figure 3.

We used the same analytical approach to compare the responses on desire for training in the different topics to each other. First, we calculated the correlation between age and responses to the desirability of training questions to determine if age should be included as a covariate in the repeated measures ANOVA. Age was not significantly related to desire for training on technology ($n=797$), program planning ($n=796$), outreach methods ($n=796$), or evaluation methods ($n=797$). There was a significant—but small—negative correlation between age and desire for training on partnerships ($n=795$, $r=-0.13$). We chose not to include the age variable in the repeated measures ANOVA because of the small size of the relationship and because age had an effect on only one of the five questions. We did include region and Q3 in the analysis. The analysis of the desire for training indicated that the training on these topics is desirable at different levels: $n=837$, $F(3.79, 2{,}970.70) = 153.81$, $p < 0.01$, $\eta^2=0.15$. This effect is conventionally considered a medium effect size. On the scale for the question regarding how much respondents would like training on the topic, a value of 4 is "somewhat" and a value of 7 is "very much." The post-hoc comparisons indicated that the average desirability ratings for program planning and outreach methods are not different from each other. The average ratings for desirability of training with 99-percent confidence intervals are provided in figure 4.

In the analysis of desire for different training topics, the interaction between region and the responses to these questions was significant: $F(30.35, 2{,}970.70) = 1.80$, $p < 0.01$, $\eta^2=0.01$. To understand how region was interacting with desire for these training topics, we conducted a series of follow up ANOVAs for the desire for training questions. The ANOVAs for technology ($n=853$), partnerships ($n=851$), program planning ($n=850$), and outreach methods ($n=848$) were not significant for regional differences. The ANOVA for evaluation methods ($n=847$) did indicate a regional effect: $F(8, 838) = 3.45$, $p < 0.01$, $\eta^2=0.03$. The post-hoc comparisons indicated that the responses from region 9 were different from the responses from regions 1 and 6. The average responses to desire for training on evaluation methods for regions 9, 1, and 6 were 4.29, 3.18, and 3.30, respectively.



	Partnerships	Technology	Program planning	Outreach methods	Evaluation methods
1-20%	5.36 $_{a}$	6.11 $_{a}$	4.14 $_{a}$	3.94 $_{a}$	3.21 $_{a}$
21-40%	5.85 $_{b}$	6.16 $_{a}$	4.97 $_{a, b}$	4.91 $_{b}$	3.95 $_{b}$
41-60%	6.28 $_{c}$	6.04 $_{a}$	5.15 $_{b}$	5.19 $_{b}$	4.39 $_{b, c}$
61-80%	6.37 $_{c}$	6.09 $_{a}$	5.19 $_{b}$	5.31 $_{c}$	4.21 $_{b, c}$
81-99%	6.5 $_{d}$	6.07 $_{a}$	5.48 $_{c}$	5.19 $_{b}$	4.53 $_{b, c}$
100%	6.52 $_{d}$	6.31 $_{a}$	5.94 $_{c}$	5.87 $_{c}$	4.93 $_{c}$

Figure 3. Averages for value of training topics according to percent of time spent on the job engaged in outreach (1–20 percent, 21–40 percent, etc.). Averages in the same column that do not share subscripts are significantly different from each other at $p < 0.01$.

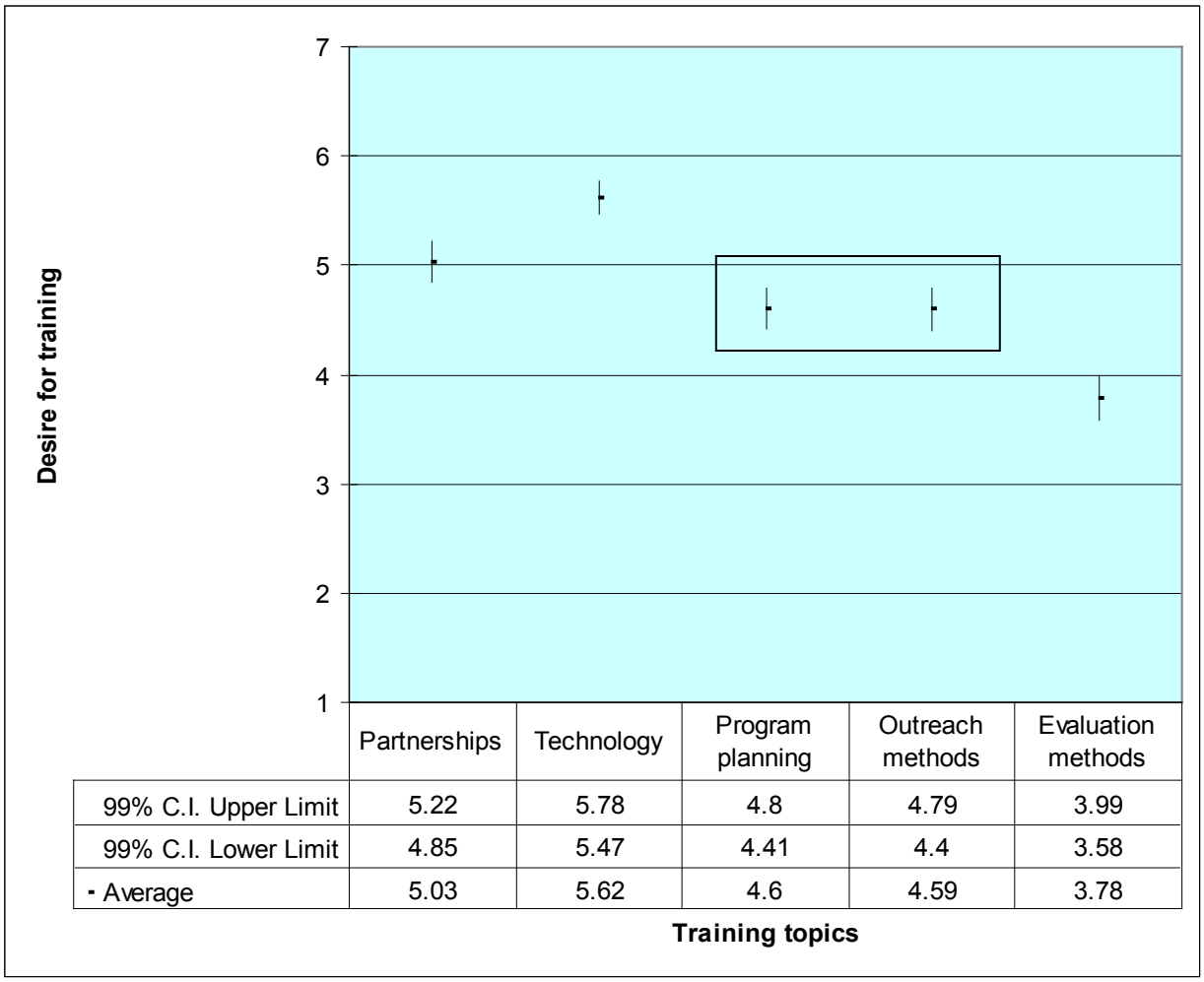


Figure 4. Averages and confidence intervals (C.I.) for training desirability. Boxes around values indicate that the included values are not significantly different from each other.

The interaction between Q3 and the desire for training questions was significant: $F(18.97, 2{,}970.70) = 5.58$, $p < 0.01$, $\eta^2 = 0.03$. To identify the nature of the interaction, we conducted a series of follow up ANOVAs between Q3 and the desire for training questions. The ANOVAs were significant for partnerships: $F(5, 844) = 20.28$, $p < 0.01$, $\eta^2 = 0.11$; program planning: $F(5, 843) = 15.10$, $p < 0.01$, $\eta^2 = 0.08$; outreach methods: $F(5, 841) = 22.18$, $p < 0.01$, $\eta^2 = 0.12$; and evaluation methods: $F(5, 840) = 15.83$, $p < 0.01$, $\eta^2 = 0.09$. These effects are medium in size. The result for technology was not significant. The post-hoc comparisons for all four analyses indicated that the desire for training on the topic was different—and lower—in the 1–20 percent group than for all other groups. We present the average for each level of Q3 for each question about desire for training in a bar graph in figure 5.

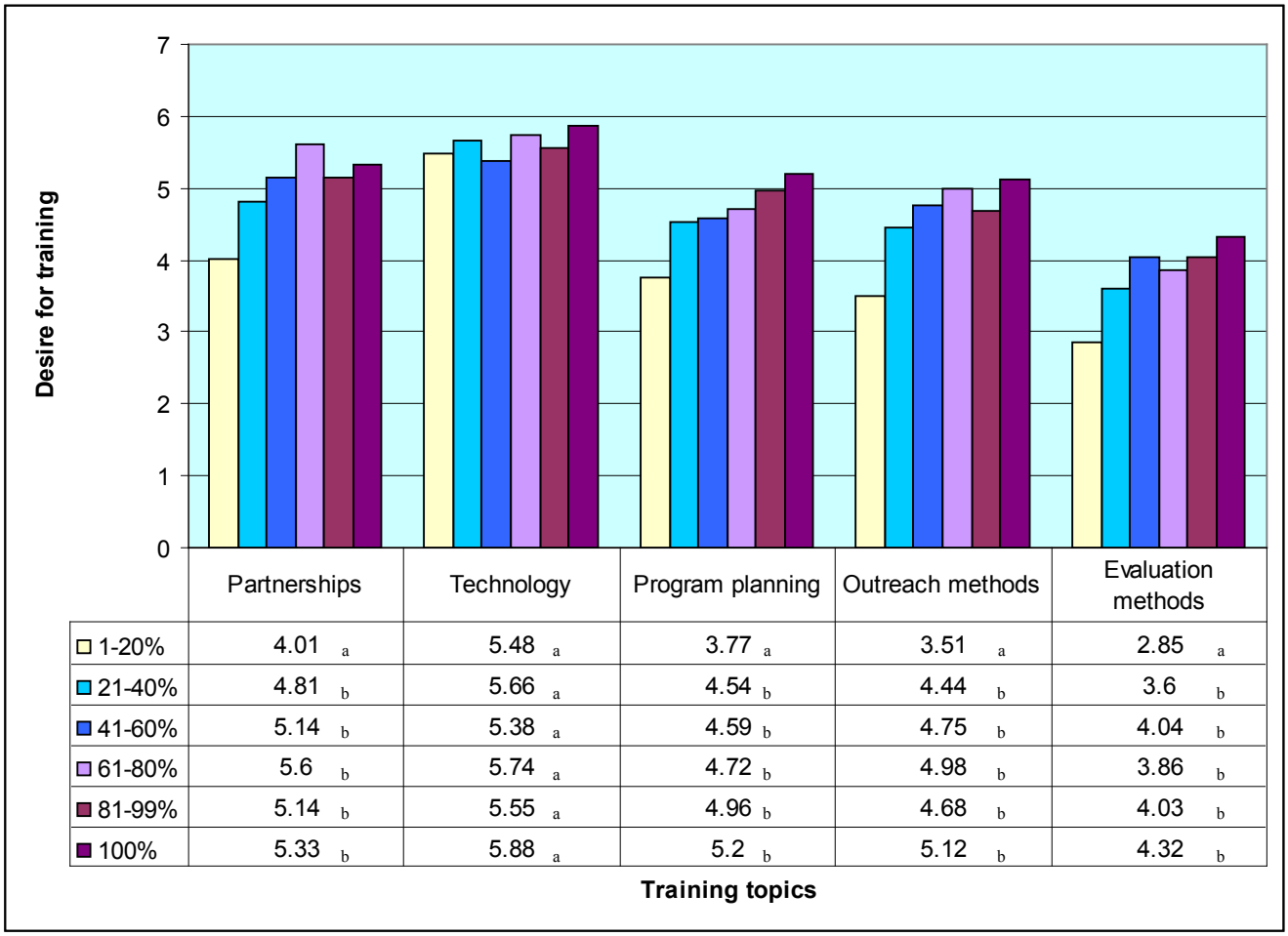


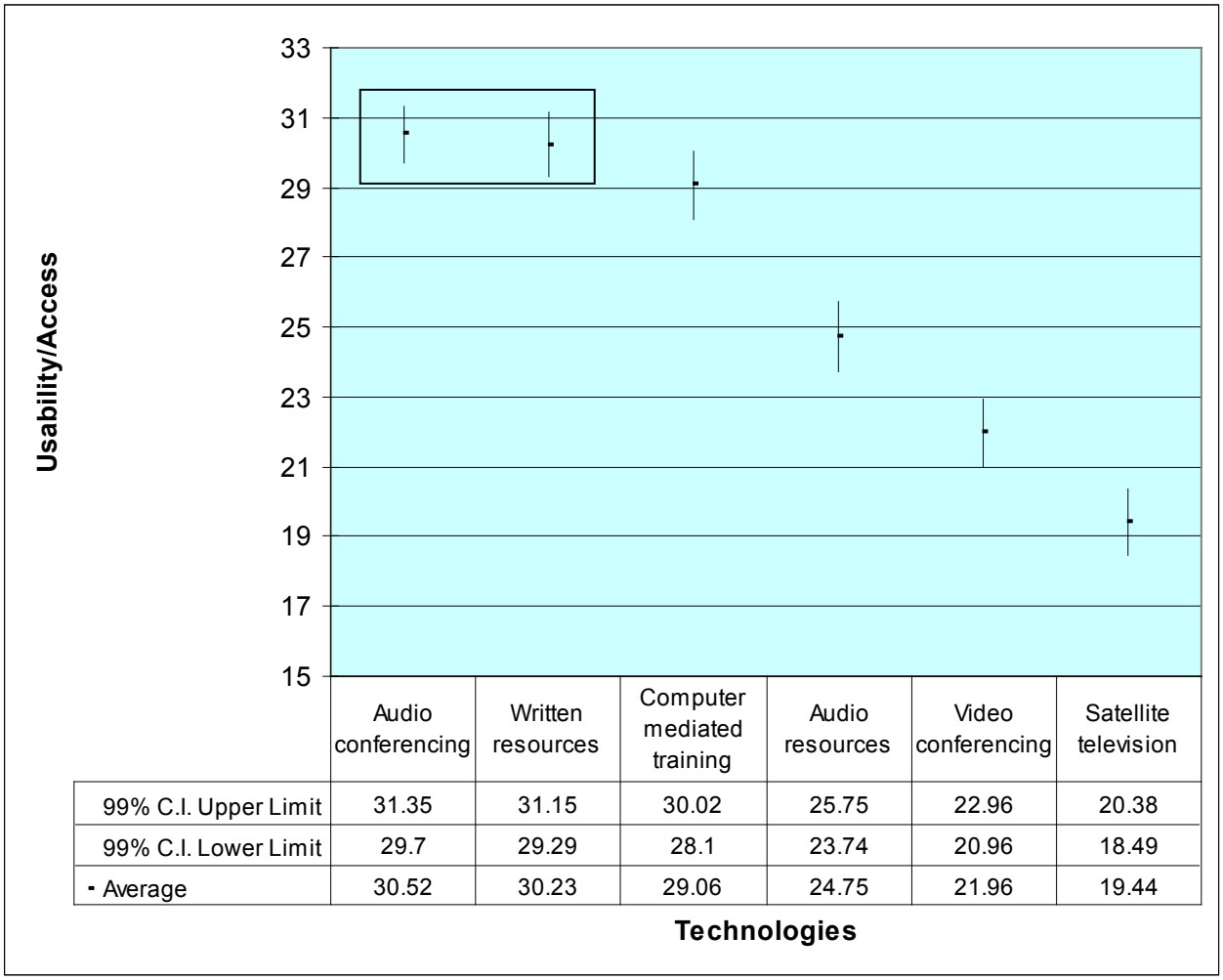
Figure 5. Averages for desire for training on topics according to percent of time spent on the job engaged in outreach (1–20 percent, 21–40 percent, etc.). Averages in the same column that do not share subscripts are significantly different from each other at $p < 0.01$.

Distance Education Options

A critical component of planning distance education is identifying which technology to use. Access to technology and perceived usability of technology by the target population are indicators of which technologies may be more appropriate for a distance education program. Because evidence in the literature suggests that age can have an effect on comfort with and preferences for technology, we correlated age to the usability/access subscales for the technologies. Age did not correlate with usability/access to satellite television (n=574), video conferencing (n=602), audio conferencing (n=728), computer mediated training (n=663), written resources (n=677), or audio resources (n=585). In order to determine if the six distance education technologies differed in usability/access, we conducted a repeated measures ANOVA, with a significance cutoff equal to 0.01, a Bonferroni adjustment for multiple comparisons, and the Greenhouse-Geisser correction to degrees of freedom. We included region as a between-subjects factor. The analysis for the usability/access to technologies indicated differences across technologies: n=410, $F(4.40, 1763.43) = 276.16$, $p < 0.01$, $\eta^2=0.39$. This η^2 value indicates a large effect. The usability/access subscale is a summation of items and with a possible score range from 8 to 41. The post-hoc comparisons indicated that audio conferencing and written resources

are not different from each other in ratings of usability/access. The average ratings and 99-percent confidence intervals for usability/access for the six technologies are provided in figure 6.

There was a significant interaction between region and usability/access subscales: $F(1, 35.18) = 2.79$, $p < 0.01$, although the effect is small in size, $\eta^2=0.03$. To understand how region interacted with technology usability/access, we conducted a series of follow up ANOVAs for these subscales. The ANOVAs for computer mediated training (n=689), written resources (n=703), and audio resources (n=607) did not have a significant effect for region. A significant regional effect was found for usability/access to satellite television: $F(8, 592) = 6.39$, $p < 0.01$, $\eta^2=0.08$. The post-hoc tests indicated differences among regions (with average scores in parentheses). The usability/access to satellite television reported by respondents in region 9 (23.19) was higher than that reported by respondents in regions 1 (19.14), 2 (17.51), 3 (16.94), 5 (18.26), and 6 (17.53). The ANOVA for usability/access to video conferencing demonstrated significant differences across regions: $F(8, 618) = 7.82$, $p < 0.01$, $\eta^2=0.09$. Reported usability/access to video conferencing was higher among respondents from region 7

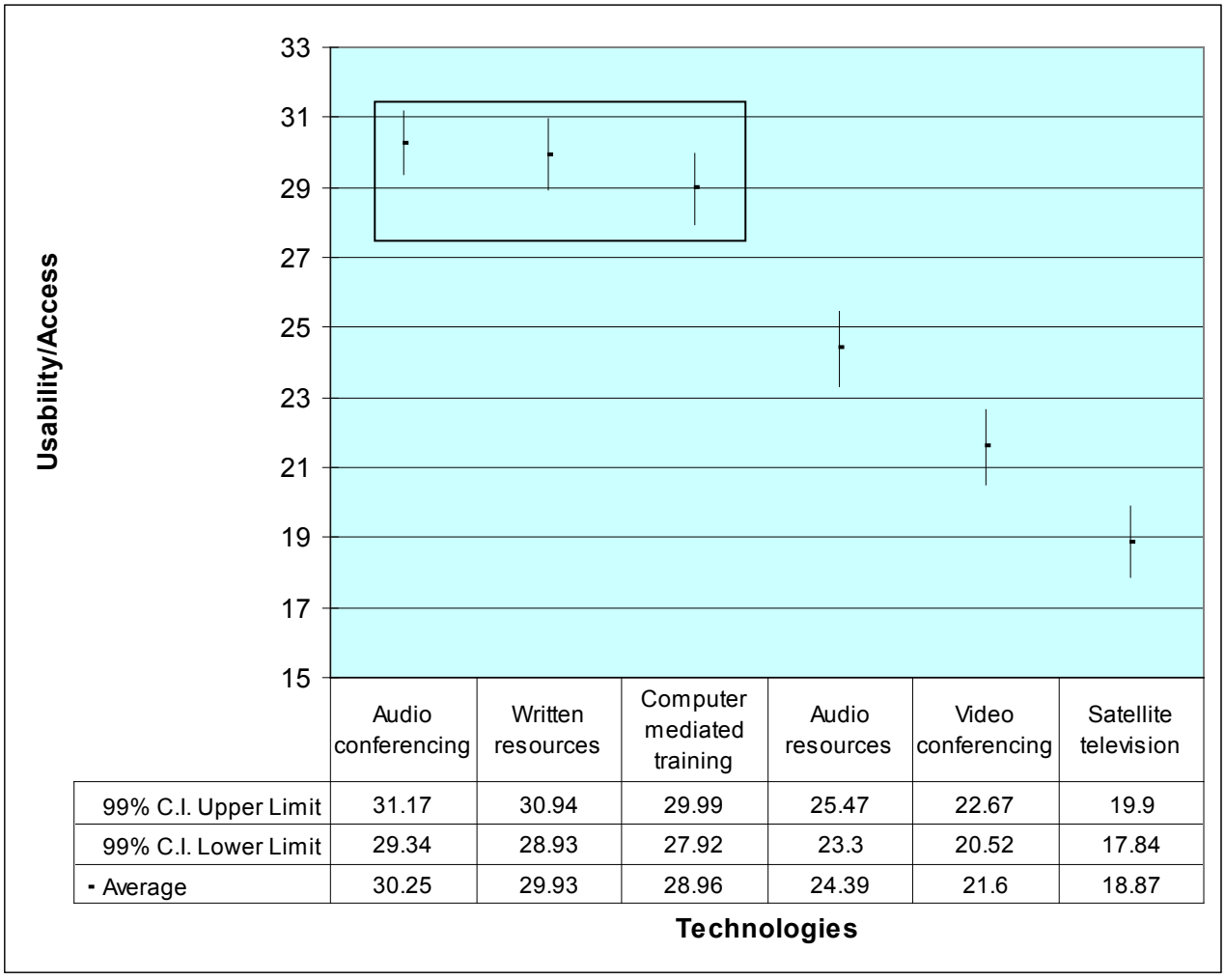


	Audio conferencing	Written resources	Computer mediated training	Audio resources	Video conferencing	Satellite television
99% C.I. Upper Limit	31.35	31.15	30.02	25.75	22.96	20.38
99% C.I. Lower Limit	29.7	29.29	28.1	23.74	20.96	18.49
Average	30.52	30.23	29.06	24.75	21.96	19.44

Figure 6. Averages and confidence intervals (C.I.) for technology usability/access for all regions. Boxes around values indicate that the included values are not significantly different from each other. The scale for this figure is truncated and begins at scale value 15 rather than the lowest possible score.

(27.68) than from regions 1 (21.20), 2 (17.92), 3 (20.32), 4 (21.45), 5 (21.04), 6 (19.43), and 8 (21.02). Additionally, the usability/access of video conferencing was higher for respondents from region 9 (24.00) than from regions 2 and 6. The ANOVA for usability/access to audio conferencing was significant for region: $F(8, 745) = 2.96$, $p < 0.01$, $\eta^2=0.03$. Usability/access to audio conferencing was higher for region 9 (32.24) than for region 2 (28.94). The effect sizes for the regional effect on usability/access to satellite television and video conferencing were medium in size; the effect size for the regional effect on usability/access to audio conferencing was small.

Because so much of the effect of region seems to be related to region 9, which as the headquarters region may differ in many ways from the other regions in the FWS, we conducted the analyses of differences in technology usability/access again but excluded data from region 9. The repeated measures ANOVA for the usability/access to technologies indicated differences across technologies with a large effect size: $n=351$, $F(4.45, 1{,}526.03) = 250.95$, $p < 0.01$, $\eta^2=0.41$. The post-hoc comparisons indicated that audio conferencing, written resources, and computer mediated training are not different from each other in ratings of usability/access. The average ratings and 99-percent confidence intervals for usability/access for responses from regions 1 through 8 are provided in figure 7.



	Audio conferencing	Written resources	Computer mediated training	Audio resources	Video conferencing	Satellite television
99% C.I. Upper Limit	31.17	30.94	29.99	25.47	22.67	19.9
99% C.I. Lower Limit	29.34	28.93	27.92	23.3	20.52	17.84
Average	30.25	29.93	28.96	24.39	21.6	18.87

Figure 7. Averages and confidence intervals (C.I.) for technology usability/access for regions 1–8. Boxes around values indicate that the included values are not significantly different from each other. The scale for this figure is truncated and begins at scale value 15 rather than the lowest possible score.

The interaction between region and usability/access subscale score was significant: F (31.14, 1,526.03) = 2.62, $p < 0.01$, $\eta^2=0.03$. The follow-up ANOVAs for satellite television (n=517), audio conferencing (n=644), computer mediated training (n=599), written resources (n=608), and audio resources (n=516) did not demonstrate significant differences across regions. The ANOVA for usability/access of video conferencing was significant: F (7, 531) = 7.02, $p < 0.01$, $\eta^2=0.08$. This η^2 value is a medium effect size. Similar to the results for the ANOVA using data from all regions, the usability/access of video conferencing subscale scores were higher for region 7 than for all other regions.

The subscales measuring technology usability/access included questions regarding access to technical support. We also asked respondents to indicate their agreement with two statements regarding preference for technical support for distance education: one question (Q31c) addressed a preference for support to be provided by the local duty station, and the second question (Q31d) addressed a preference for technical support to be provided by NCTC. Access to technical support plays a key role in an individual's ability to use technology for distance education. Because of the importance of access to technical support, these questions warranted closer analysis.

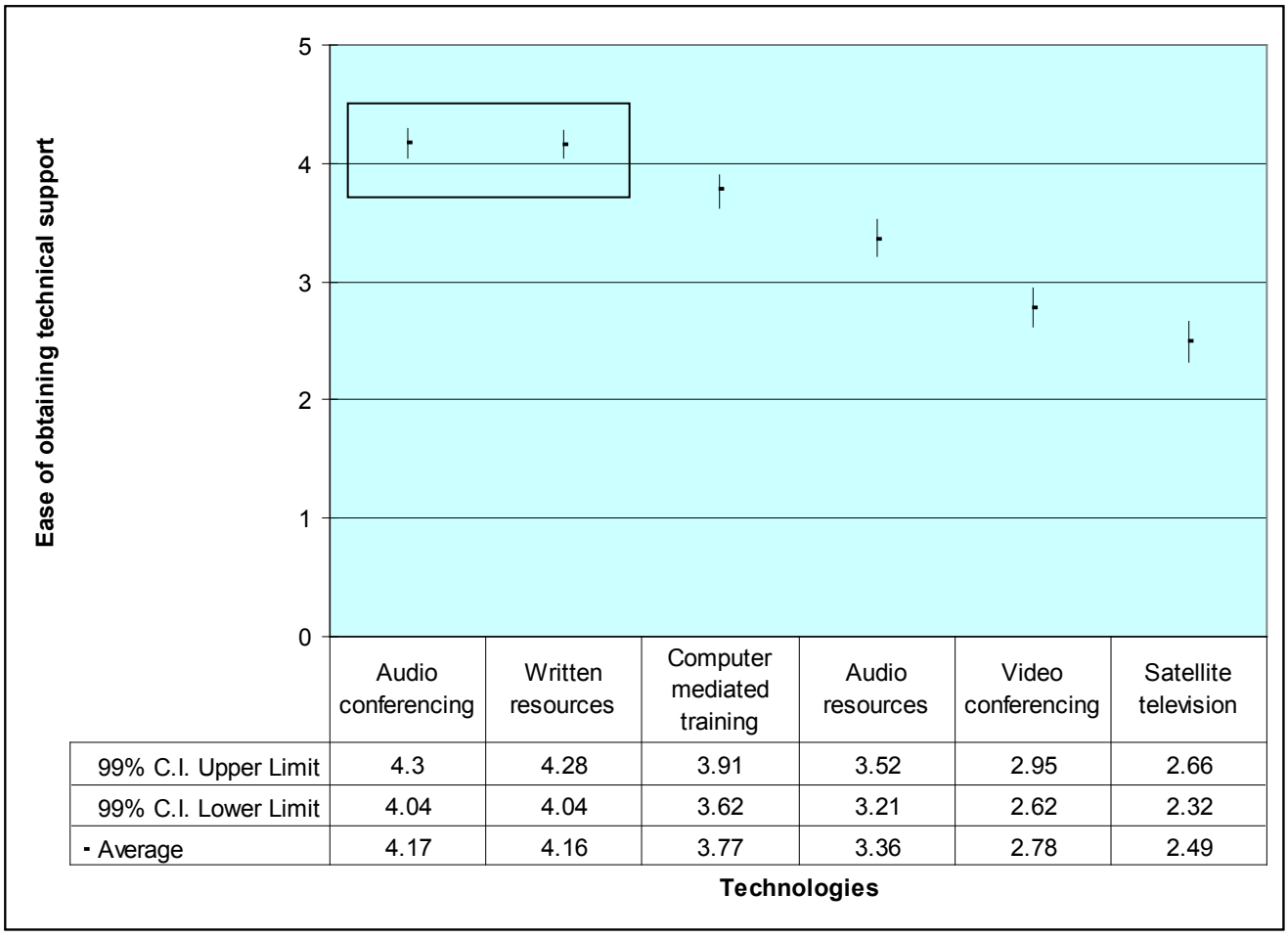
The correlation between the responses to the two questions that asked about preferences for technical support from the duty station and from NCTC was negative and statistically significant at $p < 0.01$, r=-0.21, n=854. We calculated the correlations between these two questions and the questions pertaining to ease of obtaining technical support from each of the usability subscales (Q24b, Q25b, Q26b, Q27b, Q28b, and Q29b). The preference for technical support to be provided by the duty station was related to ease of obtaining technical support for satellite television (r=0.14, $p < 0.01$, n=674) and video conferencing (r=0.15, $p < 0.01$, n=696). These correlations did reach a level of statistical significance, but they are at a size considered indicative of a weak relationship. A positive correlation between two questions indicates that respondents tended to answer both questions similarly—either both responses were high on the respective response scales or both were low. Both correlations are positive, indicating that those who preferred technical support be provided by their duty station also agreed that they could get technical support for satellite television and video conferencing when they needed it. Those who did not prefer to receive technical support from their duty station also disagreed that they could get technical support for satellite television and video conferencing when they needed it.

For further analyses we split the responses to the two preference questions into two groups. We combined those who indicated any level of agreement with the statement into one group and those who indicated any level of disagreement into a second group. Using nonparametric analyses, we evaluated if there was a relationship between regional affiliation and general agreement or disagreement with the preferences for technical support at the duty station or at NCTC. Region was not related to preferences for technical support at the duty station. Region was related to preference for technical support at NCTC: Cramer's V = 0.24, $p < 0.01$, n=517. We conducted an ANOVA to determine the nature of the relationship between region and preference for technical support from NCTC. The results indicated a statistically significant but small relationship: F (8, 846) = 4.06, $p < 0.01$, n=854, $\eta^2=0.04$. The average response on the preference scale for Q31d (support from NCTC) was 2.84 for region 8, which was significantly lower than for regions 2 (3.64), 3 (3.49), and 5 (3.59) (averages in parentheses).

We used a repeated measures ANOVA, with a significance cutoff equal to 0.01, a Bonferroni adjustment for multiple comparisons, and the Greenhouse-Geisser correction to degrees of freedom, to determine if there were significant differences in reported ease of obtaining technical support among the different technologies. The test indicated a large effect and a statistically significant difference among the technologies on ease of obtaining technical support: F (4.32, 2,397.27) = 247.91, $p < 0.01$, n=556, $\eta^2=0.31$. The ease of obtaining technical support for audio conferencing and written resources did not

differ from each other; all other comparisons were significantly different. On the response scale used to measure the ease of obtaining technical support, values 1 and 2 indicate disagreement that obtaining technical support is easy, values 4 and 5 indicate agreement, and a value of 3 is neutral. The average and 99-percent confidence interval for ease of obtaining technical support for each technology are presented in figure 8.

We used a repeated measures ANOVA to determine if the perceived ease of obtaining technical support differed between the groups of respondents who generally agreed or generally disagreed that they preferred to receive technical support from their duty station. The results of the analysis indicate a significant interaction between the agree/disagree split and ease of obtaining technical support: $F(4.26, 1{,}651.56) = 4.23$, $p < 0.01$, $n=390$, $\eta^2=0.01$. This η^2 value is considered a small effect. The agree and disagree groups differ from each other on perceived ease of obtaining technical support for some but not all of the technologies. To determine the specific characteristics of the interaction we conducted a series of follow-up ANOVAs to determine if the two groups differed in their perceived ease of obtaining technical support for satellite television (n=484), video conferencing (n=503), audio conferencing (n=553), computer mediated training (n=521), written resources (n=530), and audio resources (n=465). There were differences between the groups' ratings of the ease of obtaining technical support for



	Audio conferencing	Written resources	Computer mediated training	Audio resources	Video conferencing	Satellite television
99% C.I. Upper Limit	4.3	4.28	3.91	3.52	2.95	2.66
99% C.I. Lower Limit	4.04	4.04	3.62	3.21	2.62	2.32
Average	4.17	4.16	3.77	3.36	2.78	2.49

Figure 8. Averages and confidence intervals (C.I.) for ease of obtaining technical support. Boxes around values indicate that the included values are not significantly different from each other.

satellite technology: $F(1, 482) = 7.38$, $p < 0.01$, $\eta^2=0.02$; and video conferencing: $F(1, 501) = 12.22$, $p < 0.01$, $\eta^2=0.02$. Although these differences were statistically significant, the effect sizes are small. The average response regarding ease of obtaining technical support was higher for those in the agree group than in the disagree group (respective averages in parentheses) for satellite television (2.69, 2.21) and for video conferencing (2.98, 2.41).

We used the same analysis to detect differences in ease of obtaining technical support between the groups of respondents who generally agreed or generally disagreed that they preferred to receive technical support from NCTC. The results of this statistical test (n=334) indicated that there were no significant differences.

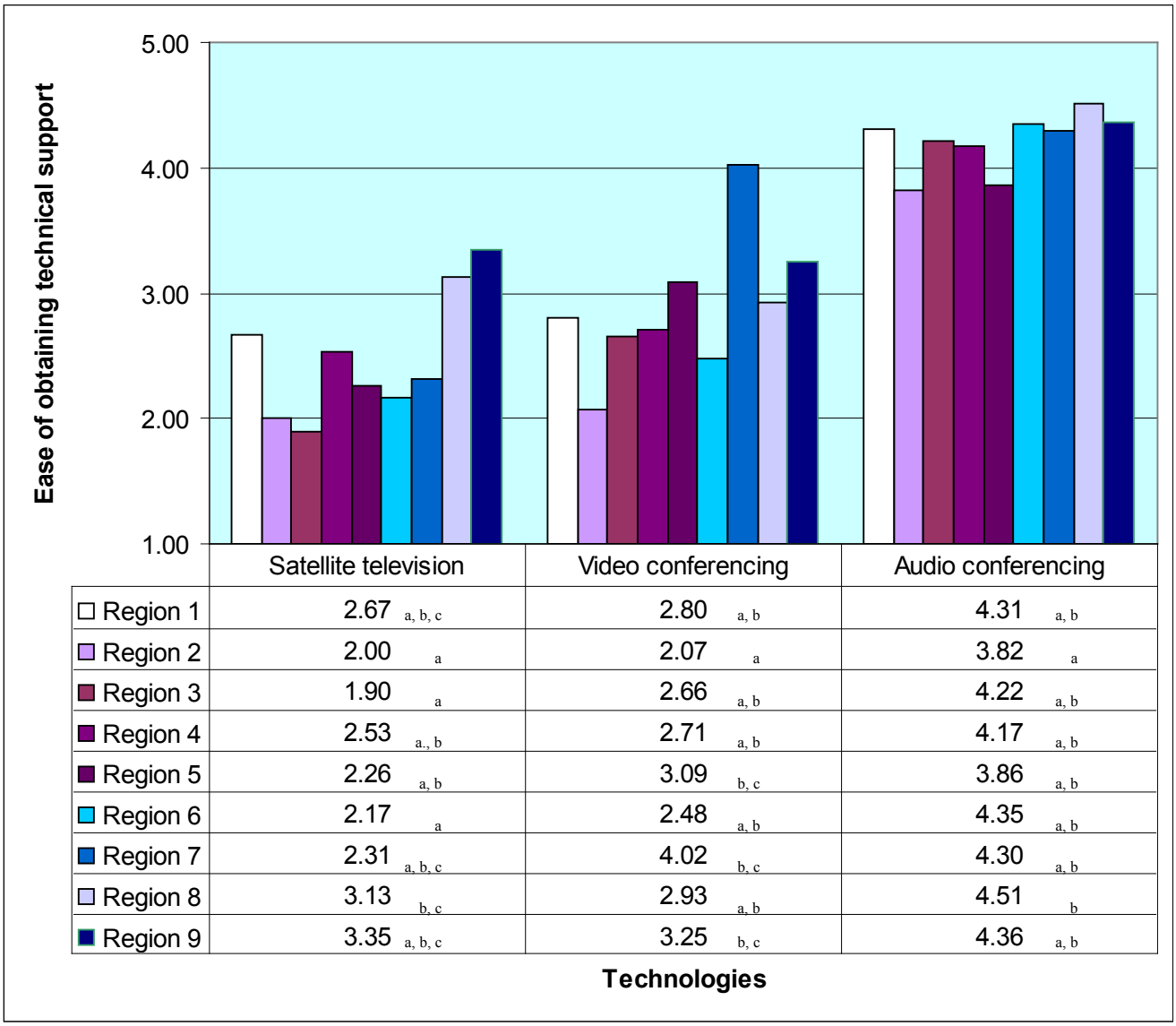
We evaluated if there were regional differences among the reported ease of obtaining technical support for the six distance education technology options. The ease of obtaining technical support for the technology options were measured with questions Q24b, Q25b, Q26b, Q27b, Q28b, and Q29b. We calculated ANOVAs for each technology option to determine if the regions differed in perceived ease of obtaining technical support. There were statistically significant regional differences in perceived ease of obtaining technical support for satellite television: $F(8, 689) = 9.08$, $p < 0.01$, n=698, $\eta^2=0.10$; video conferencing: $F(8, 708) = 8.02$, $p < 0.01$, n=717, $\eta^2=0.08$; and audio conferencing: $F(8, 782) = 3.27$, $p < 0.01$, n=791, $\eta^2=0.03$. The effects for satellite television and video conferencing are medium-sized, and the effect for audio conferencing is small. The post-hoc analyses for these significant results were based on $p < 0.01$ with a Bonferroni adjustment for multiple comparisons. The regional averages for perceived ease of obtaining technical support for satellite television, video conferencing, and audio conferencing are provided in figure 9.

There were no significant regional differences on this question for computer mediated training (n=746), written resources (n=759), or audio resources (n=673).

Onsite versus Distance Education

The survey included questions regarding the importance of aspects of training—some of which were more characteristic of either onsite training or distance education. In our scale reduction, described in appendix 3, these became the aspects of onsite and distance education subscales. Using a checklist, we asked respondents to indicate which reasons would influence them to participate in distance education instead of onsite training and which reasons would influence them to participate in onsite training instead of distance education.

We started our analysis of the aspects of onsite and distance education subscales by calculating the correlation between the two subscales. The correlation was not significant, which indicated that there is no systematic relationship between the two attitudes—they are independent. Because there is evidence in the research literature that age may be related to preferences for training mode, we calculated the correlation between age and the onsite (n=839) and distance education (n=828) subscales. Neither of the subscales was significantly related to age. We compared the subscale scores for the aspects of onsite training and aspects of distance education with a repeated measures ANOVA, with a significance cutoff equal to 0.01 and the Greenhouse-Geisser correction to degrees of freedom, to determine if there was a difference between the average responses to the two subscales. We included regional affiliation and responses to Q1 (How many courses have you taken onsite at NCTC?) and Q2 (How many courses have you taken from NCTC via distance education?) as between-subject factors. The results indicated a significant but small difference between the two subscales: $F(1, 1) = 29.71$, $p < 0.01$, n=841, $\eta^2=0.03$. The average rating of importance for aspects of onsite training was 3.02 with lower and upper bounds of a 99-percent confidence interval at 2.92 and 3.2, respectively. Based upon the 4-point response scale for these questions, the average falls slightly above the scale value of 3



	Satellite television	Video conferencing	Audio conferencing
Region 1	2.67 $_{a, b, c}$	2.80 $_{a, b}$	4.31 $_{a, b}$
Region 2	2.00 $_{a}$	2.07 $_{a}$	3.82 $_{a}$
Region 3	1.90 $_{a}$	2.66 $_{a, b}$	4.22 $_{a, b}$
Region 4	2.53 $_{a., b}$	2.71 $_{a, b}$	4.17 $_{a, b}$
Region 5	2.26 $_{a, b}$	3.09 $_{b, c}$	3.86 $_{a, b}$
Region 6	2.17 $_{a}$	2.48 $_{a, b}$	4.35 $_{a, b}$
Region 7	2.31 $_{a, b, c}$	4.02 $_{b, c}$	4.30 $_{a, b}$
Region 8	3.13 $_{b, c}$	2.93 $_{a, b}$	4.51 $_{b}$
Region 9	3.35 $_{a, b, c}$	3.25 $_{b, c}$	4.36 $_{a, b}$

Figure 9. Regional averages for ease of obtaining technical support for satellite television, video conferencing, and audio conferencing. Averages in the same column that do not share subscripts are significantly different from each other at $p < 0.01$.

(Important). The average rating of importance for aspects of distance education was 2.59 with the lower and upper bounds of a 99-percent confidence interval at 2.50 and 2.68. The average response for the aspects of distance education subscale falls midway between the scale values of 2 (Somewhat important) and 3 (Important). The effects of region and Q1 were not significant. There was a significant result for the interaction of Q2 and the aspects of onsite training and distance education subscales: $F(1, 4) = 5.48$, $p < 0.01$. However, the size of this effect was small, $\eta^2=0.02$, and the follow up analysis did not indicate a significant effect.

We treated the responses to the two checklists—reasons why respondents would select distance education instead of onsite training, and why they would select onsite training instead of distance education—as qualitative data. These checklists fall into the category of multiple response variables,

which are difficult to analyze (Bilder and Loughin, 2004). One of the concerns with checklists is that it cannot be determined if the lack of a check mark indicates missing data—a respondent skipped the question—or if it is a negative response indicating the respondent is not influenced by this factor. In table 3 we provide the top ten reasons from each checklist with the number of respondents selecting that reason.

Table 3. Ten most frequent reasons for selecting a given mode of training.

Distance education instead of onsite		Onsite instead of distance education	
Scheduling with commitments in my work life	n=696	Interaction with instructor	n=765
Scheduling with commitments in my personal life	n=648	Interaction with other students	n=745
Cost issues	n=500	Meeting others	n=670
Freedom to complete training when I can fit it in	n=459	It's easier for me to learn this way	n=492
Travel time	n=457	Level of interest in the topic	n=465
Transportation issues	n=355	It's efficient to learn this way	n=265
Level of interest in the topic	n=342	Scheduling with commitments in my work life	n=141
Independent pace of learning	n=247	Scheduling with commitments in my personal life	n=113
It's efficient to learn this way	n=172	Travel time	n=63
Needing permission from supervisor	n=164	Transportation issues*	n=59
		Cost issues*	

* These two reasons received equal numbers of marks on the checklist.

Preferences for Mode of Training and Type of Information by Content Area

We asked respondents to indicate what type of information they most needed from each training content area. The response options were basic facts, processes and procedures, technical hands-on skill, interpersonal skill, problem solving methods, and how to develop a strategy. We asked survey respondents to indicate a preferred training mode for each training content area. We included instructor-led training at NCTC (ILT onsite) and instructor-led training offsite from NCTC (ILT offsite) as options. Our goal was to combine these responses into a joint table to determine the preferred level of information and mode of training within each topic.

We included only the responses from those who indicated a higher level of desire for training. For each of the training topics, respondents were asked to rate their desire for training on that topic. For each topic area we selected respondents who rated their desire for training on that topic with a response of 4, 5, 6, or 7 and created subgroups of respondents for each training content area. The number of respondents in these subgroups is different for each training content area: partnerships, n=695; technology, n=791; program planning, n=620; outreach methods, n=621; and evaluation methods, n=488. After selecting respondents based on desire for training, we combined the data for the type of information needed and preferred mode of training. We were unable to conduct statistical analyses of these tables because of a high degree of sparseness. Sparseness occurs when there are an insufficient number of responses in each cell of a table and is a common problem in joint tables (Bilder and Loughin, 2004). We were limited to reporting the frequencies of responses, which involved a cross-tabulation of the responses to the questions regarding type of information needed and preferred training mode. For example, of those respondents who desire training on partnerships, 80 of them would like the partnership training to provide problem solving methods in an instructor-led course at NCTC. We reported the data only for those cells including 5 percent or more of the respondents included in that training content area subgroup. Table 3–5 includes the summary for partnerships; table 3–6 includes the summary for technology; table 3–7 includes the summary for program planning; table 3–8 includes the summary for outreach methods; and table 3–9 includes the summary for evaluation methods. These tables are located in appendix 3.

We layered these tables into a summary table, table 4. This summary table has the same row and column headings as the tables for each training content area. In the summary table, the names of the training content areas appear in cells in which 5 percent or more of the relevant subgroup occur in the individual table. For example, in table 3–6 at least 5 percent of the technology subgroup indicated each of the following preferences for receiving training on technology: a technical hands-on skill provided through an instructor-led course at NCTC, a technical hands-on skill provided through an instructor-led course offsite from NCTC, or a technical hands-on skill provided through computer mediated training. In table 4, the training content area of technology appears in the column for technical hands-on skill and in the rows for ILT onsite, ILT offsite, and computer mediated training.

Less than 5 percent of individuals who indicated an interest in any of the training topics preferred to receive any training via the modes of satellite television, video conferencing, audio conferencing, written resources, or audio resources.

Summary and Discussion

The objective of this study was to identify preferred training topics and preferred distance education technology to inform a plan for distance education programming. We used an open-ended survey of a small sample of FWS employees who were likely to be involved in conservation and

Table 4. Combined preferences for mode of training and type of information by training content area. The name of a training content area appears in a cell when at least 5 percent of respondents in that area's subgroup selected that combination of mode and information type. (ILT, instructor-led training).

Mode of training	Type of information: Basic facts	Processes and procedures	Technical hands-on skill	Interpersonal skill	Problem solving methods	How to develop a strategy
ILT onsite	Outreach methods Evaluation methods	Partnerships Program planning Outreach methods Evaluation methods	Technology Evaluation methods	Partnerships	Partnerships	Partnerships Program planning Outreach methods
ILT offsite			Technology		Partnerships	Partnerships
Satellite television						
Video conferencing						
Audio conferencing						
Computer mediated training	Evaluation methods	Evaluation methods	Technology			Program planning Outreach methods
Written resources						
Audio resources						

environmental education and outreach programming. The results of the first study were qualitatively analyzed to identify topics on which training programs would be of interest and use. We included questions regarding the value of these topics and the desire for training on these topics on a second survey that was distributed to a larger sample of FWS employees. This second survey also included questions regarding experience with, usability of, and access to six distance education technologies. Respondents to the survey were asked about their preferred mode of receiving training given the options of instructor-led training on or off the NCTC campus and the six distance education options.

We summarize and discuss the results of the study with an emphasis on the statistically significant results with large and medium effect sizes. Interpretation of significant effects without a corresponding consideration of the effect size can lead to misinterpretations of the results of a study (Murphy and Myors, 1998). Effect sizes that are conventionally considered to be medium or large effect sizes are likely to have practical implications. For example, a medium-sized regional effect was found for the usability/access to satellite television. Respondents from region 9 reported more access to and easier usability of satellite television than respondents from many other regions. This effect is likely to be of practical importance such that training offered via satellite television would be noticeably more accessible to employees in region 9. Small effect sizes may have little practical effect in application even if the results are statistically significant. For example, a small regional effect was found for the usability/access to audio conferencing. In this case, respondents from region 9 reported more access to and easier usability of audio conferencing than respondents from region 2. Given the small effect, it is unlikely that actual training offered via audio conferencing would have a noticeable difference in participation across regions.

Training Content Areas (Topics)

The DEO can make the most effective use of their training resources when they know which training topics are most preferred and needed by their target population. When training is relevant to a job, individuals are more likely to perform well in training (Lim and others, 2007), are more motivated to participate in training (Kraiger, 2003), and are more likely to be satisfied with the training (Giancreco and others, 2009).

The comparison of the value subscales for the training topics demonstrated a difference among the topics characterized by a large effect size. Based upon their perceived value to the jobs of those who engage in conservation and environmental education and outreach, these topics fall into three tiers. The top tier includes partnerships and technology. These topics are not valued differently from each other but they are valued more than the other topics on the survey. The second tier includes program planning and outreach methods. The bottom tier includes the topic of evaluation methods. However, the average ratings of perceived value for all topics were in the positive range of the scale, indicating that all topics were valued.

The percent of the respondents' jobs involving conservation and environmental education and outreach programming affected their perceived value of these topics. There were significant, medium-sized effects for the value of partnerships, program planning, outreach methods, and evaluation methods. There were several differences in perceived value for these topics among the percentage levels. The most consistent difference was that the group reporting the lowest percent time on the job spent on conservation education and outreach tasks valued the topics less than those reporting that a higher percent of their job involved conservation and outreach.

The comparisons of reported desire for the training topics demonstrated a significant difference in desire among the training topics, and this difference was medium in size. The training topics fall into

four tiers based on the reported desirability of training. Respondents indicated the highest desire for training on the topic of technology. Training on partnerships is on the second tier. The third tier includes program planning and outreach methods. The topic of evaluation methods is on the last tier. When considering the results of value of the topics and desire for training on the topics jointly, the partnership and technology topics are equally valued but training on technology is more desirable. The analyses indicated that percent of the job involving education and outreach had an effect on desire for training similar to the effect on value of the topics. There were medium-sized effects indicating that those with the lowest percent time on the job spent on education and outreach topics desired training less on the topics of partnerships, program planning, outreach methods, and evaluation methods.

The differences in the measures of value of training topics and desire for training among those with different levels of percent time on the job spent on education and outreach are not surprising. However, we cannot definitively conclude any reason for these differences. One possible explanation is that those who perform conservation and environmental education and outreach tasks 1–20 percent of the time do the same types of education and outreach activities as those who spend more time on them, but they have fewer of such tasks to perform. An alternate explanation is that those in the 1–20 percent group do conservation and environmental education and outreach tasks that are fundamentally different than those in the higher percent groups. What is clear from these results is that training on these topics is more valued and desired by those who spend more of their time on the job engaged in education and outreach tasks.

Mode of Training

Education via distance methods can be as effective as traditional training or education methods. Studies comparing the effectiveness of various distance education technologies with traditional classroom instruction conclude there is little difference in effectiveness of the methods (Machtmes and Asher, 2000; Allen and others, 2004; Zhao and others, 2005). Bernard and others (2004) interpreted the results of their meta-analysis comparing distance education with classroom instruction as indicating that whether a course was conducted in a traditional classroom or via distance technology made little difference because both categories of instruction included a wide variety of quality. In other words, the quality of the education varied widely for both traditional and distance education.

When they analyzed the effect of instructional methodology as part of their comparison of Web-based and classroom instruction, Sitzmann and others (2006) determined that when the instructional methods were similar, the difference in effectiveness for Web-based and classroom instruction was negligible. The quality of the instructional method seems to matter more than the specific technology used to present the course (Chumley-Jones and others, 2002; Salas and others, 2002; DeBourgh, 2003; Stein and others, 2005). As long as high-quality instructional methods are used—such as multiple instruction techniques, longer courses, giving learners more control in training, giving learners the opportunity to practice new skills and knowledge, and giving learners performance feedback—it does not seem to matter whether the courses are provided in a classroom setting or via distance education technology.

Learners tend to have more positive attitudes toward distance education technologies after successful experiences with them (Welsh and others, 2003). The caveat is that this effect seems to occur when the technology worked well; if there are difficulties due to the particular technology used—for example, errors loading a Webpage—then positive attitudes are less likely to follow. Frustration with technical problems in distance education is a common issue reported by individuals participating in online or other distance learning (Hara and Kling, 2000; Muilenburg and Berge, 2001). The provision of technical support is important to the success of a distance education initiative (Selim, 2007) and will

affect the accessibility of the technology for distance education participants (Cho and Berge, 2002). Although the literature supports a conclusion that any mode of instruction can be used successfully as long as appropriate methodology is used, the success of distance modes depends on the usability and accessibility of the technology and technical support.

The results of our analyses indicate a large effect size for differences in usability/access to the technologies we included in this study. The six technologies can be assembled into five tiers of usability and access. These tiers in order from best usability/access to worst are as follows:

- audio conferencing and written resources,
- computer mediated training,
- audio resources,
- video conferencing, and
- satellite television.

A moderately-sized regional effect was found that indicated that there were regional differences in usability and access among the different technologies. Upon closer examination it appeared that respondents from region 9 rated the usability of and access to satellite television, video conferencing, and audio conferencing higher than did respondents from some of the other regions. Respondents from region 7 rated video conferencing as higher than did respondents from other regions. Because the regional effect seemed predominantly due to differences between region 9 and other regions, we reanalyzed the responses to the usability/access subscales excluding the data from region 9. We found that the large effect for technology remained but that the technologies created a four-tiered rather than a five-tiered structure. The technologies rated highest in both usability and access are audio conferencing, written resources, and computer mediated training. The remaining technologies are each in their own tier. In descending order, they are audio resources, video conferencing, and satellite television. The regional effect did not completely disappear when we removed the responses from region 9. There was still a moderate regional effect. Respondents from region 7 rated the usability/access to video conferencing higher than did respondents from other regions. Region 7 has the highest percentage of office video conferencing units installed, and these units can receive NCTC satellite broadcasts as video conferences (Randy Robinson, NCTC, written commun., 2010). There is a clear and robust hierarchy of usability and accessibility differentiating among the technologies.

The practical consequence of this regional effect is that the choice of distance education mode can create a differential effect in serving the needs of employees in different regions. For example, training provided via satellite television is more likely to meet the needs of employees in region 9 than in other regions because the respondents in region 9 report more accessibility to that technology. The FWS Arlington office in region 9 uses software and hardware that delivers a satellite television signal to employees' computers. This technology—being used at this time by only the Arlington office—allows very convenient access to training provided via satellite television (Randy Robinson, NCTC, written commun., 2010).

The accessibility of technical support for different distance education technologies is an important consideration. When we examined the differences in the ease of obtaining technical support, we found a pattern similar to the pattern for usability/access to the technologies. The six technologies can be assembled into five tiers of ease of obtaining technical support. These tiers in descending order are as follows:

- audio conferencing and written resources,
- computer mediated training,
- audio resources,

- video conferencing, and
- satellite television.

The respondents who indicated a preference for receiving technical support at their local duty station reported more ease of obtaining technical support for satellite television and video conferencing than did those who did not want to receive technical support at their duty station, who reported lower ease of obtaining technical support for these technologies. One possible explanation is that technical support is difficult to obtain at some duty stations because of staffing and (or) budgets and that some technologies such as satellite television and video conferencing are particularly difficult to support.

There were regional differences in perceived ease of obtaining technical support. These differences were characterized by medium effect sizes for satellite television and video conferencing and a smaller effect for audio conferencing. Respondents from regions 8 and 9 reported higher ease of obtaining technical support for satellite television than did respondents from other regions. The respondents from regions 5, 7, and 9 reported higher ease of obtaining technical support for video conferencing than respondents in some other regions. In the case of audio conferencing, the only regional difference was between regions 8 and 2. Because the role of technical support can be critical in implementation of a distance education program, the use of satellite television and video conferencing to provide distance education may result in noticeable differences in participation in the training across regions. Those in regions where it is more difficult to obtain technical support for these technologies may be less inclined to participate in distance education courses that use them.

Based on the results regarding usability and access to technology and ease of obtaining technical support, the technologies most likely to effectively support distance education are audio conferencing, written resources, and computer mediated training. The technologies of audio resources, video conferencing, and satellite television are less usable, less accessible, and less easily supported. There are clear differences in how these technologies are rated by the FWS employees in our sample.

When instructor-led training options (onsite and offsite) were offered alongside the distance education technologies, respondents more frequently indicated their preferences were for the instructor-led options than for distance education. Although we could not perform statistical analyses because of sparseness in the tables, there appears to be a pattern in preferred training modes. Instructor-led onsite and instructor-led offsite training were preferred for most of the training topics and most of the different types of information. The only distance education mode that met our cutoff for determining preferences was computer mediated training. However, no distance education modes were preferred for the training topic of partnerships—only the instructor-led modes were preferred for that topic.

Because of the emphasis in the literature that age can affect preferences for use of technology and modes of distance education, it may be tempting to conclude that the results of this survey—preferences for onsite training—are explained by the average respondent age of 46. However, based upon our data, that is not a supportable conclusion. We did calculate the correlation between age and several variables, including the value of the training topics, the desirability of training, the usability and access to the different distance education technologies, and the subscales for aspects of online and distance education. Age was not significantly related to any of these variables and is therefore not a viable explanation for the results of this survey.

We asked respondents to indicate their reasons for taking distance education over onsite training and their reasons for taking onsite training over distance education. The most frequently selected reasons for taking distance education over onsite training appear to be practical in nature and include scheduling, cost, and travel issues. The most frequently selected reasons for taking onsite training over distance education include other aspects of face-to-face classroom instruction such as interactions with the instructor and other students.

Although much of the published research indicates that distance education can be as effective as face-to-face classroom education, there are still some concerns about distance education. Brown and Van Buren (2007) suggest that social capital, the beneficial quality of personal relationships, may not be developed in distance education as much as when training involves face-to-face interaction. Empirical research has not yet provided a reliable answer as to whether or not social capital is affected by training mode. Social capital can be of benefit to an organization in that employees may be able to use positive personal relationships to obtain information from outside the organization or group. Social capital can also benefit a group by enhancing cooperation within the group. It is interesting to note that, although workload management was a concern in the first survey in this study, the preferred mode of training from the second survey—onsite training—can be more time intensive and participation in such training can increase the workload burden. The possible benefit of increased social capital involved in onsite training might make the increase in workload worthwhile.

While distance education could fill a practical need and provide adequate training on the topics included in this study, instructor-led training, either at NCTC or offsite, seems to be preferred. The training considered most relevant and for which training was most desired is that related to partnerships and technology.

Acknowledgments

This study was requested and supported by the U.S. Fish and Wildlife Service National Conservation Training Center, Division of Education Outreach. This study would not have been possible without the commitment and time of the FWS employees who responded to our survey. We would like to thank Dr. Kim Buch and Dr. Clifford Blizard for their thoughtful reviews of this report.

References Cited

Ahern, T.C., 1996, A framework for improving the task-to-technology fit in distance education: TechTrends, v. 41, no. 6, p. 23–26.

Allen, Mike; Mabry, Edward; Mattrey, Michelle; Bourhis, John; Titsworth, Scott; and Burrell, Nancy, 2004, Evaluating the effectiveness of distance learning—A comparison using meta-analysis: Journal of Communication, v. 54, no. 3, p. 402–420.

Anastasi, Anne, and Urbina, Susana, 1997, Psychological testing (7th ed.): Upper Saddle River, N.J., Prentice Hall, 721 p.

Arbaugh, J.B., 2005, Is there an optimal design for on-line MBA courses?: Academy of Management Learning and Education, v. 4, no. 2, p. 135–149.

Arthur, Winifred, Jr.; Bennett, Winston, Jr.; Edens, P.S.; and Bell, S.T., 2003, Effectiveness of training in organizations—A meta-analysis of design and evaluation features: Journal of Applied Psychology, v. 88, no. 2, p. 234–245.

Barclay, Stephen; Todd, Chris; Finlay, Ilora; Grande, Gunn; and Wyatt, Penny, 2002, Not another questionnaire! Maximizing the response rate, predicting non-response and assessing non-response bias in postal questionnaire studies of GPs: Family Practice, v. 19, no. 1, p. 105–111.

Benckendorff, Pierre; Moscardo, Gianna; and Murphy, Laurie, 2005, High tech versus high touch—Visitor response to the use of technology in tourist attractions: Tourism Recreation Research, v. 30, no. 3, p. 37–47.

Berge, Z.L., and Kearsley, Greg, 2003, The sustainability of distance training—Follow-up to case studies: Technology Source, November/December, accessed November 2, 2009, at *http://ts.mivu.org/default.asp?show=article&id=2027*.

Bernard, R.M.; Abrami, P.C.; Lou, Yiping; Borokhovski, Evgueni; Wade, Anne; Wozney, Lori; Wallet, P.A.; Fiset, Manon; and Huang, Binru, 2004, How does distance education compare with classroom instruction? A meta-analysis of the empirical literature: Review of Educational Research, v. 74, no. 3, p. 379–439.

Biddle, P.B., Cross, D.H., Jennings, D.P., Sojda, R.S., and Solomon, R.C., 1995, Information needs and technology applications of Department of the Interior natural resource professionals: Wildlife Society Bulletin, v. 23, no. 4, p. 627–630.

Bilder, C.R., and Loughin, T.M., 2004, Testing for marginal independence between two categorical variables with multiple responses: Biometrics, v. 60, no. 1, p. 241–248.

Bourdeau, Jacqueline, and Bates, Anthony, 1997, Instructional design for distance learning, *in* Dijkstra, S., Seel, N.M., Schott, F., and Tennyson, R.D., eds., Instructional design—International perspectives: Mahwah, N.J., Erlbaum, p. 369–397.

Breslow, R.M., 2005, A comparison of academic performance of off-campus nontraditional PharmD students with campus-based PharmD students: American Journal of Pharmaceutical Education, v. 69, no. 1, p. 62–71.

Brown, K.G., and Ford, J.K., 2002, Using computer technology in training—Building an infrastructure for active learning, *in* Kraiger, K., ed., Creating, implementing, and managing effective training and development—State-of-the-art lessons for practice: San Francisco, Calif., Jossey-Bass, p. 192–233.

Brown, K.G., and Van Buren, M.E., 2007, Applying a social capital perspective to the evaluation of distance training, *in* Fiore, S.M., and Salas, E., eds., Toward a science of distributed learning: Washington, D.C., American Psychological Association, p. 41–63.

Burkell, Jacquelyn, 2003, The dilemma of survey nonresponse: Library and Information Science Research, v. 25, no. 3, p. 239–263.

Burton, J.K., and Merrill, P.F., 1991, Needs assessment—Goals, needs and priorities, *in* Briggs, L.J., Gustafson, K.L., and Tillman, M.H., eds., Instructional design—Principles and applications (2d ed.): Englewood Cliffs, N.J., Educational Technology Publications, p. 17–43.

Burton-Jones, Andrew, and Hubona, G.S., 2006, The mediation of external variables in the technology acceptance model: Information and Management, v. 43, no. 6, p. 706–717.

Cartwright, Ann, 1978, Professionals as responders—Variations in and effects of response rates to questionnaires, 1961–77: British Medical Journal, v. 2, p. 1419–1421.

Chatzoglou, P.D.; Sarigiannidis, Lazaros; Vraimaki, Eftichia; and Diamantidis, Anastasios, 2009, Investigating Greek employees' intention to use web-based training: Computers and Education, v. 53, no. 2, p. 877–889.

Childs, Sue; Blenkinsopp, Elizabeth; Hall, Amanda; and Walton, Graham, 2005, Effective e-learning for health professionals and students—Barriers and their solutions. A systematic review of the literature—Findings from the HeXL project: Health Information and Libraries Journal, v. 22, suppl. s2, p. 20–32.

Cho, S.K., and Berge, Z.L., 2002, Overcoming barriers to distance training and education: USDLA Journal, v. 16, no. 1, 20 p., accessed November 3, 2009, at *http://www.usdla.org/html/journal/JAN02_Issue/ED_JAN02.pdf*.

Christensen, E.W., Anakwe, U.P., and Kessler, E.H., 2001, Receptivity to distance learning—The effect of technology, reputation, constraints, and learning preferences: Journal of Research on Computing Education, v. 33, no. 3, p. 263–279.

Chumley-Jones, H.S.; Dobbie, Alison; and Alford, C.L., 2002, Web-based learning—Sound educational method or hype? A review of the evaluation literature: Academic Medicine, v. 77, no. 10 (suppl.), p. S86–S93.
Clawson, R.A., and Choate, Judd, 1999, Explaining participation on a class newsgroup: Social Science Computer Review, v. 17, no. 4, p. 455–459.
Colquitt, J.A., LePine, J.A., and Noe, R.A., 2000, Toward an integrative theory of training motivation—A meta-analytic path analysis of 20 years of research: Journal of Applied Psychology, v. 85, no. 5, p. 678–707.
Cragg, C.E.B., Andrusyszyn, M.A., and Humbert, Jennie, 1999, Experience with technology and preferences for distance education delivery methods in a nurse practitioner program: Journal of Distance Education, v. 14, no. 1, p. 1–13.
Daley, B.J.; Watkins, Karen; Williams, S.W.; Courtenay, Bradley; Davis, Mike; and Dymock, Darryl, 2001, Exploring learning in a technology-enhanced environment: Educational Technology and Society, v. 4, no. 3, p. 126–138.
Davis, F.D., 1989, Perceived usefulness, perceived ease of use, and user acceptance of information technology: MIS Quarterly, v. 13, no. 3, p. 319–339.
DeBourgh, G.A., 2003, Predictors of student satisfaction in distance-delivered graduate nursing courses—What matters most?: Journal of Professional Nursing, v. 19, no. 3, p. 149–163.
DeRouin, R.E.; Fritzsche, B.A.; and Salas, Eduardo, 2004, Optimizing e-learning—Research-based guidelines for learner-controlled training: Human Resource Management, v. 43, no. 2–3, p. 147–162.
DeRouin, R.E.; Fritzsche, B.A.; and Salas, Eduardo, 2005, E-learning in organizations: Journal of Management, v. 31, no. 6, p. 920–940.
Dillman, D.A., Eltinge, J.L., Groves, R.M., and Little, R.J.A., 2002, Survey nonresponse in design, data collection, and analysis, *in* Groves, R.M., Dillman, D.A., Eltinge, J.L., and Little, R.J.A., eds., Survey nonresponse: New York, John Wiley and Sons, Inc., p. 3–26.
Dupin-Bryant, P.A., and DuCharme-Hansen, B.A., 2005, Assessing student needs in web-based distance education: International Journal of Instructional Technology and Distance Learning, v. 2, no. 1, accessed March 18, 2008, at *http:www.itdl.org/Journal/Jan_05/article04.htm*.
Fjortoft, N.F., 1996, Persistence in a distance learning program—A case in pharmaceutical education: American Journal of Distance Education, v. 10, no. 3, p. 49–59.
Frydenberg, Jia, 2002, Quality standards in e-learning—A matrix of analysis: International Review of Research in Open and Distance Learning, v. 3, no. 2, p. 1–15.
Ghiselli, E.E.; Campbell, J.P.; and Zedeck, Sheldon, 1981, Measurement theory for the behavioral sciences: New York, W.H. Freeman and Company, 494 p.
Giangreco, Antonio; Sebastiano, Antonio; and Peccei, Riccardo, 2009, Trainees' reactions to training—An analysis of the factors affecting overall satisfaction with training: International Journal of Human Resource Management, v. 20, no. 1, p. 96–111.
Groves, R.M., and Peytcheva, Emilia, 2008, The impact of nonresponse rates on nonresponse bias—A meta-analysis: Public Opinion Quarterly, v. 72, no. 2, p. 167–189.
Hara, Noriko, and Kling, Rob, 2000, Student distress in a web-based distance education course: Information, Communication and Society, v. 3, no. 4, p. 557–579.
Harris, M.L., and Gibson, S.G., 2006, Distance education vs. face-to-face classes—Individual differences, course preferences and enrollment: Psychological Reports, v. 98, no. 3, p. 756–764.
Head, J.T., Lockee, B.B., and Oliver, K.M., 2002, Method, media, and mode—Clarifying the discussion of distance education effectiveness: Quarterly Review of Distance Education, v. 3, no. 3, p. 261–268.

Hollister, C.D., and McGee, Gloria, 2000, Delivering substance abuse and child welfare content through interactive television: Research on Social Work Practice, v. 10, no. 4, p. 417–427.
Huddlestone, John, and Pike, Jonathon, 2008, Seven key decision factors for selecting e-learning: Cognition, Technology and Work, v. 10, no. 3, p. 237–247.
Hudson, Darren; Seah, L.-H.; Hite, Diane; and Haab, Tim, 2004, Telephone presurveys, self-selection, and non-response bias to mail and internet surveys in economic research: Applied Economics Letters, v. 11, no. 4, p. 237–240.
Jackson, C.M.; Chow, Simeon; and Leitch, R.A., 1997, Toward an understanding of the behavioral intentions to use an information system: Decision Sciences, v. 28, no. 2, p. 357–389.
Jedlicka, J.S., Brown, S.W., Bunch, A.E., and Jaffe, L.E., 2002, A comparison of distance education instructional methods in occupational therapy: Journal of Allied Health, v. 31, no. 4, p. 247–251.
Johnson, R.D.; Gueutal, Hal; and Falbe, C.M., 2009, Technology, trainees, metacognitive activity and e-learning effectiveness: Journal of Managerial Psychology, v. 24, no. 6, p. 545–566.
Jones, R.A., 1985, Research methods in the social and behavioral sciences: Sunderland, Mass., Sinauer Associates, Inc., 411 p.
King, W.R., and He, Jun, 2006, A meta-analysis of the technology acceptance model: Information and Management, v. 43, no. 6, p. 740–755.
Klein, H.J.; Noe, R.A.; and Wang, Chongwei, 2006, Motivation to learn and course outcomes—The impact of delivery mode, learning goal orientation, and perceived barriers and enablers: Personnel Psychology, v. 59, p. 665–702.
Kosarzycki, M.P.; Salas, Eduardo; DeRouin, R.E.; and Fiore, S.M., 2003, Distance learning in organizations—A review and assessment of future needs, *in* Stone, D., ed., Advances in human performance and cognitive engineering research—Human resources technology: Boston, JAI, p. 69–98.
Kraiger, Kurt, 2003, Perspectives on training and development, *in* Borman, W.C., Ilgen, D.R., and Klimoski, R.J., eds., Handbook of Psychology: Hoboken, N.J., Wiley, p. 171–192.
Kraiger, Kurt, and Jerden, Eddie, 2007, Meta-analytic investigation of learner control—Old findings and new directions, *in* Fiore, S.M., and Salas, E., eds., Toward a science of distributed learning: Washington, D.C., American Psychological Association, p. 65–90.
Lau, S.-H., and Woods, P.C., 2008, An investigation of user perceptions and attitudes towards learning objects: British Journal of Educational Technology, v. 39, no. 4, p. 685–699.
Lee, Y.-C., 2008, The role of perceived resources in online learning adoption: Computers and Education, v. 50, no. 4, p. 1423–1438.
Lemak, D.J., Shin, S.J., Reed, Richard, and Montgomery, J.C., 2005, Technology, transactional distance, and instructor effectiveness—An empirical investigation: Academy of Management Learning and Education, v. 4, no. 2, p. 150–159.
Levy, Yair, 2007, Comparing dropouts and persistence in e-learning courses: Computers and Education, v. 48, no. 2, p. 185–204.
Lim, C.K., 2001, Computer self-efficacy, academic self-concept, and other predictors of satisfaction and future participation of adult distance learners: American Journal of Distance Education, v. 15, no. 2, p. 41–51.
Lim, Hyochang; Lee, S.-G.; and Nam, Kichan, 2007, Validating e-learning factors affecting training effectiveness: International Journal of Information Management, v. 27, no. 1, p. 22–35.
Luor, Tainyi; Hu, Changya; and Lu, H.-P., 2009, 'Mind the gap'—An empirical study of the gap between intention and actual usage of corporate e-learning programmes in the financial industry: British Journal of Educational Technology, v. 40, no. 4, p. 713–732.

Lynn, Peter; Clarke, Paul; Martin, Jean; and Sturgis, Patrick, 2002, The effects of extended interviewer efforts on nonresponse bias, *in* Groves, R.M., Dillman, D.A., Eltinge, J.L., and Little, R.J.A., eds., Survey nonresponse: New York, John Wiley and Sons, Inc., p. 135–147.

Machtmes, Krisanna, and Asher, J.W., 2000, A meta-analysis of the effectiveness of telecourses in distance education: American Journal of Distance Education, v. 14, no. 1, p. 27–46.

Martins, L.L., and Kellermanns, F.W., 2004, A model of business school students' acceptance of a web-based course management system: Academy of Management Learning and Education, v. 3, no. 1, p. 7–26.

Mathieu, J.E.; Tannenbaum, S.I.; and Salas, Eduardo, 1992, Influences of individual and situational characteristics on measures of training effectiveness: Academy of Management Journal, v. 35, no. 4, p. 828–847.

McMullin, J.A.; Comeau, T.D.; and Jovic, Emily, 2007, Generational affinities and discourses of difference—A case study of highly skilled information technology workers: British Journal of Sociology, v. 58, no. 2, p. 297–316.

Miller, G.E., 2000, General education and distance education—Two channels in the new mainstream: Journal of General Education, v. 49, no. 1, p. 1–9.

Moore, D.L., and Tarnai, John, 2002, Evaluating nonresponse error in mail surveys, *in* Groves, R.M., Dillman, D.A., Eltinge, J.L., and Little, R.J.A., eds., Survey nonresponse: New York, John Wiley and Sons, Inc., p. 197–211.

Morgan, G.A., Griego, O.V., and Gloeckner, G.W., 2001, SPSS for Windows—An introduction to use and interpretation in research: Mahwah, N.J., Lawrence Erlbaum Associates, 214 p.

Muilenburg, L.Y., and Berge, Z.L., 2001, Barriers to distance education—A factor-analytic study: American Journal of Distance Education, v. 15, no. 2, p. 7–22.

Muilenburg, L.Y., and Berge, Z.L., 2005, Student barriers to online learning—A factor analytic study: Distance Education, v. 26, no. 1, p. 29–48.

Murphy, K.R., and Davidshofer, C.O., 1998, Psychological testing—Principles and applications (4th ed.): Upper Saddle River, N.J., Prentice Hall, 602 p.

Murphy, K.R., and Myors, Brett, 1998, Statistical power analysis—A simple and general model for traditional and modern hypothesis tests: Mahwah, N.J., Lawrence Erlbaum Associates, 120 p.

Noe, R.A., and Wilk, S.L., 1993, Investigation of the factors that influence employees' participation in development activities: Journal of Applied Psychology, v. 78, no. 2, p. 291–302.

Pituch, K.A., and Lee, Y.-K., 2006, The influence of system characteristics on e-learning use: Computers and Education, v. 47, no. 2, p. 222–244.

Rabak, Lynne, and Cleveland-Innes, Martha, 2006, Acceptance and resistance to corporate e-learning—A case from the retail sector: Journal of Distance Education, v. 21, no. 2, p. 115–134.

Ratz, J.M., Schuster, R.M., and Marcy, A.H., 2011 A Survey of U.S. Fish and Wildlife Service Employees regarding topics for distance education—Summary report to respondents: U.S. Geological Survey Open-File Report 2011–1021, 38 p.

Roblyer, M.D., 1999, Is choice important in distance learning? A study of student motives for taking internet-based courses at the high school and community college levels: Journal of Research on Computing in Education, v. 32, no. 1, p. 157–171.

Rogelberg, S.G., and Luong, Alexandra, 1998, Nonresponse to mailed surveys—A review and guide: Current Directions in Psychological Science, v. 7, no. 2, p. 60–65.

Saade, R.G.; He, Xin; and Kira, Dennis, 2007, Exploring dimensions to online learning: Computers in Human Behavior, v. 23, no. 4, p. 1721–1739.

Salas, Eduardo, and Cannon-Bowers, J.A., 2001, The science of training—A decade of progress: Annual Review of Psychology, v. 52, p. 471–499.
Salas, Eduardo; Kosarzycki, M.P.; Burke, C.S.; Fiore, S.M.; and Stone, D.L., 2002, Emerging themes in distance learning research and practice—Some food for thought: International Journal of Management Reviews, v. 4, no. 2, p. 135–153.
Savenye, W.C.; Olina, Zane; and Niemczyk, Mary, 2001, So you are going to be an online writing instructor—Issues in designing, developing, and delivering an online course: Computers and Composition, v. 18, p. 371–385.
Sax, L.J., Gilmartin, S.K., and Bryant, A.N., 2003, Assessing response rates and nonresponse bias in web and paper surveys: Research in Higher Education, v. 44, no. 4, p. 409–432.
Selim, H.M., 2007, Critical success factors for e-learning acceptance—Confirmatory factor models: Computers and Education, v. 49, no. 2, p. 396–413.
Shih, Y.-Y., 2006, The effect of computer self-efficacy on enterprise resource planning usage: Behaviour and Information Technology, v. 25, no. 5, p. 407–411.
Sitzmann, Traci; Kraiger, Kurt; Stewart, David; and Wisher, Robert, 2006, The comparative effectiveness of web-based and classroom instruction—A meta analysis: Personnel Psychology, v. 59, p. 623–664.
Stein, D.S.; Wanstreet, C.E.; Calvin, Jennifer; Overtoom, Christine; and Wheaton, J.E., 2005, Bridging the transactional distance gap in online learning environments: American Journal of Distance Education, v. 19, no. 2, p. 105–118.
Sun, P.-C.; Tsai, R.J.; Finger, Glenn; Chen, Y.-Y.; and Yeh, Dowming, 2008, What drives a successful e-learning? An empirical investigation of the critical factors influencing learner satisfaction: Computers and Education, v. 50, no. 4, p. 1183–1202.
Taylor, Shirley, and Todd, Peter, 1995, Assessing IT usage—The role of prior experience: MIS Quarterly, v. 19, no. 4, p. 561–570.
Thiele, J.E.; Allen, Carol; and Stucky, Mary, 1999, Effects of web-based instruction on learning behaviors of undergraduate and graduate students: Nursing and Health Care Perspectives, v. 20, no. 4, p. 199–203.
Thompson, L.F., and Lynch, B.J., 2003, Web-based instruction—Who is inclined to resist it and why?: Journal of Educational Computing Research, v. 29, no. 3, p. 375–385.
Thompson, M.M., and Irele, M.E., 2007, Evaluating distance education programs, *in* Moore, M.G., ed., Handbook of Distance Education (2d ed.): Mahwah, N.J., Lawrence Erlbaum Associates, p. 419–436.
U.S. Fish and Wildlife Service, 2008, U.S. Fish and Wildlife Service servicewide EEOC MD 715 plans, FY 2008: U.S. Fish and Wildlife Service, accessed August 18, 2009, at *http://www.fws.gov/jobs/pdf/MD_715_FY08_o.pdf*.
Vehovar, Vasja; Batagelj, Zenel; Manfreda, K.L.; and Zaletel, Metka, 2002, Nonresponse in web surveys, *in* Groves, R.M., Dillman, D.A., Eltinge, J.L., and Little, R.J.A., eds., Survey nonresponse: New York, John Wiley and Sons, Inc., p. 229–242.
Venkatesh, Viswanath, and Davis, F.D., 1996, A model of the antecedents of perceived ease of use—Development and test: Decision Sciences, v. 27, no. 3, p. 451–481.
Venkatesh, Viwanath, and Davis, F.D., 2000, A theoretical extension of the technology adoption model—Four longitudinal field studies: Management Science, v. 46, no. 2, p. 186–204.
Wang, G.G., and Wang, Jia, 2004, Toward a theory of human resource development learning participation: Human Resource Development Review, v. 3, no. 4, p. 326–353.
Watkins, Ryan, and Kaufman, Roger, 2007, Strategic planning, *in* Moore, M.G., ed., Handbook of distance education (2d ed.): Mahwah, N.J., Lawrence Erlbaum, p. 363–375.

Webster, Jane, and Hackley, Peter, 1997, Teaching effectiveness in technology-mediated distance learning: Academy of Management Journal, v. 40, no. 6, p. 1282–1309.
Welsh, E.T., Wanberg, C.R., Brown, K.G., and Simmering, M.J., 2003, E-learning—Emerging uses, empirical results and future directions: International Journal of Training and Development, v. 7, no. 4, p. 245–258.
Witkin, B.R., and Altschuld, J.W., 1995, Planning and conducting needs assessments—A practical guide: Thousand Oaks, Calif., Sage Publications, 302 p.
Zhao, Yong; Lei, Jing; Yan, Bo; Lai, Chun; and Tan, H.S., 2005, What makes the difference? A practical analysis of research on the effectiveness of distance education: Teachers College Record, v. 107, no. 8, p. 1836–1884.

Appendix 1. Survey I: Content Areas for Training Topics

Appendix 1 includes the questions asked on the open-ended survey used to obtain information on training needs and potential topics for training. The questions are provided as they appeared on the survey. This appendix includes the topical themes that emerged from the survey and the general comments made by respondents to that survey.

Survey Text

In your job, do you supervise anyone (including employees, contractors, and volunteers) whose job involves work in conservation and/or environmental education, outreach programming, visitor services, or partnerships? (Y/N response)
If respondents answered yes to this question, they were directed to the following open-ended questions. If respondents answered no, they skipped the following 3 open-ended questions.

The following 3 questions are about the people you supervise, including employees, contractors, or volunteers. We want to know about the parts of their jobs that have to do with conservation and/or environmental education, outreach programming, visitor services, and/or partnership skills.

What is the most significant challenge that the people you supervise have in doing those parts of their jobs today? (open-ended response).

Thinking back over the last 6 months, what has been the most significant challenge that the people you supervise had doing those parts of their jobs? (open-ended response).

Thinking ahead to the next 12 months, what do you anticipate being the most significant challenge that the people you supervise will have in doing those parts of their jobs? (open-ended response).
Respondents who were not supervisors were directed to the following questions. Respondents who were supervisors were directed to these questions after answering the three open-ended questions above.

Considering all of your responsibilities, what percentage of your job involves conservation and/or environmental education or outreach programming? (Please make your best estimate.) (categorical response options: 0 percent, 1–20 percent, 21–40 percent, 41–60 percent, 61–80 percent, 81–99 percent, 100 percent).
If respondents marked any response other than 0 percent, they were directed to the following open-ended questions. If respondents answered 0 percent to this question, they skipped the open-ended questions and moved directly to the demographic questions.

The following questions ask about the conservation and/or environmental education, outreach programming, visitor services, and partnership parts of your job.

What is the most significant challenge that you have in doing those parts of your job today? (open-ended response).

Thinking back over the last 6 months, what has been the most significant challenge that you have had doing those parts of your job? (open-ended response).

Thinking ahead to the next 12 months, what do you anticipate being the most significant challenge that you will have in doing those parts of your job? (open-ended response).

We would like to know what you think about training for conservation and/or environmental education, outreach programming, visitor services, and partnership skills.

When you think about the challenges you have doing conservation and/or environmental education, outreach programming, visitor services, or partnerships, what education or training have you had that has been the most helpful to you in doing those parts of your job? (open-ended response).

What education or training would you like to have, but have not had, that would be helpful to you in doing those parts of your job? (open-ended response).

Demographic questions included the following:

What is your employment status with the Fish and Wildlife Service? (categorical response options: Permanent Federal Employee, Term/Temporary Federal Employee, Other).

In which region is your duty station? (categories for regions 1–9 provided).

What is your WG/GS/GM level? (categories for levels 1–15 provided).

What is the numerical code for your Job Series? (examples: 401, 023, 1713) (open-ended response).

If you have any thoughts or comments about training content for conservation and/or environmental education, outreach programming, visitor services, or establishing partnerships OR comments about this survey, please leave them here. We value your feedback. (open-ended response).

Results from Survey I

This section of the report includes two tables that provide the results of the first survey in this project. The first table includes a summary of the themes suggested by survey respondents and how frequently each theme occurred. The second table includes the text of comments made by survey respondents.

Table 1–1. Topical themes volunteered by Survey I respondents and frequencies of themes (how many survey responses mentioned that theme).

Topical themes	Frequency in responses
Workload management	26
Conducting outreach with minimal time	20
Environmental education on a shoestring budget	11
Project management with partners	7
Administrative management	6
Effective communication with partners	6
Working with internal partners	6
Competence with emerging technologies	5
Creating and maintaining community partnerships	5
Developing innovative and creative programming and materials	5
Encouraging community participation in programs	4
Maintaining relevant programming (state standards)	4
Measuring the success of EE [environmental education] programs	4
Programmatic planning	4
Leveraging technology to connect with public	3
Time for training	3
Adjustment to change	2

Table 1–2. General comments from Survey I.

The first few pages concerning challenges were very similar in what answers were required. Generally, I think that most VS folks are 10 years behind in thinking about how we do business. There are pockets of innovation throughout the nation, but too many are doing VS the same way it was done 20 years ago. We need a vehicle to share those innovative concepts and programs on a national level, and the support/encouragement to break out of the box and get creative.
More total program overviews - how other folks accomplish things, and more information about successful programs - SCA, YCC, SCEP - overviews and success stories are very helpful because people are the most important piece of the puzzle - how do we get more staff for assistance with little budget for them?
I have mentioned it several times already, but we need to bring some sociologists into the discussion of how to measure the effect of environmental education programs on social change.
I think talking to people in the business would be of much more value than a computer survey, such as this. You've wasted my time and yours.
I think that online webinars are great. Also to have those conversations archived so that people can listen to them as a podcast is really nice. It is hard to travel to a week long training, so having short things where people can share ideas is nice. I also think that having that 8 or 16 hours available to connect people with nature makes it easier for managers to approve this sort of work. It might also be good if there was more of a networking tool for people who regularly do environmental education to get help from people who have jobs that don't allow them to really design an entire program, but would be happy to help out.
I strongly support crossprogram and interagency training opportunities. Some of the most effective collaborative training I have had recently included employees from multiple agencies and multiple grade levels and disciplines. As we continue to move towards increased partnerships and collaborations, I think it is important to include a broader community and not just fish and wildlife service folks when possible.
I believe there is a huge hole in the U.S. Fish and Wildlife Service in the area of providing customer service skills for other disciplines or other employees. Many visitor service employees are innately 'people' type employees but the rest of the USFWS work force is lacking profoundly in the area of serving the public in a professional, courteous manner. I would highly recommend forwarding this comment on to someone who cares about our first impression with the public since they (the public) are the ones who support the system.
I would like to see some more Partnering classes and some fish care/disease classes.
Our History is vanishing. Nothing we do or say today will remain for others in succeeding generations to find unless we start managing our records. NCTC is the one place in the Service this task could be accomplished at. At the same time records are taught, a simple plan on acquiring our history from the Regions could be put in place.
We are becoming a 'pseudo-science' agency where grounding in natural sciences is diminishing in favor of mastery of technical delivery skills. The agency is subtly valuing process over product, and our measure of success is in the delivery of information, not in the mastery of that information by our publics.
The FWS will be providing access to social media and other web technologies very soon. We will need guidance on the Service's policy to access and use these technologies and well as governmental restrictions and requirements.
I believe training is needed in Interpretive Research and Evaluation. That's an area we will be working on in the upcoming year. As a scientific agency, we should be able to reference the primary and secondary sources of information we are using during the course of our programming and delivery. Due to changing technologies, training in basic and advanced interpretive media & graphics should be ongoing.

Appendix 2. Survey II: Training Topics and Distance Education—Survey Development

Survey Questions

In table 2–1, we provide the subscales created in the survey development process, along with the text of the questions and the question numbers. 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 others, 2011).

Table 2–1. Survey subscales, questions, and question numbers.

Subscale name	
Question number	**Question text**
Experience onsite NCTC	
Q1	How many courses have you taken onsite at NCTC in Shepherdstown, WV?
Experience NCTC distance education	
Q2	How many courses have you taken from NCTC that were offered via distance education?
Screening	
Q3	Considering all of your responsibilities, what percentage of your job involves conservation and/or environmental education or outreach programming?
Q4	In your job, do you supervise anyone (including employees, contractors, and volunteers) whose job involves work in conservation and/or environmental education, outreach programming, visitor services, or partnerships?
Value of training content area	
Q5	Relevance of creating and maintaining partnerships to my job.
Q6	Importance of creating and maintaining partnerships to my job.
Q7	I would like training on creating and maintaining partnerships…
Q8	Relevance of technology to my job.
Q9	Importance of technology to my job.
Q10	I would like training on technology…
Q11	Relevance of program planning and development to my job.
Q12	Importance of program planning and development to my job.
Q13	I would like training on program planning and development …
Q14	Relevance of outreach methods to engage the community to my job.
Q15	Importance of outreach methods to engage the community to my job.
Q16	I would like training on outreach methods to engage the community …
Q17	Relevance of evaluation methods to my job.

Q18	Importance of evaluation methods to my job.
Q19	I would like training on evaluation methods…
	Type of information by content area
What type of information do you most need from each topic as defined?	
Q20a	Creating and maintaining partnerships
Q20b	Technology
Q20c	Program planning and development
Q20d	Outreach methods to engage the community
Q20e	Evaluation methods
	Experience with technology
Q21a	How frequently do you use satellite television?
Q21b	How frequently do you use video conferencing?
Q21c	How frequently do you use audio conferencing?
Q21d	How frequently do you use computer mediated training?
Q21e	How frequently do you use written resource provision?
Q21f	How frequently do you use audio resource provision?
Q22a	How comfortable are you with satellite television?
Q22b	How comfortable are you with video conferencing?
Q22c	How comfortable are you with audio conferencing?
Q22d	How comfortable are you with computer mediated training?
Q22e	How comfortable are you with written resource provision?
Q22f	How comfortable are you with audio resource provision?
Q23a	How many distance education courses have you taken with satellite television?
Q23b	How many distance education courses have you taken with video conferencing?
Q23c	How many distance education courses have you taken with audio conferencing?
Q23d	How many distance education courses have you taken with computer mediated training?
Q23e	How many distance education courses have you taken with written resource provision?
Q23f	How many distance education courses have you taken with audio resource provision?
	Access to technology/technical support
Q24a	I have easy access to satellite television at my workplace.
Q24b	I can easily obtain technical support for satellite television if I need it.
Q25a	I have easy access to video conferencing at my workplace.
Q25b	I can easily obtain technical support for video conferencing if I need it.
Q26a	I have easy access to audio conferencing at my workplace.
Q26b	I can easily obtain technical support for audio conferencing if I need it.
Q27a	I have easy access to computer mediated training at my workplace.

Q27b	I can easily obtain technical support for computer mediated training if I need it.
Q28a	I have easy access to written resources at my workplace.
Q28b	I can easily obtain technical support for written resources if I need it.
Q29a	I have easy access to audio resources at my workplace.
Q29b	I can easily obtain technical support for audio resources if I need it.
	Ease of use
Q24c	I would find it easy to get satellite television to do what I want it to do.
Q24d	I would find satellite television easy to use.
Q24e	Using satellite television would not require a lot of mental effort.
Q25c	I would find it easy to get video conferencing to do what I want it to do.
Q25d	I would find video conferencing easy to use.
Q25e	Using video conferencing would not require a lot of mental effort.
Q26c	I would find it easy to get audio conferencing to do what I want it to do.
Q26d	I would find audio conferencing easy to use.
Q26e	Using audio conferencing would not require a lot of mental effort.
Q27c	I would find it easy to get computer mediated training to do what I want it to do.
Q27d	I would find computer mediated training easy to use.
Q27e	Using computer mediated training would not require a lot of mental effort.
Q28c	I would find it easy to get a written resource to do what I want it to do.
Q28d	I would find written resources easy to use.
Q28e	Using written resources would not require a lot of mental effort.
Q29c	I would find it easy to get an audio resource to do what I want it to do.
Q29d	I would find audio resources easy to use.
Q29e	Using audio resources would not require a lot of mental effort.
	Most preferred mode by content area
Please indicate your most preferred mode to receive training in each topic area:	
Q30a	Creating and maintaining partnerships
Q30b	Technology
Q30c	Program planning and development
Q30d	Outreach methods to engage the community
Q30e	Evaluation methods
	Preference for onsite (Enrollment survey)
Q31a*	I prefer onsite classroom training over training by distance education technology.
	Preference for distance education (Enrollment survey)
Q31b*	I would take a training course administered by distance education technology instead of a classroom based course.

Technical support at duty station	
Q31c	I would prefer technical support for technology used in a distance education course to be provided by my local duty station.
Technical support at NCTC	
Q31d	I would prefer technical support for technology used in a distance education course to be provided by the sponsor of the training, the National Conservation Training Center.
Checklist for distance education	
Please indicate which of the following reasons would influence you to take training via any type of distance education instead of onsite at the NCTC:	
Q32a	Scheduling with commitments in my personal life.
Q32b	Scheduling with commitments in my work life.
Q32c	Transportation issues.
Q32d	Physical disabilities.
Q32e	Independent pace of learning.
Q32f	Meeting others.
Q32g	Interaction with other students.
Q32h	Interaction with instructor.
Q32i	It's easier for me to learn this way.
Q32j	Cost issues.
Q32k	Needing permission from supervisor.
Q32l	It's efficient to learn this way.
Q32m	Freedom to complete training when I can fit it in.
Q32n	Travel time.
Q32o	Level of interest in the topic.
Checklist for NCTC	
Please indicate which of the following reasons would influence you to take training onsite at NCTC instead of through distance education:	
Q33a	Scheduling with commitments in my personal life.
Q33b	Scheduling with commitments in my work life.
Q33c	Transportation issues.
Q33d	Physical disabilities.
Q33e	Independent pace of learning.
Q33f	Meeting others.
Q33g	Interaction with other students.
Q33h	Interaction with instructor.
Q33i	It's easier for me to learn this way.
Q33j	Cost issues.
Q33k	Needing permission from supervisor.

Q33l	It's efficient to learn this way.
Q33m	Freedom to complete training when I can fit it in.
Q33n	Travel time.
Q33o	Level of interest in the topic.
	Behavioral intention (Enrollment survey)
Q34*	How likely is it that you would choose to take a course from NCTC via distance education instead of onsite at the NCTC campus?
Q35*	How likely is it that you would choose to take an onsite course at the NCTC campus instead of an NCTC course through distance education?
	Attitudes about training
Q36a	The USFWS providing training to me is:
Q36b	Having an instructor to provide face-to-face training is:
Q36c	Having time available on the job to participate in training is:
Q36d	Being able to access training away from the office, over the internet is:
Q36e	Having the ability to control when I complete a training course is:
Q36f	Having access to an instructor to answer my questions about course content is:
Q36g	Being able to complete training with a minimal amount of time away from the tasks of my job is:
Q36h	Being able to access information right before I need it on my job is:
Q36i	Being able to select the order in which I learn topics within a training course is:
Q36j	Being able to control the speed at which I progress through a training course is:
Q36k	Being able to talk face to face with other people enrolled in the same training course is:
Q36l	Enhancing my training experience by interacting with others who are in positions similar to mine but at locations across the country is:
	Demographics
Q37	What is your employment status with the Fish and Wildlife Service?
Q38	What is your age (in years)?
Q39	How long have you worked for the U.S. Fish and Wildlife Service?
Q40	How long have you worked at your current duty station?
Q41	How long have you worked in your current position?
Q42	In which region is your duty station?
Q43	What is your WG/GS/GM level?
Q44	Do you subscribe to the VOICES listserv?
Q45	What is the numerical code for your Job Series?

* Responses to questions 31a, 31b, 34, and 35 are not included in this study of distance education. Those questions were to gather information for a related but different study and were included in this survey for efficiency.

Appendix 3. Survey II: Training Topics and Distance Education—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.

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 2–1 in appendix 2). 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 3–1, with the list of survey questions included in each subscale. The final subscales assess: the value of the five content areas, the desire for training on the five content areas, the usability of and access to the six distance learning technologies, the importance of aspects of onsite training, and the importance of aspects of distance education.

On the subscale measuring the value of training content areas, we included questions regarding the relevance and the importance of the topic to the respondents' jobs and questions regarding the respondents' desire for training in that topic area. Based on our analyses, we determined that there was a separate subscale to measure value for each topic (partnerships, technology, program planning, outreach methods, and evaluation methods). The value measure included the questions regarding relevance and importance. The measures of content area value (for example, value of partnerships) represent the average of the relevance and importance questions for that content area. The desirability of training questions created a separate subscale. Although the questions regarding desirability of training related to each other as a single scale, those questions ultimately were used individually as filtering questions for later analyses. We did not combine these questions into a single score. It is not entirely surprising that the desirability of training questions would not have as strong of a relationship to the relevance and

Table 3–1. Description of final survey subscales.

Final subscale	Questions included	Internal consistency (alpha)	How question responses were combined	Range of possible values
Value of partnerships	Q5, Q6	0.95	Averaged	1–7
Value of technology	Q8, Q9	0.94	Averaged	1–7
Value of program planning	Q11, Q12	0.97	Averaged	1–7
Value of outreach methods	Q14, Q15	0.97	Averaged	1–7
Value of evaluation methods	Q17, Q18	0.98	Averaged	1–7
Desirability for training on content areas	Q7, Q10, Q13, Q16, Q19	0.82	Not combined	
Usability/access–satellite television	Q21a, Q22a, Q23a, Q24a–Q24e	0.83	Summed	8–41
Usability/access–video conferencing	Q21b, Q22b, Q23b, Q25a–Q25e	0.87	Summed	8–41
Usability/access–audio conferencing	Q21c, Q22c, Q23c, Q26a–Q26e	0.81	Summed	8–41
Usability/access–computer training	Q21d, Q22d, Q23d, Q27a–Q27e	0.82	Summed	8–41
Usability/access–written resources	Q21e, Q22e, Q23e, Q28a–Q28e	0.81	Summed	8–41
Usability/access–audio resources	Q21f, Q22f, Q23f, Q29a–Q29e	0.85	Summed	8–41
Aspects of onsite training	Q36b, Q36k, Q36l	0.83	Averaged	1–4
Aspects of distance education	Q36d, Q36e, Q36h, Q36i, Q36j	0.78	Averaged	1–4

importance questions. It is possible for a particular topic to be relevant and important to a person's job, but for that person to not desire training on that topic—perhaps because the individual already feels competent in that area.

As a preliminary survey structure, we initially organized questions about experience with technology, access to technology/technical support, and ease of use into three subscales based on the concept each subscale was intended to measure. This organization meant that there were questions about each of the six technologies (satellite television, video conferencing, audio conferencing, computer mediated training, written resources, and audio resources) included together on each subscale. The analyses indicated that these questions were more appropriately organized according to type of technology. Therefore, the final subscales include separate usability/access scales for each of the six technologies. To obtain a score for these subscales for each respondent, the responses to the questions were summed.

In our survey design, we included a subscale to measure attitudes about training. This subscale included questions about aspects of training and respondents were asked to indicate the importance to them of each of these aspects. The aspects included characteristics that are more typical of onsite

training than of distance education (for example, having an instructor provide face-to-face training), characteristics that are more typical of distance education than onsite training (for example, controlling the order in which topics are learned), and general characteristics of training (for example, having time available on the job to participate in training). Our analyses supported a scale for aspects of onsite training and a scale for aspects of distance education. To obtain a score for these subscales for each respondent, the responses to the questions on the subscale were averaged. The questions regarding general characteristics of training did not group together and were consequently treated as single item measures.

Internal Consistency for Final Subscales

The final subscales are provided in table 3–1 with the calculated internal consistency estimates. The values of the internal consistency estimates for the subscales range from 0.78 to 0.98. These internal consistency estimates fall within the range of acceptable levels of reliability for a survey of this nature.

There is no method to determine the reliability of single item measures. There were 12 single item measures in addition to the demographic questions. These questions included the introductory questions regarding experience with onsite training at NCTC, experience with distance education from NCTC, the screening questions regarding conservation education and outreach on the job and supervision of those conducting these types of activities, general preference for onsite education, general preference for distance education, preference for technical support at the duty station, preference for technical support at NCTC, importance of training, importance of time for training, importance of access to the instructor, and importance of limited time away from job for training.

It is not possible to determine the reliability for the two checklist questions. Respondents were asked to mark all applicable reasons from a list of 15 that would influence them to take training via distance education instead of onsite and to use the same list to indicate all applicable reasons that would influence them to take training onsite at NCTC instead of through distance education. In addition, there were two sets of questions to which respondents were asked to provide categorical responses. We asked respondents to indicate what type of information they would like for each of the topics included on the survey. We also asked respondents to indicate their most preferred type of training for each topic.

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 preferences for certain training content areas and attitudes and experiences relating to preference for distance education technologies. There are multiple approaches to establishing survey validity (see Murphy and Davidshofer, 1998). Our efforts focused on establishing a survey that would have both 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 (Ghiselli and others, 1981; Anastasi and Urbina, 1997; 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. We can use the information published about the way that these characteristics relate to each other to demonstrate the validity of our measures (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 (Ghiselli and others, 1981; Anastasi and Urbina, 1997; 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.

Content of Training

As cited in our literature review, when training is relevant to a job, individuals are more motivated to participate in training (Kraiger, 2003). For each content area, we asked respondents to rate the relevance of the content to their job, the importance of the content to their job, and the desirability of training in this content area. The relevance and importance questions were combined to create a subscale of the value for each topic. One approach to demonstrating construct validity evidence is to examine the correlations among subscales or questions measuring related characteristics (Murphy and Davidshofer, 1998). To demonstrate the validity of the subscales of value for each topic, we correlated the score on the value scale with the response to the question that asked respondents to rate the desirability of training for that topic. We expected the correlations to be significant and in a positive direction, indicating that those who valued the topic were also likely to indicate a desire for training and that those who did not value the topic would indicate less desire for training. A significant positive correlation was found for each of the value subscales: partnerships ($r=0.54$), technology ($r=0.61$), program planning ($r=0.78$), outreach methods ($r=0.78$), and evaluation methods ($r=0.86$). These correlations were significant at the 0.01 level for a two-tailed test.

Usability and Access to Distance Education Technologies

Anastasi and Urbina (1997) describe the use of the criterion of internal consistency to establish validity. The method of using internal consistency to establish validity should not be confused with internal consistency reliability. In the internal consistency method to establish validity, the positive correlation of subscales with the combined scale is used as evidence of validity. When the correlation between the subscale and the combined scale is not too low, this pattern of relationships among the scales is considered evidence of validity. This approach is considered acceptable but not the strongest evidence for validity.

The subscale to measure the usability and access to each technology includes questions regarding experience with, access to, and perceived ease of use. Although these characteristics are often measured separately in the published research literature, we determined that the questions were closely enough related for the purpose of this study to be combined into one subscale. However, we used the experience with technology subscales, the access to technology subscales and the perceived ease of use subscales for each technology as part of the validation process. For example, we combined the questions regarding experience with satellite television into a subscale, the questions regarding access to satellite television into a subscale, and the questions regarding perceived ease of use of satellite television into a subscale. We refer to these as component subscales of the combined subscale to measure usability and access to technology. We did this for all of the technologies included on the survey.

We correlated the component subscales with the combined subscale, expecting the correlations would be significant and positive. Correlations between the component subscales measuring experience with technology, access to technology, and perceived ease of use of technology and the combined subscale measuring usability and access to technology are provided in table 3–2. All of the correlations

Table 3–2. Correlations between component subscales and the combined subscale for usability/access to technology. All correlations are significant at the 0.01 level for a 2-tailed test.

Usability/access to	Experience	Access	Perceived ease of use
Satellite television	0.70	0.82	0.85
Video conferencing	0.71	0.85	0.91
Audio conferencing	0.76	0.82	0.89
Computer mediated training	0.71	0.83	0.88
Written resources	0.80	0.79	0.83
Audio resources	0.67	0.83	0.91

were positive, significant, and within the range of sizes considered to be strong correlations. Based on the method of internal consistency to establish validity, we interpret these correlations as evidence supporting the validity of the subscales of usability and accessibility of these technologies.

Another approach to demonstrating construct validity evidence is to examine the correlations among subscales measuring related characteristics (Murphy and Davidshofer, 1998). From our review of the literature, we know that the characteristics of experience with technology, access to technology, and perceived ease of use of a technology are related. Experience with technology relates to perceived ease of use of technology in distance learning (Venkatesh and Davis, 1996; Martins and Kellermanns, 2004). Accessibility to technology as well as to supportive resources affect an individual's belief that the technology is easy to use (Lee, 2008). Based on the information in our literature review, we expected that the component subscales would relate positively to each other. Correlations among the component subscales measuring experience with technology, access to technology, and perceived ease of use of technology are provided in table 3–3. All of the correlations were positive, significant, and within the range of sizes considered to be correlations of moderate strength. Based on this method of assessing construct validity, we interpret these correlations as evidence supporting the validity of the component subscales that compose the usability of technology subscales.

One of the more persuasive methods for establishing construct validity is to correlate a subscale score with some external measure (Anastasi and Urbina, 1997; Murphy and Davidshofer, 1998). In this case, we were able to use the questions on the survey included as part of the enrollment study (Q34 and Q35) as external measures. One of the enrollment questions (Q34) asked about the likelihood of taking a course via distance education instead of onsite at NCTC. We expected that the subscales measuring usability/access to technology would correlate positively with this question. The second enrollment question (Q35) asked about the likelihood of taking a course onsite at NCTC instead of through distance education. We expected that the subscales measuring usability/access to technology would either correlate negatively or not at all with this question. As expected, the correlations between the usability/access subscales for all the technologies and Q34 were positive and significant, but weak in strength. The usability/access subscales did not correlate with Q35. The correlations between the usability/access to technology subscales and the enrollment questions are provided in table 3–4.

Table 3–3. Correlations among component subscales. All correlations are significant at the 0.01 level for a 2-tailed test.

	Experience	Access
	Satellite television	
Access	0.37	--
Perceived ease of use	0.41	0.53
	Video conferencing	
Access	0.43	--
Perceived ease of use	0.48	0.66
	Audio conferencing	
Access	0.35	--
Perceived ease of use	0.43	0.77
	Computer mediated training	
Access	0.34	--
Perceived ease of use	0.38	0.73
	Written resources	
Access	0.34	--
Perceived ease of use	0.38	0.75
	Audio resources	
Access	0.27	--
Perceived ease of use	0.40	0.74

Table 3–4. Correlations between usability/access subscales and external measures.

Usability/access to	Likelihood of distance education (Q34)	Likelihood of onsite training (Q35)
Satellite television	0.08*	0.04
Video conferencing	0.14**	0.04
Audio conferencing	0.15**	-0.01
Computer mediated training	0.22**	-0.06
Written resources	0.16**	-0.002
Audio resources	0.13**	0.04

* 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.

Attitudes about Training

The questions regarding the importance of aspects of training condensed into two subscales—aspects of onsite training, aspects of distance education—and several single item measures. We evaluated the construct validity for the two subscales. We used two approaches to examine the validity evidence. First, we correlated the subscales to one of the questions initially included in the section of attitudes about training. The question we used was one of the general aspects of training: "Being able to complete training with a minimal amount of time away from the tasks of my job is:" (Q36g). We selected this question because, theoretically, one advantage of distance education is that it allows training to occur without significant disruption to everyday work tasks. Traveling to NCTC for onsite training does require time away from other job tasks for many FWS employees. We expected the aspects of onsite training subscale would correlate negatively with this question and that the aspects of distance education subscale would correlate positively with it. The pattern of correlations was as expected and all correlations were significant at the 0.01 level for a 2-tailed test. The correlations between question Q36g and the subscales were -0.18 for onsite training and 0.54 for distance education.

Second, as with our approach to establishing the construct validity for the usability/access to technology subscales, we correlated the subscales of aspects of onsite training and aspects of distance education with the questions included on the survey for the enrollment study. We expected the aspects of onsite training subscale to correlate negatively with Q34 (likelihood of choosing distance education) and positively with Q35 (likelihood of choosing onsite training) and the aspects of distance education subscale to correlate positively with Q34 and negatively with Q35. All four correlations were in the expected direction and significant at the 0.01 level for a 2-tailed test. The correlations with the aspects of onsite training subscale were -0.43 (Q34) and 0.55 (Q35), and the correlations with the aspects of distance education subscale were 0.32 (Q34) and -0.13 (Q35).

We conclude that the available evidence supports this survey as a valid measure of preferences for content of training, usability and access to distance education technologies, and attitudes about training.

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 Myors, 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 is a strong relationship between regional affiliation and value of training topics—in other words, if the training topics would be valued differently among the regions—then that relationship would be described as a strong effect. If value of training topics shows a negligible difference among the regions, the relationship between value of training topics and regional affiliation 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 911 respondents. A dataset of this size ensures high power in analyses. We clearly have sufficient power for the statistical analyses to yield results that can be used for decisionmaking.

However, a caution is in order. Just because an analysis yields a significant result does not mean that the result is practically useful (Murphy and Myors, 1998). This study has a large sample size that in

turn increases the power of the analyses and makes it more likely that even very small effects will be found to be statistically significant.

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. Based on that sample, we would not be able to generalize from the survey results 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 to 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 911 respondents, we would expect approximately 109 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 nonsignificant; there is not a detectable difference between the actual and expected regional distribution of respondents ($X^2 = 8.27$, 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 is provided in the report to respondents for this survey (Ratz and others, 2011). We asked respondents to indicate their employment status with the FWS. The majority of respondents (94 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. There were responses at all levels of the response scale. The most frequent responses 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 3 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 96 different job series codes provided. The most frequently provided code was 0401 for General Biological Science; 34 percent of respondents to this question provided this answer. Reported ages ranged from 22 to 69 and, upon

inspection, appears to approximate a normal distribution. The average age was 46; the most frequently reported age was 50.

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, age, job level, and job series classifications.

As part of our sampling strategy, we relied on a list of subscribers to the VOICES electronic distribution list. We expected that because of 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 = 0.06, $p < 0.05$); however, the relationship was very small in size. The significance of the test is likely due to the statistical power generated by such a large dataset.

In our sample, 291 of the 1,488 employees (19.5 percent) who received surveys were supervisors. We asked respondents, "In your job, do you supervise anyone (including employees, contractors, and volunteers) whose job involves work in conservation and/or environmental education, outreach programming, visitor services, or partnerships?" Based on the responses to this question—41 percent of respondents answered "yes"—it appears that more than 20 percent of respondents supervise environmental education activities in some way. However, the question was worded in such a way that individuals who supervised contractors and volunteers would be considered as having supervisory status even if in fact their positions were not formally supervisory. Of the 291 formal supervisors in the sample, 168 responded to the survey—the survey response rate among supervisors is 57 percent. Based upon our dataset from 911 respondents, 18 percent of responses are from known supervisors. There were 697 individuals who indicated that they were supervisors based upon our question but who were identified as being in nonsupervisory positions in the database we used to generate the sample. This means that 76 percent of respondents indicated that they supervise these activities while not being in a formal supervisory position. We tested if supervisory status was related to survey response. We calculated phi as a measure of the relationship between supervisory status and survey response. The results indicated no significant relationship. Supervisors were not more or less likely to respond to the survey than nonsupervisors.

Based upon 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, and job series. 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 small, and 88 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 and that the DEO and the NCTC can use the results for decisionmaking and planning.

Nonresponse Bias

Nonresponse occurs when individuals to whom the survey is sent do not respond to the survey (Dillman and others, 2002; Burkell, 2003). 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; Sax and others, 2003; Hudson and others, 2004). 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 (Rogelberg and Luong, 1998; Burkell, 2003; 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 are surveying FWS employees who have enrolled in NCTC training, we know that the individuals in the survey sample have had prior contact with the sponsor of the survey, the NCTC. 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, Cartwright, 1978; Barclay and others, 2002). 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 upon the distribution of FWS employees. The result of this test was nonsignificant, 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. When we compared respondents and nonrespondents on the basis of regional affiliation, we did find a significant effect (Cramer's $V = 0.13$, $p < 0.01$). This effect was small in size and indicated a relationship between survey response and region.

The within-region response rates provided in table 2, in a prior section of this report on response rate, showed that there are differences in the response rates between regions. Regions 1 and 3 had response rates of 74 percent and 72 percent, respectively, and regions 7 and 9 had response rates of 56 percent. Although there appears to be a real but small relationship between survey response and region, the differences were not sufficient to have shifted the distribution of respondents across regions within the sample. As described in the prior section on representativeness in this appendix, we 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 late responders as those who only responded after the second reminder to complete the survey was sent. There were 66 late responders. We selected an equal number of early responders. There were 335 surveys completed during the first 24 hours of the data collection period. We used the first 66 for the early responder group. Using binary logistic regression, we regressed the early/late response variable on regional affiliation and the subscales for the attitudes of interest (Dillman and others, 2002). We included the value of training topic subscales, the usability/access to technology subscales, aspects of onsite training subscale, and the aspects of distance education subscale. None of these variables were significantly predictive of early or late response using a 0.01 significance cutoff. 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 attitude subscales, the actual sample for the analysis was n=55. A small sample such as this has low statistical power and may not correctly identify a significant difference between early and late responders. To increase the sample size for the analyses, we calculated four binary logistic regressions for regional affiliation (n=132), value of training topic subscales (n=118), usability/access to technology subscales (n=57), and the aspects of onsite and distance education subscales (n=127). None of these regressions showed significant differences between early and late responders. The method of comparing early and late responders resulted in a lack of evidence for nonresponse bias. Because the analyses we completed did not indicate that nonresponse bias was likely, 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.

Data Analyses

After selecting respondents based on desire for training, we combined the data for the type of information needed and preferred mode of training. We were limited to reporting the frequencies of responses. This involved a cross tabulation of the responses to the questions regarding level of information needed and preferred training mode. For example, of those respondents who desire training on partnerships, 80 of them would like the partnership training to provide problem solving methods in an instructor-led course at NCTC. We reported the data only for those cells for which 5 percent or more of the respondents included in that training content area subgroup indicated a preference for that particular combination of mode of training and type of information. Table 3–5 includes the summary for partnerships; table 3–6 includes the summary for technology; table 3–7 includes the summary for program planning; table 3–8 includes the summary for outreach methods; and table 3–9 includes the summary for evaluation methods.

Table 3–5. Preferences for mode of training and type of information for the partnerships training content area (n = 695). Number of respondents appears in a cell when at least 5 percent of respondents selected that combination of mode and information type. (ILT, instructor-led training)

Mode of training	Type of information: Basic facts	Processes and procedures	Technical hands-on skill	Interpersonal skill	Problem solving methods	How to develop a strategy
ILT onsite		39 (6%)		50 (8%)	80 (12%)	72 (11%)
ILT offsite					36 (6%)	39 (6%)
Satellite television						
Video conferencing						
Audio conferencing						
Computer mediated training						
Written resources						
Audio resources						

Table 3–6. Preferences for mode of training and type of information for the technology training content area (n = 791). Number of respondents appears in a cell when at least 5 percent of respondents selected that combination of mode and information type. (ILT, instructor-led training)

Mode of training	Type of information: Basic facts	Processes and procedures	Technical hands-on skill	Interpersonal skill	Problem solving methods	How to develop a strategy
ILT onsite			255 (34%)			
ILT offsite			129 (17%)			
Satellite television						
Video conferencing						
Audio conferencing						
Computer mediated training			114 (15%)			
Written resources						
Audio resources						

Table 3–7. Preferences for mode of training and type of information for the program planning training content area (n = 620). Number of respondents appears in a cell when at least 5 percent of respondents selected that combination of mode and information type. (ILT, instructor-led training)

Mode of training	Type of information: Basic facts	Processes and procedures	Technical hands-on skill	Interpersonal skill	Problem solving methods	How to develop a strategy
ILT onsite		68 (12%)				77 (13%)
ILT offsite						
Satellite television						
Video conferencing						
Audio conferencing						
Computer mediated training						32 (5%)
Written resources						
Audio resources						

Table 3–8. Preferences for mode of training and type of information for the outreach methods training content area (n = 621). Number of respondents appears in a cell when at least 5 percent of respondents selected that combination of mode and information type. (ILT, instructor-led training)

Mode of training	Type of information: Basic facts	Processes and procedures	Technical hands-on skill	Interpersonal skill	Problem solving methods	How to develop a strategy
ILT onsite	32 (5%)	34 (6%)				52 (9%)
ILT offsite						
Satellite television						
Video conferencing						
Audio conferencing						
Computer mediated training						30 (5%)
Written resources						
Audio resources						

Table 3–9. Preferences for mode of training and type of information for the evaluation methods training content area (n = 488). Number of respondents appears in a cell when at least 5 percent of respondents selected that combination of mode and information type. (ILT, instructor-led training)

Mode of training	Type of information: Basic facts	Processes and procedures	Technical hands-on skill	Interpersonal skill	Problem solving methods	How to develop a strategy
ILT onsite	37 (8%)	35 (8%)	28 (6%)			
ILT offsite						
Satellite television						
Video conferencing						
Audio conferencing						
Computer mediated training	32 (7%)	37 (8%)				
Written resources						
Audio resources						

Publishing support provided by:
Denver Publishing Service Center

For more information concerning this publication, contact:
Center Director, USGS Fort Collins Science Center
2150 Centre Ave., Bldg. C
Fort Collins, CO 80526-8118
(970) 226-9398

Or visit the Fort Collins Science Center Web site at:
http://www.fort.usgs.gov/