National Park Service Preservation and Skills Training Program

A Kirkpatrick Level-4 Evaluation



by

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Table	of	Contents
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Acknowledgements	i
List of Tables	iii
List of Figures	iv
Executive Summary	v
Introduction	1
The PAST Program	2
Calling for Higher Order Evaluation: A Level-4 Evaluation Study	3
The Evaluation Framework	4
Study Purpose	5
Study Objectives	5
Chronology of Research Design and Development	6
Results	11
Description of PAST Graduates	11
Level-2 – Learning	12
Level-3 – Behavior	23
Combining Learning and Behavior Data – A Diagnostic Tool	
Level-4 – Outcomes	35
Dissemination of PAST Knowledge, Skills and Abilities	
Conclusions	41
References	45
APPENDICES	

A – PAST Competencies

- B Pre-test/Post-test Exam
- C Mail Survey Instrument
- D Phone Survey Instrument
- E ROI Cost Estimate Worksheets
- F Mentor and Student Geographic Distribution Maps
- G Class 1 (1993-1995) Employee Competencies and Application Tables
- H Class 2 (1995-1997) Employee Competencies and Application Tables
- I Class 3 (1998-2000) Employee Competencies and Application Tables
- J Class 4 (1999-2001) Employee Competencies and Application Tables
- K Class 5 (2002-2004) Employee Competencies and Application Tables
- L Class 6 (2005-2007) Employee Competencies and Application Tables
- M Suggestions for Program Improvement from Telephone Interviews

LIST	OF	TAB	LES
------	----	-----	-----

Table 1	Enrollment in PAST Classes 1-6	3
Table 2	Student Pre-test and Post-test Scores from PAST – Class 6 (2005-07)	
	Table 2A – Preservation Philosophy	
	Table 2B – Masonry	
	Table 3C – Carpentry	14
	Table 3D – Painting	14
	Table 3E – Preservation Materials and Technology	15
Table 3	Increases in Employee Competencies Attributed to PAST Training	
	Table 3A – Preservation Philosophy	16
	Table 3B – Safety Awareness	17
	Table 3C – Carpentry	
	Table 3D – Masonry	19
	Table 3E – Paint Skills	20
	Table 3F – Preservation Materials and Technology	22
Table 4	Reported Frequency of Application of PAST Competencies	
	Table 4A – Preservation Philosophy	24
	Table 4B – Safety Awareness	25
	Table 4C – Carpentry	26
	Table 4D – Masonry	27
	Table 4E – Paint Skills	
	Table 4F – Preservation Materials and Technology	
Table 5	Individuals' Competency Gains and Applications – PAST Education Products	
	Table 5A – Preservation Philosophy	31
	Table 5B – Safety Awareness	31
	Table 5C – Carpentry	32
	Table 5D – Masonry	
	Table 5E – Paint Skills	34
	Table 5F – Preservation Materials and Technology	
Table 6	PAST Program Outcomes	

LIST OF FIGURES

Figure 1	Distribution of all PAST Mentors and Students by Class (1993-2007)	40
Figure 2	Distribution of PAST Mentors and Students in Class #1 (1993-1995)	.F-2
Figure 3	Distribution of PAST Mentors and Students in Class #2 (1995-1997)	.F-3
Figure 4	Distribution of PAST Mentors and Students in Class #3 (1998-2000)	.F-4
Figure 5	Distribution of PAST Mentors and Students in Class #4 (1999-2001)	.F-5
Figure 6	Distribution of PAST Mentors and Students in Class #5 (2002-2004)	.F-6
Figure 7	Distribution of PAST Mentors and Students in Class #6 (2005-2007)	.F-7
Figure 8	Distribution of all PAST Students (1993-2007)	. F-8
Figure 9	Distribution of all PAST Mentors (1993-2007)	.F-9

National Park Service Preservation and Skills Training Program A Kirkpatrick Level-4 Evaluation

Executive Summary

The historic built environment plays a large role in our lives, providing a tangible link to the past and our national heritage. The National Park Service, as stewards of many of the United States' most valuable historic resources, is responsible for the care and preservation of over 27,000 historic structures. Park managers have long recognized the ever-increasing threats to these resources -- maintenance backlogs due to inadequate funding are coupled with a workforce that is unprepared to deal with the problems inherent to maintaining historic structures.

The PAST Program

From 1991-1993, a small group of preservation and maintenance professionals identified a plan to attack the problem of preparing the preservation maintenance workforce. In his 1992 article, Tom McGrath notes, "the group proceeded with the goal of developing a wide-reaching program that would enhance preservation maintenance skills, impart confidence in using those skills, provide a basic knowledge of preservation philosophy and requirements, and upon completion of the training, assure the application of the skills of the graduates on the historic structures in their parks." A vital component of the training was the concept of utilizing a cadre of mentors to supervise actual hands-on preservation maintenance projects in the students' parks.

- *Purpose*: To develop a cadre of trained non-supervisory maintenance employees capable of preservation maintenance of the historic structures within the National Park System.
- *Objectives*: To train maintenance employees to preserve and maintain NPS historic structures; to create a certification program in the preservation maintenance of historic structures; and, to ensure that at least one employee from each unit of the NPS has been trained to preserve and maintain historic structures.

In May 1993, the first Preservation and Skills Training Class (PAST) was convened in Hagerstown, Maryland, consisting of 10 mentors and 20 students. Since the inaugural class, an additional five PAST classes have completed training in preservation skills, totaling 140 participants (Table 1).

Class	Students	Mentors	Total
1 (1993-95)	20	10	30
2 (1995-97)	16	8	24
3 (1998-00)	11	7	18
4 (1999-01)	12	6	18
5 (2002-04)	15	5	20
6 (2005-07)	22	8	30
Total	96	44	140

Table 1. Enrollments in PAST Classes 1-6.

The Evaluation Framework

Kirkpatrick

- *Level One Reaction*: Measures participants' reaction to the program; *e.g.*, students' ratings of various aspects of a training event, their overall satisfaction, etc.
- *Level Two Learning*: Measures the extent to which participants change attitudes, improve knowledge, and/or increase skills; *e.g.*, calculating pre-test/post-test differences in test scores; examining reported increases in preservation competencies as a result of training.
- *Level Three Behavior*: Measures the extent to which change in behavior occurs; *e.g.*, application of knowledge, skills and abilities to *actual* preservation maintenance projects.
- *Level Four Results*: Measures changes in business results; *e.g.*, estimating changes in the number, scope and time dedicated to preservation maintenance projects since training.

Phillips

• *Level Five – Return on Investment*: Compares the monetary value of the business impact with the cost of the program; *e.g.*, estimates the total cost of PAST program per student and compares it to the estimated value of a historic preservation program conducted by the student, producing a Return on Investment statistic.

Study Purpose

The purpose of this study was to design and implement a system of evaluation for the PAST program that measures *actual* results or outcomes. This is consistent with Kirkpatrick's Level-4 Evaluation and consonant with the Department of Interior's Training Directors Council (ITDC) directives. Further, this study explored the feasibility of expanding the methodology to achieve Level-5 or Return on Investment (ROI). Achieving Level-5 assumed the valid measurement of training results/outcomes as specified in Level-4, but goes beyond to establish the costs of training and estimate the economic values associated with the results/outcomes.

Study Objectives

- To identify competencies learned via the PAST training program and compare with those actually applied in preserving park historic structures;
- To map the migration of PAST graduates throughout the National Park System in order to determine the diffusion and dissemination of PAST knowledge, skills and abilities, in the preservation of park historic structures;
- To map PAST training projects throughout the National Park System in order to determine the effect that PAST graduates' knowledge, skills and abilities has had on the long-term preservation of historic structures within the NPS; and,
- To compare the costs associated with completion of common historic preservation projects by PAST graduates (e.g., appropriate replacement of a historic window, installing a slate roof, etc.) with estimates from known commercial contractors capable of meeting NHPA and NPS standards, thus establishing a comparison of return on training investment (ROI).

A multi-tiered strategy for collecting data was developed that was consistent with each level of Kirkpatrick's evaluation framework. The data collection strategy included: a pre training/post training test instrument which probed the knowledge gained during PAST education reaching a Kirkpatrick Level 2 assessment; a mail survey of all PAST graduates (students and mentors) reached a Kirkpatrick Level 2 & 3 assessment; telephone interviews reached a Kirkpatrick Level 4 assessments, while additional efforts were made to estimate and/or collect data pertaining to costs and benefits appropriate for ROI calculations, Phillips Level 5 assessment.

Conclusions

The importance of establishing and sustaining a program to train and educate a workforce of preservation maintenance specialists is well documented. Whether in the United States, United Kingdom, or in other countries around the globe, it has long been recognized that the costs of maintaining these priceless heritage resources is increasing, while the number of skilled, trained employees to sustain them is diminishing. The National Park Service's Preservation and Skills Training Program (PAST) was at the forefront of the global movement to develop such an educational endeavor nearly fifteen years ago. This study was initiated to evaluate its effectiveness and efficiency, and establish a higher order evaluation framework, in an effort to refine and continually improves its outcomes. From the results of this effort, several conclusions may be drawn:

- The PAST Program is conducive to evaluation at Kirkpatrick's Level-4 order of evaluation. As was shown in this document, outcomes of the program can, and should, be systematically reviewed.
- Documentation of *Reaction* data (Level-1) should be collected and archived so that formative and summative changes to the program can be analyzed. We believe that information pertaining to students' reaction to each class was collected, but no archival record of that information was maintained in a manner that could be used in this study.
- Efforts to isolate the pre-training effects from past experience or on-the-job training were successful in the pre-test/post-test exam portion of this study. We documented a 46 percent increase in knowledge between the pre-test and post-test for Class 6 (2005-2007). The area of Preservation Philosophy revealed a 95 percent increase. However, this strategy should be systematized and more thought put into establishing an on-going examination where the validity and reliability of the exam can be established and documented for each class, and analyzed across classes over time.
- The development of a comprehensive list of PAST competencies was a valuable exercise and served as the foundation for all subsequent evaluation data collections. This list should be refined and revised over time, and used as the benchmarks from which future evaluations are conducted. Care should be taken, however, to avoid the temptation for a complete "re-invention of the evaluation wheel" by establishing other measures in future evaluation studies. Doing so will leave training managers with a patchwork of evaluation tools and little long-term continuity of effort.

- The PAST program participants, as a group, were highly diverse in terms of ethnicity. Significant numbers of employees from under-represented ethnic groups were present in the population of PAST employees.
- PAST graduates are a 'graying' population. They were over 50 years old and had accumulated over 18 years of federal service. Workforce succession plans should be developed as part of future recruitment of PAST training classes.
- The PAST program was an avenue from which graduates could move upwards in the organization through promotions. Over 75 percent of the graduates had been promoted since graduating from PAST and almost 4 in 10 had been re-classified into a career field such as Exhibit Specialist or Facility Manager. It appears that PAST is an excellent vehicle for providing career advancement opportunities for an ethnically-diverse workforce.
- The mail survey instrument successfully generated data from which to evaluate competencies gained and applied as a result of PAST participation. Further, it offered a strategy to assess the impacts of the full PAST program, as opposed to assessment by class, and should be undertaken on a systematic, periodic basis.
- Educational content in the area of Preservation Philosophy and Preservation Materials and Technology appeared to be extremely potent topical areas; significant increases were observed in each.
- Preservation skills in the areas of Carpentry, Masonry, and Painting also exhibited increases in competency attributable to PAST training; however, the significance of these increases may have been tempered by the level of skills brought into the program by participants based on their previous experience. By combining the mail survey methodology with pre-/post-test examinations, a clearer picture of the actual competency gained can be attained.
- Frequency of application data were collected and analyzed. However, more exploration into what is limiting employees from applying these skills needs to be conducted. Insight from telephone interviews indicate that some of the reasons that PAST graduates may not be utilizing their skills more fully include inadequate agency and park budgets, supervisor perception of more pressing responsibilities, discordant park, supervisor and staff job goals, individual's assignment, and promotion out of preservation-oriented positions. Empirical assessment of these limitations was beyond the scope of this study, but should be undertaken to assure the on-the-ground effectiveness of the PAST program training efforts.
- The combination of learning and behavior data into "education products," as a way to compare different aspects of the program, appeared to provide a diagnostic for training managers in assessing the impact of the program more fully. For example, the low response rate on the "ability to perform FMSS assessments" may be seen as a red flag

warning to facility managers that historic resources may not be fully considered in the FMSS process at the park level.

- PAST graduates were engaged in significant numbers of preservation maintenance projects each year, although less than half their time (average 40.2%) was allocated to such projects. These projects ranged from small projects of insignificant costs to multi-million dollar projects.
- In working on preservation maintenance projects, PAST graduates not only regularly assist other parks with their preservation projects, but also regularly collaborate with partners, either other parks or external organizations such as friends groups or more formal non-profit preservation organizations. Hence, the network of trained professionals the PAST program creates and supports is being engaged for both National Park system and advocacy group preservation projects.
- The distribution of PAST graduates throughout the National Park System was mapped, based on the known location of study participants. Although 140 people have gone through the PAST program, over 25 percent of the program's participants could not be located. Undoubtedly, some had retired, and others had left the Service. Given the relatively small size of this population, more effort should be made to track participants and a better understanding of the "training loss" gained.
- The value of the mentorship portion of the program is significant and obviously aided in the effectiveness and distribution of PAST impacts. Although the documented number of people directly influenced by the PAST program is 140, indirectly the number of people the PAST program has influenced is potentially much greater considering 76.6% of graduates have served as instructors on preservation projects, 50% have served as instructors in a formal classroom setting, 36.7% have career field titles that indicate a supervisory role, 89.9% have changed parks and nearly 70% have been promoted since their PAST training. The diffusion of PAST skills was greatly increased through these types of mentor relationships.
- Although mentorship is critical to the success of the PAST program, only three regions (PWR, IMR, SER) have consistently supported the program by providing mentors. Further, mentor retention from class to class is weak. Increased efforts to recruit mentors from graduating PAST program participants, as well as working with parks to identify any issues and increase a "win/win" situation is needed to maintain the stability of the mentor portion of the PAST training program.
- In 1993, the PAST program was initiated with 30 people representing 29 parks and regional offices. Combining geographic locations of mentors and students, each class has had from 11-23 parks represented with only the first two classes having regional office representation. By 2005, the program had certified and/or directly influenced 140 people representing 99 parks and regional offices. The PWR, SER, and IMR have consistently sent students for training every class since its inception; the MWR and AKR have sent students half the time.

• While efforts to establish ROI statistics as part of this evaluation were not successful, one value that became apparent as we explored this level of evaluation was the value of having trained eyes on the ground looking at historic structures daily. The value of assessing and preventing additional deterioration of historic resources by trained personnel in close proximity, as opposed to hiring outside personnel when deterioration becomes more obvious, cannot be overstated

National Park Service Preservation and Skills Training Program

A Kirkpatrick Level-4 Evaluation

Introduction

The historic built environment plays a large role in our lives, providing a tangible link to the past and our national heritage. Historic resources not only contribute to our quality of life and sense of belonging, but they connect us to the future. Historic buildings also contribute directly to our social, educational, and environmental prosperity, and to the economy through tourism and regeneration, which helps sustain our existing historic resources.

In 1966, the National Historic Preservation Act codified the value of historic buildings, sites and objects. Today over 1 million historic buildings, sites and objects have been designated as nationally significant and listed on the National Register of Historic Places; each year over 30,000 are added. Although there is broad recognition that these historic resources are important, they are under threat as there is a shortage of skilled and knowledgeable craftspeople to repair these valuable buildings and structures.

The National Park Service, as steward of many of the United States' most valuable historic resources, is responsible for the care and preservation of over 27,000 historic structures. Park managers have long recognized the ever-increasing threats to these historic resources — maintenance backlogs due to inadequate funding are coupled with a workforce that is unprepared to deal with the problems inherent to maintaining historic structures.

Suffering from similar problems, the United Kingdom established a National Heritage Training Group in 2002 in an attempt to take strong action regarding the shortage of skilled craftspeople to repair and care for the historic built environment. From 2003-2005, a nine-region study of seven types of building trades in the United Kingdom was conducted. Looking at this subset of trades within the broader construction industry, the survey addressed supply, demand, employers

and training provider issues. In essence, they found that the amount of money spent on building repair and maintenance was increasing, but there was a shortage of craftspeople with the skills and experience to do historic repair work.

In response to the UK study and committee work, in 2004 the World Monuments Fund (WMF) formalized its support of hands-on learning opportunities for conservators, craftspeople and others concerned with the preservation of our built heritage by launching the Traditional Building Arts Training Initiative. The WMF convened a Task Force to undertake an assessment of the state of traditional building arts, particularly education and training opportunities in the United States. The U.S. Task Force first met in October 2005 to examine the need to survey and analyze traditional building arts skills, levels and training opportunities in the United States; they also developed a plan for undertaking a national assessment of trades, including a list of target outcomes. The Task Force also began identifying individuals, private organizations, and public agencies outside the historic preservation community that could serve as potential partners in implementing the assessment. The Task Force recently undertook a preliminary survey of the Timber Framers Guild and is currently identifying and assessing an approach to survey other trades.

The PAST Program

In 1991, NPS Associate Director for Cultural Resources, Jerry Rogers, convened a small group of preservation and maintenance professionals and challenged them to come up with a plan to attack the problem of preparing the preservation maintenance workforce. Over the next two years, "the group proceeded with the goal of developing a wide-reaching program that would enhance preservation maintenance skills, impart confidence in using those skills, provide a basic knowledge of preservation philosophy and requirements, and upon completion of the training, assure the application of the skills of the graduates on the historic structures in their parks" (McGrath, 1992). A vital component of the training was the concept of utilizing a cadre of mentors to supervise actual hands-on preservation maintenance projects in the students' parks.

- *Purpose*: To develop a cadre of trained non-supervisory maintenance employees capable of preservation maintenance of the historic structures within the National Park System.
- *Objectives*: To train maintenance employees to preserve and maintain NPS historic structures; to create a certification program in the preservation maintenance of historic structures; and, to ensure that at least one employee from each unit of the NPS has been trained to preserve and maintain historic structures.

In May 1993, the first Preservation and Skills Training Class (PAST) was convened in Hagerstown, Maryland. It consisted of 10 mentors and 20 students. Over the 2-year period, students attended two 2-week training sessions at various parks and training centers, and also worked on several preservation maintenance projects in their parks with their mentors. Since the inaugural class, an additional five PAST classes have completed training in preservation skills, totaling 140 participants (Table 1).

Class	Students	Mentors	Total
1 (1993-95)	20	10	30
2 (1995-97)	16	8	24
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Table 1. Enrollments in PAST Classes 1-6.

Calling for Higher Order Evaluation: A Level-4 Evaluation Study

Commensurate with the effort of all government agencies to gain efficiency during economically-challenging times, the National Park Service Training and Development Program, as part of the Department of Interior's Training Directors Council (ITDC), established "Training Investment and Evaluation Guidelines" in November 2003. These guidelines adopted nationallyrecognized models of evaluation from which to derive higher levels of evaluation data and to improve decisions about training effectiveness and organizational investments.

Kirkpatrick (1994) described a model of evaluation consisting of four levels, increasing in measure and sophistication as one rises in the hierarchy. Phillips (1996) built upon Kirkpatrick's framework, but argued for a fifth level which estimates the monetary benefits and costs of training, calculating *Return on Investment*.

The Evaluation Framework

Kirkpatrick

- Level One Reaction: Measures participants' reaction to the program; e.g., students' ratings of various aspects of a training event, their overall satisfaction, etc.
- Level Two Learning: Measures the extent to which participants change attitudes, improve knowledge, and/or increase skills; *e.g.*, calculating pre-test/post-test differences in test scores; examining reported increases in preservation competencies as a result of training.
- Level Three Behavior: Measures the extent to which change in behavior occurs;
 e.g., application of knowledge, skills and abilities to actual preservation maintenance projects.
- Level Four Results: Measures changes in business results; e.g., estimating changes in the number, scope and time dedicated to preservation maintenance projects since training.

Phillips

Level Five – Return on Investment: Compares the monetary value of the business
impact with the cost of the program; e.g., estimates the total cost of PAST
program per student and compares it to the estimated value of a historic
preservation program conducted by the student, producing a Return on Investment
(ROI) statistic.

Study Purpose

The purpose of this study was to design and implement a system of evaluation for the PAST program that measures *actual* results or outcomes. This is consistent with Kirkpatrick's Level-4 Evaluation and consonant with ITDC directives. Further, this study explored the feasibility of expanding the methodology to achieve Level-5 or ROI. Achieving Level-5 assumed the valid measurement of training results/outcomes as specified in Level-4, but goes beyond to establish the costs of training and estimate the economic values associated with the results/outcomes.

Study Objectives

- To identify competencies learned via the PAST training program and compare with those actually applied in preserving park historic structures;
- To map the migration of PAST graduates throughout the National Park System in order to determine the diffusion and dissemination of PAST knowledge, skills and abilities, in the preservation of park historic structures;
- To map PAST training projects throughout the National Park System in order to determine the effect that PAST graduates' knowledge, skills and abilities has had on the long-term preservation of historic structures within the NPS; and,
- To compare the costs associated with completion of common historic preservation projects by PAST graduates (e.g., appropriate replacement of a historic window, installing a slate roof, etc.) with estimates from known commercial contractors capable of meeting NHPA and NPS standards, thus establishing a comparison of return on training investment (ROI).

Chronology of Research Design and Development

To meet the purpose and objectives of the study, a multi-tiered strategy for collecting data was developed that was consistent with each level of Kirkpatrick's evaluation framework. Additionally, efforts were made to estimate and/or collect data pertaining to costs and benefits appropriate for ROI calculations.

The first challenge faced was the creation of a comprehensive list of competencies developed through the PAST training program. Review of competencies proposed during the initial development of the PAST program (1991-1993) as well as partial lists of knowledge, skills and abilities required of selected current preservation-related job series (entry level, journeyman and expert trades people as well as Exhibit Specialists and Facility Managers) were compiled and reworded/formatted for use in this study.

Next, a panel of six preservation maintenance experts from parks and the Historic Preservation Training Center was convened to assist in the development of evaluation tools and generally guide the study. Many of these experts had been involved with the PAST program since its inception and were extremely knowledgeable about its history and purpose. The advisory panel's first major task was to refine the comprehensive list of competencies learned through the PAST program. Over a 3-month period, the panel finalized a list of 63 competencies under the categories of Preservation Philosophy, Safety Awareness, Carpentry, Masonry, Paint Skills, and Preservation Materials and Technology. These competencies formed the basis for all subsequent data collection for each level of evaluation. A list of these competencies is included as Appendix A.

And, as Phillips reiterates, "When evaluating at a higher level, it is important to evaluate at lower levels as well. A chain of impacts should occur through each level of evaluation..." (Phillips, 2002: p48). Therefore, this report is organized around discussions at each of these five levels.

Level-1

Like most training programs, the PAST Program collected data from each class of students throughout their 2-week training events to assess the content, process and overall satisfaction with the course. These data were evaluated by training staff and used to inform curricular and logistical decisions for future classes, thus striving to continually improve the effectiveness of the training. Discussion of this level of evaluation is minimized in this report, due to the timeframe in which our research was initiated (just prior to Class 6) and the inability to capture the data from previous classes. However, the results of training administrators' efforts in this regard are analogous to the "pit crew" adjusting the suspension on their car during the Daytona 500 to adapt to changing environmental conditions. Our focus is on the car's performance at the end of the race. But, the training "pit crews" were highly influential in the outcome and, in reality, are assessed as part of the "education product."

Level-2

The second level of Kirkpatrick's framework evaluates *Learning*. Due to the timing of the initiation of this study and the commencement of the most recent PAST class (#6, 2005-07), we had the opportunity to assess increases in knowledge competencies immediately before and after the completion of the class. A test instrument generally probing the knowledge gained during PAST education was developed by the Principal Investigators and reviewed by the advisory panel for content. Upon approval from the advisory panel, the Principal Investigator administered the pre test in March 2005 and the post test in February 2007. Pre- and Post-test results were scored and differences analyzed. The test instrument used in this phase of the study is included as Appendix B.

However, a pre- and post-test strategy was not feasible for classes prior to 2005. Therefore, a mail survey of all PAST graduates (students and mentors) was conducted in late 2005. A survey instrument was designed to obtain data commensurate with the different levels of evaluation. Again, the advisory panel reviewed the survey instrument for content and upon approval it was mailed to the last known park address of all PAST graduates. A month later, a follow-up letter and questionnaire was sent to those who did not respond in order to increase the response rate. At

the end of the data collection period, a total of 77 PAST graduates had responded to our request to participate in the study, resulting in a 75 percent response rate.

In this survey, a battery of questions assessing *the increase in knowledge, skills and abilities* attributable to their participation in the PAST program was posed to participants. Data depicted participants' assessment of how much their KSA's increased relative to the 63 competencies identified by the panel of experts. This data is clearly conducive to Level-2 evaluation of learning. The mail survey instrument is included as Appendix C.

Level-3

To achieve a Level-3 evaluation (*Behavior*), a second battery of survey questions was posed to respondents in the mail survey, this time assessing how frequently each graduate had actually *applied* the competencies in his/her park (s). This level of data is a direct measure of behavior, *i.e.*, the application of these competencies during historic preservation maintenance projects.

Additionally, we combined the data depicting increases in learning (Level-2) with the data on the frequency of application (Level 3), to develop a diagnostic assessment tool. This tool allows managers to assess the overall "education product" produced by PAST in that it depicts how much was learned through PAST and how much that education was actually used.

Level-4

For Level-4 evaluation another tier of data was collected via a telephone survey of a subset of those who responded to the initial mail survey questionnaire. These individuals (n = 43) indicated on the initial questionnaire that they were willing to participate in a telephone interview at a later date. Similar to the other survey development processes, the telephone survey instrument was reviewed for content by the advisory panel. By the end of the phone survey, a total of 30 interviews were completed (69.7% response rate). The purpose of these interviews was to probe more deeply into the careers of PAST graduates, estimate the number of parks that had benefited from their expertise, the number and scope of preservation maintenance projects that had been undertaken, and gain other insight related to the of PAST training across the National Park system. Data from this instrument demonstrated *actual results or outcomes*

attributable to the PAST program, thus achieving Kirkpatrick's Level-4 evaluation. The telephone survey instrument is included as Appendix D.

Level- 5

Achieving Level-5, Return on Investment (ROI) evaluation, assumes the valid measurement of training results/outcomes as specified in Level-4, but goes beyond to establish the costs of training and estimate the economic values associated with the results/outcomes. An effort was made to establish Return on Investment statistics for this study. As a part of Level 5 evaluation it is critical to isolate the effects of the program. While the data needed to estimate the training costs to produce PAST graduates was generally available by review of training program documentation, it was also necessary to calculate the business impact data and convert them to monetary values and compare them to program costs.

In an effort to isolate the business impact data, we posed the broad question, "What is the cost differential of having an NPS PAST trained employee do preservation project work versus managing an outside consultant to do such work?" or in Level -5 terms "How can we estimate the cost to do the work (personnel, design, implementation, etc.) for both NPS personnel and an outside contractor, and additionally the cost of NPS personnel to manage an outside contract?" We chose two "typical" preservation projects that a PAST graduate might undertake to assist us in answering these questions: a log cabin rehabilitation project and a masonry rehabilitation project. To compare the costs associated with completion of such common historic preservation projects by PAST graduates, we needed not only real projects, but cost estimates from known commercial contractors capable of meeting National Historic Preservation Act and NPS qualification standards.

With the advisory panel's assistance we identified two real projects: a log cabin rehabilitation project in Grand Teton National Park, Wyoming (GRTE) and a masonry horizontal surfaces preservation project in Castillo de San Marcos, Florida (CASA).

For the log cabin rehabilitation project, an architecture and engineering consultant who had worked with GRTE on preservation projects for several years agreed to assist by providing a cost

estimate for the design and implementation work, as well as personnel costs.¹ For comparison purposes, GRTE personnel provided not only their costs to undertake such a preservation project on their own, but also their administrative costs to manage such a project, if it were contracted out.

For the masonry project, the NPS Historic Preservation Training Center had recently (2006) completed a masonry horizontal surfaces stabilization project on the fort at Castillo de San Marcos, so details were available for their project work and administrative costs. The costs of various CASA personnel who either oversaw the project work or played an administrative role in some way were also gathered. The CASA administrative tasks were allocated differently than in GRTE. GRTE took care of all administration activities within the park; while for administration of the masonry project, CASA took care of some of the administrative tasks and other tasks were the responsibility of the Southeast Regional Office in Atlanta.

In reflecting on project costs, it became clear that the cost differential for materials and labor to complete the work was negligible between the two workforces – PAST graduates or contractors.² Where the primary cost differential truly lies, is in the project management. Theoretically, because of proximity and perceived immediate access to the project site and workers, park staff would have lower project management/oversight costs. As such, we chose to put our efforts towards quantifying the NPS cost for project management of an outside contractor and cost estimate sheets were crafted for the administrative oversight of each project. The project administration cost estimate was completed for GRTE, but not for CASA. For the CASA project cost estimate, although some data was available, isolating administrative costs between HPTC, the park and the regional office became very complicated and impossible to easily define.

Furthermore, assessing the value of a specific project does not equate to the full-time responsibilities of a trained PAST graduate. Too many variations were found that made it

¹ The A/E firm submitted a cost estimate for the White Grass Dude Ranch preservation project in 2004, which consisted of numerous log buildings. We chose one simple log cabin rehabilitation project from that 2004 cost estimate with the intent to work with the consultant to update his cost estimate for the individual cabin. The consultant also generously provided then current (2006) hourly wage figures for their project management costs on the "test" project.

 $^{^{2}}$ The greatest potential difference was in labor costs – specifically hourly rates and travel costs due to geographic distance of contractor to work site.

unfeasible to establish exhaustive, valid estimates of the value of the business impacts. Therefore, further analyses pertaining to ROI were abandoned. However, some value from this exercise was attained and further deliberations regarding moving toward ROI in the future should take place. The preliminary cost estimate sheets are included as Appendix E.

Results

Through the mail survey of PAST graduates, we obtained a picture of this population of employees, the influence of their training on developing historic preservation maintenance competencies, and their impact on the historic structures of the National Park System. A mailing list of 103 PAST graduates with known park addresses was provided by the NPS. Of the graduates contacted, 77 graduates provided usable data for this study, resulting in a response rate of 75 percent.

Description of PAST Graduates

The PAST workforce is predominantly male (90%) and ethnically diverse. While 64% of the workforce was White, slightly over 16% was Hispanic and almost 15% was Black or African-American. Furthermore, American Indian or Alaska Native (5.4%), Asian (4.1%) and Native Hawaiian or Pacific Islander (4.1%) employees were also represented.

Over two-thirds of the respondents had graduated from high school. And, more than 31 percent of these employees had an Associates (15.6%) or Bachelors (15.6%) degree.

One of the most interesting things about this population was its age. While their ages ranged from 35-65 years of age, the average employee was almost 50 years old. Moreover, they had over 18 years of federal service, of which almost 16 years were with the National Park Service. In sum, they are a rapidly "graying" population. They reported being in their current jobs for an average of slightly more than six years.

Level-2 – Learning

<u>*Pre-test/Post-test Exams.*</u> Employees enrolled in Class 6 (2005-07) were evaluated at the beginning and completion of their training (n = 22). A classroom-administered exam was given to the students and scored in a manner similar to any standard college exam. The questions were designed to assess the amount of knowledge students possessed regarding five aspects of the PAST Program (preservation philosophy; preservation skills and abilities including masonry, carpentry, painting; and preservation materials and technology).

In Tables 2A-2E, data from both the pre-test and post-test exam scores are listed by topic taught within the PAST program. Overall, students in Class 6 increased their knowledge by an average of 46 percent. The largest increases in knowledge occurred in the area of Preservation Philosophy; although students' knowledge regarding the five topics increased by 95 percent. Significant increases were observed in knowledge of the Secretary of Interior's Standards for Treatment of Historic Properties, the National Historic Preservation Act and the National Register of Historic Places.

The area of Carpentry also showed relatively large increases in knowledge (73%). Masonry (21%), Painting (24%), and Preservation Materials and Technology (23%) exhibited more modest increases. With the exception of four topics, all topics showed increases. Two of the topics where we found a decrease in knowledge were negligible and probably due to test error. The most significant decrease in a topic was under Preservation Materials and Technology ("What is a story pole?") which reported a decrease of 22 percent.

Table 2A. Student Pre-test and Post-test Scores from PAST Class #6 (2005-07) –Preservation Philosophy

То	pic		Pre-Test	Post-Test	Difference
<i>A</i> .	P r	eservation Philosophy			+95%
	1)	How many levels of preservation treatment are defined by the Secretary of the Interiors' Standards for the Treatment of Historic Properties?	.50	1.00	.50
	2)	According to the National Register of Historic Places, a historic property may be considered historic if it is how old?	.35	.81	.46
	3)	What is the purpose of NPS 28?	.00	.68	.68
	4)	What is the L.C.S and what is its purpose?	1.0	.93	07
	5)	What does Section 106 of the National Historic Preservation Act do?	.20	.60	.40
	6)	What three entities related to historic preservation did the National Historic Preservation Act of 1966 establish?	.33	.60	.27

Table 2B. Student Pre-test and Post-test Scores from PAST Class #6 (2005-07) – Masonry

Торіс	Pre-Test	Post-Test	Difference
B. Masonry			+21%
1) What is repointing?	.95	1.0	.05
 In general, when using Portland cement for historic masonry work, the best color to use is: 	.20	.25	.05
3) What would a mortar analysis tell you?	.65	.88	.23
4) What is a dry laid masonry wall?	.80	.93	.13
5) List five hand tools needed to do historic masonry work	1.00	.99	01
6) Have you ever repaired or laid stone in a wet or dry wall?	.68	1.00	.32

Topi	c	Pre-Test	Post-Test	Difference
<i>C. C</i>	larpentry			+73%
1)	What chalk color is used when working with historic structures?	.69	.88	.19
2)	Have you ever worked on a log construction or repair project (peeled logs, replaced deteriorated logs, etc.)?	.32	.88	.56
3)	What is mortise and tenon joinery?	.33	1.00	.67
4)	The difference between a wood shake and wood shingle is:	.38	.63	.25
5)	List the carpentry hand tools you have used in building and repairing historic wood structure	.96	1.0	.04
6)	Have you ever fabricated architectural replacement materials? (Tongue & Groove flooring, molding, siding, etc.)	.55	.69	.14
7)	Which of the following is NOT an essential ingredient for replacing a historic roof?	.89	1.0	.11

Table 2C. Student Pre-test and Post-test Scores from PAST Class #6 (2005-07) – Carpentry

Table 2D. Student Pre-test and Post-test Scores from PAST Class #6 (2005-07) – Painting

Торіс		Pre-Test	Post-Test	Difference
D. Painting				
1)	What would a paint analysis tell you?	.47	.63	.16
2)	A china bristle paint brush can be used in what kind of paint?	.44	.57	.13
3)	To match an 1840s paint application on an interior wall the tool to use would be a:	.75	1.00	.25
4)	The number one health hazard in historic paint is	.95	1.0	.05
5)	Describe the overriding philosophy of paint removal from historic wooden structures and name 2 types of acceptable paint removal methods	.50	.79	.29
6)	When painting any structure that is historic, you must match the historic paint composition	.47	.50	.03
7)	Replacing historic paint with modern paints is not allowed when repainting a historic structure	.94	.94	0.0

Topic		Pre-Test	Post-Test	Difference
E. Pr	eservation Materials and Technology			+23%
1)	What is quicklime?	1.00	1.00	.00
2)	The principal agent of deterioration of historic buildings is usually what?	.82	1.00	.28
3)	Have you ever selected cleaning materials to clean historic masonry, metals or wood structures?	.32	.56	.24
4)	What is glazing compound?	1.00	.93	.07
5)	When would you want to use substitute materials on a historic structure?	.75	.94	.19
6)	The top priority for protecting and maintaining roof gutters and downspouts is what?	.77	.69	08
7)	What is a story pole?	1.00	.78	22
8)	Which of the following exterior building materials has the greatest potential of damaging the integrity and character of a historic building?	.40	.70	.30

Table 2E. Student Pre-test and Post-test Scores from PAST Class #6 (2005-07) –Preservation Materials and Technology

Even though a pre-/post-test design was not a feasible alternative for Classes 1-5, data assessing increases in PAST competencies was collected through the mail survey that was sent to all PAST graduates with known addresses within the NPS in 2005 (n = 103). This provided a more comprehensive look at the PAST Program since its inception.

Therefore, to build a more complete assessment at Level-2 (Learning), PAST graduates were asked to report their perceptions of increases in 63 specific competencies that were attributable to their PAST training. As can be seen in Tables 3A-F, the 63 competencies were segmented into six distinct categories of learning.

<u>*Mail Survey*</u>. Respondents reported the most significant increases in competency in the area of Preservation Philosophy (Table 3A). Roughly 70 percent of all respondents rated the increase in competency for each item as 4 or greater on the 5-point Likert scale (grand mean = 3.97). "Knowledge of the National Historic Preservation Act (1966)" (mean = 3.95) and the "Secretary of Interior's Standards for the Treatment of Historic Properties" (mean = 4.03) were subjects in

which students reported significant increases. The same is true of "Knowledge of Preservation Treatment" (mean = 4.09), the "Differences between Preservation Treatment and Rehabilitation" (mean = 4.12) and, "Knowledge of when it is more appropriate to repair rather than replace" (mean = 4.00). Further, it is interesting that, with the exception of the variables mentioned above, no other competencies in any category had means of 4.0 or higher.

 Table 3A. Increases in Employee Competencies Attributed to PAST Training – Preservation Philosophy

				[
		No .		Moderate		Significant	
Co	npetencies	increase	2	Increase 3	4	Increase 5	Mean
			4	~ .	-	-	wican
<i>A</i> .	Preservation Philosophy		-	Grand m	ean = 3.9	7	
	 Knowledge of the National Historic Preservation Act of 1966 (with revisions) 	2.7	6.7	22.7	29.3	38.7	3.95
	 Knowledge of the Secretary of the Interior's Standards for the Treatment of Historic Properties 	4.1	4.1	18.9	31.1	41.9	4.03
	 Knowledge of preservation treatments (preservation, rehabilitation, restoration, reconstruction) and circumstances under which each treatment is appropriate 	2.7	4.0	18.7	30.7	44.0	4.09
	4) Ability to use historic preservation terms correctly as a tradesperson	4.1	4.1	21.6	36.5	33.8	3.92
	5) Knowledge of the importance of historic character and integrity (authenticity) in the treatment of historic structures	5.3	3.9	15.8	39.5	35.5	3.96
	6) Knowledge of the difference between preservation maintenance and rehabilitation	3.9	1.3	18.4	31.6	44.7	4.12
	 Ability to identify common character- defining features of a historic structure 	5.3	1.3	25.0	34.2	34.2	3.91
	8) Knowledge of when it is more appropriate to repair rather than replace	5.3	1.3	21.3	32.0	40.0	4.00
	9) Knowledge of how to select in-kind materials	4.1	11.0	19.2	37.0	28.8	3.75

Four other categories of learning – Safety Awareness, Carpentry, Masonry, and Preservation Materials and Technology – all showed similar increases in learning. Each of these categories reported grand means between 3.28 and 3.22. "Knowledge of general safety and health provisions" (mean = 3.44) and "Knowledge of when to employ personal protection equipment"

(mean = 3.56) were the items showing the largest increases under Safety Awareness (Table 3B).

		in	No ncrease		Moderate Increase		Significant Increase	
Co	ompetencies		1	2	3	4	5	Mean
<i>B</i> .	Safety Awareness				Grand M	ean = 3.2	2	
	 Knowledge of general safet provisions 	y and health	10.7	8.0	33.3	22.7	25.3	3.44
	 Knowledge of OSHA electrony OSHA motor vehicle stands fall protection standards and ladder and stairway standar 	ical standards, ards, OSHA d OSHA ds	14.5	14.5	31.6	21.1	18.4	3.14
	3) Ability to properly use hand tools	l and power	13.2	21.1	22.4	19.7	23.7	3.20
	4) Knowledge of how to safely hazardous materials	v handle	18.7	21.3	16.0	28.0	16.0	3.01
	5) Knowledge of proper fire protection techniques	revention and	20.3	24.3	21.6	20.3	13.5	2.82
	6) Knowledge of lead paint ha safety measures	zards and	12.0	14.7	21.3	25.3	26.7	3.40
	7) Knowledge of when to emp protection equipment (PPE)	loy personal	15.8	13.2	18.4	25.0	27.6	3.56

 Table 3B.
 Increases in Employee Competencies Attributed to PAST Training – Safety Awarness

Respondents also reported large increases in five Carpentry competencies. "Knowledge of the causes of and remedies for wood deterioration" (mean = 3.47), "Ability to use appropriate historic and modern carpentry tools" (mean = 3.47), "Ability to choose appropriate historic and modern equipment..." (mean = 3.56), "Ability to implement appropriate carpentry preservation techniques" (mean = 3.47), and "Ability to identify and differentiate between historic and current carpentry work" (mean = 3.45), were all competencies respondents rated well above the midpoint (Table 3C).

		Percentages					
C		No increase		Moderate Increase		Significant Increase	
Com	petencies	1	2	3	4	5	Mean
<i>C</i> . <i>C</i>	arpentry		1	Grand M	ean = 3.2	5	
1)	Knowledge of the causes of and remedies for wood deterioration	5.4	8.1	37.8	31.1	17.6	3.47
2)	Ability to use appropriate historic and modern carpentry tools	6.7	10.7	36.0	22.7	24.0	3.47
3)	Ability to choose the appropriate historic or modern equipment to complete a carpentry repair or preservation treatment project	6.7	10.7	26.7	32.0	24.0	3.56
4)	Ability to implement appropriate carpentry preservation techniques (use of axes, adzes and slicks)	12.3	8.2	26.0	27.4	26.0	3.47
5)	Knowledge of the appropriate chalk color to use on historic structures (i.e. when to use red or blue chalk)	22.9	15.7	18.6	27.1	15.7	2.97
6)	Ability to repair, restore and reconstruct timber framing, joints and millwork elements in situ	12.5	18.1	26.4	22.2	20.8	3.21
7)	Ability to construct mortise and tenon joinery	15.1	19.2	28.8	19.2	17.8	3.06
8)	Ability to create architectural replacement elements (millwork, etc.)	24.3	14.3	24.3	28.6	8.6	2.83
9)	Knowledge of appropriate modern tools for use in historic preservation treatment work	8.0	12.0	42.7	26.7	10.7	3.20
10)	Ability to identify historic craft elements or markings (i.e. elephant tracks) and use that knowledge to guide appropriate treatment decisions	15.3	20.8	27.8	25.0	11.1	2.96
11)	Ability to recognize when a carpentry skill is beyond my capability and I need to ask for skilled guidance	8.0	20.0	26.7	18.7	26.7	3.36
12)	Knowledge of historic and current carpentry trade materials, product lines and changing manufacturing practices as related to materials and techniques for carpentry-related preservation maintenance and treatments	6.7	20.0	29.3	30.7	13.3	3.24
13)	Ability to identify and differentiate between historic and current carpentry work	6.7	10.7	33.3	29.3	20.0	3.45

Table 3C. Increases in Employee Competencies Attributed to PAST Training – Carpentry

Similarly, the following six Masonry competencies posted significant increases in learning (Table 3D):

"Knowledge of the causes of and remedies for masonry and mortar deterioration" (mean = 3.54);

"Ability to use appropriate historic and modern masonry tools" (mean = 3.47);

"Ability to implement appropriate masonry preservation techniques" (mean = 3.47);

"Ability to understand purpose of mortar analysis..." (mean = 3.53);

"Knowledge of modern mortar mixes and their impact on historic resources" (mean = 3.71); and,

"Ability to recognize when a masonry skill is beyond [their] capability..." (mean = 3.53).

		No		Moderate		Significant	
Con	matancias	increase	2	Increase		Increase	Maria
Con	ipetencies	1	2	3	4	5	Mean
D. 1	Masonry			Grand m	ean = 3.2	5	
1) Knowledge of the causes of and remedies for masonry and/or mortar deterioration	5.4	9.5	33.8	28.4	23.0	3.54
2	 Ability to use appropriate historic and modern masonry tools 	10.7	13.3	20.0	30.7	25.3	3.47
	B) Ability to choose the appropriate historic or modern equipment to complete a masonry repair or preservation treatment project	10.8	12.2	31.1	24.3	21.6	3.34
2	 Ability to implement appropriate masonry preservation techniques 	12.0	9.3	28.0	21.3	29.3	3.47
-	 Ability to understand purpose of mortar analysis and incorporate results into proposed mortar mixes 	10.7	10.7	26.7	18.7	33.3	3.53
6	5) Knowledge of modern mortar mixes and their impact on historic resources	8.0	12.0	16.0	29.3	34.7	3.71
	7) Ability to create appropriate mix of materials to match in-kind repointing or find new sources for materials	14.9	8.1	23.0	32.4	21.6	3.38

Continued.../

	No increase		Moderate Increase		Significant Increase	
Competencies	1	2	3	4	5	Mean
8) Ability to do mortared masonry in historic bonds and patterns	25.4	9.9	33.8	15.5	15.5	2.86
 Ability to repair or restore dry laid masonry wall 	26.9	14.9	25.4	16.4	16.4	2.81
10) Ability to repair or apply lath and plaster	32.3	10.8	30.8	13.8	12.3	2.63
11) Knowledge of the properties of lime mortars and their appropriate use in a preservation treatment project	15.1	13.7	27.4	21.9	21.9	3.22
12) Ability to identify historic craft elements or markings and use that knowledge to guide appropriate treatment decision	15.3	22.2	27.8	18.1	16.7	2.99
13) Ability to recognize when a masonry skill is beyond my capability and I need to ask for skilled guidance	11.1	12.5	20.8	23.6	31.9	3.53
14) Knowledge of historic and current masonry trade materials, product lines and changing manufacturing practices as related to materials and techniques for preservation maintenance and treatment	14.9	13.5	36.5	21.6	13.5	3.05

Table 3E. Increases in Employee Competencies Attributed to PAST Training – Paint Skills

		Percentages					
Co	mpetencies	No increase 1	2	Moderate Increase	4	Significant Increase 5	Mean
<i>E</i> .	Paint Skills	1		Grand M	ean = 2.99)	Witcan
	1) Knowledge of the causes of and remedies for paint deterioration	9.3	12.0	46.7	18.7	13.3	3.15
	2) Ability to use appropriate historic and modern paint tools	16.0	13.3	37.3	25.3	8.0	2.96
	3) Ability to choose the appropriate historic or modern equipment to complete a paint repair or preservation treatment project	16.2	12.2	43.2	21.6	6.8	2.91
	4) Ability to properly identify historic paint and analyze paint application processes, techniques and materials	21.9	21.9	34.2	16.4	5.5	2.62
	5) Ability to undertake proper paint surface preparation	12.0	14.7	37.3	22.7	13.3	3.11

Continued.../

	Percentages					
Competencies	No increase		Moderate Increase		Significant Increase	
	1	2	3	4	5	Mean
 Ability to understand purpose of a paint analysis and incorporate results into a proposed treatment, if necessary 	21.9	11.0	34.2	21.9	11.0	2.89
 Ability to determine appropriate paint removal methods for a historic structure 	9.5	14.9	28.4	28.4	18.9	3.32
 Ability to identify hazardous paint surfaces 	14.7	9.3	34.7	25.3	16.0	3.19
 Ability to identify historic craft markings and use that knowledge to guide appropriate treatment decisions 	17.3	18.7	34.7	20.0	9.3	2.85
 Ability to recognize when a paint skill is beyond my capability and I need to ask for skilled guidance 	16.2	12.2	32.4	20.3	18.9	3.14
11) Knowledge of historic and current paint trade materials, product lines and changing manufacturing practices as related to materials and techniques for prospution maintenance and treatment	17.6	18.0	36.5	20.2	6.9	2.80
preservation maintenance and treatment	17.0	18.9	30.5	20.3	0.8	2.80

Finally, three competencies under the category of Preservation Materials and Technology posted means around the 3.5 mark on the 5-point Likert scale (Table 3F).

"Ability to select appropriate materials for a preservation treatment program" (mean =

3.47);

"Knowledge of preservation resources" (mean = 3.63); and,

"Ability to execute a preservation maintenance project" (mean = 3.57).

		No		Moderate		Significant	
Comr	natancias	increase	•	Increase		Increase	Maaa
Comp	Jetencies	I	2	3	4	5	Mean
<i>F. Pr</i>	eservation Materials and Technology	<i>v</i>	Gr	and Mean	= 3.28		
1)	Ability to select appropriate materials for a preservation treatment project	6.6	6.6	40.8	25.0	21.1	3.47
2)	Ability to read construction drawings, conservation reports, specifications, data from hazard surfaces, etc	13.3	14.7	29.3	29.3	13.3	3.15
3)	Knowledge of preservation resources (Preservation Briefs, Preservation Tech Notes, other preservation professionals, etc.)	6.7	5.3	32.0	30.7	25.3	3.63
4)	Ability to perform Facility Management Software System (FMSS) building inspections and condition assessments	19.4	21.0	33.9	6.5	19.4	2.86
5)	Knowledge of the List of Classified Structures as the official list of historic structures in NPS	8.3	15.3	34.7	23.6	18.1	3.28
6)	Knowledge of appropriate and inappropriate cleaning materials for historic masonry, metals, wood, painted surfaces	10.7	21.3	29.3	22.7	16.0	3.12
7)	Knowledge of appropriate use of architectural replacement elements in a preservation treatment project	14.5	10.5	38.2	26.3	10.5	3.08
8)	Ability to identify the root cause and analyze deterioration of historic structures	9.2	9.2	30.3	38.2	13.2	3.37
9)	Ability to execute a preservation maintenance project	6.6	7.9	35.5	22.4	27.6	3.57

Table 3F. Increases in Employee Competencies Attributed to PAST Training – Preservation Materials and Technology

Generally speaking, all categories showed, on average, at least moderate increases in competency. Moreover, when viewed as single competencies, it is interesting that the majority of all competencies showed increases above the mid-point of 3.0; only 14 of the 63 competencies (22%) reported below this mark.

Competencies receiving lower ratings appeared to be more associated with KSA's that students could have possessed previously due to past experience. For example, the competency "Ability

to repair or apply lath and plaster" and "Knowledge of proper fire prevention and protection techniques" received the lowest ratings of increase among all 63 competencies posed to respondents (2.63 and 2.82, respectively). But it is possible, even probable, that these ratings were influenced by employees having past experience applying these skills, thus limiting increases in competency.

This sheds light on the limitations of having only *post hoc* data; that is, we could not discern how data were influenced by an individual's previous training and/or on-the-job experience. Unlike the pre-/post-test evaluation of Class 6, the mail survey could not control for external variables such as prior knowledge, skills and abilities, after the fact. Therefore, caution must be used when interpreting these data, as lower ratings pertaining to some variables may be more a function of what students brought into PAST, than any weakness in training content or delivery. Even so, these data provide training managers with information to adjust the program appropriately. And, it will be interesting to observe how the need for these competencies change, over time, as new generations of employees come to the NPS with different skills and backgrounds.

Level-3 – Behavior

The ability to measure the increase in competencies attributable to PAST is obviously a critical component of gauging the value of the training. However, it is equally obvious that the value of any competency gained is limited significantly if that competency is not applied to preserving historic structures. Therefore, as part of the survey of all PAST graduates, the mail survey instrument also collected data depicting how frequently graduates had applied their learned skills since graduating from PAST. Respondents rated the frequency with which they had applied each competency while serving in their *current* position; their responses ranging from Never (1) to Frequently (5).

As can be seen in Table 4A, PAST graduates frequently used the knowledge of Preservation Philosophy in their current positions. All competencies were rated higher than 3.60 on the 5point scale. The range of responses was tightly clustered (3.61-3.84). "Apply knowledge of preservation philosophy to a preservation treatment project" (mean = 3.84), Apply knowledge of repair rather than replace in preservation treatments" (mean = 3.78), "Apply knowledge of

preservation, maintenance, repair, restoration, or reconstruction..." (mean = 3.74), and "Apply knowledge of how to select in-kind materials..." (mean = 3.72) were reported as the competencies most frequently applied to their positions.

Table 4A. Reported Frequency of Application of PAST Competencies – Preservation Philosophy

		Percentages						
		Never		Sometimes		Frequently		
Com	petencies	1	2	3	4	5	Mean	
A. P	Preservation Philosophy			Grand me	an = 3.7	·/1		
1) Apply knowledge of preservation philosophy to a preservation treatment project	7.9	3.9	26.3	19.7	42.1	3.84	
2) Identify common character-defining features that contribute to the integrity of a historic structure	9.2	6.6	26.3	28.9	28.9	3.62	
3	 Apply knowledge of preservation treatment options to guide an appropriate treatment choice for a historic structure 	10.7	4.0	28.0	28.0	29.3	3.61	
4	 Apply knowledge of preservation maintenance, repair, restoration, or reconstruction to a preservation treatment project 	9.2	5.3	25.0	23.7	36.8	3.74	
5	Apply knowledge of repair rather than replace in preservation treatments	9.2	6.6	23.7	19.7	39.5	3.78	
6	 Apply knowledge of using appropriate preservation terms 	11.8	6.6	19.7	28.9	32.9	3.65	
7	 Apply knowledge of the importance of historic character and integrity (authenticity) to defining a preservation treatment for a project 	9.5	5.4	23.0	32.4	29.7	3.68	
8	 Apply knowledge of how to select in-kind materials to a preservation treatment project 	11.8	3.9	18.4	31.6	34.2	3.72	

The highest ratings for application were in the learning area of Safety Awareness. This area had a grand mean of 4.23 (Table 4B). "Practicing safe use of hand and power tools" (mean = 4.68), "Using personal protection equipment" (mean = 4.64), and generally "Practicing safe worksite principles" (mean = 4.61) were the competencies reported as most frequently applied.

Table 4B. Reported Frequency of Application of PAST Competencies – Safety Awareness

		Percentages					
	Never		Sometimes		Frequently		
Competencies	1	2	3	4	5	Mean	
B. Safety Awareness			Grand me	an = 4.2	3		
1) Practice safe worksite principles	1.4	0.0	6.9	19.4	72.2	4.61	
 Apply OSHA electrical standards, OSH motor vehicle standards, OSHA fall protection or OSHA ladder and stairwa standards to project work 	HA ny 2.7	2.7	16.2	23.0	55.4	4.26	
3) Practice safe use of hand and power tools	1.3	0.0	6.7	13.3	78.7	4.68	
4) Practice safe handling and disposal of hazardous materials	2.7	1.3	20.0	25.3	50.7	4.20	
5) Practice proper fire prevention and protection techniques appropriate for preservation construction	8.0	4.0	25.3	21.3	41.3	3.84	
6) Apply safety measures when working with lead paint	10.7	9.3	18.7	20.0	41.3	3.72	
 7) Use Materials Safety Data Sheets (MSDS) and Job Hazard Analysis (JHA reports in projects 	A) 2.7	8.0	22.7	25.3	41.3	3.95	
8) Use personal protection equipment (PPE)	1.3	1.3	6.7	13.3	77.3	4.64	

Carpentry skills (Table 4C) were reported to be used slightly less frequently than others (grand mean = 3.08). Responses ranged from 3.70, "Apply knowledge of wood deterioration causes and remedies" to 2.66, "Construct mortise and tenon joinery."

Table 4C. Reported Frequency of Application of PAST Competencies – Carpentry

			Percentages					
~			Never		Sometimes		Frequently	
Co	mp	etencies	1	2	3	4	5	Mean
С.	Ca	rpentry			Grand me	an = 3.0	8	
	1)	Apply knowledge of wood deterioration causes and remedies	9.2	6.6	18.4	36.8	28.9	3.70
	2)	Use appropriate historic and modern carpentry tools in preservation treatment projects	13.2	7.9	21.1	27.6	30.3	3.54
	3)	Implement appropriate carpentry preservation techniques (use of axes, adzes and slicks, etc.)	21.1	10.5	30.3	22.4	15.8	3.01
	4)	Repair, restore or reconstruct timber framing, joints and millwork, etc	25.0	14.5	23.7	21.1	15.8	2.88
	5)	Use appropriate chalk color on historic structures	30.7	17.3	16.0	21.3	14.7	2.72
	6)	Construct mortise and tenon joinery	23.7	27.6	17.1	22.4	9.2	2.66
	7)	Create architectural replacement elements (millwork, etc.)	30.3	15.8	23.7	15.8	14.5	2.68
	8)	Use appropriate historic or modern equipment to complete a preservation treatment	15.8	9.2	25.0	28.9	21.1	3.30
	9)	Recognized when a carpentry skill was beyond my capability and asked for skilled guidance	14.5	13.2	36.8	23.7	11.8	3.05
	10)	Use my knowledge of historic and current carpentry trade materials, product lines and changing manufacturing practices in carpentry-related preservation maintenance and treatment projects	14.5	10.5	27.6	21.1	26.3	3.34
	11)	Identify historic craft elements or markings (i.e. elephant tracks) and use that knowledge to guide appropriate treatment decisions	19.7	13.2	26.3	26.3	14.5	3.03

Masonry skills were the least frequently used competencies reported by PAST graduates (Table 4D). For example, "Repair and restore a stone dry laid masonry wall" (mean = 2.45), "Create mortared masonry in historic bonds and patterns" (mean = 2.39) and "Repair and apply lath and plaster" (mean = 2.11) were competencies respondents reported not using very often.

Table 4D. Reported Frequency of Application of PAST Competencies – Masonry

			Percentages					
			Never		Sometimes		Frequently	
Co	mp	etencies	1	2	3	4	5	Mean
D.	Ma	isonry			Grand me	an = 2.8	<i>\</i> 4	
	1)	Apply knowledge of masonry and/or mortar deterioration causes to remedies	10.7	17.3	33.3	21.3	17.3	3.17
	2)	Use appropriate historic and modern masonry tools to complete a masonry repair or preservation treatment project	10.7	17.3	36.0	18.7	17.3	3.15
	3)	Practice appropriate masonry preservation techniques	10.8	18.9	28.4	25.7	16.2	3.18
	4)	Apply results of a mortar analysis to develop an appropriate mortar mix, if necessary	17.3	21.3	34.7	16.0	10.7	2.81
	5)	Repoint masonry	13.5	20.3	28.4	20.3	17.6	3.08
	6)	Repair and restore a stone dry laid masonry wall	33.3	24.0	18.7	12.0	12.0	2.45
	7)	Repair and apply lath and plaster	48.0	18.7	13.3	14.7	5.3	2.11
	8)	Apply my knowledge of modern mortar mixes to limit their impact on historic resources	21.3	18.7	24.0	20.0	16.0	2.91
	9)	Create an appropriate mix of materials to match in-kind repointing and/or find new sources for materials	20.0	24.0	21.3	20.0	14.7	2.85
	10)	Create mortared masonry in historic bonds and patterns	36.0	22.7	18.7	12.0	10.7	2.39
	11)	Apply my knowledge of the properties of lime mortars and their appropriate use in preservation maintenance and treatment projects	24.3	17.6	27.0	23.0	8.1	2.73
	12)	Identify historic craft elements or markings and use that knowledge to guide appropriate treatment decisions	18.9	23.0	29.7	18.9	9.5	2.77
	13)	Recognized when a masonry skill was beyond my capability and asked for skilled guidance	9.6	19.2	38.4	23.3	9.6	3.04
	14)	Use my knowledge of historic and current masonry trade materials, product lines and changing manufacturing practices in masonry-related preservation maintenance and treatment projects	13.5	18.9	28.4	25.7	13.5	3.07

In contrast, Paint Skills were the preservation skills most frequently used (Table 4E). This area of learning produced a grand mean of 3.20. With the exception of three competencies (out of 13), all competencies had means greater than 3.0. "Practice proper paint surface preparation" (mean = 3.75), "Conduct proper paint application techniques" (mean = 3.68), and "Apply knowledge of paint removal methods..." (mean = 3.46) were skills that were used on a relatively frequent basis.

		Percentages					
Co	Competencies			Sometimes		Frequently	
Competencies		1	2	3	4	5	Mean
<i>E</i> .	Paint Skills	Grand mean = 3.20					
	1) Apply knowledge of paint deterioration causes to remedies	9.2	10.5	31.6	34.2	14.5	3.34
	2) Use appropriate historic and modern paint tools in preservation treatment projects	11.8	17.1	30.3	26.3	14.5	3.15
	 Choose appropriate historic or modern equipment to complete a paint repair or preservation treatment project 	11.8	17.1	27.6	23.7	19.7	3.22
	4) Practice proper paint surface preparation	5.3	11.8	17.1	34.2	31.6	3.75
	5) Conduct proper paint application techniques	5.3	13.2	19.7	31.6	30.3	3.68
	 Apply knowledge of paint removal methods to projects 	5.3	17.1	25.0	31.6	21.1	3.46
	 Apply results of a paint analysis to develop an appropriate paint treatment, if necessary 	21.1	21.1	30.3	23.7	3.9	2.68
	8) Use appropriate paint removal methods for a historic structure	15.8	15.8	17.1	38.2	13.2	3.17
	9) Identify hazardous paint surfaces	13.2	18.4	19.7	27.6	21.1	3.25
	10) Identify historic craft markings and use that knowledge to guide appropriate treatment decisions	17.1	13.2	26.3	32.9	10.5	3.07
	 Recognized when a paint skill was beyond my capability and asked for skilled guidance 	10.5	19.7	43.4	21.1	5.3	2.91
	12) Apply my knowledge of historic and current paint trade materials, product lines and changing manufacturing practices to paint-related preservation maintenance and treatment projects	12.0	16.0	37.3	20.0	14.7	3.09
	13) Identify historic paint application processes, techniques and materials	16.2	17.6	39.2	16.2	10.8	2.88

Table 4E. Reported Frequency of Application of PAST Competencies – Paint Skills

Finally, Preservation Materials and Technology skills were used regularly (Table 4F). This area of learning had a grand mean of 3.26. "Selecting appropriate materials..." (mean = 3.53), "Identifying the root cause of deterioration..." (mean = 3.46), "Reading construction drawings, conservation reports, specifications..." (mean = 3.38), and actually "Executing a preservation maintenance project" (mean = 3.37) were competencies with means well above the mid-point.

 Table 4F. Reported Frequency of Application of PAST Competencies – Preservation Materials and Technology

	Percentages					
	Never		Sometimes		Frequently	
Competencies	1	2	3	4	5	Mean
F. Preservation Materials and Technology	,	Gra	nd mean =	3.26		
 Select appropriate materials for a preservation treatment project 	11.8	3.9	30.3	27.6	26.3	3.53
 Reference preservation resources (Preservation Briefs, Preservation Tech Notes, other preservation professionals, etc.) 	14.5	14.5	35.5	19.7	15.8	3.08
3) Perform FMSS building inspections and condition assessments	25.0	13.2	23.7	14.5	23.7	2.99
 Choose appropriate cleaning materials for historic masonry, metals, wood or paint surfaces 	15.8	13.2	30.3	25.0	15.8	3.12
 Apply knowledge of appropriate use of architectural replacement elements in a preservation treatment project 	14.5	15.8	26.3	25.0	18.4	3.17
 Read construction drawings, conservation reports, specifications, data from hazard surfaces, etc 	13.2	9.2	27.6	26.3	23.7	3.38
 Execute a preservation maintenance project 	15.8	9.2	28.9	14.5	31.6	3.37
8) Identify the root cause of deterioration of historic structures	9.2	13.2	28.9	19.7	28.9	3.46

In summary, some caution must be used when interpreting application data. One should not equate "low application" with "low importance." The ability to apply PAST education skills can be adversely influenced by a person's assignment, the park's budget, other more pressing responsibilities, or being promoted out of a preservation-oriented position. It is important to remember that these data reflect the respondents' application in their *current* position. No attempt was made to collect application data across respondents' entire career since PAST due to

the difficulty of capturing that data, recall bias and other factors. However, these data do provide training managers with some idea of how much employees are using PAST competencies and may provide insights into the types of personnel to select as students for future classes.

Combining Learning and Behavior Data – A Diagnostic Tool

In Tables 5A-5F, we combined each graduate's increase in learning score and their reported frequency of application score, then produced an overall mean for all respondents. In this way, the actual impact of PAST education on the historic resources of the National Park Service can be viewed. By simply multiplying these two scores, we produced an index called the "education product." While these numbers do not mean much when reported in isolation, they can be used comparatively as a diagnostic to assess the impact of the PAST program.

As one would imagine, given the discussions surrounding the findings pertaining to learning increases and application frequency previously, Preservation Philosophy produced the largest "education products." This area of learning produced a grand mean of 14.63, and all competencies (save one) reported education product scores of 14.32 or higher. Competencies under this area of learning were consistently high when we combined the learning and application scores.

Safety Awareness and Preservation Materials and Technology also produced relatively high overall means (13.49 and 10.99, respectively). The frequency of application scores for safety competencies drove the education products higher, particularly in the competencies, "Knowledge of general safety and health provisions," "Knowledge of OSHA standards...," and the "Ability to properly use hand and power tools." Education product scores for competencies categorized under Preservation Materials and Technology generally ranged between 10.25 and 12.47. There was one outlier – "Ability to perform FMSS assessments" which only produced a score of 8.14. This may be considered a red flag for facility managers as to whether historic resources are being fully considered in the FMSS process at the park level.

Of the competencies under the three preservation skills categories (Carpentry, Masonry, and Painting), each produced grand means of 10.26, 9.62, and 9.62, respectively.

Table 5A. Individuals' Competency Gains and Applications – PAST Education Products – Preservation Philosophy

Item		Mean Increase	Mean Application	Education Product
A. Pr	reservation Philosophy	Grand mean	= 14.63	
1)	Knowledge of the National Historic Preservation Act of 1966 (with revisions)	3.94	3.84	15.13
2)	Knowledge of the Secretary of the Interior's Standards for the Treatment of Historic Properties	4.03	3.61	14.55
3)	Knowledge of preservation treatments (preservation, rehabilitation, restoration, reconstruction) and circumstances under which each treatment is appropriate	4.09	3.61	14.86
4)	Ability to use historic preservation terms correctly as a tradesperson	3.92	3.65	14.32
5)	Knowledge of the importance of historic character and integrity (authenticity) in the treatment of historic structures	3.96	3.68	14.43
6)	Knowledge of the difference between preservation maintenance and rehabilitation	4.12	3.74	15.68
7)	Ability to identify common character-defining features of a historic structure	3.91	3.62	14.43
8)	Knowledge of when it is more appropriate to repair rather than replace	4.00	3.64	14.68
9)	Knowledge of how to select in-kind materials	3.75	3.72	13.62

Table 5B. Individuals' Competency Gains and Applications – PAST Education Products – Safety Awareness

Item	Mean Increase	Mean Application	Education Product
B. Safety Awareness	Grand mean	= 13.49	
1) Knowledge of general safety and l	nealth provisions 3.44	4.61	14.96
 Knowledge of OSHA electrical sta motor vehicle standards, OSHA fa standards and OSHA ladder and st 	Il protection airway standards 3.14	4.26	13.57
3) Ability to properly use hand and p	ower tools 3.20	4.68	14.88
 Knowledge of how to safely hand materials 	e hazardous 3.01	4.20	12.43
5) Knowledge of proper fire preventi techniques	on and protection 2.82	3.84	10.92
 Knowledge of lead paint hazards a measures 	nd safety 3.40	3.72	12.18
7) Knowledge of when to employ per equipment (PPE)	rsonal protection 3.36	4.64	15.52

Item		Mean Increase	Mean Application	Education Product
<i>C. C</i>	arpentry	Grand mean =	10.26	
1	Knowledge of the causes of and remedies for wood deterioration	3.47	3.70	12.84
2	Ability to use appropriate historic and modern carpentry tools	3.47	3.54	12.45
3	Ability to choose the appropriate historic or modern equipment to complete a carpentry repair or preservation treatment project	3.56	3.30	11.75
4	Ability to implement appropriate carpentry preservation techniques (use of axes, adzes and slicks)	3.47	3.01	10.53
5	Knowledge of the appropriate chalk color to use on historic structures (i.e. when to use red or blue chalk)	2.97	2.72	8.44
6	Ability to repair, restore and reconstruct timber framing, joints and millwork elements in situ	3.21	2.88	9.56
7	Ability to construct mortise and tenon joinery	3.05	2.66	8.55
8	Ability to create architectural replacement elements (millwork, etc.)	2.83	2.68	7.97
9	Knowledge of appropriate modern tools for use in historic preservation treatment work	3.20	3.30	10.66
1	 Ability to identify historic craft elements or markings (i.e. elephant tracks) and use that knowledge to guide appropriate treatment decisions 	2.96	3.03	8.88
1	 Ability to recognize when a carpentry skill is beyond my capability and I need to ask for skilled guidance 	3.36	3.05	10.42
1	2) Knowledge of historic and current carpentry trade materials, product lines and changing manufacturing practices as related to materials and techniques for carpentry-related preservation maintenance and treatments	3.24	3.34	10.97
1	3) Ability to identify and differentiate between historic and current carpentry work	3.45	3.03	10.45

Table 5C. Individuals' Competency Gains and Applications – PAST Education Products - Carpentry

Ite	em		Mean Increase	Mean Application	Education Product
D.	Ma	isonry	Grand mean	= 9.62	
	1)	Knowledge of the causes of and remedies for masonry and/or mortar deterioration	3.54	3.17	11.57
	2)	Ability to use appropriate historic and modern masonry tools	3.47	3.15	11.27
	3)	Ability to choose the appropriate historic or modern equipment to complete a masonry repair or preservation treatment project	3.34	3.15	10.52
	4)	Ability to implement appropriate masonry preservation techniques	3.47	3.18	11.28
	5)	Ability to understand purpose of mortar analysis and incorporate results into proposed mortar mixes	3.53	2.81	10.35
	6)	Knowledge of modern mortar mixes and their impact on historic resources	3.71	2.91	11.19
	7)	Ability to create appropriate mix of materials to match in-kind repointing or find new sources for materials	3.38	2.85	10.17
	8)	Ability to do mortared masonry in historic bonds and patterns	2.86	2.39	7.27
	9)	Ability to repair or restore dry laid masonry wall	2.81	2.45	7.26
	10)	Ability to repair or apply lath and plaster	2.63	2.11	5.92
	11)	Knowledge of the properties of lime mortars and their appropriate use in a preservation treatment project	3.22	2.73	9.19
	12)	Ability to identify historic craft elements or markings and use that knowledge to guide appropriate treatment decisions	2.99	2.77	8.61
	13)	Ability to recognize when a masonry skill is beyond my capability and I need to ask for skilled guidance	3.53	3.04	10.39
	14)	Knowledge of historic and current masonry trade materials, product lines and changing manufacturing practices as related to materials and techniques for preservation maintenance and treatment	3.05	3.07	9.71

Table 5D. Individuals' Competency Gains and Applications – PAST Education Products - Masonry

Item		Mean Increase	Mean Application	Education Product
E. Pai	nt Skills	Grand mean = 9.62		
1)	Knowledge of the causes of and remedies for paint deterioration	3.15	3.34	10.75
2)	Ability to use appropriate historic and modern paint tools	2.96	3.14	9.51
3)	Ability to choose the appropriate historic or modern equipment to complete a paint repair or preservation treatment project	2.91	3.22	9.53
4)	Ability to properly identify historic paint and analyze paint application processes, techniques and materials	2.62	2.88	7.57
5)	Ability to undertake proper paint surface preparation	3.11	3.75	11.94
6)	Ability to understand purpose of a paint analysis and incorporate results into a proposed treatment, if necessary	2.89	2.68	7.75
7)	Ability to determine appropriate paint removal methods for a historic structure	3.32	3.17	10.75
8)	Ability to identify hazardous paint surfaces	3.19	3.25	10.58
9)	Ability to identify historic craft markings and use that knowledge to guide appropriate treatment decisions	2.85	3.07	9.23
10)	Ability to recognize when a paint skill is beyond my capability and I need to ask for skilled guidance	3.14	2.91	9.22
11)	Knowledge of historic and current paint trade materials, product lines and changing manufacturing practices as related to materials and techniques for preservation maintenance and treatment	2.80	3.09	8.94

Table 5E. Individuals' Competency Gains and Applications – PAST Education Products – Paint Skills

Item		Mean Increase	Mean Application	Education Product	
F. Pr	eservation Materials and Technology	Grand mean	Grand mean = 10.99		
1)	Ability to select appropriate materials for a preservation treatment project	3.47	3.53	12.36	
2)	Ability to read construction drawings, conservation reports, specifications, data from hazard surfaces, etc.	3.15	3.38	10.86	
3)	Knowledge of preservation resources (Preservation Briefs, Preservation Tech Notes, other preservation professionals, etc.)	3.63	3.08	11.49	
4)	Ability to perform Facility Management Software System (FMSS) building inspections and condition assessments	2.85	2.99	8.14	
6)	Knowledge of appropriate and inappropriate cleaning materials for historic masonry, metals, wood, painted surfaces	3.12	3.12	10.25	
7)	Knowledge of appropriate use of architectural replacement elements in a preservation treatment project	3.08	3.17	10.31	
8)	Ability to identify the root cause and analyze deterioration of historic structures	3.37	3.46	12.00	
9)	Ability to execute a preservation maintenance project	3.57	3.37	12.47	

Table 5F. Individuals' Competency Gains and Applications – PAST Education Products – Preservation Materials and Technology

Level-4 – Outcomes

Per the telephone interviews, PAST graduates reported working annually on 6.7 preservation maintenance projects that cost an average of \$73,663 (Table 6). The costs of projects ranged from a low of \$300 to a high of \$12 million. Further, respondents indicated they devoted slightly over 40 percent of their time to preservation maintenance projects each year.

All PAST respondents noted using the skills taught (carpentry, masonry, painting) during the PAST program while over 90 percent mentioned wood and masonry as the primary materials they worked with in their preservation projects. However, it should also be noted that 27 percent of the graduates reported working with metals and adobe, skills not addressed in the current PAST training curriculum. The range of materials used per project included logs, full dimension

timber, paint, masonry, lath, plaster, historic roofing, stone, cedar shakes, cypress shingles, rolled asphalt, metal siding, adobe, brick, lime putty, steel, coquina stone, lodgepole pine, stain, and sandstone.

A majority of graduates (77.2%) indicated that the historic structures in their parks were in better condition since their PAST training. Therefore, the impact of PAST on the historic resources of the NPS has been overwhelmingly positive. Less than five percent of the graduates perceived the resources entrusted to them were in worse condition.

The professional networks established since development of the PAST training program, and the mentorship aspects of the program, are other major outcomes of the program. As can be seen in Table 6, respondents noted that 13.6 percent of the preservation projects they worked on annually were in other parks. In addition, in this age of partnerships, 12.7 percent of the respondents noted their preservation project work occurred with partners, both internal and external to the NPS. Moreover, the majority of respondents (76.6%) noted that they have served as an instructor to others while on preservation projects work sites, with half stating they formally have served as workshop or training course instructors.

The outcomes of the PAST program have not only benefited the parks and the historic resources within them, but the program also has had a positive influence on the careers of the graduates. Over 75 percent of PAST graduates reported receiving promotions after PAST training, with 36.7 percent indicating they have entered the career fields of Exhibit Specialist or Facility Manager.

Table 6. PAST Program Outcomes

Average number of preservation maintenance projects undertaken <u>annually</u> by each PAST graduate:	6.7 projects (range 0-50 projects)
Average time allocated to preservation maintenance projects <u>annually</u> by each PAST graduate:	40.2% (range 0-100%)
Average cost of individual preservation maintenance projects worked on <u>annually:</u>	\$73,662.50 (range \$0-\$12M)
Average percentage of time PAST graduates work on preservation maintenance projects in other parks:	13.6% (range 0-100%)
Average percentage of time PAST graduates bring in people from other parks to work on preservation maintenance projects in their parks:	2.5% (range 0-40%)
Average percentage of all PAST projects that were partnership projects:	12.7% (range 0-100%)
Building materials used in typical preservation maintenance projects: Wood Masonry Paint Other (mostly metal, adobe)	93% 90% 35% ³ 27%
Range of materials used per project: logs, full dimension timber, paint, masc cedar shakes, cypress shingles, rolled asphalt, metal siding, adobe, brick, lin pine, stain, and sandstone.	onry, lath, plaster, historic roofing, stone, ne putty, steel, coquina stone, lodgepole
PAST graduates serving in an instructor role while working on typical preservation maintenance projects:	76.6%
PAST graduates serving in an instructor role in formal classroom setting:	50%
PAST graduates who have performed FMSS assessments:	52%
Perceptions of PAST graduates regarding the condition of historic structures in their parks since PAST training:	
Better	77.2%
Worse	4.5%
No Opinion	18.3%
Average percentage of preservation work done by PAST graduates <u>annually</u> by category:	
Preservation Project	43%
Rehabilitation Project	20%
Restoration Project	18%
Reconstruction Project	6%
No Answer	<u>13%</u>
	100%
Average percentage of PAST graduates who participated in additional	
preservation trades education since their PAST training experience:	73.3%

Continued.../

³ Although paint was not consistently mentioned as a material used in preservation projects, it should be noted that when asked what PAST skills are typically used during preservation projects painting was always mentioned.

Γ						
Average percentage of PAST graduates who participated in additional preservation trades education since their PAST training experience:	73.3%					
Range of preservation trades education courses taken: adobe repair, masonry training, diffusible wood preservatives wrought work/metals, worked with the NPS Bronze specialist (Dennis Montona), Dry Stone Conservancy courses, courses and/or conferences offered by a variety of organizations including International Preservation Trades Workshops, Preservation Trades Network, National Trust for Historic Preservation, the Campbell Center, NPS Historic Preservation Training Center, Virginia Limeworks, other NPS courses.						
Average number of parks graduates assigned to since PAST training:						
No change	10%					
1 park	76.6%					
2 parks	13.3%					
Average percentage of PAST graduates who have a Career Field title of Exhibit Specialist or Facility Manager	36.7%					
Average percentage of graduates who were promoted following PAST						
training:						
0 promotions	23.3%					
1 promotion	36.6%					
2 promotions	20%					
3 promotions	13.3%					
4 promotions	3%					
5 promotions	3%					

Dissemination of PAST Knowledge, Skills and Abilities

To broadly understand the impact that the PAST program has had educating and placing graduates in parks and offices across the national park system, the geographic distribution of mentors and students was mapped. Based on the 2005 mail survey addresses, mentors and students were mapped by class, as well as collectively. Figure 1 is a distribution of all mentors and students by class throughout the 14-year existence of the PAST program.

In 1993, the PAST program was initiated with 30 people representing 29 parks and regional offices. By combining geographic locations of mentors and students, each class has had from 11-23 parks represented with only the first two classes having regional office representation. By 2005, the program had certified and/or directly influenced 140 people representing 99 parks and regional offices. Although undocumented, the number of people the PAST program has *indirectly* influenced is potentially much greater considering 76.6% of graduates have served as instructors on preservation projects, 50% have served as instructors in a formal classroom setting, 36.7% have career field titles that indicate a supervisory role, 89.9% have changed parks and nearly 70% have been promoted since their PAST training. These statistics and maps support

that the PAST program has indeed begun to achieve its initial program objectives. Appendix F contains six individual class maps, as well as a geographic distribution map of mentors, and a geographic distribution map of students.



Conclusions

The importance of establishing and sustaining a program to train and educate a workforce of preservation maintenance specialists is well documented. Whether in the United States, United Kingdom, or in other countries around the globe, it has long been recognized that the costs of maintaining these priceless heritage resources is increasing, while the number of skilled, trained employees to sustain them is diminishing. The National Park Service's Preservation and Skills Training Program (PAST) was at the forefront of the global movement to develop such an educational endeavor nearly 15 years ago with the following purpose and objectives which it has substantially achieved:

- *Purpose*: To develop a cadre of trained non-supervisory maintenance employees capable of preservation maintenance of the historic structures within the National Park System.
- *Objectives*: To train maintenance employees to preserve and maintain NPS historic structures; to create a certification program in the preservation maintenance of historic structures; and, to ensure that at least one employee from each unit of the NPS has been trained to preserve and maintain historic structures.

This study was initiated to evaluate the PAST program's effectiveness and efficiency, and establish a higher order evaluation framework, in an effort to refine and continually improves its outcomes. From the results of this effort, several conclusions may be drawn:

- The PAST Program is conducive to evaluation at Kirkpatrick's Level-4 order of evaluation. As was shown in this document, outcomes of the program can, and should, be systematically reviewed.
- Documentation of *Reaction* data (Level-1) should be collected and archived so that formative and summative changes to the program can be analyzed. We believe that information pertaining to students' reaction to each class was collected, but no archival record of that information was maintained in a manner that could be used in this study.
- Efforts to isolate the pre-training effects from past experience or on-the-job training were successful in the pre-test/post-test exam portion of this study. We documented a 46 percent increase in knowledge between the pre-test and post-test for Class 6 (2005-2007). The area of Preservation Philosophy revealed a 95 percent increase. However, this strategy should be systematized and more thought put into establishing an on-going examination where the validity and reliability of the exam can be established and documented for each class, and analyzed across classes over time.

- The development of a comprehensive list of PAST competencies was a valuable exercise and served as the foundation for all subsequent evaluation data collections. This list should be refined and revised over time, and used as the benchmarks from which future evaluations are conducted. Care should be taken, however, to avoid the temptation for a complete "re-invention of the evaluation wheel" by establishing other measures in future evaluation studies. Doing so will leave training managers with a patchwork of evaluation tools and little long-term continuity of effort.
- The PAST program participants, as a group, were highly diverse in terms of ethnicity. Significant numbers of employees from under-represented ethnic groups were present in the population of PAST employees.
- PAST graduates are a 'graying' population. They were over 50 years old and had accumulated over 18 years of federal service. Workforce succession plans should be developed as part of future recruitment of PAST training classes.
- The PAST program was an avenue from which graduates could move upwards in the organization through promotions. Over 75 percent of the graduates had been promoted since graduating from PAST and almost 4 in 10 had been re-classified into a career field such as Exhibit Specialist or Facility Manager. It appears that PAST is an excellent vehicle for providing career advancement opportunities for an ethnically-diverse workforce.
- The mail survey instrument successfully generated data from which to evaluate competencies gained and applied as a result of PAST participation. Further, it offered a strategy to assess the impacts of the full PAST program, as opposed to assessment by class, and should be undertaken on a systematic, periodic basis.
- Educational content in the area of Preservation Philosophy and Preservation Materials and Technology appeared to be extremely potent topical areas; significant increases were observed in each.
- Preservation skills in the areas of Carpentry, Masonry, and Painting also exhibited increases in competency attributable to PAST training; however, the significance of these increases may have been tempered by the level of skills brought into the program by participants based on their previous experience. By combining the mail survey methodology with pre-/post-test examinations, a clearer picture of the actual competency gained can be attained.
- Frequency of application data were collected and analyzed. However, more exploration into what is limiting employees from applying these skills needs to be conducted. Insight from telephone interviews indicate that some of the reasons that PAST graduates may not be utilizing their skills more fully include inadequate agency and park budgets, supervisor perception of more pressing responsibilities, discordant park, supervisor and staff job goals, individual's assignment, and promotion out of

preservation-oriented positions. Empirical assessment of these limitations was beyond the scope of this study, but should be undertaken to assure the on-the-ground effectiveness of the PAST program training efforts.

- The combination of learning and behavior data into "education products," as a way to compare different aspects of the program, appeared to provide a diagnostic for training managers in assessing the impact of the program more fully. For example, the low response rate on the "ability to perform FMSS assessments" may be seen as a red flag warning to facility managers that historic resources may not be fully considered in the FMSS process at the park level.
- PAST graduates were engaged in significant numbers of preservation maintenance projects each year, although less than half their time (average 40.2%) was allocated to such projects. These projects ranged from small projects of insignificant costs to multi-million dollar projects.
- In working on preservation maintenance projects, PAST graduates not only regularly assist other parks with their preservation projects, but also regularly collaborate with partners, either other parks or external organizations such as friends groups or more formal non-profit preservation organizations. Hence, the network of trained professionals the PAST program creates and supports is being engaged for both National Park system and advocacy group preservation projects.
- The distribution of PAST graduates throughout the National Park System was mapped, based on the known location of study participants. Although 140 people have gone through the PAST program, over 25 percent of the program's participants could not be located. Undoubtedly, some had retired, and others had left the Service. Given the relatively small size of this population, more effort should be made to track participants and a better understanding of the "training loss" gained.
- The value of the mentorship portion of the program is significant and obviously aided in the effectiveness and distribution of PAST impacts. Although the documented number of people directly influenced by the PAST program is 140, indirectly the number of people the PAST program has influenced is potentially much greater considering 76.6% of graduates have served as instructors on preservation projects, 50% have served as instructors in a formal classroom setting, 36.7% have career field titles that indicate a supervisory role, 89.9% have changed parks and nearly 70% have been promoted since their PAST training. The diffusion of PAST skills was greatly increased through these types of mentor relationships.
- Although mentorship is critical to the success of the PAST program, only three regions (PWR, IMR, SER) have consistently supported the program by providing mentors. Further, mentor retention from class to class is weak. Increased efforts to recruit mentors from graduating PAST program participants, as well as working with parks to identify any issues and increase a "win/win" situation is needed to maintain the stability of the mentor portion of the PAST training program.

- In 1993, the PAST program was initiated with 30 people representing 29 parks and regional offices. Combining geographic locations of mentors and students, each class has had from 11-23 parks represented with only the first two classes having regional office representation. By 2005, the program had certified and/or directly influenced 140 people representing 99 parks and regional offices. The PWR, SER, and IMR have consistently sent students for training every class since its inception; the MWR and AKR have sent students half the time.
- While efforts to establish ROI statistics as part of this evaluation were not successful, one value that became apparent as we explored this level of evaluation was the value of having trained eyes on the ground looking at historic structures daily. The value of assessing and preventing additional deterioration of historic resources by trained personnel in close proximity, as opposed to hiring outside personnel when deterioration becomes more obvious, cannot be overstated.

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