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Working for the environment: Pathways to environmental careers

Carol Aline DeVault

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WORKING FOR THE ENVIRONMENT: PATHWAYS TO ENVIRONMENTAL CAREERS

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment of the Requirements for the Degree
Master of Arts in
Education:
Environmental Education

by
Carol Aline DeVault
June 2001
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ABSTRACT

Fifteen professionals in a variety of environmental occupations in the United States were interviewed in a structured, open-ended format. Job profiles were developed from the interviews. The philosophy of these environmental professionals is expressed in their own words and offers insights into influences upon career choice, professional training and personal fulfillment. In addition, environmental related career activity guides were developed to help students and their parents and teachers gain an awareness of the occupations available in this field.
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>iv</td>
</tr>
<tr>
<td>CHAPTER ONE: INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Significance of the Project</td>
<td>3</td>
</tr>
<tr>
<td>Statement of Need</td>
<td>5</td>
</tr>
<tr>
<td>CHAPTER TWO: REVIEW OF THE LITERATURE</td>
<td></td>
</tr>
<tr>
<td>The Need for Career Education in the Environmental Education Curriculum</td>
<td>8</td>
</tr>
<tr>
<td>The Effect of School Reform on Career Development Programs</td>
<td>11</td>
</tr>
<tr>
<td>Influences on Environmentally Responsible Behaviors</td>
<td>13</td>
</tr>
<tr>
<td>Defining Career and Environmental Careers</td>
<td>17</td>
</tr>
<tr>
<td>CHAPTER THREE: DESIGN OF THE PROJECT</td>
<td></td>
</tr>
<tr>
<td>Methodology</td>
<td>21</td>
</tr>
<tr>
<td>Results</td>
<td>23</td>
</tr>
<tr>
<td>CHAPTER FOUR: IMPLICATIONS FOR EDUCATORS</td>
<td></td>
</tr>
<tr>
<td>The Role of Environmental Education - A Rationale for Educators</td>
<td>26</td>
</tr>
<tr>
<td>APPENDIX A: ENVIRONMENTAL CAREER PROFILE INTERVIEWS</td>
<td>31</td>
</tr>
<tr>
<td>APPENDIX B: GUIDE TO ENVIRONMENTAL CAREER EXPLORATION AND PLANNING ACTIVITIES FOR HIGH SCHOOL STUDENTS</td>
<td>65</td>
</tr>
<tr>
<td>APPENDIX C: GUIDE FOR TEACHERS TO FACILITATE EXPLORATION OF ENVIRONMENTAL CAREERS BY STUDENTS</td>
<td>69</td>
</tr>
</tbody>
</table>
APPENDIX D: GUIDE FOR PARENTS TO FACILITATE EXPLORATION OF ENVIRONMENTAL CAREERS BY CHILDREN ............................................. 73

APPENDIX E: RESOURCES FOR CAREER DEVELOPMENT ............... 76

APPENDIX F: WARNER'S CLASSIFICATION OF ENVIRONMENTAL CAREERS ............................................. 81

APPENDIX G: SUMMARY OF RESPONSES BY ENVIRONMENTAL .... 83

APPENDIX H: SUMMARY OF RESPONDENT'S RECOMMENDATIONS TO STUDENTS SEEKING A CAREER IN AN ENVIRONMENTAL FIELD ............................... 85

REFERENCES ............................................................... 87
CHAPTER ONE
INTRODUCTION

This research project explores the wide variety of career options available in the environmental field. It provides information about the usefulness of career planning and practical methods of career preparation that demonstrate the effectiveness of environmental related educational training, career exploration projects, service-learning, field study, internships, the value of having mentors, and volunteer work that may increase career opportunities for students. It also provides information to students and educators about the important role environmental professionals serve in society and how their work contributes to the sustainability of the natural environment. It includes a discussion about the importance of environmental literacy and the influence of salient early environmental experiences as being possible factors for people choosing environmental careers. The need for the inclusion of a career guidance component within environmental education curriculum is also presented.

Fifteen interviews were conducted with environmental professionals working in a variety of careers. The
detailed career profiles developed from these interviews are supplemented with discussions and important points from the literature that are relevant to understanding various job categories, job descriptions, and the necessary education, training and experience required to obtain different environmental career positions.

The data collected in the interviews covers the following topics: job title, specific job descriptions, educational background and qualifications, personal characteristics needed, how the worker obtained his or her job, and the tasks that are performed in their jobs. Respondents also answered these questions: What early experiences or interests influenced you to choose this career? What advice would you offer students who seek a career in your field? What are the current and future prospects in your field? And lastly, What are some of the most rewarding aspects of your job? Complete job profiles developed from this data appear in Appendix A.

The project includes a guide to career-planning resource books and periodicals. Practical guides are presented for students, parents, and teachers. These guides feature recommendations for learning more about environmental careers together with activities that may provide assistance to students and educators for career
planning. These guides foster career exploration, nurture an interest in pursuing an environmental career, and provide specific strategies that may assist students to obtain an environmental career position in the future. These guides appear as Appendixes B, C, D, and E.

Significance of the Project

Collectively, environmental professionals bring a level of specialized knowledge and training together that can help to prevent and solve environmental problems (Basta, 1991). People throughout the world are working simultaneously to restore damaged ecosystems, trying to reduce harmful environmental impacts of people's actions, and to build a sustainable way of life for the future. Environmental professionals are at the forefront of these efforts (The Environmental Careers Organization, 1999).

Today there is a great need for highly qualified professionals working in many capacities for the environment (Kinney & Fasulo, 1993). A surge in natural resource and environmental jobs occurred during the 1990s because of the implementation of many environmental protection laws (The Student Conservation Association, 1994). In addition, many environmental jobs in the 1990s were driven by the environmental values of environmental
and conservation organizations such as The Nature Conservancy and the National Wildlife Federation. Furthermore, advances in technology created many new jobs in this field (The Environmental Careers Organization, 1999). It was estimated that "by the year 2000 the United States will need between 450,000 and 750,000 more chemists, physicists, engineers, and other scientists than it is expected to produce, and many of these job openings will be in the environmental sciences" (Fasula & Walker, 1995, p. 23).

The goal of this project is to show that the need exists for the mission of environmental education to include strengthening the emphasis of career development within the field. This may provide a pathway for students to gain knowledge of the vital role that environmental professionals play in the world. It can also facilitate the development of responsible environmental behavior and action. The implementation of these programs can give valuable information and guidance to students, thereby assisting them in the selection of a career. The findings of this project provide evidence that shows that direct, hands-on experience is one of the most important ways to learn about a job, and gain valuable knowledge and skills.
to acquire a career position in an environmental profession.

Statement of Need

Over the past 30 years there has been an increasing level of awareness and concern about the environment. "As the concern has increased, opportunities in the environmental job market have also increased" (Heimlich, 1993, p. 1). Despite the fact that jobs in environmental fields have increased, many students are lacking the proper career education, applicable experience, knowledge and job search skills to obtain these jobs.

A study, entitled Environmental Studies: 2000 - An Overview of Undergraduate, Interdisciplinary Environmental Programs and the Careers of their Graduates, reported that many alumni of various university level environmental studies programs did not have adequate information about environmental careers. They also did not know how to apply their degree to a job search. "Much of this can be attributed to a paucity of career knowledge and advice from career services and academic advisors" (The Environmental Careers Organization, 1999, p. 1).

N. J. Smith-Sebasto, a career counselor at the Ohio State University School of Natural Resources, was
concerned about how few of his students were aware of the need for career guidance and preparation beyond the basic academic requirements for graduation. He also wondered why more students at the university were not considering careers in environmental related fields, even though this field is growing and has a large number of career opportunities (1993).

Smith-Sebasto also noted a research study reported in The Chronicle of Higher Education conducted by Astin in 1991 that found that 87.9% of first year college students believed that the government was not doing enough to control pollution. More surprising to him was that the same survey showed that a mere 0.6% of these students planned to become a conservationist or forester (1993).

In light of this information, Smith-Sebasto was also surprised that many of his own students were not adequately preparing ahead for life beyond college. They seemed to have little knowledge about possible career directions. They also were uninformed about what career resources were available and did not know where to find them. To illustrate his point about the seeming lack of knowledge of the importance of career planning, and the need for students to gain relevant job related experience
beyond school, he related the story of a student who came to his office for career advisement.

He was a senior natural resources major who wanted to be a park ranger. I asked to see his resume, expecting to find at least three summer positions with the National Park Service. Instead I found three summers of slinging burgers and painting houses. This bright young man's rationalization was that he did not know how to find seasonal positions. (Smith-Sebasto, 1993, p. 36)

A need exists for more educational avenues that facilitate solid community connections that are relevant to students in their career planning. Many students do not clearly see a link between traditional lessons or courses they complete in school and real life experiences. One road that has the potential to form a relevant path from school to work is environmental education and its emphasis on interdisciplinary, experience-based learning activities.
CHAPTER TWO

REVIEW OF THE LITERATURE

Becoming an environmentally literate citizen is valuable and, ideally, is an essential background for those who choose to become environmental professionals. The Environmental Literacy Assessment Consortium described that environmental literacy has cognitive dimensions; affective dimensions; additional determinants of environmentally responsible behavior, and person and/or group involvement in these behaviors (Hoody, 1997). Environmental literacy is defined as "essentially the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems" (Hoody, 1997, p. 4). These desired outcomes are certainly relevant rationale for the inclusion of a career development component within existing environmental education programs and the creation or expansion of new ones in the future.

The Need for Career Education in the Environmental Education Curriculum

An important, but often under-emphasized, aim of environmental education is to encourage students to see
the potential opportunities that can exist within environmental related careers. These jobs offer a wide variety of options where people can find meaningful, satisfying, and productive life work (Fanning, 1996; Fasula & Walker, 1995; Stienstra & Schlueeter, 1997; The Environmental Careers Organization, 1999).

Dr. Frederick J. Deneke, an environmental professional who served as assistant director of the USDA Forest Service commented:

People who live in healthy ecosystems are healthier. People who view themselves as a part of that ecosystem, and are actively involved in its protection, care and restoration, develop a sense of empowerment and ownership over their lives. This translates into socially, culturally, and economically stronger communities, neighborhoods, cities, and society as a whole. (in Adams, Brickell, Clark, et al., 1995, p. III)

It is prudent to educate students to see the benefits and possible personal rewards from the selection of these environmental career paths. Howard Figler, director of Counseling and Placement at Dickinson University, noted that careers related to the environment have great personal reward, intrinsic meaning, and community importance. Many environmental professionals also believe that they are making a positive contribution to society (Thomas, 1981). "Whatever the career choice, environmental
work demands a conviction and dedication that can’t be measured strictly in dollars or work hours. The reward is making the world a better place” (Quintana, 1996, p. 10).

Educating students to understand the vital role that environmental related careers provide for society is discussed in general terms in the Declaration of the Tbilisi Conference document, a landmark in environmental education related literature. Among many other objectives, this document said that environmental education provides a mechanism for the renovation of the educational process. It encouraged a greater understanding of the connections between socioeconomic development and improving the environment, and using environmental education as a link between educational processes and real life. It also advocated that environmental education should provide guidance to specialized professional groups such as those associated with environmental careers. Specifically it said that environmental education should cater to “social groups whose professional activities affect the quality of the environment and to scientists and technicians whose specialized research and work will lay the foundations of knowledge on which education, training and efficient management of the environment should be based” (UNESCO, 1978, p. 25).
A quality environmental education program can affect the types of careers young people pursue. It can be effective in paving the way to provide technical training that will improve the quality of workers who enter environmental fields. Additionally, career opportunities associated with the environment can assist low socioeconomic individuals to gain access to well-paying, skilled jobs (Disinger & Monroe, 1994).

The Effect of School Reform on Career Development Programs

Developing more extensive career education programs that have relevance to students’ lives beyond school is one of the goals advocated by recent school reform movements. In his book, A Time to Learn, Dr. George H. Wood, suggested that the goals of high schools work best when they are constructed around these themes: The development of active citizens, lifelong learners, and enabling students to have flexibility in their occupational choices (1998).

The Report of the California High School Task Force document, Second To None, recommended that program majors should involve field experiences that are organized around a special focus and career fields, including providing students with practical and technical career-related
skills. This book also encouraged outcome based curriculum standards and student assessment on performance standards so that instruction can produce concrete results. When students understand that quality work requires them to organize, explain, analyze, and evaluate important experiences, then they may more clearly see a relationship between what they do in school and future educational or career goals (California Department of Education, 1992).

A federal effort to improve the connection between what students do in schools and the work environment was the passage of the School-to-Work Opportunities Act of 1994. It was developed through the collaboration of education, business, labor, and community-based organizations that have a stake in how well American students are prepared for a changing work world. It incorporates three elements: work-based learning, school-based learning, and connecting programs and activities (California Department of Education, 1998).

The California School-to-Career Plan of 1995 is a dovetailing reform effort to implement the national plan. It calls for improving the efficiency and effectiveness of using state resources to “better prepare students for an economy which demands that workers have strong academic and career knowledge and skills, are adaptable to change,
and are prepared for lifelong learning” (California Department of Education, 1998, p. 4).

One of the most significant results of these acts is the increased positive youth development through service-learning programs (The National School-To-Work Learning and Information Center, 1996). Service-learning pedagogues are now increasingly used by teachers and schools at all levels to enhance traditional modes of learning and instruction.

Community service is an opportunity for students to enrich and apply classroom knowledge; explore careers or majors; develop civic and cultural literacy; improve citizenship; develop occupational skills; enhance personal growth and self-image; establish job links; and foster concern for social problems which leads to a sense of social responsibility and commitment to public/human service. (The University of Colorado, Boulder, 1995, p. 1)

Service activities engage the student, “through experiential learning in course-relevant contexts, and foster lifelong connections between students, their communities, and the world outside the classroom” (The University of Colorado at Boulder, 1995, p. 1).

Influences on Environmentally Responsible Behaviors

Recommendations made by environmental education researchers point to the need for understanding the
influences that affect responsible environmental behaviors and action (Chawla, 1998). Tanner (1980) studied the formative motivational factors and significant life experiences of people who had chosen environmental related careers or showed support for environmental action through various environmental organizations. His work attempted to identify how these early influences on people may effectively have led to a deep level of environmental concern, commitment, and community action by these individuals (Chawla, 1998).

It should be noted that neither of these studies included a comparison group to distinguish whether any difference is seen between environmentally committed people and the general public. However, the application of an environmental sensitivity scale developed by Sia (1984) does seem to suggest that the measure of degree that people demonstrate environmental action is higher when they have had these notable experiences (Chawla, 1998).

Research has shown that people who are most likely to become actively involved in environmental protection and problem solving activities often had similar experiences in childhood where they had spent extended periods of time in natural areas outdoors. Another influence on them was that of parents or other family members who led them to an
appreciation of the out-of-doors. Other reasons identified in the research were that these individuals had teachers or classes that sparked an interest in the environment. Additionally, they were involved in environmental organizations, read books with an environmental topic or message, and had experienced the degradation or loss of a natural area they had known in childhood (Chawla, 1998; Tanner, 1980). Others generally support these findings (James, 1993; Palmer & Suggate, 1998).

Chawla’s study supports the idea for inclusion of environmental education in career education. She concluded that environmental educators need to: 1) better understand how to prepare people for a general level of environmental citizenship, 2) learn to produce leaders who can effectively mobilize others into taking action, 3) promote quality out-of-school experiences that are so salient in creating lasting memories that form a foundation for environmental commitment, 4) increase opportunities and the chance that lives will take an environmentally responsible form by including more informal learning out-of-doors and non-formal learning in environmental organizations, and 5) continue providing formal learning in the field and traditional environmental education topics in the classroom (1999).
David Orr, chair of the environmental studies program at Oberlin College, has also written extensively about the premise that spending time outdoors at an early age is a primary influence on whether people will develop a strong environmental ethic. He believes that having meaningful experiences in the natural world at a young age contributes to a positive environmental consciousness (1994). Author David J. Warner also supported this view. He concluded that a large number of people who work in the environmental field were first attracted to this type of work because of some positive, memorable experiences from their childhood's that contributed to an interest in and deep respect for the natural world (1992).

Another important factor in whether a person may be more inclined to demonstrate environmentally responsible behavior is a person's "locus of control." This is described as having a perceived feeling of effectiveness in one's actions. Furthermore, it is believed that, "Locus of control may be influenced when a student learns and applies citizenship action skills. More specifically, locus of control may become more internal when students have had an opportunity to apply these skills successfully in the community" (Volk, 1993, p. 51).
Defining Career and Environmental Careers

The Webster’s New International Dictionary defined the term career as, “a profession for which one undergoes special training and which is undertaken as a permanent calling.” Also it is described as “an occupation or profession engaged in as a lifework” (1993, p. 338). Interestingly, career also has the following meanings, “a course of continued progress (as in the life of a person or nation),” and “consecutive progressive achievement” of an individual (p. 338).

The choice of a career is a significant life decision. A career requires a genuine commitment of energy and effort, as well as considerable time and resources (Thomas, 1981). Environmental careers in a broad sense, are defined as those jobs, “involved with the protection and conservation of nature, natural resources and inhabitants of our land” (Hendrix & Cegiel, in Heimlich, 1993, p. 1). Within this broad category of environmental careers, a distinction is usually made between environmental experts, such as scientists or engineers, and environmentalists whose work tends to involve a moral position (Heimlich, 1993). Environmental professionals have mastered a particular body of knowledge in their work
(Dalaney, Erhardt & Gaylord, in Heimlich 1993). Sometimes environmental work is described by content issues such as land use, water quality, waste management, wildlife management or environmental education, to name a few. Another approach that is used to identify these careers is by means of various positions such as environmental science, policy, information or related professions (Heimlich, 1993).

David J. Warner describes environmental careers by using the following categories: environmental protection, environmental health and safety, environmental education, allied environmental professions, natural resource management, and non-degree technical environmental careers (Warner, 1992). He included a further breakdown of some of the specific jobs within each of these major categories. (See Appendix F).

Career counselors and authors of career guidance material have pointed out that many, if not most, of those who are planning a career are looking for work that has meaning and relevance (Bingham & Stryker, 1990; Bolles, 2000; Farr, 1990). In addition to matching their interests and skills, and having a source of income, many job seekers look for work that is worth doing (The Environmental Careers Organization, 1999; Thomas, 1981).
"As we enter the twenty-first century, it is important to show young people that the environmental field is very dynamic and offers many different career opportunities they may wish to pursue" (United States Environmental Protection Agency Region 9, 2000, p. 1). The motivation that this type of work has inherent value has a very important purpose and it becomes a guiding force for choosing an environmental career (Thomas, 1981). Another factor involved in environmental minded pursuits is a concern for social justice (James, 1993).

Unfortunately, students and college graduates who are considering a particular career field, or even mid-career professionals contemplating a career change, tend to spend very little time at all thinking reflectively about their goals. Quite often they do not assess their own interests, skills, values, personality type, and then skillfully match these with a career (Bolles, 2000; The Job Search People, 1990; Tieger & Barron-Tieger, 1995).

For 40 years Richard Nelson Bolles, author of the acclaimed career manual for job hunters, *What Color is Your Parachute?*, has been advising job seekers. He noted that when someone chooses a career they must first truly know what it is that they want to do otherwise, "somewhere along the line you can do irreparable damage to your self-
esteem, your sense of worth, and your stewardship of the
talents that God gave you" (2000, p. 61).

An essay by Jon Kabat-Zinn phrased it this way:
"Rarely do we question and then contemplate with
determination what our hearts are calling us to do and to
be. I like to frame such efforts in question form. 'What
is my job on the planet with a capital J?' " (Kabat-Zinn,
1994, p. 207). On this same subject Buckminster Fuller
once posed this question, "What is it on this planet that
needs doing that I know something about, that probably
won't happen unless I take responsibility for it?"
(Fuller, in Kabat-Zinn, 1994, p. 207).
CHAPTER THREE
DESIGN OF THE PROJECT

The design of this project was to compile descriptions of environmental jobs and useful information about career education relevant to environmental related careers. The information in this project is intended for use by students and educators at the secondary and college level, and by parents of children of all ages for the purpose of enhancing career planning in environmental related fields.

Methodology

A thorough review of available literature relevant to career planning, environmental-related careers, and environmental education was completed for this project. In addition to this review, career related interviews were conducted with 15 people who currently hold professional environmental positions. Ten of the interview respondents were men and five were women. Nine of these subjects work and reside in California. Three live in Colorado, one in Alaska, one in Missouri, and one in Washington state. Each voluntarily participated in the project.

A data collection instrument of open-ended questions was created to facilitate the interviews in a standardized
format and method to ensure that thorough, targeted responses would be acquired that would provide detailed and useful information. Various environmental related agencies were identified and potential participants were then contacted by telephone and asked if they were interested in providing interviews for the project. Interviews were then arranged.

A total of 15 interviews were conducted between December 1999 and April 2000. Twelve of the interviews were conducted in person using written notes and an audio cassette tape recorder. These interviews typically averaged 30 to 40 minutes in length. Three of the interviews were obtained by using a combination of phone calls and electronic mail correspondences. Professional job profiles were then developed from the tape transcriptions, notes and email responses for each interview subject.

Information obtained from each respondent included job title, job description, education and qualifications, and personal characteristics needed for the job. They also answered the following questions: How did you get your job? What tasks do you perform? What early experiences or interests influenced you to choose this career? What advice would you offer students who seek a career in your
field? What are the current and future prospects in your field? What is the most rewarding aspect of your job?

Results

The analysis of the data collected from the interviews showed that environmental professionals have very broad job descriptions and duties that require them to be knowledgeable in a variety of areas, especially in the sciences, and competent with many practical work skills. These professionals are often responsible for the collection of information, doing research, and completing hands-on work such as planning programs, creating exhibits, or writing reports, and general correspondence. Those in management level positions are typically involved in training and supervising others, overseeing facilities, general operations, and planning and managing budgets. Many of the respondents have dual job descriptions or a combination of duties such as Public Affairs Specialist/Archeologist, Director of Animal Husbandry and Facilities, Natural Area Superintendent/Nature Center Director, Graphic Designer/Botanical Illustrator, Science Learning Center Director/Senior Technician/Machinist. The ability to work cooperatively, and communicating well with
others was also cited by many of the respondents as being important in their jobs.

An analysis of the educational levels of the respondents showed that 13 of the 15 have at least a bachelor’s degree (twelve bachelor of science degrees and one bachelor of arts degree). Two had a high school diploma and had completed some community college coursework. The areas of concentration of the BS degrees included biology (6), and one each in botany, zoology, forestry and wildlife management, archeology, geology, and education. One respondent had a BA degree in recreation and park administration. One-third of all interview subjects had obtained a master’s degree and one had completed a doctorate.

When asked specifically about how each respondent got their present job, the findings are particularly interesting because they support the importance of gaining relevant, hands-on job related experience, networking with others, and doing volunteer work. Because of the significance of this data, it is useful to summarize and present each person’s response to the question, “How did you get your job?” This information is depicted in Appendix G.
Two-thirds of the respondents specifically recommended that students seeking environmental careers should do some type of volunteer work, service project or internship to gain work experience. Science education, community involvement and joining organizations were also cited as ways for students to prepare for jobs in the environmental field. See Appendix H for a summary of these recommendations.
CHAPTER FOUR
IMPLICATIONS FOR EDUCATORS

Educators who present exciting and relevant opportunities for students to learn about environmental careers may produce environmentally literate and responsible citizens, including some who dedicate their life's work to the worthy pursuit of environmental stewardship. Educational programs with a strong career guidance component can provide students with a compass to seek direction for their personal and professional lives, and a barometer to help them weather storms of indecision in choosing a career. Students offered the knowledge and proper tools for school-to-work planning can develop effective mapping strategies to guide their own travel along a chosen path of opportunity, meaning, and satisfaction.

The Role of Environmental Education - A Rationale for Educators

"Since Thomas Jefferson first proposed free public education, the primary goal has been to engender in citizens the habits of heart and mind that make democracy possible" (Wood, 1998, p.102). But education is also instrumental in shaping the behavior of individual
citizens, thus enabling them to develop basic literacy skills such as reading, writing, critical thinking, and problem solving abilities. Education also helps to foster important universally held values such as responsible citizenship, productive employment, and successful consumerism (Hungerford & Volk, 1990).

In many ways the pedagogic model of environmental education grew from the teachings of Aristotle. It was his belief "that the role of the teacher was to aid students in developing into human beings with moral and mental excellence by integrating the curriculum with real observations and sensory experiences" (Sterling, 1999, p. 23). Aristotle said profoundly, "For the things we have to learn before we can do them, we learn by doing them" (in Blau, 1995, p. 2).

In her monumental work The Teaching of Nature Study, Anna Botsford Comstock, the first woman professor to teach at Cornell University, wrote compelling words that addressed the underlying essence of what many believe are important core values of environmental education. Comstock is considered by many, including the National Wildlife Federation, to be the founder of nature study, an important precursor to the study of ecology and environmental studies that we know today. To Comstock, the
study of nature was an aesthetic experience, not just an academic discipline. The 1939 publisher’s forward of her book makes this important acknowledgement: "nature study is a science, and it is more than a science; it is not merely a study of life, but an experience of life. One realizes...that with Mrs. Comstock it even contributed to a philosophy of life" (Comstock, 1986, p. 1).

Though written almost a century ago, her words still provide important vision and guidance for educators today. Her words and philosophy offer relevant rationale for the inclusion of quality environmental study as part of environmental education programs in schools and non-formal settings.

Comstock inspired teachers to instill a love of nature in students, to actively observe the world around them. In a broader sense, she believed that teachers can facilitate students’ discovery of life paths of their own. She shared the following ideas in 1911.

Let us not inflict permanent injury on the child by turning him away from nature instead of toward it. However, if the love of nature is in the teacher’s heart, there is no danger; such a teacher, no matter by what method, takes the child gently by the hand and walks with him in paths that lead to the seeing and comprehending of what he may find beneath his feet or above his head. And these paths, whether they lead among the lowliest plants, or whether to the stars, finally converge and bring the wanderer
to the serene peace and hopeful faith that is the sure inheritance of all those who realize fully that they are working units of this wonderful world. (Comstock, 1986, p. 2)

Comstock believed nature offers an ideal setting where students can study, learn, and grow. She viewed the natural world reverently, as a beautiful place. Moreover, she believed it provided an important place where students and teachers might find a healing antidote for the pressures and problems that plague the busy world.

Environmental education, with its emphasis on hands-on outdoor lessons using a problem solving approach, can help students learn solutions and a balanced approach to effective environmental management. Environmental education is a key for educating students that may work one day as environmental professionals. The Environmental Careers Organization believed that progress is being made in cleaning up the environment through more efficiency, alternative energy, recycling, and better environmental planning. But new challenges need to be faced.

The task at hand today is not only to control pollution, but to prevent it: to not only slow the rate of habitat and soil loss, but to reverse it; to not only regulate unsustainable activity, but to create a sustainable way of life on a crowded planet. (The Environmental Careers Organization, 1999, p. 3)
Ideally, effective environmental education assists students in meaningful career choices. It can lead the individual student to make confident choices in determining a life path. The responses of environmental professionals compiled for this project offer insights for educators, who may apply the findings to their teaching methods and techniques. Especially important is engaging students in meaningful experiences in the out-of-doors at an early age while assisting them to gain interactive learning and hands-on experiences.

Engaging students in service-learning activities is also very beneficial to both their academic learning and personal growth. It is critically important to encourage students to see the relevance of engaging in career-related volunteer, or part-time work and interaction with professionals in their chosen field. These can be invaluable experiences to their future career endeavors. The working environmental professionals interviewed for this project speak clearly to the importance of these influences in their own personal and professional lives.
Job Profile: Biologist/Botanist
Arcadia, California

Name: Jim Bauml, PhD

Job Title: Senior Biologist for the County of Los Angeles at the LA County Arboretum in Arcadia, California.

Job Description: The job description for biologist and senior biologist is fairly broad because they encompass a lot of specialized positions. At the arboretum the position is primarily working as a botanist and plant taxonomist. Mostly that involves keeping track of what we have in our plant collection.

I also oversee the education or research division that includes the librarian, two plant information officers, and a biologist whose primary function is doing research here. Also I supervise many volunteers.

Education and qualifications: I received a Bachelor's Degree in Science at Texas A&M University with a major in botany. I received a Master's Degree from Cornell University in botany studying at the Bailey Hortorium. Also I completed a doctorate in botany with a specialty in ethnobotany from the Claremont Graduate University. Before I came to work here I worked as the botanist at the Huntington Botanic Gardens in Pasadena for three and a half years.

Personal Characteristics: A lot of botanical garden work doesn't pay that well so I think that a strong motivating factor is just having a passionate interest in plants. I suppose that being a little obsessive-compulsive doesn't hurt. (laughter) In this field, you have to deal with a lot of very picky little rules that govern the selection and application of plant names and it all revolves around providing a structure – as natural a structure as possible – over the entire living world, or at least that part of it in which you're especially interested. So, in plant taxonomy we're interested in proving names and establishing biological connections, relationships, and histories for all the plants we find alive today.

How did you get your job? When I got my first job at the Huntington Library, I saw the job advertised in the American Association of Botanic Gardens and Arboretum (AABGA) newsletter. It is still one of the main places to start if you're looking for jobs in the field. Regarding how I got my job here, I heard about it through networking and decided it would be an advantageous career move for me, so I applied for the position. Just as an aside, for students who might be interested in careers in botanical garden work of any sort, there's now quite an array of botanical gardens that offer summer internships to students in the plant sciences. Information about internships is also published every year by the AABGA.

What tasks do you perform? Give examples of the variety and frequency of these tasks. As I mentioned I have to keep track of our plant collection. That entails making sure that the names on the plants records section are accurate and complete, making sure that the plants are completely identified and labeled. I oversee the entire record keeping process that begins when a plant arrives and is assigned an accession number. As an extension of that I do a lot of plant identification work when it is needed. This happens when someone brings in an unknown plant or I try to identify plants on the grounds of the arboretum which have lost their identification tags. I do work primarily with the living collections of plants, but we do have an
herbarium. We have had a separate herbarium curator whose primary responsibility was taking care of the dried plant collection.

One of the nice aspects of my job is that there is really no “routine.” The job varies from day to day. I have to do some office work, because of my position as a supervisor. But I also get the opportunity to do various kinds of tasks out among the plant collections, which I really enjoy. The one I do on a regular basis is to go out for a half a day once a week with the volunteer crew to mapping of the grounds and collection. For example, chart exactly where all of the plants are in different locations. Sometimes we need to re-tag plants and add them to our inventories.

What early experiences or interests influenced you to choose this career? Both of my grandmothers were gardeners and that influenced me a lot. My paternal grandmother was especially a big influence. Then I remembered learning about four o’clocks from my other grandmother. My paternal grandmother had big flower collections, and she was always puttering around her garden.

I remember being in the backyard as a kid and because I was just naturally curious, I pulled a leaf off of a bush and just peeled off the upper half so I could see the veins. It seemed fascinating to me. I don’t know what came first, my interest or just simply doing that.

Then there was a one magic moment that came to me in high school. Up until that time the direction of my future career was mostly toward mechanical engineering, and I was especially interested in race cars and engines. But a friend of mine who was the class clown gave me a packet of seeds that had been zapped with x-rays and he said, “Here, why don’t you grow these and see what comes up.” I was thinking, “Oh, maybe I’ll get a monster plant or something strange.” I believe that was in my junior year.

So I did sew those seeds at home and I started reading about how to plant seeds, how to care for them, and started looking at these seed catalogs and pictures of some really amazing plants. In high school I also began to go down to Mexico during the summers where I found some amazing plants. I wrote up an article for the local bulb society of one of my trips and then I started my own collection of bulb plants. All of that field-work made me know that when I started college that I really wanted to major in botany.

What advice would you offer students who seek a career in your field? I would highly recommend doing volunteer work at a botanic garden to get a feel for what’s going on and whether you would like the work in the first place. It is so important to learn like that. As you learn on the job, people can get to know you and appreciate your talents. If you can demonstrate that you have expertise and knowledge it will make people see your diligence and work habits. It greatly increases your chances that you will get put on a potential job roster, and may eventually get a job. I’ve seen that happen over and over again where volunteers were the first pick.

Also I just recommend simply to associate with people who have similar interests as you. This can be in an informal setting. As I said, you can apply for a summer job or internship too. Also you can work in a nursery or start a horticulture club at school, or take over a planting bed and make a garden area.

One of my first jobs working with plants was that I worked for a person who had a huge collection of irises. She had hundreds of different varieties. At one time she had run a commercial iris nursery. Anyway, her irises had grown so much that they needed to be divided up, so she paid me to dig up and replant some iris bulbs. She gave me a piece of every different one and I created a big garden of my own. And to this day I really love irises. They have a very characteristic fragrance that no other plants have and to me that’s, “Spring is here, the iris are blooming and that smell is in the air.”
What are some of the current and future prospects in your field? As for the future, I think as the world shrinks and places that are really still intact in their natural form will be more and more preserved and there will be a need for biologists to do inventories and to maintain the health of populations of endangered plants.

From my perspective there is basically two ways to go: in situ and ex situ conservation. Ex situ is plants that are taken out of their natural environment and they get preserved and protected and multiplied. That occurs in botanical gardens and seed banks. In situ is actually dealing with plants as they occur in nature. To me, in situ is a more satisfying place to be. But there’s work in biology and botany for people in both areas.

I recommend that a person just needs to follow his/her own passion. That’s the best advice I have.

What is the most rewarding part of your job? Two equally rewarding aspects of my job are that I get to work with people and also with plants. I enjoy the opportunity to work with people who have an intensity and depth of knowledge and with whom I share a passion of interest in plants. Also helping people is an important part of this job. It is a nice challenge when people bring in a plant that needs to be identified. If I don’t know it, then I’m excited because it means that by the time the process is over I’ve learned a new plant, and added it to my mental flora of the world. Just learning something new can be exciting. I actually love it when a person calls and asks me a question that I really should know, but don’t. I see that as a challenge, because then that’s an excuse to spend the time to work on it.

Today my biggest interest is in ethnobotany, studying the usefulness of plants to people. I travel down to Mexico and am doing research work with the Indians to try and collect information about their plant lore uses.

In a sense, this is a very important arena to try to record the uses of plants in different cultures. As cultures die out and all that hard won information is lost, then every little bit of information that we collect now will be a gold mine in the future.
Job Profile: Coordinator of Environmental Interpretation Programs - Washington State Parks and Recreation Commission Olympia, Washington

Name: Mike Thorniley

Job Title: The official job classification for my position is Parks and Recreation Coordinator II.

Job Description: I have a management level position to coordinate and oversee the entire Environmental Interpretation Program for the Washington State Parks and Recreation Commission. This is a state government agency that fosters outdoor recreation and education programs throughout the state. Among the responsibilities for the Commission itself is to acquire new park units, and to operate, enhance and protect park sites that have significance as recreational, cultural, historical, or natural areas.

Education and qualifications: I obtained a BA degree in Recreation and Park Administration from Eastern Washington State College (now a university), which is located in Cheney, WA.

Personal characteristics needed: One of the most important qualities is being able to provide good customer service. My position also depends on the positive attitude of the park rangers I work with. So I try to keep the staff morale high and encourage the rangers to be positive at the facilities where we provide services for the visitors. In considering my job responsibilities, it is important to keep the customers (park visitors) satisfied, because if they are dissatisfied then somehow the system has failed. So I try to be a cheerleader and a tour director all at the same time to try and make the park system successful in our mission of serving the public.

How did you get your job? I worked as a park aide for the Washington State Parks for four summers while I was going to college. I then worked as a park ranger for ten years and then competed 14 years ago for the position I have now. To qualify for this position I had to take an "experience and training" exam. That test measures all previous experience and training related to a specific job that you apply for. Fortunately, I was ranked high enough on the state registry to get the position.

What tasks do you perform? Give examples of the variety and frequency of these tasks.

I establish the budgets for 47 different park programs. I determine expected revenue projections that will be coming in over the next three years. I also set various fees, market and promote the environmental learning programs and facilities and allot the spending authorities to the parks and monitor all of the accounts.

I oversee the usage and programs at 12 Environmental Learning Centers which are year-round camps that we rent to groups. My job is to make sure that operations of these facilities run smoothly. I also work to create more new programs.

There are a variety of operations that I oversee. One is an Environmental Education Program where we operate a fall and spring program where we offer a facility, food service, and a curriculum. Seven are special interpretive programs where we provide tours for a fee. Five are Overnight Heritage Place Rentals where I have provided “seed money” for parks to remodel old park houses to rent to the public. Then we offer 22 Day-Use Heritage Place Rentals where we rent various facilities including gardens, halls, and other Civilian
Conservation Corps built structures. Typically these places may be used for weddings, picnics, family reunions, and conferences.

**What early experiences or interests influenced you to choose this career?** Those four summers when I worked as a park aid gave me “hands on” experience and that influenced me to decide on this career. I also remember when I realized I wanted to be a park ranger. After spending a cold, rainy night camping at Doeswallips State Park when I was 20 years old, the ranger there brought us over some hot coffee and some dry firewood and helped us get our campfire going. I still have that camping receipt in my “Keepsake Box” at home.

**What advice would you offer students who seek a career in your field?** The best advice I could give is try to work at a state park or any park related job. Even if you have to volunteer it is very worthwhile to get that direct experience.

**What are the current and future prospects in your field?** There are always entry-level positions for park aides or rangers, usually available on a seasonal basis to start. Many programs in the state have greatly expanded which requires additional staffing. For example, fourteen years ago when I started this job I had the responsibility to oversee ten Environmental Learning Centers and I had a budget of $250,000 per year. I was given the opportunity by my supervisor and my agency to “build and expand” new programs. I have added two new ELCs since then and I came up with the idea for the other programs that I’ve already mentioned in the last four or five years. My present budget is just over $4,000,000 per year now. So I anticipate that we will continue to grow even more in the future. I believe the continued growth within my position indicates that programs similar to these will also expand in the coming years.

**What are some of the most rewarding aspects of your job?** I have a lot of freedom to create new programs and do what I want. I also like the satisfaction of positively affecting the people who use our park facilities. I’m also glad that the educational programs and facilities provide enjoyment and enrichment to the lives of our visitors.
Job Profile: Director of Animal Husbandry and Facilities
Aquarium of the Pacific
Long Beach, California

Name: Perry Hampton

Job Title: Director of Animal Husbandry and Facilities

Job Description: I oversee the operation of facilities and supervise all of the biologists and technicians who care for the animals.

Education and qualifications: I have a Bachelor of Science in Environmental Biology from the Long Island University in New York.

Personal Characteristics Needed: Above all, I definitely would say that you have to have a love for animals and particularly aquatic animals that live in the ocean. In a sense I think it helps to have a “wet thumb” in much the same way that a gardener or botanist has a “green thumb.” Also I think that it helps to have a certain talent for artistry to be able to help design the animal exhibits so they look like natural habitats and attractive to the visitors.

How did you get your job?

I applied to volunteer at the New England Aquarium. I worked as a volunteer there full time for about three or four months. That gave me a tremendous opportunity to learn hands-on and get valuable experience in aquarium work. The key to getting into this field is to learn how to keep fish at a large aquarium. You have to learn the requirements for their tanks, how to take care of their dietary needs, understand generally how to care for aquatic animals of all types whether they be fish, mammals, invertebrates, or even birds.

After that I applied to the National Aquarium in Baltimore. I had to be persistent because I had applied for a job two previous times and I didn’t get a job there until my third try. I spent many years there and then when the Aquarium of the Pacific opened up in June of 1998, it was a great opportunity to get in on the ground floor of a new aquarium. That was very rewarding.

What tasks do you perform? Give examples of the variety and frequency of these tasks.

A big responsibility of my job is to supervise all of the technicians and biologists who care for the animals. These are specialists like aquarists (people who care for the fish and invertebrates), mammologists (people who care for the mammals like the seals and otters), and aviculturists (people who care for the sea birds like puffins and mures). I also have to make sure that the facilities are running just right and oversee the work of the technicians. The technicians are water quality specialists and facilities technicians who operate all of the life support pumps and filtration systems to maintain the special requirements for temperature and salinity levels for all of the various tanks to keep the animals alive and healthy. I also oversee a Dive Safety Officer and Boat Captain. There are also about 100 volunteer divers who participate part time on boat trips and even dive as part of some of our exhibits. These divers help in the feeding of the fish and cleaning of the exhibits and are very valuable to the care of the aquarium. Unlike some jobs where you work nine-to-five, some of our staff members have to work late and very early shifts because support staff have to be here 24 hours a day, seven days a week, caring for the animals and making sure the aquarium tanks are operating efficiently and safely.
What early experiences or interests influenced you to choose this career? I lived inland for my early life and didn’t have a chance to go to the beach or ocean very often. But I remember that when I was a kid I was fascinated by all of the animals living in the ocean by watching television. I especially remember programs such as Sea Hunt or Jacques Cousteau specials. In high school I happened to read The Old Man and the Sea by Ernest Hemingway. It was very influential in furthering my fascination with the ocean environment and the lure of the sea. When I was in high school I decided to go to Long Island University. I think my love of the ocean was definitely a deciding factor to go there because I knew that I could pursue a specialized biology degree there that was geared towards my interests in marine science.

What advice would you offer students who seek a career in your field? Know that people who work in biology don’t do it for the money. Generally jobs in my field don’t pay very much and you need to be willing to sacrifice a little. However, there are some great rewards and satisfaction in having the opportunity to work in a very exciting and interesting job. Another suggestion I have is that you have to be prepared to volunteer or serve in an internship to first see if this is the type of work you would really like to do. The work may sound exciting and glamorous to some, but it is a lot of hard work. It may not be for everyone. I think that you have to experience some of the “nitty gritty” aspects of the job to see if this is really what you want to do.

What are the current and future prospects in your field? I would say that the prospects in aquarium work are very good right now. There has been an explosion of aquariums being built throughout the country in the past 15 years or so, and we anticipate that others will be built. I think that these aquariums have been pretty successful and have helped the local economies of many rural areas, and have enhanced some urban renewal projects. Such was the case here in Long Beach.

What are the most rewarding aspects of your job? Certainly one of the greatest rewards from working here at the Aquarium of the Pacific has been being in on the planning and design stage of some of the exhibits and the opportunity to build a brand new aquarium from the ground up. It was a wonderful experience to have the opportunity to collect many of the actual animal specimens for the Blue Cavern Exhibit. It is an exhibit featuring the marine environment and animals that can be found in ocean waters off the coast of Southern California. Another thing I really enjoy about my job is simply being able to work around the beautiful animals. And on a grand scale I enjoy re-creating “nature in a bottle” by using artistic and creative talents in the exhibit work. You have to make the exhibits look naturalistic and visually and aesthetically appealing so they showcase the animals and provide a wonderful facility for the visitors to enjoy.
Job Profile: Fish and Wildlife Assistant
Fillmore, California

Name: Randy Sawyer

Job Title: Assistant I for the California Department of Fish and Game at the Fillmore State Fish Hatchery.

Job Description: I feed the fish at the fish hatchery and generally do all kinds of maintenance at the hatchery. I also stock fish in about 37 waters in Ventura, Los Angeles, Santa Barbara, and San Luis Obispo Counties. I have a class A driver's license, which is required. As an assistant I have to maintain the facilities and equipment like the various pumps and even how to fix and operate the vehicles which include a 1300 gallon tanker truck, several other pickup trucks, some electric golf cart type vehicles, and a fork lift.

Education and qualifications: I graduated from high school and also completed some college courses, especially ones that taught welding, and electrical work. Pretty much it helps to just have a good, well rounded knowledge of maintenance and good mechanical abilities so you can fix things when they break.

Personal characteristics needed: It is important to be out-going with both the people you work with and the public that you encounter on the job. It is also essential that you have many general skills, and have to care about maintaining all of the facilities and taking care of the fish. And also you need to have a willingness to fix things.

How did you get your job? When I was just out of high school I did a lot of volunteer work at the Los Banos Wildlife Refuge. By doing that I learned a lot through first hand experience. The more experience you can get seems to help a lot. Eventually I landed the job here, but it took several years of just persevering and continuing to take the state test that is required by the Department of Fish and Game.

What tasks do you perform? Give examples of the variety and frequency of those tasks. Work that I might do in a typical week would be to feed the fish periodically through out the day. Another important part of my job is doing general maintenance that might include wood working, welding, cement work, or fixing the plumbing and water filtration flows in the hatchery. A busy time for us here at the Fillmore Hatchery is between January and June when the fish are growing a lot and then we are driving all around Southern California stocking the larger fish in reservoirs, lakes, and streams for the anglers to catch. The average planting size for the Rainbow Trout, of which we grow four different strains, is between one to three pounds. Even though we grow the fish for the purpose of being caught by fishermen, I think that this still provides a very important resource for people in a recreational setting.

What early experiences or interests influenced you to choose this career? When I was young I spent quite a bit of time outdoors hunting and fishing and I really enjoyed being outside in natural areas seeing wildlife. I think those early experiences made me want to work outside.

What advice would you offer students who seek a career in your field? Start out volunteering or working part time as a seasonal aid in high school at a wildlife refuge or hatchery if you can. That way you would find out if you like the setting or the work involved in this kind of job.
What are the current and future prospects in your field? [No data]

What are the most rewarding aspects of your job? It is a great job that provides the opportunity to work outside. Certainly I enjoy the opportunity to plant the fish in the various reservoirs and fishing lakes. As part of that, when I am out releasing the fish at a site, I like talking with the people who are out fishing. I enjoy meeting the public and answering questions that people have about the fish. Especially the kids are very curious and when I point out certain things to them, their eyes just light up. I think that kids who come out from the city and urban areas may not have many opportunities to get out in natural areas or maybe don't even really know where fish come from. Occasionally I have an opportunity to talk with them about the life cycle of the fish and explain what purpose the fish hatcheries provide.
Job Profile: Geologist
Fairbanks, Alaska

Name: Greg Laird

Job Title: Geologist- Chief of Natural Resource Information for the State of Alaska/Section Chief of geologic publications. (Retired). I am currently self-employed as a geologist consultant and live in Fairbanks, Alaska.

Job Description: While I worked for the State of Alaska I served on a research team that collected geologic data and presented it to colleagues where it was reviewed by other geologists who were familiar with the field science for further analysis and assessment. I also did reconnaissance mapping and worked with hydrologists. I was responsible for writing and editing publications that the state Natural Resource Information agency produced.

Education and qualifications: To be a geologist you need a BS Degree in Geology. To write and edit these types of publications you should have a major in geology and a minor in English.

Personal Characteristics Needed: For one thing, I think that you should enjoy being outdoors because you spend a lot of time doing that as a geologist in rugged, remote areas. Also you have to learn to be optimistic when the conditions outdoors may make you feel uncomfortable. Some of these times are when the weather is bad, or having to spend long periods of time camped out “roughing it” in places where there are mosquitoes, insects, and no luxuries like there are at home. One other thing is you really have to enjoy looking at maps and translating the information contained in them for your purposes.

How did you get your job? Originally, I worked part-time through the University of Alaska, Fairbanks career center, starting in an internship program. My job title at that time was “Geologic Assistant” for the state of Alaska. Now they simply call it serving in an internship.

What tasks do you perform? Give examples of the variety and frequency of these tasks. The tasks that need to be done are geologic reconnaissance work- going out in the field looking at the petrology, geochemical make-up of rock, noting the surficial geology like landslides and other anomalies, and note movement and offset from recent seismic activity, or sedimentary occurrences which have taken place. Also, I collect mineral samples, and superimpose the mineral localities where I found them onto maps. Then I need to correlate the minerals with different rock types and match them to other map data. So I spend the summers doing research working out in the field collecting data, then I do the writing of reports and documents during the winter months inside an office.

What early experiences or interests influenced you to choose this career? When I was younger I always wondered where rocks came from and how were they were formed. Also, I knew that I always wanted to work outside because I had already spent so much time inside school as a kid. Also early traveling experiences made me realize that I wanted to work outdoors.

What advice would you offer students who seek a career in your field? Try to get into a program to learn cartography which is the study of mapping. I also recommend that someone
learn Geographic Information System (GIS) and to study the "Arcinfo," a geographic computer information system that is used out in the field.

**What are the current and future prospects in your field?** Well, fresh water hydrology is a big field increasing in demand right now. Gemstones and platinum exploration are exciting areas, but for steady employment, I would go into hydrology. Also, geo-engineering for soil sampling, mostly associated with road work, is an easier lab type of job that might be appealing work.

**What is the most rewarding aspect of your job?** Certainly as a geologist I've enjoyed being able to spend great amounts of time outdoors in strikingly beautiful country. Now that I've retired from working for the state, I am working on a consultant basis and my work schedule is much more flexible. I can choose the projects on which I want to work. Recently, I returned from working on a natural gas exploration project in New Zealand.
Job Profile: Graphic Designer/Botanical Illustrator
Fort Collins, Colorado

Name: Tracy Wager

Job Title: I am a graphic designer and botanical illustrator for the Center for Ecological Management of Military Lands which is operated by the Department of Forest Sciences at Colorado State University in Fort Collins, Colorado.

Job Description: I draw or create anything that needs to be graphically presented for research studies or publications for the center. I might design and produce posters or make sketches and illustrations for a brochure. I enjoy the fact that I have a pretty varied job and I rarely do the same thing everyday. I am often asked to make illustrations of rare plants here in the lab. But besides doing drawings, my job now involves a fair amount of computer generated graphics. Sometimes I accompany the research botanists when they are out in the field and make drawings of the plants and habitat areas where plants are found.

Education and qualifications: I have a background in geology, archaeology, anthropology, and biology. I actually got my degree in biology, with a concentration in botany. Although I have had a few formal art classes, my drawing has always been more therapeutic or done to learn plants because you have to draw in biology and botany classes.

Personal qualifications: I think that flexibility is key to this kind of work.

How did you get your job? Besides a biology degree I received an art degree in graphic design. I decided that would be the useful part of an art degree. A job opportunity came about after hearing about a project Colorado State was conducting dealing with rare plants in Hawaii. I did some networking and spoke with one of the professors involved in the project. I inquired about the possibility of doing some plant illustrations. That very day he gave me a plant to draw. That led to a part time job drawing plants in the botany lab. Eventually that job lead to me going to Hawaii with the botanical research team where I illustrated the rare plants that they couldn’t collect.

I also used to work for the Forest Service and National Park Service in seasonal positions in the summers and I volunteered in the winter months doing all kinds of things, so I had a lot of outdoor skills work experience besides my education.

What tasks do you perform? Give examples of the variety and frequency of these tasks.

I do most of my work today using computer graphics programs. Originally, I started out using Rapidograph pens in illustrating. Increasingly, I use computer graphic images created with drawing programs so that they are more easily put in a report or a book. The drawing programs I use are Freehand, Photoshop, and Page Maker. It is very helpful to learn all of these programs. It doesn’t matter which ones you use, but I do try to stay up with all of the new technology including slide scanners, plotters, and digital cameras.

What early experiences or interests influenced you to choose this career? My background is kind of unique in that I started out studying geology. In fact my father was a geologist. When I was young I spent a great deal of time going out in the field with him. He always did drawings and illustrations of what he saw out in the woods of Minnesota and Canada where I grew up. We accompanied him on walks and he taught all of us kids how to
What advice would you offer students who seek a career in your field? In this field I would highly recommend that students learn as much science as they can even if they want to combine it with art. I believe they go hand in hand. Take as many science courses as you can in order to understand subjects. This educational background will help you to portray something you have to illustrate in the most accurate way. That's why I think that you can't just rely on drawing skills alone. It helps to have the perspective and knowledge of a scientist.

Even though my dad taught me some art skills at an early age, I have been able to teach many adults how to draw even when they thought they didn't have much artistic ability. The key is, I believe that everyone can see, and I believe that training someone to see is how people learn how to draw. I highly recommend a book called Drawing on the Right Side of the Brain. I believe that book is effective in helping people to learn how to draw. Give that book a try. The lessons in it are very good.

Lastly, my advice is to keep up with the newest technology. Also, consider combining a good liberal arts degree with science courses.

What are some of the most rewarding aspects of your job? I enjoy working with the various scientists here at the center because I like to work with people who are interesting and have really diverse knowledge. As far as I am concerned, equipment like computers is just a tool to help you get jobs done. In any job, our personal interactions with colleagues are really the most important.
Job Profile: Interpretive Specialist, USFS
Denver, Colorado

Name: Cheryl Hazlitt

Job Title: I am an interpretive specialist for the US Forest Service. I work out of offices in Denver, Colorado.

Job Description: I do interpretive planning, writing, and project management for various exhibit projects. This means that I help to conceptualize and design what are effective methods for interpreting natural history or information for exhibits for the Forest Service. This may be for the creation and development of visitors centers or signs located at scenic overlooks, parking areas or campgrounds. I write proposals for projects, as well as text for signs, and exhibits to make sure that the information is accurate to explain resources or management issues to visitors.

Education and qualifications: I have a MA in Environmental Education from Colorado State University and a BS in Education (Home Economics and Life Sciences) from Oklahoma State University.

Personal characteristics needed: Important characteristics to have for my job are diplomacy and leadership skills. Having good verbal and writing skills are essential. The ability to focus on details is also helpful. Having an eagerness to learn new things, an openness to new ideas and methods is also very important.

How did you get your job? I started out as a seasonal employee with the National Park Service. I also worked for the YMCA of the Rockies near Rocky Mountain National Park during college. When I originally obtained my present job, I believed that it was only going to be a three month, temporary position. Fortunately, it has extended for six years now and I was hired into a permanent position in 1999.

What tasks do you perform? Give examples of the variety and frequency of these tasks. Site planning for interpretive signing, research and writing, coordination with engineers and architects for facility designs is the main emphasis of my job. This involves developing project plans, agreements, scope of work, cost estimates, contract administration for exhibit design and fabrication. It also entails me providing advice, recommendations, and information on signage types, and interpretive planning. My time on any of these tasks varies and is specifically driven by the scope of project needs at any given period.

What early experiences or interests influenced you to choose this career? I have had a life long love of the outdoors which was nurtured by family camping trips and early childhood visits to national parks. It was while I was working at the YMCA camp during college where I really discovered a deeper “sense of place” in the natural world.

What advice would you offer students who seek a career in your field? I recommend that you be diverse in life experiences. Don’t worry about the “right” career, just do something that piques your interest. Be responsible for yourself and seek out work that appeals to you. It is likely that your interests will change somewhat as you mature, so keep several interests open to yourself in life.
What are the current and future prospects in your field? I would say that prospects right now are very good. Interpretation is a growing field as tourism grows around the world. Heritage tourism is a growing industry and interpretation is now combining with museums, government agencies, and private business in many new and evolving relationships. It's is definitely an ever changing field, not just for "park rangers" anymore.

What are some of the most rewarding aspects of your job? Doing something that I believe makes some difference in people’s lives and the planet we call home. Educating and inspiring others to understand our natural resources better combined with sharing knowledge about how important these resources are that we depend upon is very rewarding.
Job Profile: Manager of Educational Services
Shaw Arboretum
Gray Summit, Missouri

Name: Lydia Toth

Job Title: My job title is Manager of Educational Services at Shaw Arboretum which is an annex of the Missouri Botanical Garden.

Job Description: I manage all aspects of youth and adult educational activities, including staff and volunteer supervision, curriculum design and implementation. I also am involved with budget management, general interpretation, and planning of a brand new overnight education facility and new visitor center. I work closely with the Arboretum director on visitor services, special events, and the day-to-day operation of the Arboretum facility.

Education and qualifications: I have a BS in Forestry and Wildlife Management from the University of Florida in Gainesville. I also completed an MA in Education at the University of Northern Colorado at Greeley. Previous to working here, I had five years of teaching experience with the Houston Independence School District at their Outdoor Learning Center in Trinity, TX.

Personal characteristics needed: It helps to have flexibility, patience, and good "people skills." Some other very important abilities to have are good communication skills, organization, and the ability to delegate responsibilities to other staff members. It also helps to be decisive, creative, and to cope well with frustrations and pressure. In a management position I have to be a "team player," dependable, able to motivate others, and a good listener and problem solver.

How did you get your job? I found the job listed in the national newsletter called Environmental Opportunities.

What tasks do you perform? Give examples of the variety and frequency of these tasks.

My largest task is managing all administrative aspects of educational activities (30%), including scheduling activities and staff, coordination with other division managers, marketing, completing insurance reports, compiling monthly statistics, and attending board meetings.

Another area I spend quite a bit of time on (20%) is development and coordination of the Education Division special projects. This might include grant writing, planning special events within the Garden or other nearby institutions like the Missouri Department of Conservation, or the St. Louis Zoo or Science Center. I am always monitoring various projects.

Other important aspects of my job entail designing curriculum for programs and interpretive material for the general public (15%), including the creation of school program curriculum that is aligned with national and state standards. Supervising employees, including hiring, training, setting goals and prioritizing tasks, budget management, and helping in the design work of the Environmental Education Overnight Facility that is being built are all aspects of performing my job. Lastly, I conduct volunteer training and I also still do some teaching of youth classes, and at special programs and events.
What early experiences or interests influenced you to choose this career? I have always had a love of the outdoors and a love for science. I grew up in south Florida and I was always spending time outside when I was growing up. I also spent a lot of time with my family in the summertime going on camping trips across the country. There were many entire summers spent in this fashion. I also attended summer camps as a child.

What advice would you offer students who seek a career in your field? I recommend getting degrees in environmental science or related degrees as well as a teaching certification. Also try to take advantage of any internships or volunteer opportunities. Many of the staff that I have hired got their start by working in this capacity. Special training is also helpful (i.e. Project WET facilitator, Project WILD facilitator, CPR, First Aid, Wilderness First Responder).

What are the current and future prospects in your field? I believe the future looks bright for prospects in this field. More and more states are legislating environmental education in the schools and, consequently, for training of pre-service teachers. Unfortunately, states are not equitable. My state, Missouri, is far behind other states when it comes to this. I do believe that people in general are more aware of environmental issues, and out of necessity, will have to do something about these educational mandates. In the case of the Arboretum where I work, our attendance is increasing without much effort on our part because people are finding it harder and harder to find substantial areas of green space where they can enjoy spending time.

What are some of the most rewarding aspects of your job? One of the most rewarding aspects of my job is simply having the opportunity to work in such a wonderful, scenic physical setting. I never take it for granted! Also I enjoy working with students, helping them to see something wonderful and inspiring in the natural world outdoors. I also like helping teachers to feel more comfortable teaching in the outdoors. I feel very fortunate having the opportunity to work with incredibly dedicated people. It is truly an honor to work for such a prestigious institution as the Missouri Botanical Garden. Another rewarding part of my job is knowing that I am “trying to make a difference!”
Job Profile: Natural Areas Supervisor & Nature Center Director  
Pasadena, California

Name: Michael “Mickey” Long  

Job Title: My technical job title is Los Angeles County Regional Park Superintendent I at Eaton Canyon Park and Nature Center in Pasadena. I serve basically a double function of superintendent of the natural area and director of the nature center.

Job Description: I am the director of operations and programming at the nature center and canyon park. That includes overseeing the maintenance of the natural area and the upkeep of the physical plant that includes the nature center building. I prepare and guide programs and activities for the public. Another responsibility I have is supervising six staff members, four full time and two part time employees. I recruit, train and oversee about 60 volunteers. In addition to planning and leading nature programs, I have to keep the park safe and clean for visitors. I also need to monitor and provide for the general protection of the wildlife that lives in the canyon.

Education and qualifications: For my position, one should have a bachelor’s degree in either a life science or related physical science. My degree is a Bachelor’s of Science in zoology, which is animal study. I graduated from California State University, Los Angeles after attending East Los Angeles College where I got an AA degree. But a degree in any biological or environmental studies field would be a good background for someone in my position.

Some other positions at county parks include entry-level positions. These do not require a degree, but it is probably a good idea to be working towards a degree if you are interested in working in a park.

Personal Characteristics Needed: One personal characteristic that is very helpful is to have had a childhood interest in nature. I had a strong interest in nature by the time that I was about seven. Even at that young age, I was pretty sure that I wanted to go into biology in some way. That lifelong interest and having a passion for the natural environment and an interest in animals has really helped me in many aspects of my career.

How did you get your job? I started out in college working part-time as a naturalist/recreation services leader at Whittier Narrows Nature Center. Through the years I’ve continued working for the county and I kept applying for various promotions which enabled me to become a director and supervisor. Though I have large responsibilities in my current position, I’m fortunate to still have the opportunity to do many of the original duties that first lead me to work as a naturalist.

What tasks do you perform? Give examples of the variety and frequency of these tasks.

We have about 130,000 visitors each year including about 12,000 school children who receive a guided tour through the nature center. So there are a wide variety of things that I am responsible for in the area of operations and programs. I wear many hats, from planning and presenting programs, to supervising grounds maintenance and I’m even required to do some aspects of law enforcement. Another important part of my job is to prepare different kinds of reports such as periodic revenue and attendance reports and I keep track of staff scheduling and time cards. Also I am responsible for equipment acquisition and the collection and care of live animals and plants that are on exhibit. I oversee landscaping of native plants and the
protection of the natural area itself. I train and supervise staff members, docents and many volunteers.

Another part of my job is to conduct on-going fundraising to supplement the budget. The fundraising allows us to produce some revenue that will offset the cost of feeding the live animals that are on exhibit at the nature center. And it also enables us to increase and change various interpretive displays and to acquire some equipment that we might not get otherwise under our regular budget.

**What early experiences or interests influenced you to choose this career?** I read quite a bit when I was younger and all the way through high school. I read books by Edwin Way Teale that come to mind. I recall that most of the books I read involved stories where the characters were intrigued by animals, interacting with nature, bringing something home and studying it. I guess I enjoyed living vicariously through people in the books who were traveling the world, discovering something new on an exciting adventure.

Another childhood influence on me was an open area I called "The Gully" at the end of my street when I was growing up in Monterey Park. I remember exploring this open space and finding lizards and snakes. This got me interested in looking things up in a nature guide. So those were neat experiences to see things in the natural world and feel a sense of discovery and independence as well. Unfortunately, because of development that natural area I enjoyed exploring as a kid is all gone now.

**What advice would you offer students who seek a career in your field?** Young people who are in high school or even college students don't realize that when they apply for a job they can put down volunteer experience. So I highly recommend volunteering somewhere at a nature center, a museum, a zoo, or whatever is interesting to them in their field. When I am looking at hiring someone for a job I consider their volunteer experience to be at least fifty percent of their qualifications. Schooling is certainly important, but volunteering shows me that someone is dedicated and very interested in this field and I also know that they have some practical, hands-on job experience. You can start to build a resume very early in life. Volunteering or doing service work can often give you that extra foot in the door to get a job.

**What are the current and future prospects in your field?** I believe that the future will bring more opportunities for jobs in environmental protection, biodiversity studies, endangered species and wildlife protection work. There will be the need for more scientists to study toxin and pesticide problems and how these affect the health of people, wildlife, plants, and whole ecosystems. Unfortunately, much open space has already been lost to development and urban sprawl, but the public and various government agencies realize a need exists to protect more open spaces and wilderness parks. Here in Los Angeles County we are currently building and planning more nature centers.

**What are some of the most rewarding aspects of your job?** A very rewarding aspect of my job is the teaching that I do to help educate people about the land here, the plants, and animals that call Eaton Canyon home. It is rewarding to get positive feedback from the visitors, school children, or those who attend an evening interpretive program. Another tremendous reward of this job is to be able to walk outside the nature center or hike out in Eaton Canyon and see 190 acres of open space. It is a beautiful place that has been saved for the protection of the environment and the enjoyment of people who come to visit. My job is to operate this open space and to continue to care for its protection and preservation. In that regard, my job is not just a rewarding one, it is an honor and a privilege.
Job Profile: Public Affairs Specialist/Archeologist, USFS
Lone Pine, California

Name: Jan Cutts

Job Title: My job is working as a public affairs specialist for the United States Forest Service. I also do some work as an archeologist.

Job Description: I serve as a liaison between the Forest Service and the general public and I work with the media. My responsibilities are producing news releases, conducting public meetings, and keeping the public apprised about the status and progress of the Regional Wilderness Management Plan. I also still conduct some field work at various archeological sites in the Inyo National Forest, although that is not the main emphasis of my job now.

Education and qualifications: I received a Bachelor of Science Degree from UC Davis in Archaeology and I did some graduate work at San Francisco State in that field. Most importantly, I received on the job training by working on an archeological dig in this area. This was part of a summer field school internship that I did while at UC Davis.

Personal Characteristics: I think that you need to have the ability to work alone and be self-directed. You need to have good communication skills and be willing to ask questions. Having perseverance is also really helpful.

How did you get your job? I got the job here through the field-work I had completed in this area. One of my college professors was very instrumental in teaching me about the archeology of this area and encouraged me to apply for the job.

What tasks do you perform? Give examples of the variety and frequency of these tasks.
I start in the morning with a list of things that I need to do. Phone calls and e-mail messages come to us from the Washington, DC office or from the regional office. These take priority over anything else in setting up my daily schedule. I also disseminate information to a mailing list of 3,000 addresses, especially if we are going to be holding public meetings locally in Southern California and in the San Francisco Bay Area.

A big responsibility of my job now is to plan and coordinate these public meetings, call people together, find places to hold them, and schedule them. After I have done these tasks I have to write up a news release and often I have to oversee getting the mailing out. Due to budget constraints, we don’t have a lot of staff to help, but I usually get some help in doing the folding and labeling by people around in the office. Then I assist various Forest Service subject specialists to conduct the meetings and follow them up by trying to generate public and agency input.

When I do work as an archeologist, in the summertime a typical day for me would be putting field notes on clipboards, and any records that we have that are pertinent to the place where I am going to go out to survey. This is important because building a trail or some other agency activity may possibly be impacting an archeologically significant site.

To do this I need a camera, topographic maps, a notebook, compass, basically anything that I’m going to need to record a site if I find it. Then I’ll go out for a whole day or sometimes even a whole week or ten days. It just depends on where the location of the site may be. In the past I’ve spent a lot of time in the backcountry up on the Kern Plateau in the Golden Trout Wilderness conducting surveys. So, often as soon as the snow melts at the beginning of the summer, until the snow flies, I’m going to be out in the field.
Another thing I do as an archeologist is educational work with schools, taking kids out into the field and teaching them in the spring and fall. I like teaching about the various sites that we have here in the Owens Valley that date back at least 10,000 years.

**What early experiences or interests influenced you to choose this career?** Originally I wanted to be a forensic anthropologist because I was interested in studying bones. My great grandmother was a medical doctor, so I saw her as a role model. I wanted to grow up and be like her. Then when I was in high school I was a volunteer in our local hospital in Truckee, CA, which is where I grew up. I worked in the radiology department and was surrounded by pictures of bones. I began to identify what the bones were and what they could tell us and I just became fascinated with them. And I think that is probably what led me to become interested in the field of archeology.

My interest in history probably came from even before that when I was a kid. My father was a school teacher and we had summers off. And we would travel and we would stop at every road side historical marker, every museum, and my parents just packed our brains with the history of wherever we were. So I always had this interest in where I was, and wondered who were the people who had lived there. What did they do? Why were they there? What were they like? I asked myself those kinds of questions and I have always just been fascinated by trying to find out the answers to those questions.

**What advice would you offer students who seek a career in your field?** In either field, I would say be willing to volunteer. Be willing to go out and get paid nothing or very little to work really hard hours and get that invaluable experience. Getting the best hands-on experience and background knowledge will give you the experience to be able to be qualified for jobs. Probably the best way to gain an upper hand in a job search is to be willing to go and spend a whole summer volunteering and not care about getting paid.

**What are the current and future prospects in your field?** The prospects in archeology are good because we have federal laws that protect archeological sites and we're required to protect them. There will always be the need for archeologists. These laws are the Antiquities Act and the Archeological Resources Protection Act (ARPA) that really protects sites from just the average person going out and digging up and disturbing a site or removing artifacts. ARPA was enacted in the 1960s and basically it is the law we use to go out and prosecute against people committing vandalism of sites. Another law that tells any federal agency or person who has federal money that they have to protect archeological sites is the National Historic Preservation Act. Also there is a very important need for public affairs specialists to communicate with the public about what is going on in the Forest Service related to regulations and multi-use of the resources found in them.

**What are the most rewarding aspects of your job?** The first thing that comes to mind is the ability in my archeology job to go out into the mountains by myself and just be out there. I've been so lucky to have the ability to do that. Also it is neat to go out and look at the artifacts, I mean how many people get paid to go look for artifacts? Not too many. So it has been great just to work and learn in the outdoors and get paid to do it. I really value having had these opportunities.

Another rewarding thing is working with people, creating a place for communication to happen, to facilitate relationships between the agency and the people and to bring people together. Being able to resolve problems and help foster cooperation among various groups of people gives me a lot of satisfaction.
Job Profile: Resource Associate in Botany
Fort Collins, Colorado

Name: Nancy Hastings

Job Title: I am a Resource Associate, and I work as a botanist, for the Center for Ecological Management of Military Lands/Department of Forest Sciences at Colorado State University which is located in Fort Collins, CO.

Job Description: We have contracts with military bases to go on site at these locations to study and collect the plants, identify the plants, and take them to a herbarium. This is part of a large biological inventory of Federal Lands in the United States.

Education and qualifications: I have a BS degree in biology which I obtained at North Georgia College in 1975. I eventually completed my MS in Range Science at Colorado State University. Besides my interest in botany, I was interested in the relationships within habitats and I thought that the Range Science program offered a good opportunity to study this area.

Personal characteristics needed: I think it really helps to have a sense of humor and be good natured about things. (Laughter) Also flexibility is important, because in our job there can be a very tentative schedule due to the nature of doing work outside when the weather and climate conditions affect the plants and flowers that we need to study. Before we can make travel arrangements, we have to make sure that the plants will be out, and that there has been sufficient moisture and favorable weather for plant growth. Depending on the weather and the arrival of spring, we may need to set dates back or move up our schedule for travel plans.

Another important ability is being able to get along well with people. Often we need to work closely together over long periods of time as part of a research team when we’re out on a survey and plant collection. So cooperation and working as a team is very important. Also, in working with the military you have to be able to communicate well about ecology management. Good communication skills help you to work together in order to reach a good compromise that enables you to get your work completed as easily as possible.

How did you get your job? In my final year of my master’s work, I had a graduate plant systematics class and the teacher who was teaching the class was Patricia Douglas, my current boss. I thought that she had a job that was just fantastic. As part of her job at Colorado State, people were paying her to go out and collect and identify plants. It was through my association with the botany department then that I was offered my job. I studied very hard in graduate school, but amazingly, my job just walked up and patted me on the back.

Certainly much of the course work you take in college helps to prepare you for a job. But for many jobs I’ve had in the past, and in my present position, I have always tried to emphasize that I am willing to learn, and I’m a quick learner even if I didn’t know everything that they were requiring for the job. Having that kind of attitude and a diverse background in science, computers, and information technology can really help you a lot.

What tasks do you perform? Give examples of the variety and frequency of these tasks. During the growing season we’re usually out on a research site for about two weeks of each month. But that also depends on the number of contracts that we have.

Before we go to a site we look at as many topographic and habitat maps as we can and read about what might be found in those locations. Our purpose is to sample all of the
habitats and hopefully visit some unique areas that might contain a wide diversity of plants. If there is a possibility to find something rare or out of the ordinary, we especially want to visit that location.

Once we get out in the field we use the maps and then try to inventory all of the various habitats found in a geographic area and then do our collections. During the day we collect and press flowers and specimens, especially we want to try to get plants that are blooming or in fruit and we try to get the entire plant, including the root if possible. This will help us when we go back later in the lab to study our data. We also record the density or occurrence of the plants (how wide spread and abundant a particular plant is in an area). We also record and describe the height, shape, color, and various parts of the plant on a collection card. We collect and press the specimens in a plant press. The work is very intensive and usually our collecting doesn’t end until six or seven in the evening. It requires many long days of concentrated work to accurately record each site, the habitat, and soil type, the aspect of the topography, or whether something occurred in shady areas or in bright sunlight. We provide these collection cards and all of the research information available to the ecology managers at the military bases.

We bring the actual plant specimens back to the lab in Fort Collins where we spend the late fall and early winter identifying what we have collected. Once we have completed the identification process we take all the plants to a herbarium (a collection of dried and pressed plants, typically found at a botanical garden, arboretum or plant research facility) like the one at the University of Wyoming at Laramie to verify that the plants are what we believe them to be. Being able to make a comparison with another specimen at a herbarium is very useful in botanical research.

What early experiences or interests influenced you to choose this career? I have always enjoyed being outdoors with my family. When I was a kid growing up in Texas we spent a lot of time going fishing, rock hunting, and looking for arrowheads together. In the 1970s there was also a big movement in the country for getting back to the outdoors and that actually was one influence that lead me to study biology. My husband attending graduate school in wildlife biology was also influential on my own interests.

What advice would you offer students who seek a career in your field? If you’re in school and if something is really a strong interest to you, then I would suggest going to visit with a teacher or professor who is in that particular field. It is always good to network with people and see if they need any kind of help with a project. Or they might just have some suggestions that will be helpful to you. Also be willing to volunteer and find out more about a certain job. That way you can find out if it is the type of job you’re going to like. Also establishing a contact with someone who has seen your work may improve your chances to find out about jobs that could be opening up.

What are the current and future prospects in your field? Unfortunately, the creation of government positions, and the filling of those positions, often tends to be very cyclic. It always depends on the availability of funding or the acquisition of research grants. But it looks like natural resource positions may be opening back up again and there is certainly the need for the type of botany field work and lab work that I do.

No matter what, I would always just make sure that you keep your ears open and do your own searching and it will eventually pay off. Also I recommend trying to be flexible within a job. To get a job, keep on developing diverse talents and skills. Having approach this will be very beneficial to you.
What are some of the most rewarding aspects of your job? I enjoy my job because it is always interesting. Having the opportunity to be outdoors and see some of the areas we go to is just beautiful. It still amazes me when I'm in Hawaii or Germany or some other area where I am working and I think to myself how privileged I am to have such a neat job.
Job Profile: Resource Ecologist  
Lancaster, California

Name: John Crossman

Job Title: My job title is Associate Resource Ecologist for the Mojave Desert State Parks which is a unit within the California State Parks system.

Job Description: I work in seven different state park areas, four are within Los Angeles County, two are in Kern County, and one is in San Bernardino County. I study the plants and animals here in our parks. We have some threatened and endangered species that are of particular concern. Two principle ones are the Desert Tortoise and the Mojave Ground Squirrel.

Education and qualifications: I have a bachelor’s degree in biology and a chemistry minor. I worked as a park ranger for about 19 years prior to this job, including working as a chief ranger where I researched and wrote environmental impact reports. I also have done several habitat restoration projects over the years. Also I have always just had a great interest in the environment, bird watching particularly, and I've enjoyed figuring out some of the biological aspects of the land.

Personal characteristics needed: It is important to have an interest in the environment and a curiosity about nature. It also helps to have good powers of observation and trying to figure out why something is happening and examining details that might provide clues that lead to answers about something. Another very important characteristic is having the ability to work well with people. You have to be able to supervise and direct staff in order to complete work projects and work with contractors and work crews of staff and volunteers to accomplish a task.

How did you get your job? I started out working for the city of San Diego as a student assistant at a fishing reservoir and also worked at the San Diego Zoo. I worked in security for awhile and then drove buses and worked for the zoo education division by giving tours. I gave talks about the animals and did presentations for school groups.

In my career as a ranger I worked for two years up in the redwoods in Santa Cruz at Big Basin Redwoods State Park. From there I took a promotion and worked as a supervisor for five years at Lake Oroville, which is 90 miles north of Sacramento, at the start of the California Water Project. Then I moved to the Antelope Valley and worked as chief ranger of what used to be called the High Desert District of the state park system. Eventually, because of the elimination of some positions because of budget constraints, including my old job as chief ranger, and a reorganization of various positions within the state park system, I moved into my present position as associate resource ecologist.

What tasks do you perform? Give examples of the variety and frequency of these tasks.

A very important part of my job is overseeing the protection and study of the habitats of the Desert Tortoise and the Mojave Ground Squirrel. We have to do certain things in order to protect these animals and to insure that we are under compliance with federal and California State Fish and Game rules and regulations. In this role I do environmental impact reports for our projects as well as comment on projects that produce environmental impact statements that affect our parks.
Another responsibility I have is that we have several habitat restoration projects ongoing right now. One is at the Ripley Desert Woodlands, which is a 560 acre area in the western Antelope Valley, five miles west of the California State Poppy Reserve. It is a Juniper-Joshua Tree Woodland, but part of it had been previously farmed, so we are trying to restore and add more native trees and plants to the woodland, which is an increasingly threatened plant community in the desert. We've also done some habitat restoration up at Red Rock Canyon where flooding and Cal Trans had removed an old highway and we have been planting native plants and shrubs. That also needed some soil amendments done in addition to the planting and I supervise the work crews there when I can get out to that location.

Some other things I've done specifically in the past week were to complete a "presence or absence survey" for the desert tortoise. The US Fish and Wildlife is very specific about the required protocol for doing this survey. Last week I also spoke to the Sierra Club about the Proposition 12 Parks Bond Act that would affect and hopefully expand a lot of things that the state parks and other county parks are doing. I went to Kern County Agricultural Commissioners to get an "agricultural pest prevent" which allows us to do a control of exotic species of plants, especially the Tamarisk up at Red Rock Canyon.

Another thing I like to do is work with various environmental services interns who do service work for us. I am currently supervising one up at Red Rock Canyon who is reassembling our shade greenhouse up there and we went to go get some plants for the greenhouse and we expect to add many more. I also met up there with a professor and one of his master's students who are doing a restoration project with a couple of different types of desert plants.

Even though I enjoy getting out in the field as much as possible, I would say that about 75% of my time is spent in the office, but it does depend on the season. Sometimes I might be out more in the spring collecting data, making observations of animals, or bird watching. Then I try to correlate the data after that and write reports. Fairly recently, I have taken on the job of Web Coordinator for the office here in Lancaster. I have developed some of the text and some charts such as our rainfall charts.

What early experiences or interests influenced you to choose this career? As a child I often went camping with my family. My father was a boy scout when he was young and he enjoyed going camping. That is probably what introduced me to the out-of-doors. My mother also was influential in getting me interested in outdoor pursuits such as gardening and bird watching. I also spent a lot of time outdoors fishing when I was younger.

What advice would you offer students who seek a career in your field? Seek jobs that would enable you to work outdoors to see if you want to do that. I was fortunate to have had the chance to work in several different places to know that I wanted this type of career. A good place to start is to look for entry jobs in city or county parks. I also recommend joining a volunteer organization where you can give people tours of a park, nature center, or facility such as the Antelope Valley Indian Museum. Try to get involved in scouting or other organizations that do service projects. That is such an important avenue for learning and gaining experience when you are young.

What are the current and future prospects in your field? With our new governor in California, our department has expanded and we should continue to in the future. We're projecting to add some new positions and hire people as ecologists, rangers and maintenance staff. It looks like with the passage of Proposition 12, which was passed in March of 2000, we'll be in pretty good shape for the next eight to ten years for jobs in both state and local parks and natural areas.
What are the most rewarding aspects of your job? I really enjoy the chance to camp out and get paid for it. The chance to make observations of wildlife in my job is really nice. The mission of our department is to "provide for the inspiration and education of people of California by helping to preserve the states most valued natural and cultural resources." So interpretation of the natural resources and providing for high quality outdoor education and awareness of the environment are a part of my job which I enjoy as well.
Job Profile: Science Learning Center Director  
College of Natural Sciences, California State University, Long Beach  
Long Beach, California

Name: James N. McKibben

Job Title: I am the Director of the Science Learning Center in the College of Natural Sciences at Cal State Long Beach. I also work as head machinist and senior technician for all of the science shops.

Job Description: I coordinate exhibit development and fabrication of descriptive materials for the museum. I am in charge of coordinating school group visitation. I recruit and train docent volunteers. I provide guidance for classroom usage and host visiting groups.

Education and qualifications: I received both a Master of Science degree in Biology and a Bachelor of Science in Marine Biology from Cal State Long Beach. Beyond my formal education, I have many years of experience in electronics engineering and hands-on experience developing, fabricating, and repairing scientific equipment for laboratory use. Additionally, I've worked in my own business developing ultrasonic telemetry systems for the tracking of aquatic animals.

Personal characteristics needed: It helps to have an outgoing and friendly personality. It is also important to have the ability to work closely with student volunteers as well as faculty and administrators and to readily relate science concepts to children of all ages. It is very beneficial to have a broad base of experience in all areas of science and mathematics. This background enables me to translate science concepts into functional, entertaining, and educational exhibits.

How did you get this job? I started as an undergraduate as a volunteer working for Dr. Donald Nelson's shark research project during the summer of 1971. I then spent a year working on his team, living aboard a yacht converted to a research vessel, in Tahiti studying sharks. Upon my return as a graduate student, I was offered a job as a research associate. That developed into my working with the old Natural Sciences Museum programs. That led to me being offered a part-time job as a physics technician. I then became the machinist for the College of Natural Sciences and became senior technician for all of the science department shops. I was then able to revive the old Natural Sciences Museum program and develop the current on-campus Science Learning Center and rejuvenate the Mobile Science Museum.

What tasks do you perform? Give examples of the variety and frequency of these tasks.

The majority of my time is spent working on developing new exhibit materials and repairing damaged exhibits or science equipment. I also spend a significant amount of time trying to get volunteers and coordinating their activities. An additional element is trying to generate outside funding for both programs. These tasks are performed on a daily basis along with setting up and supervising weekly visits of school groups to the museum. Since the Mobile Science Museum is currently undergoing renovation, it is not presently touring the local middle schools. However, we will begin touring the schools once again this coming fall.

I also recently oversaw the renovation of the Marine Biology laboratory from the ground up. We completely refurbished the fresh water and saltwater tanks, including the water...
filtration systems and pipes. I also just finished designing and building a large walk-in refrigeration storage unit for the entomology professor to keep her insect and butterfly specimens in year-round.

**What early experiences or interests influenced you to choose this career?** In the early 1950s, the television program, *Watch Mr. Wizard* had a profound influence on my early curiosity and interest in science. I also remember being fascinated by insects, watching caterpillars become butterflies, or being intrigued by trapdoor spiders. I also have fond memories of my father bringing home broken clocks, televisions, radios, etc. and giving them to me so I could try to repair them just for the experience of tinkering with them. Since there was no pressure to repair them, the experience was always positive, because I always gained experience whether the repair was successful or not. Another very important childhood curiosity is that I always had an interest in the ocean and wanted to explore the world underneath the sea.

**What advice would you offer students who seek a career in your field?** I suggest trying to get a broad base of experience. If a course in school interests you, even if it doesn't apply to your major, go ahead and take it anyway. Don't focus your efforts in only one subject of science. I feel that it is important to have general experience in many areas rather than a tremendous amount of experience in only one area. Everything in the world is tied together with common scientific explanations, and finding solutions to particular problems are often found by relating different disciplines.

**What are the current and future prospects in your field?** Hands-on science “discovery” centers and children's museums are becoming a very important part of the extended educational experience. Many communities are developing children's museums with a strong science influence. The need for this type of program will continue to grow as schools have less time for extensive involvement in teaching science. I believe informal science education will become significantly more important and influential. My goal is not to “teach” science, but to stimulate a sense of curiosity in the visitors. It is important to provide learning centers where we promote inquiry by asking, “Why” questions. I hope that programs like mine will reduce the fear of science that many children and their teachers may have.

**What are some of the most rewarding aspects of your job?** The enthusiasm of the children who come to the Science Learning Center is a great reward. Seeing their eyes light up when they “get it” is a very rewarding experience. Being able to answer the questions that arise during their visit and watching the response on their faces when they understand the answer to their question. I also very much enjoy developing new exhibits to present a science concept. I also get a great deal of satisfaction when faculty members respond positively to the exhibits.
Job Profile: Visitor Center Tour Coordinator  
Castaic, California

Name: Nicholas “Nick” Dibs

Job Title: I am a Guide and Tour Coordinator for the California Department of Water Resources which operates the state water project. I work at the Vista Del Lago Visitor Center, a water education and museum learning center. It is located above Pyramid Lake along Interstate-5 north of the town of Castaic.

Job Description: My job is to educate visitors about the California Department of Water Resources and the delivery of water from where water is abundant in the state to places like metropolitan areas where there is a high demand for water. I set up tours for school children and then guide them through the museum and facility to teach them about water resources. We also educate the public about protecting water resources, water conservation, and boating and water safety. This is one of three visitor centers in the state that is operated by the CDWR as an educational facility. It is open to the public free of charge. I also arrange tours at some of the other nearby facilities, such as power plants and pumping stations, although tours at those sites are conducted by the plant operators of each facility.

Education and qualifications: I have a degree in biology from California State University, Long Beach. I also have a teaching credential. However, this job doesn’t require a bachelor’s degree, but having a background in the natural sciences is very helpful. They do require that someone in this position has at least six months to a year of public speaking experience because we do what’s called “informal teaching.”

Personal characteristics needed: It helps to be enthusiastic and have an out-going personality. You genuinely have to have an interest in talking with people. I think that you should also be unbiased when it comes to any political or economic viewpoints related to water: uses and resources, because otherwise some controversial issues can arise. We have to serve the needs of everyone, and thus, we need to educate everyone from a balanced perspective when it comes to our water education outreach.

How did you get your job? There are two requirements for acquiring employment with a state government agency. The first step is you have to qualify by getting placed on a civil service list, which is also called an exam. This also entails an oral interview and sometimes a written test, and/or both. You also have to complete a job application. Then if you have a high enough ranking, as job openings occur, you may be called in for an interview with the supervisor and an interview panel. That is the process by which I got this job.

Prospective employees should take these exams as soon as possible to be considered when job openings occur. It is a good idea to do this in college because exams are not given that often. Then the exam list is good for about one to two years.

What tasks do you perform? Give examples of the variety and frequency of these tasks.

When the staff arrives in the morning, we have to turn on the exhibits, touch screen computers, video projectors, and generally get the place up and running for visitors. After that, I usually have some kind of paper work to complete such as writing reports. About 30 percent of my job is doing paper work. I have many phone calls to make to arrange schedules for school group tours or to order various supplies and equipment we may need.
I also spend part of my day staffing the front counter answering questions. Then of course, I conduct both formal and informal tours at the visitor center.

What early experiences or interests influenced you to choose this career? I have always been interested in science and biology. When I was a sophomore in high school I entered a solar water heating experiment in a science contest and I won. I was encouraged to get involved in that project by my teachers and mentors. As part of the prize for winning the contest I received an all expense paid trip to tour the State Water Project, from Lake Oroville to the Sacramento Delta. That science project led to my initial contact with the SWP and I became interested in a water-related career.

What advice would you offer students who seek a career in your field? I encourage high school students to be looking for what they may be interested in well before their senior year. They shouldn’t wait until they’re ready to graduate to choose a possible career. I think it is helpful to spend time in high school doing some self exploration and discover new things, and to also observe what’s going on in your communities that may be of interest to you. Doing service projects or getting involved in organizations can help them learn new interests and hobbies too.

What are the current and future prospects in your field? I think that there are a lot of good job and career prospects in water agencies and water districts statewide. This field is wide open in terms of opportunities. For instance, in this field we need trades workers, including electricians, plumbers, water plant operators, water quality monitoring technicians, accountants, engineers, chemists, environmental planners, computer, and data technicians and clerical workers.

In California we have two important water regulations, the Federal Clean Water Act and the State Safe Drinking Water Act. Because of these laws we must work very hard to protect and improve groundwater supplies. Also it is going to become increasingly important as the population of the state increases, that we become much wiser users of water. This also means that people in the water industry will have to guard against potential pollutants and protect our streams, rivers, reservoirs, aqueducts, and groundwater supplies even more. This need to protect water will also provide many more jobs for environmental monitoring of water resources.

What are some of the most rewarding aspects of your job? I would say that the rewards of my job are two fold. I get a lot of satisfaction in knowing that I can answer questions, provide information, and resources to help people understand water policies and issues better. I also enjoy working with the school groups. Hopefully in some way I’m impacting the students to learn something about water safety and also helping them to gain a good appreciation for water.
Job Profile: Water Agency Operations Manager
Palmdale, California

Name: Guy Smith

Job Title: Operations Manager

Job Description: The operations manager is responsible for overseeing the general operations at the Antelope Valley-East Kern water agency. I plan and direct the maintenance of the facilities, supervise technical and support staff personnel, do purchasing and plan and oversee the budget.

Education and qualifications: I have a background of a solid high school and community college education that included course work in biology, chemistry, and water quality and treatment training. I have a Grade 5 California Department of Health Services license in water treatment. Also, a lot of the experience I have for my job came from a strong background of on-the-job training. Currently, the job education requirement for someone going into my position would be the equivalent of a college degree with a major in civil, mechanical, or sanitary engineering. Also they would want someone with a combination of ten years of education and experience in water system operations.

Personal Characteristics: You need to be a responsible, conscientious person who isn’t afraid to trouble-shoot and take on the work that has to be done. You have to be a “go-getter” when you’re in charge of operations and you have to be able to get along with other people.

How did you get your job? I think that I just happened to be at the right place at the right time, so to speak. I was the construction inspector for this plant when it was being built back in 1977. So I applied to be the manager of plant operations when the facility and pump station opened. I consider myself to be very lucky, although I’ve worked very hard.

What tasks do you perform? Give examples of the variety and frequency of these tasks.
The tasks that I perform are the operation of four water plants and safe water availability. I deal with the chief operators at all of the plants. I start my day by consulting with them in the mornings. I communicate with the health department and I have to keep up on current and changing water regulations. Part of my job entails having to order new equipment, materials, and supplies for the maintenance upkeep on the pumping stations, pipelines, canals, and settling ponds. I also have to supervise and help train the technicians and assure the safe water quality of water before it is distributed to our customers. I write reports of operating procedures and correspond with various state and local agencies and entities.

I also attend Water Quality/Technology Conferences where I learn about various water problems and solutions. These are very helpful to go to because it helps me to know about what is going to be required of the water industry facilities. This is helpful to know before new standards and measures that are required by law. It helps to anticipate needs and plan for the future.

What early experiences or interests influenced you to choose this career? I’ve always been a mechanically inclined person and I relish the idea of keeping all the equipment running and operating efficiently. Equipment, such as metering pumps, cranes, hoists, and the filtration systems, is pretty interesting. The whole treatment process is intriguing to me.
What advice would you offer students who seek a career in your field? Take a water treatment course at a community college; that will tell you a lot about whether you will enjoy this kind of work. Then you could get a basic Class 2 license. I also recommend taking science and technical classes. Try to become a "Jack of all trades," and work with things so that you develop mechanical abilities. All of these things will help you to become more qualified to work for a water agency.

What are the current and future prospects in your field? I think that the prospects for this field are extremely good. There is a definite need for the development of more water agencies. For example, just in the Antelope Valley/East Kern water agency there has already been recent growth and we foresee tripling in the coming years. It is definitely a growing field to supply people with their increasing water needs. It is a great industry and it will always be in demand because people will always need to turn on the tap, or to irrigate fields, or to wash their clothes. We can't do anything without good, clean water.

What are the most rewarding aspects of your job? There is certainly a strong satisfaction to know that your job is important to create the delivery of clean, safe water. I know that people will be drinking this resource and it's important to safeguard it. Another aspect I like about my job is being able to work with a crew of people who are committed to that goal and who pitch in to complete a job. It's good to have that feeling of, "a job well done."
APPENDIX B
GUIDE TO ENVIRONMENTAL CAREER
EXPLORATION AND PLANNING
ACTIVITIES FOR HIGH
SCHOOL STUDENTS
GUIDE TO ENVIRONMENTAL CAREER EXPLORATION AND PLANNING
ACTIVITIES FOR HIGH SCHOOL STUDENTS

This guide has been developed especially for students considering an environmental related career. These recommendations also may be more broadly applied to investigate and plan for potential careers in other fields. Adapt the activities so they match your intended goals.

1. Begin to expand your interests and experiences in the environment at an early age. Gain relevant experience and transferable skills as early as possible while in high school.

2. Participate in a wide variety of activities, extra-curricular activities, and hobbies that help you discover your abilities and develop your skills.

3. Develop lists of “What would you like to do?” “What can you do?” and “What are possible things you would like to do in the future for a job or career?”

4. Write an autobiography or chronological history of your life. Include significant events, people you have known, and places where you have traveled. Also consider some of your important accomplishments, influential people, and things that have captivated your interest and attention. Other considerations are school, church, teachers, vacations, hobbies, sports, friendships, field trips, pets, role models, favorite books and magazines, and outdoor places where you have spent time. What has been joyful, exciting, enjoyable, and piqued your curiosity the most?

5. Identify what subjects in school and out of school which are the most interesting to you.

6. Identify what special abilities you have (i.e., artistic, creative, musical, athletic, innovation, technical or mechanical abilities, speaking, leadership).

7. Take a skills/interest survey such as those found in Eureka or Discover software programs or any other kind of assessment and aptitude test found in books like What Color is Your Parachute? Also check with your guidance counselor, career center, school or local library to locate similar resources.

8. Read environmental career related books, periodicals and newsletters. Pay careful attention to job profiles of people who hold jobs of interest to you. (Refer to the Job Profiles Section in Appendix A).

9. Find environmental career professionals who can act as mentors and informally interview them about their careers and job duties. Nature centers, water agencies, arboretums, museums, aquariums, county, state and national parks, newspapers, waste management facilities, air quality agencies, and power generating stations are places you may locate these professionals.

10. Do service projects or a senior project related to a possible future environmental career.
11. Join youth organizations such as scouting, boys and girls clubs, big brothers and big sisters, YMCA, 4-H, or conservation groups such as the Student Conservation Association.

12. Gain practical career-related work experience by volunteering, serving in an internship or apprenticeship or getting specialized training or a certification. Consider taking the initiative to approach someone to create a volunteer position even if one does not formally exist. People are often looking for the assistance provided by a knowledgeable and hardworking volunteer.

13. Use your summers and free time productively to expand your experiences, training, and skills. Environmental professionals recommend taking advantage of these opportunities to gain relevant, "hands-on" experience. They emphasize that gaining this experience is essential, even crucial for successful future employment.

14. Develop effective communication skills. Solid reading, writing, speaking, computer, and phone skills are essential for success in any job.

15. Take relevant coursework in school to gain important knowledge, and do well in your work.

16. Take science coursework in physical and life sciences, ecology, environmental biology, horticulture, or other specialized environmental classes. Any course that expands your scientific knowledge and problem solving abilities is especially useful. Local community colleges may feature courses not offered at your high school.

17. Create a resume. Remember to give yourself credit for all of the things you have done!

18. Create and organize a "Career Workbook" or file where you keep the following records: Self, Education, Career Field, College Information, Correspondence, Resume, References, Job Search Information, Sample Cover Letters.

19. Create a portfolio of your work. Include reports, essays, projects, artwork, photographs, a disk with your computer work or other things you have created that represents your best work.

20. Attend environmental related workshops, job fairs, training sessions, seminars, special events, and lectures to stay informed about current and future trends in a potential career field.

21. Network with other students and adults in your community who share your interests in the environment.

22. Visit agencies, businesses, and places in the community where you can find out new information about your career.
23. Keep working toward your dreams!
   - Set goals
   - Prioritize your goals
   - Set objectives to reach your goals including a timeline for completion
   - Be flexible
   - Be persistent

24. Plan, ask questions, and allow yourself to grow.

25. Remember that it is all right to change your mind or change your course when you are considering possible careers. Life is a process and you will "learn by doing."
APPENDIX C

GUIDE FOR TEACHERS TO
FACILITATE EXPLORATION
OF ENVIRONMENTAL CAREERS
BY STUDENTS
1. Demonstrate a sense of enthusiasm and excitement in helping students learn about different careers. It helps to get students to think about "the world outside the classroom," whether it is their communities, the local surrounding environment, or far away places.

2. Plan a field trip to a natural area for students to experience some activities and lessons outdoors. Interact with someone there who has an environmental career.

3. Create visual displays in the classroom such as bulletin boards, mobiles, or a "career center" that highlights environmental careers.

4. Create active lessons where students learn about environmental careers. Consider doing in-depth lessons about famous people whose life's work influenced the environment in a positive way. This could include skits and plays about John Muir, Rachel Carson, Jacques Cousteau, Teddy Roosevelt, Gifford Pinchot, Frederick Laws Olmstead, Marjorie Stoneman Douglas, Olaus Murie, Margaret Murie, George Perkins Marsh, Enos Mills, Sigurd Olson, Bob Marshall, Aldo Leopold, David Brower, Anna Botsford Comstock, and many others.

5. Assist students in preparing reports that describe different environmental careers. Have students make presentations to the rest of the class.

6. Assign students to interview someone who has an environmental career. It helps to do some groundwork and establish contacts ahead of this assignment. Remember that students can use e-mail or fax machines to conduct these interviews with someone who does not work nearby who cannot set a convenient time to meet in person. Have students present their interviews to the class.

7. Invite guest speakers who have an environmental job to come speak to your class or schedule an assembly where more than one class can hear the presentation. Help the students to prepare questions ahead of time. Some professional people make presentations to schools as part of their job description. Many people enjoy having the opportunity to share what they do in their job with others. If possible, arrange for the guest to demonstrate something that they do in their job. Then, enable students to do a related experiment or "hands-on" activity or make a brochure about the job.


9. Plan and organize a Science Fair and include a section highlighting the work performed in environmental careers.

10. Plan and organize a classroom Environmental Jobs Fair. Students could come dressed in costumes and make props for equipment that environmental workers use in their jobs. Students could explain and demonstrate the purpose and use of the equipment.
11. Provide general career related resources and books about environmental careers. For younger students Career World magazine or Ranger Rick are useful. Contact the Student Conservation Association. For secondary students the Occupational Outlook Handbook published by the United States Department of Labor is a good source. Local libraries should have environmental career books.

12. Plan cooperative lessons about careers with a guidance counselor or a fellow teacher.

13. Visit the school career center or if one is not available, plan a class trip to the local library and assist students to locate and use the career section. Most good libraries have extensive information in this section. This section includes guides to many careers, locating job opportunities, searching the internet, job search techniques, and tips on writing resumes and cover letters.

14. Facilitate student service-learning activities, community service, and senior projects.

15. Encourage students to write to various public and private environmental agencies and facilities. Inquire about doing volunteer work or a part-time or summer internship.

16. Develop partnerships with good mentors in the community and network with people in agencies and private businesses who can provide assistance to students in career exploration.

17. Assign students to conduct research about environmental careers on the Internet.

18. Utilize the career profiles of science or environmental related workers that are highlighted in special sections in science and social studies textbooks. Expand these into longer lessons.

19. Administer interest inventories and values assessment surveys to students through specialized computer software programs including Eureka and Discovery.

20. Spend time outdoors teaching a variety of lessons that are better taught in that setting.

21. Set up a weather station to teach a unit on meteorology. Have students monitor the equipment, check the weather forecast on the news or the Internet, and present a daily weather report to the class based on their observations and research.

22. Plan an evening pizza and star-gazing party at school for an "Astronomy Night." This could easily be set up as an activity on a back-to-school night or open house.

23. Invite a local nursery owner, farmer or other agricultural agent to describe their job and discuss growing a garden with students. Follow this up with students planning and planting a school garden.
24. Assign students to investigate and obtain literature on environmental jobs in their own community. Then, use this material to create a bulletin board. Possibilities include park workers, firefighters, hazardous materials specialists, community planners, civil engineers, sanitation workers, humane society workers, veterinarians, landscape architects, water quality specialists, air quality specialists, regulatory specialists, environmental activist, conservationist, ecologist, natural resource specialist, and environmental educators. Examples will vary in each community.

25. Show slide presentations or video programs featuring environmental careers.

26. Organize and advise an environmental science or ecology club.
APPENDIX D

GUIDE FOR PARENTS TO FACILITATE EXPLORATION OF ENVIRONMENTAL CAREERS BY CHILDREN
GUIDE FOR PARENTS TO FACILITATE EXPLORATION OF ENVIRONMENTAL CAREERS BY CHILDREN

1. Help your child to spend time outdoors at an early age and engage in activities that facilitate a sense of wonder, exploration, curiosity, imagination, play and discovery for your child.

2. Travel to new places with your child and talk about the things you have seen. Encourage a sense of discovery with topics of interest such as cities, natural areas, historical points of interest, animals, and geographic features such as lakes, beaches, and mountains.

3. Visit museums, zoos, aquariums, arboretums, botanical gardens, nature centers, and visitor centers. Interact with the people you see working there.

4. Explore outdoor, open-spaces near home where you live or simply take a walk in your neighborhood and point out natural objects. Have your child look for "evidence" of living things they may observe. (i.e., birds, squirrels, snails, lizards, rabbits, insects, butterflies).

5. Visit outdoor parks, natural areas, beaches, state and national parks, and recreation areas. Note the various jobs being performed at these places.

6. Take your child to a variety of nearby outdoor places and walk, bike ride, picnic, watch a sunset, sled, ice skate, or star gaze.

7. Spend quality time reading with your child. Choose science or environmental related stories in books and magazines such as National Geographic.

8. Encourage your child to join youth organizations such as scouting, 4-H, Future Farmers of America, or the Student Conservation Association.

9. Go hiking with binoculars and field guides and assist your child in using these tools of discovery.

10. Encourage and assist your child to plant and cultivate a garden. Take them to a local nursery or garden store and encourage them to help choose the plants and seeds to be planted and other gardening materials or equipment you will need for this project.

11. Watch quality educational television programs related to the environment or animals. The Discovery Channel, Animal Planet, The Learning Channel, National Geographic programs and Public Broadcasting television stations offer good programming.

12. Subscribe to environmental related magazines or publications for children such as Ranger Rick, or Career World by Weekly Reader.

13. Attend and participate together in activities at nature centers, science fairs, ecology festivals, and Earth Day events.
14. Go bird watching with a bird field guide and assist your child to observe the birds they see. Note the shapes, colors, and behaviors of the birds and the places and habitats in which you observe them.

15. Go on a whale-watching trip with your child. Discuss whale migration habits and look for other marine animals on the trip.

16. Help your child conduct a simple, informal interview with someone who has a job related to the environment or working with natural resources. Involve your child in the discussion.

17. Tour a waste management facility, power plant, water resource facility, fish hatchery, wind farm, solar power generating station, hydro-electric dam, or wildlife rehabilitation facility. Help your child to observe the variety of tasks performed by the workers in these places.

18. Encourage your child to attend an environmental education school or science learning center.

19. Assist your child to make a collection of natural objects including rocks, feathers, leaves, seeds, acorns, or pine cones. Help them use field guides and science books to identify these items and learn more information about them. Limit the amount of the things collected and these should only be taken when you have received permission from a private land-owner to collect on their property. Never pick wild flowers, or other organic material from any public park or other area where it is prohibited by law. It also could be harmful to the environment, so use careful consideration. An alternative to a collection is to take photographs and make photo albums or scrapbooks that the child can use in conjunction with field guides.

20. Read books about a variety of occupations and discuss them with your child.

21. Provide old equipment and materials to your child for “tinkering.” By allowing your child to take things apart and put them back together they can learn “hands-on” about how things work, such as old mechanical and electrical items. Some examples to consider are broken clocks, radios, small electric motors, etc. This is a wonderful way to get more use from something rather than throwing it away and it adds educational value.

22. Provide educational manipulatives such as puzzles, magnifying glasses, binoculars, microscopes, a chemistry set, or stereoscope that facilitate experiences of exploration and discovery for your child.

23. Provide age-level appropriate reading material at home. Include topics related to science and the environment. (i.e., books, CD ROMS, encyclopedias, and magazines).

24. Talk with your child about the jobs of people you encounter on a daily basis.

25. Visit the library regularly with your child. Walk there if possible to make observations along the way. Give your child the freedom to choose books that interest them.
APPENDIX E

RESOURCES FOR CAREER DEVELOPMENT
RESOURCES FOR CAREER DEVELOPMENT

General Career Planning Guide Books

The books in this section appear in order of preference, with those the author found most useful appearing first.

What Color Is Your Parachute?
Richard Nelson Bolles
Ten Speed Press
PO Box 7123
Berkeley, CA 94707

Exploring Careers: A Young Person's Guide to Over 300 Jobs
JIST, The Job Search People
720 North Park Avenue
Indianapolis, IN 46202-3431

Job Finding Fast
J. Michael Farr
GLENCOE DIVISION
Macmillan/McGraw-Hill
15319 Chatsworth Street
PO Box 9609
Mission Hills, CA 91346-9609

Do What You Are
Paul D. Tieger & Barbara Barron-Tieger
Little, Brown and Company
Boston, MA

Non-Profits & Education Job Finder
Daniel Lauber
Planning/Communications
River Forest, IL 60305

Career Exploration on the Internet: A Student's Guide
to more than 300 Web Sites
Elizabeth H. Oakes
Ferguson Publishing Company
200 West Madison Street, Suite 300
Chicago, IL 60606

Occupational Outlook Handbook
United States Department of Labor
VGM Career Books/NTC Contemporary Publishing Group, Inc.
Lincolnwood, IL 60712-1975
Environmental Career Planning Guide Books

Books in this section are presented in alphabetic order.

100 Jobs in the Environment
Debra Quintana
MACMILLAN
A Simon & Schuster Macmillan Company
1633 Broadway
New York, NY 10019

Careers for Animal Lovers
Russell Shorto
The Millbrook Press
Brookfield, CT

Careers For Environmental Types & Others Who Respect the Earth
Jane Kinney & Michael Fasulo
VGM Career Horizons/NTC Publishing Group
4255 West Touhy Avenue
Lincolnwood, IL 60646-1975

Careers for Nature Lovers & Other Outdoor Types
Louise Miller
VGM Career Horizons/NTC Publishing Group
4255 West Touhy Avenue
Lincolnwood, IL 60646-1975

Careers in the Environment
Michael Fasulo and Paul Walker
VGM Career Horizons/NTC Publishing Group
4255 West Touhy Avenue
Lincolnwood, IL 60646-1975

Complete Guide to Environmental Careers in the 21st Century, The
The Environmental Careers Organization
Island Press
1718 Connecticut Avenue, NW, Suite 300
Washington, DC 20009

Double Eagle Guide to Working in Western Parks and Forests, The
Thomas Preston & Elizabeth Preston
Discovery Publishing
PO Box 50545
Billings, MT 59105

Earth Work: Resource Guide to Nationwide Green Jobs
The Student Conservation Association
HarperCollins West
HarperCollins Publishers
10 East 53rd Street
New York, NY 10022
Education for the Earth: The College Guide for Careers in the Environment
Peterson's Guides, Inc.
Princeton, NJ

Environmental Career Guide: Job Opportunities with the Earth in Mind, The
Nicholas Basta
John Wiley & Sons, Inc.
New York, NY

Environmental Careers: A Practical Guide
To Opportunities in the '90s
David J. Warner
Lewis Publishers/CRC Press, Inc.
Boca Raton, FL 33431

Environmental Studies: 2000-An Overview of Undergraduate, Interdisciplinary Environmental
Programs and the Careers of their Graduates
The Environmental Careers Organization
179 South Street, Fifth Floor
Boston, MA 02111

Green at Work: Finding a Business Career That Works For the Environment
Susan Cohn
Island Press
Washington, DC 20009

Guide to Outdoor Careers
Martha Thomas
Stackpole Books
Harrisburg, PA

Opportunities in Environmental Careers
Odom Fanning
VGM Career Horizons/NTC Publishing Group
4255 West Touhy Avenue
Lincolnwood, IL 60646-1975

Peterson's Guide to Four-Year Colleges
Peterson's Guides, Inc
Princeton, NJ

Peterson's Guide to Two-Year Colleges
Peterson's Guides, Inc.
Princeton, NJ

Sunshine Jobs: Career Opportunities Working Outdoors
T. Stienstra & R. Schluter
Live Oak Publications
Boulder, CO
Career Information for Elementary and Middle School Students

Books in this section are presented in alphabetic order.

Careers in Conservation
Ida Graham and Frank Graham
Sierra Club Books
Charles Scribner's Sons
New York, NY

Career World (Periodical)
Weekly Reader Corporation
200 First Stamford Pl.
PO Box 120023
Stamford, CT
1-800-446-3355
APPENDIX F

WARNER'S CLASSIFICATION OF
ENVIRONMENTAL CAREERS
<table>
<thead>
<tr>
<th>Environmental Protection</th>
<th>Environmental Health and Safety</th>
<th>Environmental Education</th>
<th>Allied Environmental Professions</th>
<th>Natural Resource Management</th>
<th>Nondegree Technical Environmental Careers</th>
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</thead>
<tbody>
<tr>
<td>Environmental Engineer</td>
<td>Risk Assessment Specialist</td>
<td>School Teacher</td>
<td>Activist</td>
<td>Park Professional</td>
<td>Natural Resource Management Technicians</td>
</tr>
<tr>
<td>Environmental Geologist</td>
<td>Environmental Toxicologist</td>
<td>Interpretive Naturalist</td>
<td>Lobbyist</td>
<td>Recreation Professional</td>
<td>Environmental Technicians</td>
</tr>
<tr>
<td>Environmental Hydrologist</td>
<td>Risk Communication Specialist</td>
<td>Environmental Trainer</td>
<td>Environmental Lawyer</td>
<td>Wildlife Biologist</td>
<td>Engineering-Related Technicians</td>
</tr>
<tr>
<td>Regulatory Compliance Specialist</td>
<td>Sanitary Health Scientist</td>
<td>Community Activist</td>
<td>Environmental Journalist</td>
<td>Fisheries Biologist</td>
<td></td>
</tr>
<tr>
<td>Environmental Scientist</td>
<td>Environmental Health Scientist</td>
<td>Cooperative Extension Agent</td>
<td>Public Relations Specialist</td>
<td>Forager</td>
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<tr>
<td>Environmental Enforcement Specialist</td>
<td>Epidemiologist</td>
<td>Communication Arts Professional</td>
<td>Consumer Advocate</td>
<td>Resource Geologist</td>
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<tr>
<td>Air Quality Scientist</td>
<td>Emergency Response Specialist</td>
<td>Data Processing Specialist</td>
<td>Urban and Regional Planner</td>
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<tr>
<td>Environmental Policy Analyst</td>
<td>Industrial Hygienist</td>
<td>Photographer</td>
<td>Landscape Architect</td>
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<tr>
<td>Community Relations Specialist</td>
<td>Health Physicist</td>
<td>Artist</td>
<td>Remote Sensing Specialist</td>
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<tr>
<td>Laboratory Scientist</td>
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<td>Conservation Officer</td>
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<tr>
<td>Environmental Entrepreneur</td>
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<td>Ecologist</td>
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<tr>
<td>Industrial Environmental Manager</td>
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<td>Water Resources Specialist</td>
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<tr>
<td>Environmental Program Specialist</td>
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<td>Soil Scientist</td>
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<td>Entomologist</td>
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<td>Botanist</td>
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<td>Natural Resource Policy Analyst</td>
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<td>Natural Resource Program Administrator</td>
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<td>Oceanographer</td>
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<td></td>
<td></td>
<td>Geographer</td>
</tr>
</tbody>
</table>

82
APPENDIX G

SUMMARY OF RESPONSES BY

ENVIRONMENTAL
<table>
<thead>
<tr>
<th>Respondent's Professional Title</th>
<th>Summary of Respondent's Statement Describing How They Obtained their Professional Position</th>
<th>Cited Volunteer Service or Preliminary Experience for Entering Profession (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biologist / Botanist</td>
<td>Heard about it through “networking” with others in professional circles. First job as a botanist was advertised in a professional newsletter.</td>
<td>No</td>
</tr>
<tr>
<td>Coordinator of Environmental Interpretive Programs</td>
<td>Worked in seasonal positions for the state park system as a ranger while in college. Scored well on state examination.</td>
<td>Yes</td>
</tr>
<tr>
<td>Director of Animal Husbandry and Facilities</td>
<td>Initially volunteered full time at an aquarium for first job. Persistence led to gaining on-the-job experience.</td>
<td>Yes</td>
</tr>
<tr>
<td>Fish and Wildlife Assistant</td>
<td>Did volunteer work in high school at a wildlife refuge to gain experience; was persistent at applying for job and went through testing program each time it was offered.</td>
<td>Yes</td>
</tr>
<tr>
<td>Geologist</td>
<td>Worked part time as a geologic assistant in an internship program during college.</td>
<td>Yes</td>
</tr>
<tr>
<td>Graphic Designer / Botanical Illustrator</td>
<td>Gained experience as a seasonal employee with the US Forest Service and National Park Service while in college and volunteering. &quot;Networked&quot; with professors to get present position.</td>
<td>Yes</td>
</tr>
<tr>
<td>Interpretive Specialist</td>
<td>Worked seasonally with the National Park Service and the YMCA. Worked part-time for several years, leading to present position.</td>
<td>Yes</td>
</tr>
<tr>
<td>Manager of Arboretum Educational Services</td>
<td>Used a national environmental jobs-newsletter to acquire present position after obtaining several years of similar job related experience.</td>
<td>Yes</td>
</tr>
<tr>
<td>Natural Areas Supervisor / Nature Center Director</td>
<td>Worked part-time to gain job experience in the county parks that led to present job.</td>
<td>Yes</td>
</tr>
<tr>
<td>Public Affairs Specialist / Archeologist</td>
<td>Did a summer internship and fieldwork in archeology during college. A professor encouraged respondent to apply for a job.</td>
<td>Yes</td>
</tr>
<tr>
<td>Resource Associate in Botany</td>
<td>Inquired about the possibility of getting a job after finishing graduate school and “networked” with a professor at the university.</td>
<td>Yes</td>
</tr>
<tr>
<td>Resource Ecologist</td>
<td>Worked as a student assistant at a fishing reservoir and at the San Diego Zoo in original jobs. Accumulated many years of experience working as a park ranger.</td>
<td>Yes</td>
</tr>
<tr>
<td>Science Learning Center Director</td>
<td>Started by volunteering in a marine biology related shark research project as an undergraduate. Then served as a research associate while a graduate student.</td>
<td>Yes</td>
</tr>
<tr>
<td>Visitor Center Tour Coordinator</td>
<td>Scored well on civil service examination and oral interviews.</td>
<td>No</td>
</tr>
<tr>
<td>Water Agency Operations Manager</td>
<td>Gained skill as a construction inspector; it was noticed and he was encouraged to apply for the job.</td>
<td>Yes</td>
</tr>
</tbody>
</table>
APPENDIX H

SUMMARY OF RESPONDENT’S RECOMMENDATIONS TO STUDENTS SEEKING A CAREER IN AN ENVIRONMENTAL FIELD
<table>
<thead>
<tr>
<th>Respondent's Professional Title</th>
<th>Summary of Respondent's Recommendations to Students</th>
<th>Recommended Volunteer Service (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biologist/Botanist</td>
<td>Highly recommend doing volunteer work to gain knowledge and expertise. Network with people who have similar interests.</td>
<td>Yes</td>
</tr>
<tr>
<td>Coordinator of Environmental Interpretation Programs</td>
<td>Try to obtain any park-related work. It is very worthwhile to volunteer to get direct experience.</td>
<td>Yes</td>
</tr>
<tr>
<td>Director of Animal Husbandry and Facilities</td>
<td>Be prepared to volunteer or serve in an internship. This will help you to see if it is the type of work you would like to do.</td>
<td>Yes</td>
</tr>
<tr>
<td>Fish and Wildlife Assistant</td>
<td>Start volunteering or working part-time. It’s a good way to decide if you like the setting and the work involved.</td>
<td>Yes</td>
</tr>
<tr>
<td>Geologist</td>
<td>Learn cartography, including mapping and Geographic Information Systems (GIS).</td>
<td>No</td>
</tr>
<tr>
<td>Graphic Designer/Botanical Illustrator</td>
<td>Learn as much about science as you can to gain the perspective and knowledge of a scientist. Also keep up with the latest technology.</td>
<td>No</td>
</tr>
<tr>
<td>Interpretive Specialist</td>
<td>Gain diverse life experiences. Seek out work that appeals to you. Do something that piques your interest.</td>
<td>No</td>
</tr>
<tr>
<td>Manager of Arboretum Educational Services</td>
<td>Pursue a degree in environmental sciences or a related field. Take advantage of volunteer opportunities and get special training.</td>
<td>Yes</td>
</tr>
<tr>
<td>Natural Areas Supervisor/Nature Center Director</td>
<td>Volunteering is highly recommended. It shows dedication and interest and provides practical hands-on experience.</td>
<td>Yes</td>
</tr>
<tr>
<td>Public Affairs Specialist/Archeologist</td>
<td>Be willing to volunteer to get valuable hands-on experience and background knowledge.</td>
<td>Yes</td>
</tr>
<tr>
<td>Resource Associate in Botany</td>
<td>Talk with a teacher or professor who is in your field of interest. Network with people to see if they need help with a project. Be willing to volunteer to learn whether the work is something you would enjoy.</td>
<td>Yes</td>
</tr>
<tr>
<td>Resource Ecologist</td>
<td>Join a volunteer organization doing similar work. Do service projects.</td>
<td>Yes</td>
</tr>
<tr>
<td>Science Learning Center Director</td>
<td>Get a broad base of experience in many areas rather than a tremendous amount in only one area. Take a course that interests you even if it's not in your major.</td>
<td>No</td>
</tr>
<tr>
<td>Visitor Center Tour Coordinator</td>
<td>Self-exploration in high school is helpful. Also, observe interesting things in your community. Doing service projects or getting involved in organizations helps you learn new interests and hobbies.</td>
<td>Yes</td>
</tr>
<tr>
<td>Water Agency Operations Manager</td>
<td>Take science and technical classes and specific classes such as a water treatment course that may tell you whether you would like this kind of work.</td>
<td>No</td>
</tr>
</tbody>
</table>
REFERENCES


