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Exploring Occupations in the Natural Resources

A Student Resource Guide for the Middle School

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Developed and disseminated pursuant to a grant
from the U.S. Office of Education
under Part I – Curriculum Development in Vocational and Technical Education,
Vocational Education Amendments of 1968, Public Law 90-576
by
Department of Agricultural Education
The Pennsylvania State University
University Park, Pennsylvania
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FOREWORD

Career education is a comprehensive, systematic, and cohesive plan of instruction that provides each student the opportunity to plan and prepare for a meaningful and satisfying role as a working member of society. Occupational clusters, representative of the entire world of work and around which a career education system can be designed, were identified by the U.S. Office of Education. The 15 occupational clusters are:

business and office	environmental control
marketing and distribution	public services
communications and media	health
construction	hospitality and recreation
manufacturing	personal service
transportation	fine arts and humanities
agribusiness and natural resources	marine science
consumer and homemaking-related	

This suggested guide is one of four publications developed by the Department of Agricultural Education, College of Agriculture, The Pennsylvania State University, as a result of a project entitled, "Career Education in the Natural Resources." The project was funded under a grant from the Division of Vocational and Technical Education, Office of Education, U.S. Department of Health, Education, and Welfare.

This project grew out of a need for materials offering strategies for implementing career development programs in the field of natural resources, a part of one occupational cluster area. Although there was an abundance of information concerning vocational development theories, there was an apparent shortage of materials offering strategies for implementing these theories into operational programs. This void was causing considerable frustration to practitioners who were attempting to design and implement plans for career education.

The purposes of the overall project were: (1) to develop appropriate curriculum guides in the natural resources suggesting a sequentially-developed education program offering career awareness, career exploration, and job preparation, (2) to acquaint educational leadership in all states with the curriculum materials resulting from this project and promote their use, and (3) to disseminate in the states, copies of the curriculum materials produced in the project.

Regional Workshops were held during May and June, 1973 in nine of the Regional Offices of the U.S. Office of Education in the following cities: Boston, Philadelphia, Atlanta, Chicago, Dallas, Kansas City, Denver, San Francisco, and Seattle. These meetings were attended by more than 300 classroom teachers, guidance counselors, school administrators, teacher educators, and state education department personnel, who were acquainted with the outcomes of the project, reviewed the guide, and were instructed in its effective use and implementation in a local program. Participants made recommendations for improving the guide and for the purpose of meeting the wide variations in needs and practices across the country. These recommendations are reflected in this final document.

The student in middle school/junior high school should find this period in his education an opportunity to analyze his abilities and interests, and attempt to fit them with one or more career choices (Figure 1). To do these things, an individual needs to do some exploring of occupations. The student should acquire decision-making skills and develop constructive work attitudes. Lastly, a course of action and study needs to be planned that will equip the individual to enter a first position in a chosen career. Career exploration should result in a spiral of ever-increasing understanding of work and of the self in relationship to work. Activities suggested in this natural resources occupational exploration guide were developed to offer a means of learning from experience as well as in the classroom.

Other curriculum materials resulting from this project are:

Natural Resources and Career Awareness
A Teacher's Guide for Grades K-6

Occupational Preparation in the Natural Resources
A Suggested High School Curriculum Guide

Natural Resources Technologies
A Suggested Post High School Program Development Guide

Dr. David R. McClay
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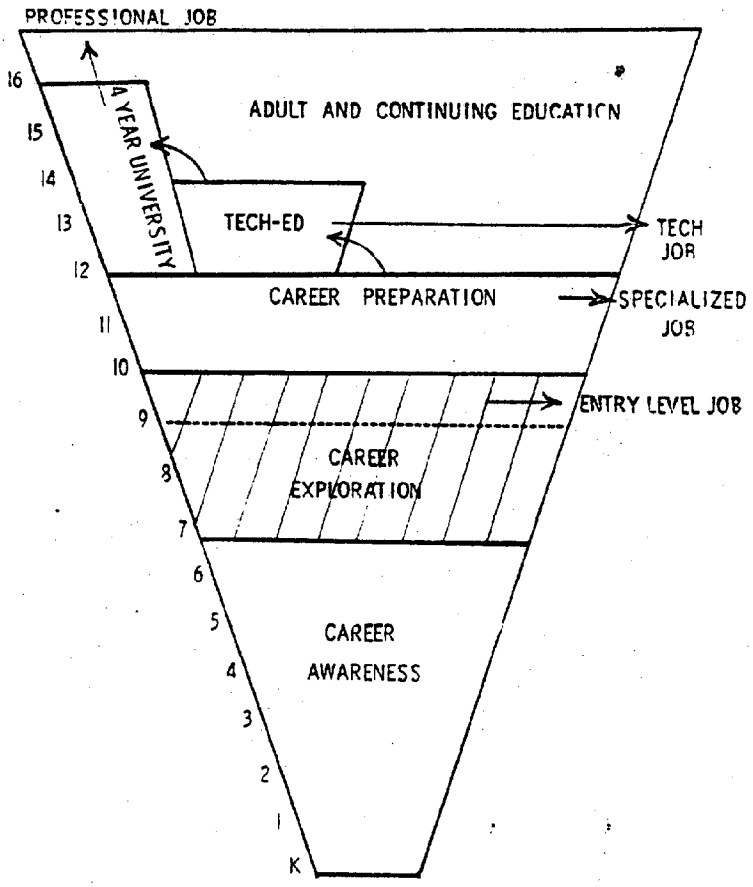

Figure 1. Career Education. From U.S. Department of Health, Education, and Welfare, Office of Education. Career Education. A Model For Implementation, Draft April 1971.

ACKNOWLEDGEMENTS

This resource guide was prepared by James H. Mortensen, Instructor in Agricultural Education and Edward J. Brown and A. Ronald Attarian, Graduate Assistants in Agricultural Education, The Pennsylvania State University, with assistance from the faculty of The Pennsylvania State University's Department of Agricultural Education. Illustrations and sketches were prepared by James P. Campbell. The Project Advisory Committee is extended the sincere appreciation of the authors. Appreciation is also extended to William Berndt, Project Officer, and H. Neville Hunsicker, Education Program Specialist, Agribusiness and Natural Resources Occupations, U.S. Office of Education, Bureau of Adult, Vocational and Technical Education, for their direction during the preparation of this guide.

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USE OF THIS GUIDE

This student resource guide is designed for both individual and group use in a variety of settings including middle schools, junior high schools, vocational schools, youth opportunity centers, and private and public placement and counseling agencies.

This guide suggests a continuum of experiences planned for the individual student which takes him from where he is and moves him progressively toward the goal of vocational maturity by mustering all the resources and persons available.

This guide can serve as the nucleus for group instruction in career development. Career exploration guided by the classroom teacher, normally concentrates on the needs and interests of the group. This has the advantage of allowing counselors to work with students after they have had group instruction. A merger of the group experiences with the process techniques of counseling offers an excellent strategy for improving the student's self-understanding. It cannot be assumed that students will personalize such experiences automatically and thereby understand themselves better in terms of the world of work. Guidance and vocational development education must be merged if the student is to realize the full value of such experiences. A team approach involving the counselor, teachers (particularly vocational teachers), and the work experience coordinator, offers great potential for enhancing the career development of students.

For the purposes of this guide, natural resources are all of those naturally occurring materials of nature having human utility. The term natural resources includes, in all their forms, soil, water, air, plant life, non-human animal life, sunlight, minerals and mineral fuels, and space on land and ocean surfaces. Occupations primarily concerned with the development, maintenance, protection, and regulation of the natural resources were identified and grouped into ten areas. The ten major natural resources occupational areas considered in this guide are: air, fish, forestry, land use planning, minerals and mineral fuels, range, recreation, soil, water and wildlife. Application of the material in this guide should be appropriate to the career opportunities in the part of the country where it is being used. Employment agencies, guidance counselors, and vocational technical instructors may be of assistance in determining natural resources occupations in the area.

Information and activities in Section A, Chapters I, II, and III, are designed to help students develop knowledge of their personal strengths and weaknesses and be able to understand the relationship of these characteristics to educational and vocational choices. Each time students experience a work role, they should be encouraged to share with other students:

1. Their observation of job performance and job conditions.
2. Their personal feelings while performing or observing the work.
3. The personal needs they feel would be met or thwarted by such work.
4. The aptitude the students feel they might have for such work.
5. How they think one goes about preparing for such work.

This approach will result in increased understanding of work and of the self in relationship to work.

Section B of this publication consists of brief descriptions of selected natural resources occupations. The usual duties, characteristics of the job, qualifications, employment prospects, and advancement opportunities are described. Occupational briefs are helpful to individual students, teachers and counselors in working with groups of students, and parents as they become involved in assisting their children with occupational choices.

The appendices suggest related printed and audiovisual resource materials and aid in identifying community resources and other occupational information.

A student, in pursuing his long range career development goals – or those who assist him, such as counselors, teachers, parents – will find this publication to be a systematically organized guide, which provides an overview of occupational requirements and opportunities in the natural resources, and the relationships of persons to these careers, through exploratory experiences and observations.

Chapter I

PLANNING A CAREER

Suggested Student Performance Objectives

After completing Chapter I, you can:

1. Identify and describe five reasons why people work.
2. List and describe briefly at least two ways in which your occupation will affect your family and life style off the job.
3. Recognize major decisions relating to your occupational goal which you will be making before completing your formal education.
4. Identify, locate, and describe all career guidance services in your school.
5. Locate the *Dictionary of Occupational Titles*, the *Occupational Outlook Handbook*, and the *Job Guide for Young Workers* in the library, and describe briefly the contents of each.
6. Identify, locate, and describe three sources of occupational information in your community.
7. Recognize differences between several broad occupational areas in terms of (a) satisfaction each might offer you, (b) the type of duties performed, (c) qualifications for employment, and (d) opportunities for advancement.
8. List your special skills, talents, interests, and physical abilities for doing work and select some occupations which provide outlets for them.

WHY STUDY OCCUPATIONS?

Choosing a field of work will be one of the most important decisions you will make in your lifetime. You may have asked yourself often, "How can I decide on a field of work when there are so many jobs from which to choose?" In the United States more than 30,000 distinct jobs have been identified. Deciding on one field of work or even several tentative choices is a task that will require much thought and investigation.

This publication has been written for you, the student, to familiarize you with careers in natural resources. A natural resource is anything in nature that we have available for our use. Natural resources include air, water, soil, forests, grasslands, minerals, wildlife, fish, and space on land surfaces. This section will help you to become aware of the reasons why people work. You will have a better understanding of the importance of careful career selection. You will have a better idea of what courses to take in high school to prepare yourself for a chosen field. You will become familiar with what type of school will be useful to you in furthering your education in the future. After evaluating your interests, you will be able to determine whether you should seek employment or seek further education.

WHY DO PEOPLE WORK?

There are many reasons why people work. People work to make money. You must be able to make money to buy enough food, clothing, and shelter in order for you and your family to live comfortably. You also will want enough money to buy some luxuries for your pleasure (boats, vacations, hobbies, etc.). People look for security in their occupations. A person needs to know that tomorrow there is work for him to do and money for him to earn. Each person wants stability in his life so that he can make realistic and effective plans for the future. Your work can provide you with security.

People work for personal satisfaction. You would find life very boring if you had nothing worthwhile and interesting to do. People need to accomplish things in order to be content.

There is a so-called activity drive in people. This means that man cannot just sit around and do nothing. He must keep his mind and body occupied. Interesting work solves this problem.

People work in order to meet goals that they have set. Reaching a goal is part of life. For example, a man may set a goal of becoming president of a company. He may work most of his life to reach this goal. If and when he reaches it, he may then set another goal. This goes on throughout life.

People basically like to be with other people. Each person seeks companionship with persons who have interests similar to his own. Working is a way of associating with people who have similar interests. Being part of a group gives you a feeling of belonging. Your work can provide companionship and associations with other persons.

Service is described as the things a person does that are beneficial or useful to others. Most people like to create new products, make quality products, provide useful services, and in general make a contribution to their community and country. Man likes to feel that the work he does is important and is of value to others. Your work can be of service to others.

Finally, people also work because they want to be recognized by others. Nearly everybody seeks status. They are constantly trying to improve their achievements.

IMPORTANCE OF CHOOSING A CAREER

The average person will work some 2,000 hours a year and 80,000 hours in his lifetime. Does this seem like a long time to you? I am sure you will agree that it is a very long time. This means that the average person will work from the time he is 20 years old until he is 60 for an average of 40 hours a week for 50 weeks a year. If you are to spend the greater part of your adult .ife working, then it is important that you become familiar with broad fields of work and occupations in order to make a careful choice of the kind of work you wish to do during your lifetime.

Every decision that you make in life will help to shape your future. That is why you must be very careful in making decisions. You should become familiar with jobs in your area of interest and then decide what interests you most. People who enjoy the work that they do are most likely to be successful in it. Before you can make major decisions, you must set goals (such as what kind of job you would like).

You must be physically, intellectually, and emotionally compatible with the job of your choice. It is important for you to study occupations as much as possible. You should know all about an occupation before deciding to choose it. For example, some jobs are temporary or seasonal; the employee may have difficulty in keeping a job. Government jobs may be more stable and dependable but may pay lower salaries than similar jobs in business and industry.

You must be able to perform your work satisfactorily in order to be a good worker. You should choose an occupation that will utilize your strengths and minimize your weaknesses. This will guide you to success.

A lot of your life will be spent on the job. You should enjoy your work. By choosing the right occupation, you will find much more happiness in life.

DECISIONS YOU WILL HAVE TO MAKE

Your future plans will determine what courses you may need to take in high school. For instance, if you are planning to enter a vocational field following high school, you should take practical vocational courses. If you are planning to enter a college, you must be certain that you take the appropriate academic courses including mathematics, science, and English for admission to college.

Following high school graduation, you may begin working and enroll for courses to further your education. Vocational-technical schools, 2-year community colleges, and 4-year colleges have excellent part-time and full-time programs that you may want to take either before getting a job, or while working. Many people take one or two courses at a time, at night or on weekends.

Another consideration is the United States Armed Forces. You may further your education while in the service. In addition to a salary, military training, and an education, you often are able to travel to many parts of the world. Often the training and experience you receive will be valuable asssets when you look for a job after serving your country.

Things to Think About

1. The personal satisfaction a particular job can offer you.
2. The future of a particular job. Will it exist as long as you?
3. The physical requirements of an occupation. Manual labor may become too difficult as you get older.
4. The geographical location of your work.
5. The working environment (indoor, outdoor; rural, suburban, urban).
6. The income you will need.
7. The education you will need.
8. The cost of financing your education.
9. Plans for marriage.
10. Military service obligations.

SUGGESTED LEARNING ACTIVITIES

1. Ask your parents to give at least five reasons why they work.
2. Ask your parents or other workers how many hours they work in one day and how many days a week they work. From this information, figure out how many hours they work in a year and how many hours they will work in their lifetime if they work for 40 years.

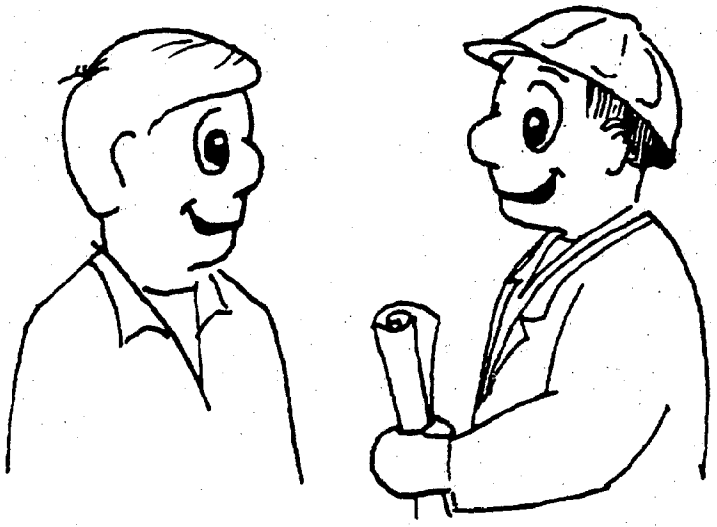
3. List some of the ways in which a person's occupation affects his family and his life off the job.
4. List reasons why choosing an occupation is important.

WHERE TO GET OCCUPATIONAL INFORMATION

In this section, we will discuss the numerous sources of information you may use to help broaden your background in careers in the natural resources. For example, you may visit workers in a job area in which you are interested. These workers may be helpful in giving you a good idea of what the job is like. Your parents, counselors, teachers, and your principal can give you occupational information. Employment offices, trade associations, union officials, and business and industry personnel can give you occupational information. The civil service commission offices may give you information. There are good publications available that you may read. These will help you learn all about the various jobs.

SOURCES OF INFORMATION IN THE SCHOOL AND COMMUNITY

As your interests turn to some definite job areas, you may wish to go to the workers and ask them questions. After all, who knows more about a job than the man doing the work? From these people, you can get very definite ideas of just what the job is all about. The Chamber of Commerce may be able to help you locate sources of information on jobs in your home town.



Your county agricultural agent, 4-H agent, and home economist have sources of agricultural and natural resources occupational information. Their materials may be helpful in career planning. If they do not have the information that you want on a certain job, they should be able to help you find it.

You should discuss your ideas with your guidance counselor. Your counselor has special training as well as many sources of occupational information which will be useful to you in planning a career. He may be able to find films or film strips that explain certain careers of interest to you.

Talk with your teachers. You may find that one or more of your teachers has some background in the area of your interest. They may be able to help you locate more information. Vocational teachers can be especially helpful. They may be able to assist you in locating occupational information or in helping you appraise yourself.

Your parents and other members of your family know what kind of person you are and what sort of job might suit you best. They will be able to tell you if a certain job may be a good choice.

Civil service commission offices may be able to supply you with information on job descriptions and openings. You can get federal announcements of job openings from your post office. State civil service commission announcements may be obtained from state employment offices. Some cities, boroughs, and townships issue announcements of job openings for their particular area. You can check on this at the city hall, municipal building, or township office.

The Bureau of Employment Security is the local office of the U.S. Department of Labor. It is often called the employment office or state employment service. The state employment service is organized to give assistance to job seekers. They provide testing, counseling, job placement, labor market information, and other services related to employment. The state employment service is an excellent source of occupational information on all types of occupations.

There are many private employment offices as well as state employment services. These offices have information about jobs, especially for your home town.

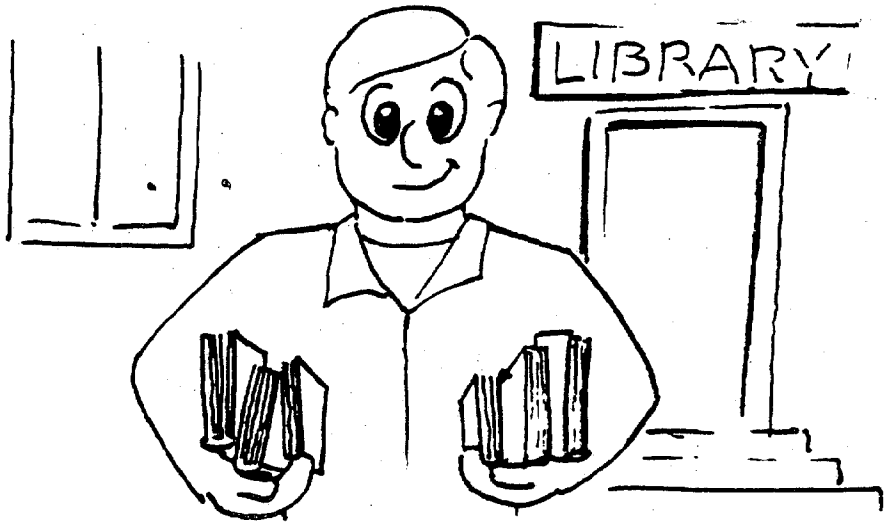
You may be able to get help from trade associations and unions about specific jobs. Check on contracts, membership, and other aspects of union organizations.

REFERENCE MATERIALS

There are many publications available that can give you detailed information on careers. Guidance counselors and libraries should be able to supply you with some of these guides.

The *Occupational Outlook Handbook* is published by the U.S. Bureau of Labor Statistics. Another helpful guide is the *Job Guide for Young Workers*, published by the U.S. Employment Service. The *Dictionary of Occupational Titles* (D.O.T.) contains descriptions of nearly all jobs that exist. This book will give you a general idea of what a job is about, as well as titles of related jobs.

Read trade, technical, and professional journals from the library. These journals often list jobs and potential openings.



As you see, there are many sources of information you may use to help you make decisions about your career. Find out as much as possible about a job that interests you. Discuss your ideas with workers, your family, counselors, teachers, employment service personnel, and union and trade officials. Read journals and civil service announcements. Read publications that will give you more information on careers.

The sources of occupational information just discussed are some of the major aids in career planning. If you have any unanswered questions after you have studied an occupation on your own, it would be wise to seek assistance or additional information from one or more of these sources. Get as much information about the occupation as possible before you make a decision, and use every source of reliable information.

SUGGESTED LEARNING ACTIVITIES

1. Visit your school's career resource center and become familiar with its contents.
2. Visit the school guidance counselor and determine what services are offered to assist you in career planning.
3. Interview a representative of the local office of the state employment service and determine what services are available to you.
4. Locate the *Dictionary of Occupational Titles*, the *Occupational Outlook Handbook*, and the *Job Guide for Young Workers* in the school library and read about natural resource occupations in each.

HOW TO CHOOSE AN OCCUPATION

This section will explain some of the things you should know about an occupation, things you should know about yourself, and how you can select occupations which will offer potential satisfaction to you. You should become familiar with employment prospects and the nature of the work, including usual duties and characteristics of the job. You should know what qualifications are required for a particular job and what opportunities for advancement exist in the future. You should appraise your abilities, talents, previous experience, interests, and other characteristics and should explore occupational outlets for each.

THINGS TO KNOW ABOUT AN OCCUPATION

As you study the various jobs, many questions will have to be considered. Consider the employment prospects. In other words, what are your chances of being hired? Are businesses in your general area hiring people? Would you consider moving to a different place in order to find employment?

Consider the nature of the work. What are the duties required of an employee on the job? Does the job require technical training or a college degree? Does it require much outdoor physical work or is most of the work done indoors? Keep in mind that some jobs are seasonal, some jobs require more than a 40-hour work week, and most jobs require the ability to work well with people.

Consider your qualifications and whether they may be applied to the job of your choice. Are you taking the right courses to qualify for the job? Is a high school diploma enough or do you need work experience and/or a degree from a 2-year or 4-year college?

Consider whether you are physically able to handle the job.

What advancement opportunities exist for you after a year or more of satisfactory work performance? In many instances, you may move to a position of greater responsibility after you demonstrate your capabilities.

EVALUATING YOURSELF IN RELATIONSHIP TO AN OCCUPATION

You should know something about yourself. What kind of person are you? Be familiar with your abilities and talents. It would be foolish to choose a job which would not suit you.

Consider your physical abilities. Will you be able to perform the required duties? Some jobs require a lot of manual labor. In some instances, work must be performed outdoors in all weather conditions.

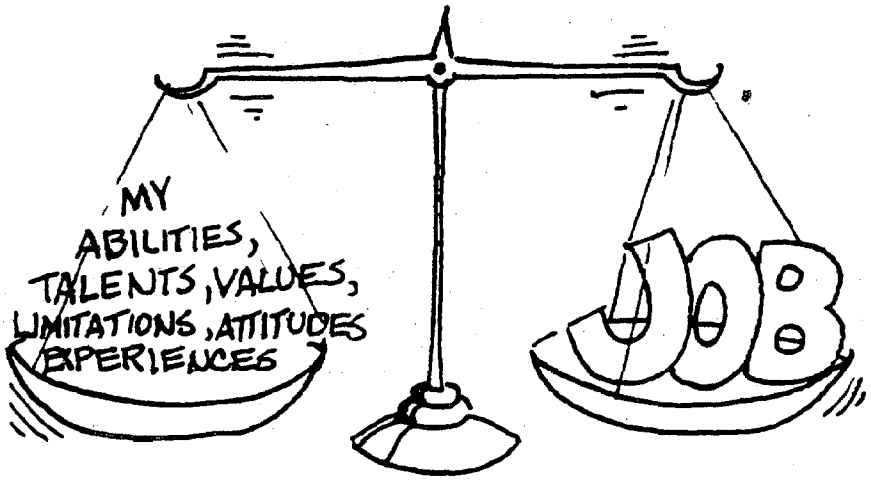
What experience have you had which may contribute to your selection of a job? Courses taken in high school may provide experiences. You may learn a lot about an occupation from part-time and summer jobs. On-the-job work experience may be an important factor when you are being considered for a job.

Think about your personal interests. In which subjects do you perform best? Your recreational interests may indicate a career area for you to consider. Let your interests guide you in selecting a career best suited to you.

If you have difficulty in determining areas of occupational interest, discuss this matter with your school guidance counselor. He has tests, or surveys, which may help you in finding your areas of interest.

What are your attitudes and values? How do you feel about things? What do you like and what do you dislike? Consider what things are important to you and what things are unimportant to you. For example, if you have a deep love for the outdoors and living things, you may like a job in wildlife or forestry. You might not be happy working in an air-conditioned office.

Find out how others see you. Ask people what kind of job they think you would enjoy. They may know more than you think. Many times others may notice things about you which you did not know.



SUMMARY

Choosing an occupation takes time. You must think about many things as you try to decide what you would like to do. You may want to take special courses to help qualify for a particular area, or you may consider work experience to gain more knowledge about a job.

Things to Think About

1. What are my abilities?
2. What special talents do I possess?
3. What are my special interests?
4. What are my physical abilities and limitations?
5. What are my attitudes and values?
6. How do I see myself, or what is my self-concept?
7. What are my previous experiences?
8. What are my educational plans for the future?
9. Am I the kind of person who works well in a large group, or do I work better with only one or two people?
10. Am I willing to accept change?

If you give serious thought to these questions, your self-appraisal should give you a clearer picture of your interests and abilities, and you should be able to start thinking of one or more occupations that will fit you as an individual. If the occupations which interest you have requirements that you do not possess, can you acquire them? How? How long will it take?

SUGGESTED LEARNING ACTIVITIES

1. Make a list of the jobs and other activities you like to do. Then make a list of the jobs and other activities you don't like to do and compare your likes and dislikes.
   Make a list of special skills and talents that you possess. Also make a list of skills and subjects in which you are weak.
3. Appraise your physical abilities in relationship to doing work. Consider your physical strength, eyesight, stamina, height, weight, coordination, hearing, speech, and emotional stability.

4. Identify two or more occupations in the natural resources which interest you.
   a. Appraise the nature of the work, physical requirements, qualifications, and advancement opportunities.
   b. Determine whether your special skills, talents, and physical makeup are compatible with these jobs.
   c. Determine what satisfaction each occupation might offer you.

Chapter II

EXPLORING OCCUPATIONS IN THE NATURAL RESOURCES

SUGGESTED STUDENT PERFORMANCE OBJECTIVES

After completing Chapter II, you can:

1. Identify eight of the ten natural resources areas of employment and describe briefly two occupations within each area.
2. List at least six employers of natural resources workers.
3. Demonstrate an understanding of the different levels of employment by describing the typical responsibilities and educational requirements for each level.
4. Identify three natural resources occupational areas that you like most and three areas that you like least.
5. Compare the differences between two or more natural resources occupational areas in terms of:
   a. the personal satisfaction each offers you
   b. the kind of work performed
   c. the employment outlook

OCCUPATIONAL OPPORTUNITIES

Many job opportunities exist in the natural resources. You, the student, should become familiar with the outlook for jobs in the future. You should know the special abilities required of workers in the natural resources. What are the employment opportunities in the development, regulation, protection, and maintenance of natural resources?

OUTLOOK FOR JOBS IN THE NATURAL RESOURCES

Demands for natural resources are growing at a rapid rate. Timber and water needs are increasing rapidly. There is an increasing demand for facilities to satisfy outdoor recreation needs. This means that increased career opportunities will develop for properly trained individuals. The demand for skilled workers and technicians to assist the professional worker is expected to increase most rapidly.

Federal, state, and local government agencies are developing programs for environmental improvement and the wise use of natural resources. Large numbers of aides, technicians, and scientists are employed by federal agencies. Some of the agencies are: U.S. Environmental Protection Agency (EPA); Public Health Service in the U.S. Department of Health, Education, and Welfare; U.S. Department of Housing and Urban Development; Army Corps of Engineers in the U.S. Department of Defense; National Marine Fisheries and National Oceanic and Atmospheric Administration in the U.S. Department of Commerce; Forest Service, Soil Conservation Service, and Extension Service in the U.S. Department of Agriculture; Fish and Wildlife Service, National Park Service, Bureau of Land Management, Bureau of Indian Affairs, Bureau of Outdoor Recreation, and Bureau of Sport Fisheries and Wildlife in the U.S. Department of the Interior; and the Tennessee Valley Authority (TVA).

State agencies which may employ natural resources personnel include: Department of Environmental Protection; Department of Natural Resources; Department of Environmental Resources; Department of Fish and Game; Department of Parks and Recreation; Department of Health; Department of Agriculture; and the Department of Urban Development. Not all of these agencies will be found in every state.

Employment opportunities also exist with many county or municipal governments because of increasing pollution problems, greater demands for water, and the need for more outdoor recreation areas.

Private industries also are responding to the public's demand for environmental improvement. Employment in this area should increase in the future.

SPECIAL ABILITIES REQUIRED OF WORKERS IN THE NATURAL RESOURCES

The natural resource workers must have special abilities to qualify for employment. Workers should have an appreciation of the natural resources and understand the need for conservation practices. They should have good knowledge in their specialized area. Previous work experience is very beneficial.

The natural resource workers must be able to work well with people. They must be able to take orders, give orders, accept responsibility, and work harmoniously with fellow workers. Many natural resource jobs involve working with the general public. The workers must be courteous, helpful, and friendly at all times.

The workers must be able to apply what they have learned to their work. Often, a good mathematics background is needed. They must be able to use materials, procedures, and equipment effectively. Workers must be able to plan, organize, and carry out assignments, and to present the results of their work.

OCCUPATIONAL LEVELS

Occupations are often categorized as skilled, technical, and professional. Skilled and technical workers are the men who do work under supervision. For example, a technician may work with instruments in a laboratory. He may work outdoors with other people and possibly with sampling soil, air, plants, and animals. The professional man has had more work experience and usually more education. Much of his work includes the supervision of several to many skilled and technical workers. He also spends a lot of time making decisions and solving problems.

In the following sections, you will have the opportunity to explore some occupations in the natural resources. By doing the activities which are suggested, you will become better acquainted with the natural resources. You will also get to know some workers and the kinds of work they do.

AIR

BACKGROUND

Air is the mixture of gases which makes up the earth's atmosphere. Air is composed of 78 percent nitrogen, 21 percent oxygen, and 1 percent other gases, water vapor, and particulate matter. The oxygen of the air is necessary for normal breathing by plants and animals. Nitrogen is an important component of amino acids which comprise all proteins. Much of our nitrogen is found in the air.

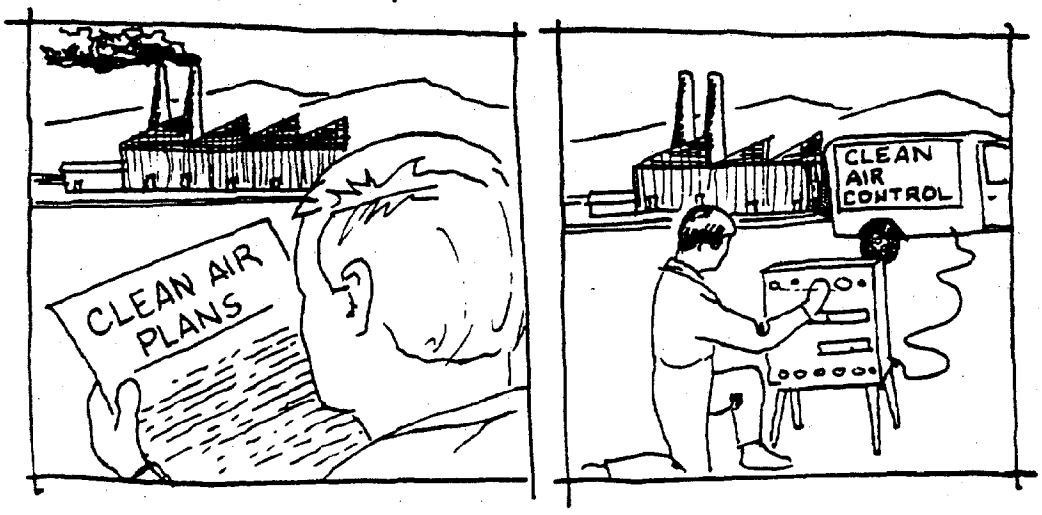
In your lifetime, air has become an important natural resource. Early conservation activities were built around use of land, water, and wildlife. People were concerned with the maintenance of our natural resources, but few considered the effects of pollution as a major concern. Conservationists were more concerned with the availability of oil or coal than they were with the pollution of the air caused by their use. Air pollution is a difficult concept to grasp because many harmful gases cannot be seen or smelled, yet the dangers are present.

Other factors have tended to submerge the importance of clean air. Not only are the dangers of air pollution difficult to envision, but they seldom affect one directly. Lung cancer, emphysema, and bronchitis develop over long periods of time. Urban, technological societies are subject to greater pollution danger than rural, agricultural cultures. Yet the world trend is to urbanize and industrialize. Man, through technology, has created a world of pollution. Can man create a world free of pollution?

It is a problem faced by all nations. Probably the issue is more serious in the United States than in any other part of the world. Thus, you will be able to explore the situation right in your own community.

OCCUPATIONS

There are many occupations in the natural resources area of air. Workers in this area monitor, control, and study air pollution and its causes. They work with industries and government to lower the levels of pollutants being discharged into the air.



Listed below are some of the job titles for the natural resources area–air. Descriptions of these occupations can be found in Section B of this guide.

Skilled and Technical Positions
- Air Pollution Control Aide
- Air Pollution Control Technician

Professional Position
- Air Pollution Control Supervisor

SUGGESTED LEARNING ACTIVITIES

The following activities are suggested to help you understand better the natural resource of air and to acquaint you with air pollution control work.

1. Select at least two of the air pollution control occupations in Section B of this guide and study the occupational briefs. Write a summary of the usual duties, characteristics of the job, qualifications, employment prospects, and advancement opportunities for each job title. Then put these summaries in a folder.
2. Visit a weather station. Find out what basic weather information is measured and recorded.
3. Build and put to use a homemade weather station. It is not difficult to construct some simple yet effective equipment. Directions are found in most general science books.
4. Keep a record of weather conditions. Keep a data sheet and write your observations close to the same time each day. From a study of barometric changes, clouds, and wind direction, see if you can make a weather prediction.
5. Visit an air-sampling station. Observe the types of sampling devices and meteorological equipment present.
6. Test for air pollutants. Obtain and weigh a piece of filter paper. Secure the filter paper over the opening of a vacuum hose which draws in volumes of air. Draw air through the filter paper for five minutes. Weigh the filter paper again. Note any increase in weight or change in color of the paper. Use a magnifying glass to note the different sizes, colors, and shapes of particles collected on the filter paper.
7. Repeat Activity 6 in different types of weather. Compare the cleanliness of the air during clear weather and shortly after a rain or snow.
8. Repeat Activity 6, but this time place a filter over the tail pipe of a motor vehicle, while the motor is running.
9. Compare plants growing near a dusty road with plants of the same species growing farther away from the road. Observe differences in height, vigor, and color of these plants.
10. Examine maps of several community or regional air-sampling networks. Investigate the reasoning behind the selection of the sampling sites.
11. After you have completed several of the suggested activities, discuss the following questions:
    a. When on field trips, what did you see air pollution control workers doing? What were their job conditions?
    b. How did you feel about yourself while you were doing the suggested learning activities and while you were observing air pollution control workers?
    c. What personal needs do you feel you could meet by doing this kind of work?
    d. What abilities do you feel you have for doing these kinds of activities?

FISH

BACKGROUND

Fish and fish products hold a place of great importance in the world markets. Man has included fish in his diet at least as long as recorded history. It is still one of the main sources of protein for some people of the world.

Because of population growth, there have been more demands for our fish resources. These demands have put many fishing grounds in danger. Efforts are being made to limit the amount of fishing so that there will be enough fish for all. A secondary problem which accompanies population growth is the pollution from population centers which is compounding an already serious environmental situation.

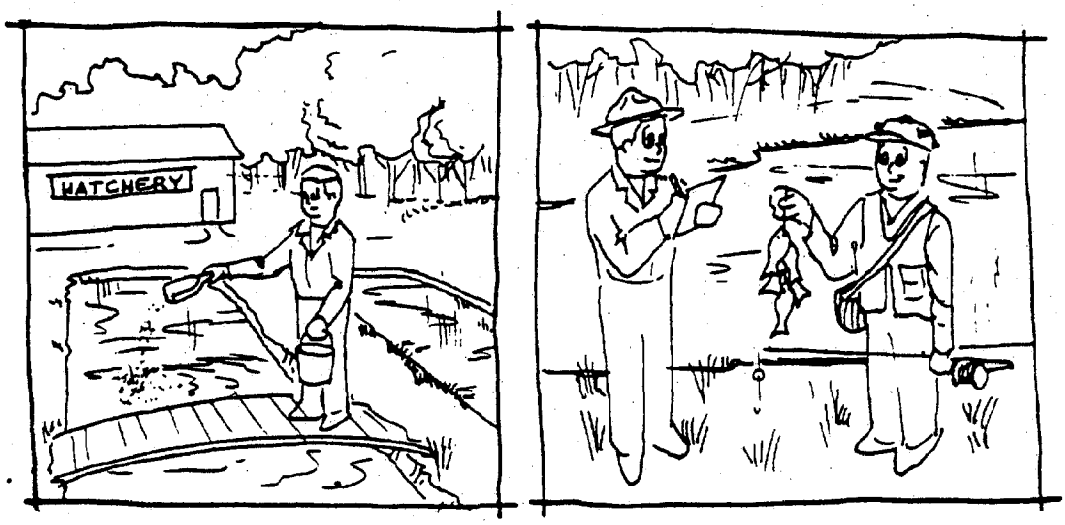
The Federal Government, in cooperation with state agencies and private citizen groups, is attempting to regulate and manage the fish resources to maintain them for future generations.

OCCUPATIONS

Workers in the area are concerned with the management of fish in streams, lakes, rivers, and ponds. Work may involve patrolling waterways, maintaining fish populations, and controlling disease. Some job titles are listed below. Descriptions of these occupations can be found in Section B of this guide.

Skilled and Technical Positions
- Fish Hatchery Worker
- Fish Technician

Professional Position
- Fish Biologist



SUGGESTED LEARNING ACTIVITIES

The following activities will help you become better acquainted with fish, the many workers involved in fish management, and their work.

1. Take a field trip to one or more of the following places of interest:
   a. Fish hatchery
   b. Fish research station
   c. Commercial fishing pond or lake
2. Obtain a map from a fish warden or the state game and fish department and locate the streams, lakes, and bays which may be used for public fishing.
3. Arrange through the local fish warden to view the stocking of fish in lakes, streams, and ponds.
4. Have the local fish warden speak to your class.
5. Stock two or more aquariums with plants and water life. Keep a daily record of the aquarium and its care.
6. Prepare a report on the kinds of fish in local waters. Information may be found in the school library.
7. Attend a meeting of a local fishing club.
8. After you have completed several of these suggested activities, discuss the following questions:
   a. On field trips, what did you see the workers doing? What were their job conditions?
   b. How did you feel about yourself while you were doing the suggested learning activities and while you were observing fish resource workers?
   c. What personal needs do you feel you could meet by doing this kind of work?
   d. What abilities do you feel you have for doing these kinds of activities?

FORESTRY

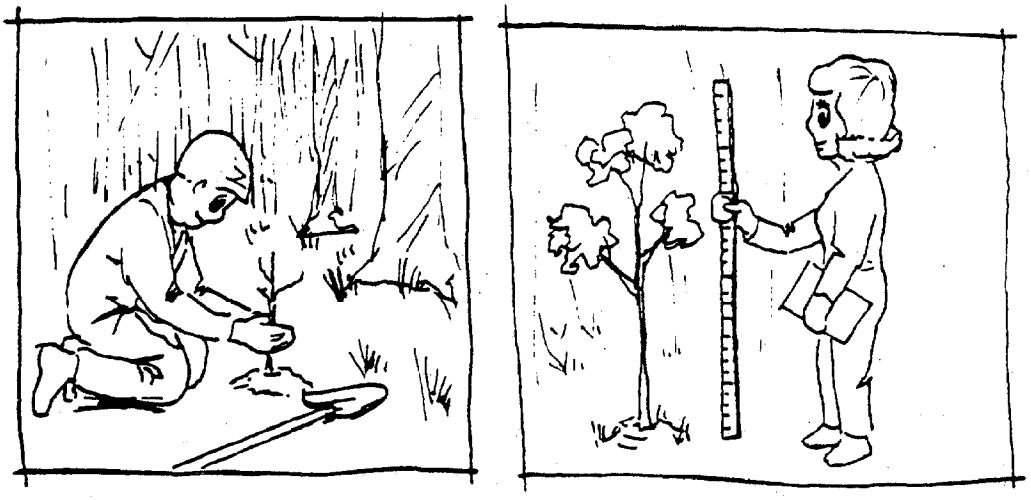
BACKGROUND

A forest is a living community of plants, in which trees are the dominant species. From a distance, the forest appears to be just big trees. As we come nearer we see other plants—medium-sized trees and shrubs. Then, as we enter the forest, we see many small plants. Some of them are young trees. A few will eventually become giants. Shrubs, vines, herbs, wild flowers, and mosses also sprawl over the forest floor.

There is other life in the forest community—birds sing from the tree tops, frogs peep on the ground, grouse drum on a fallen log. Some can be seen but not heard—a snake slithers for cover, caterpillars devour a leaf, spiders wait on webs that glisten in the sunshine. Plants and animals compete for living room both above and below the surface of the ground. It is the joint activity of all the living things of the forest, as they live, grow, reproduce, and die, that makes for soil improvement.

The American forests have been very important in the growth and development of our nation. Products from the forest sheltered and fed the American Indian and the early settlers. Forest products were some of the first exports from the new world. From those early days to the present, our forests have provided many products for home, farm, and industry.

Although many persons in the past have realized the value of our forests, now there is a new growth of appreciation for this natural resource. Recent efforts by many individuals have renewed growth and production on forested lands. In addition, much planning and work is necessary to establish and maintain forested recreational areas for people seeking to get away from big city and suburban living.



OCCUPATIONS

Forestry workers are concerned with the management of our forested lands. This includes reforestation, logging, fire prevention, and insect and disease control. Job titles for some occupations in forestry are given below. Descriptions of these occupations in forestry can be found in Section B of this guide.

Skilled and Technical Positions

- Forester Aide
- Forest Technician

Professional Position

- Forester

SUGGESTED LEARNING ACTIVITIES

The following activities are suggested to acquaint you with forest resources, and forestry workers and their work.

1. Find out what kind of trees grow in your yard at home, in the school yard, or in some location near you. Make a list of them.
2. Prepare a poster of each kind of tree listed in number 1.
   a. a winter and summer picture of each
   b. a bark sample of each
   c. a pressed leaf from each
   d. fruit, nut, or seed from each
3. Describe the uses for each kind of wood from the trees found in your area.
4. Collect different kinds of finished wood to show the grain, color, and surface.
5. Collect different kinds of cones of pines, spruce, firs, etc. Make a wall display from them.
6. Take a walk through a forest and look for logs that have been cut. Study:
   a. annual rings
   b. damage by insects
7. Invite a fire warden, forest ranger, or forester to talk to the class about his work.
8. Visit a tree farm in your area and find out how some of these management practices are carried out.
   a. selective cutting
   b. improvement cutting
   c. fire control
   d. care of trails and roads
   e. disease and insect control
   f. soil erosion control
9. Plant trees on school land or at a playground.
10. After you have completed several of the suggested activities, discuss the following questions:
    a. On your field trips, what did you see foresters doing?
    b. How did you feel about yourself while you were doing the suggested learning activities and while you were observing the foresters?

c. What personal needs do you feel you could meet by doing this kind of work?
d. What abilities do you feel you have for doing these kinds of occupations?

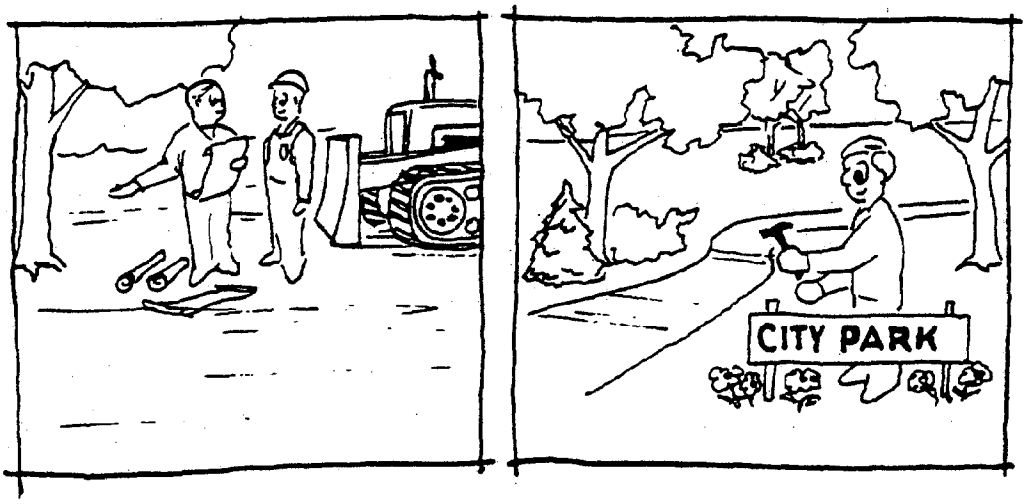
LAND USE PLANNING

BACKGROUND

Our growing population is creating many new problems for urban planners. New homes, expanding highways, and developing industries all require space. Our land area is a relatively fixed resource. The expansion of the urban areas into the surrounding countryside is affecting the balance of nature. At one time forests, fields, and farms covered the land. Now rows of homes, paved streets, and manufacturing plants are coming into view.

The problem of providing for the growing needs of our expanding society is one that requires a great deal of thought and planning. Not only do we have to consider the importance of home and factory sites, but also the effect these have on the forests, water, air, and soil of the area. Careful planning of urban areas is necessary to protect water supplies, provide for parks, and establish recreation areas. This will do much to maintain the balance of nature.

Wise land use planning is necessary for the maintenance of our natural resources. Planning commissions can set priorities and establish zoning laws for the most efficient use of our natural resources for the long-range well-being of our expanding population.



OCCUPATIONS

Today, more than ever, there is a great need for wise land use planning. Many job opportunities have developed from this need and include work in land use planning and zoning. Some job titles are listed below. Descriptions of these jobs can be found in Section B of this guide.

Skilled and Technical Positions
- Planning Aide
- Planning Technician
- Zoning Technician

Professional Positions
- Urban Planner
- Zoning Inspector

SUGGESTED LEARNING ACTIVITIES

The following activities are suggested to help you become acquainted with the many activities of workers involved in land use planning and zoning.

1. Secure from the Soil Conservation office a soils map and land use map for your area. Study these maps and the community for recommendations.
2. Obtain a copy of the local zoning laws or regulations and become acquainted with their provisions.
3. Arrange for a talk by one or several of the following: city planning engineer, landscape architect, chief planner, or a regional planner. Some suggested topics are: problems of a growing community, the ideal city, conserving our natural resources, or transportation problems of a city.

4. Select a community problem and work out several alternative solutions for presentation to the class. Have the class evaluate your recommendations.
5. Have the class organize into city departments and design a model city, each department being responsible for the planning. Each student group should meet with the community's comparable group for realistic problems and information.
6. Visit a nearby community which has an urban renewal project under way and talk with officials on plans and problems.
7. After you have completed several of the suggested activities, discuss the following questions:
   a. When you were on field trips, what did you see land use planners and zoners doing? What were their job conditions?
   b. How did you feel about yourself while you were doing the suggested learning activities and while you were observing land use planners and zoners?
   c. What personal needs do you feel you could meet by doing this kind of work?
   d. What abilities do you feel you have for doing these kinds of activities?

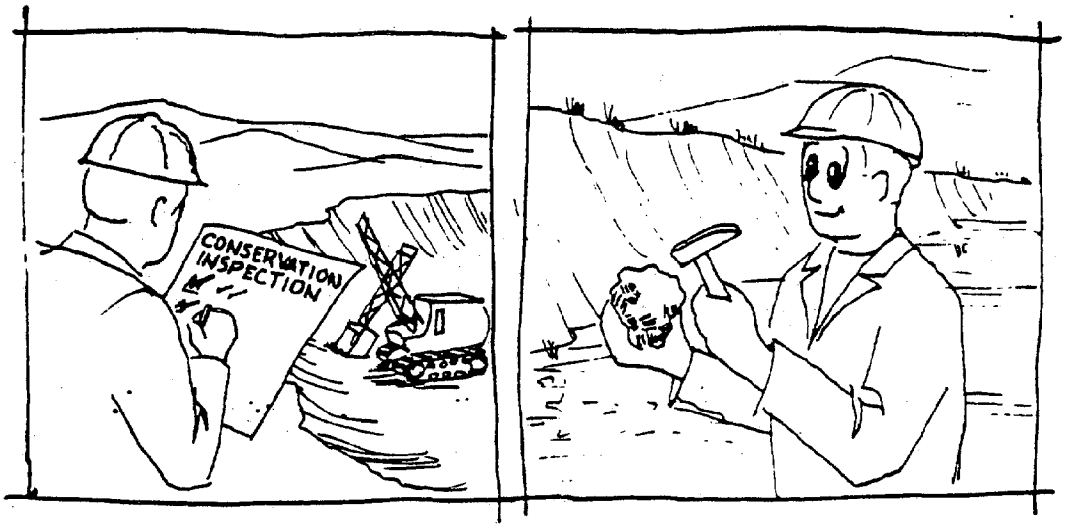
MINERALS AND MINERAL FUELS

BACKGROUND

Beneath the land lie the minerals on which our civilization depends: sand, gravel, and stone for building; phosphates and potash for fertilizing croplands; iron ore for making steel; fuels for heat and power; and many other essential raw materials.

Our minerals and mineral fuels are non-renewable resources. Nature does not replace them. In some cases such as coal and oil, nature replaces them so slowly that they do not become available for man's use. Even though deposits of minerals and mineral fuels are enormous, they still are limited and will be used up. We are using these irreplaceable resources at rapid rates. There are ever greater numbers of us to feed and to clothe, to transport, house, and keep warm.

Some people are employed in positions to help conserve and stretch out these limited resources. They encourage their wise and efficient use for the benefit of all our people.



OCCUPATIONS

Listed below are some of the job titles in the area of minerals and mineral fuels. Workers in this area are concerned with all mining practices and land reclamation procedures. Descriptions of these occupations are located in Section B of this guide.

Skilled and Technical Positions

- Open Pit Mine Conservation Technician
- Mining Area Restoration Technician
- Oil and Gas Inspector

Professional Position

- Petroleum Geologist

SUGGESTED LEARNING ACTIVITIES

The following activities are suggested to help you understand our non-renewable natural resources better, the workers who protect them, and their work.

1. Watch icicles form. You will see that they are made up of tiny crystals of water (ice). What is the shape of the crystals?
2. Salt is a mineral. Look at table salt under a hand lens. What is the shape of a salt crystal? How is salt used in your home?
3. Rocks are made of mineral crystals. Some rocks are made up of one mineral and others are made up of several minerals. Visit a gravel pit and collect different types of rocks.
4. Make your own crystals.
   a. Dissolve powdered alum in hot water (bring water to boiling point, turn off heat, add alum slowly).
   b. Suspend a string in the water and set aside to cool.
   c. Watch the crystals form.
5. Of what material is your schoolhouse made? If it is made of stone, look at it carefully. Is it like the salt or alum crystals?
6. Go to your school or local library and find information on crude oil.
   a. How did oil come to be in the rocks?
   b. What type of rock yields petroleum?
   c. What is the relationship between old seas that covered the state, plants and animals that lived then, and petroleum?
7. Visit an oil field. Find out what type of rock is likely to yield oil. What conservation measures are being practiced by the oil field workers?
8. Make a collection of rocks, coal, or petroleum products.
9. Interview miners and have them tell you about conservation practices employed in underground mines.
10. Take a field trip to a strip mining operation. Observe conservation measures being taken. Is there a mine drainage treatment facility? What future use will be made of this land?
11. After you have completed several of these suggested activities, discuss the following questions:
    a. When you were on field trips, what did you see the workers doing? What were their job conditions?
    b. How did you feel about yourself while you were doing the suggested learning activities and while you were observing the workers?
    c. What personal needs do you feel you could meet by doing this kind of work?
    d. What abilities do you feel you have for doing these kinds of activities?

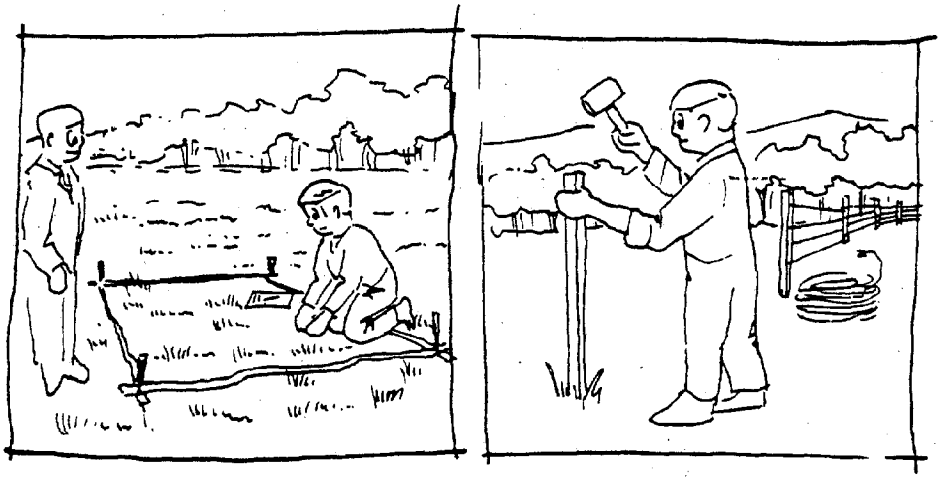
RANGE

BACKGROUND

Large areas of the western states that are too rough, dry, and steep to grow crops, can be valuable as livestock pasture on a limited scale. Through proper management of this land and by controlling the amount and kind of grazing, the value of this natural resource can be increased.

Some men have long been concerned about the misuse of the grazing lands of the buffalo, elk, wild sheep, and other kinds of wildlife. Overgrazing of the range can destroy the native cover. Cover crops of grasses and shrubs help to prevent erosion by wind and water. The range worker is concerned about preventing range and forest fire and controlling disease and poisonous plants. There are also the problems of maintaining roads, trails, water holes, and salt stations.

The vast areas involved in management of the rangeland, as well as the variable weather and elevation factors, increase the problems for persons employed in this challenging and interesting work. Rewards for those who like to work in the rugged outdoors are many, with mountain views, fresh air, and the many related outdoor activities close at hand.



OCCUPATIONS

Workers in this natural resource area are concerned with the conservation and use of our rangelands. Work includes range management, pest control, and maintenance of animal and plant life. Some job titles are listed below. Descriptions of these occupations can be found in Section B of this guide.

Skilled and Technical Positions

- Range Aide
- Range Technician

Professional Position

- Range Manager

SUGGESTED LEARNING ACTIVITIES

The following activities are suggested to help you become acquainted with rangelands, the workers who manage them, and their work.

1. Contact your State Department of Agriculture for information on rangeland locations and persons in charge.
2. Prepare reports on rangeland in your state, containing the following information:
   a. Name of the person or persons in charge
   b. Mailing address
   c. Number of acres managed
   d. Types of livestock using the range
   e. Number of persons employed and job titles
   f. The major problems in each area
   g. Predominant type of native or improved varieties of plants
   h. Kinds of improvements on the sites such as water holes, salt stations, shelters, trails, and roads
3. Prepare a list of recommended practices for rangeland improvements.
4. Prepare a report on poisonous plants using color pictures or slides and written descriptions, along with control procedures.
5. Invite a range manager or conservationist to speak to your class on the topic of job opportunities in rangeland work.
6. Plan a field trip to a rangeland office, field station, or rangeland pasture.
7. Plan a meeting with a farmer to discuss plans for using rangeland for pasture.
8. Report on special problems which came to light as a result of field trips, interviews, or meetings with range officers or farmers including the following:
   a. Competition between livestock growers
   b. Problems with wildlife
   c. Erosion or pollution problems
   d. Disease or insect control
   e. Difficulty with rangeland laws
   f. Weather problems
   g. Fire control problems
   h. Any other
9. Prepare a list of plant cover using the following three categories:
   a. "Decreasers"
   b. "Increasers"
   c. "Invaders"
10. Set up a range judging contest and have the class members compete.
11. After you have completed several of the suggested activities, discuss the following questions:
    a. When you were on field trips, what did you see the range workers doing? What were their job conditions?
    b. How did you feel about yourself while you were doing the suggested learning activities and while you were observing this kind of work?
    c. What personal needs do you feel you could meet by doing this kind of work?
    d. What abilities do you feel you have for doing these kinds of activities?

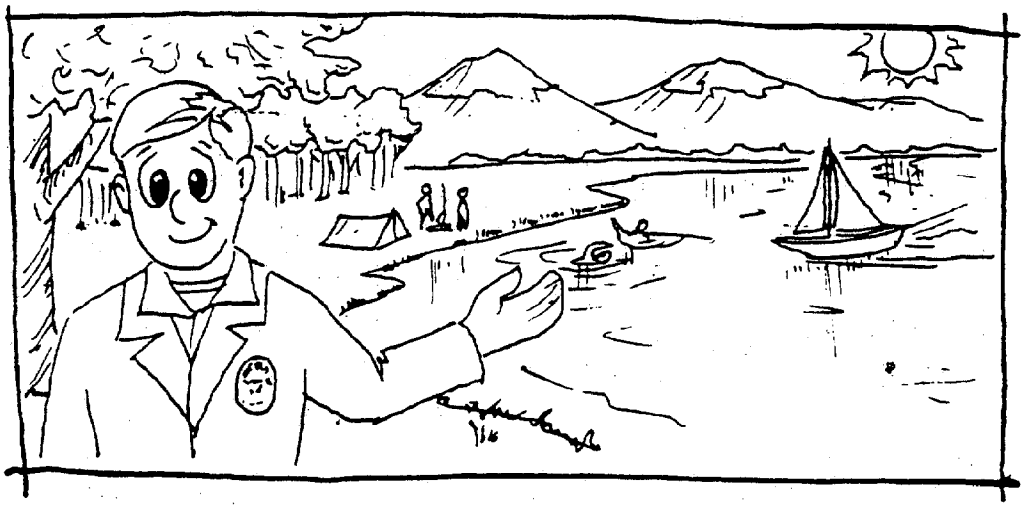
RECREATION

BACKGROUND

Today, more than ever, Americans have the time and money to use recreation facilities. Those living in urban and suburban areas often plan visits to private and public parks where they can enjoy the peace and beauty of nature.

People have more free time today because of earlier retirement and shorter working hours. Due to the extra time on their hands, they swamp the recreational facilities to their limit. The young and old want a chance to see the U.S.A. from a

camper, a trailer, or a motor bike. People want to go camping, take hikes, visit historic sites, and explore wilderness areas. They also want to get away from the congested, noisy, and often polluted city.



OCCUPATIONS

Workers in this area are concerned with the proper use of our natural resources for human recreational activities. They are involved in developing and maintaining parks and campgrounds, guiding hunters, and patrolling land and waterways. Some job titles are listed below. Descriptions of these occupations can be found in Section B of this guide.

Skilled and Technical Positions
- Park Foreman
- Campground Caretaker
- Hunting and Fishing Guide

Professional Position
- Park Naturalist

SUGGESTED LEARNING ACTIVITIES

The following activities are suggested to help you become acquainted with outdoor recreation activities, and the workers and their work.

1. Make a survey of the outdoor recreation facilities in your community.
2. Prepare a report on each of the facilities in item one and include the following:
   a. Activities available
   b. The number of part-time and full-time people employed
   c. The kinds of jobs the people in part "b" do
   d. Ownership of the business and its organization or structure
3. Select several of the facilities and plan field trips to see their operation.
4. Secure bulletins from the U.S. Government printing office on private and government recreational areas and prepare or add to the school file of these materials.
5. Invite a representative from the "AAA" or a travel agency to talk to the class on recreation opportunities.
6. Ask the manager of the local Bureau of Employment Security to send or bring to the school a list of job openings in the area of recreation in your state.
7. Investigate the possible recreation facilities that could be developed or improved in the local area and prepare a report.
8. Have the class select the best report from item 7 and develop the idea for presentation to the local recreation board or authority for further action.
9. Invite a member of a camping trailer organization to talk with the class on camping vacations.
10. After you have completed several of the suggested activities, discuss the following questions:
    a. While you were on field trips, what did you see outdoor recreation workers doing? What were their working conditions?
    b. How did you feel about yourself while you were doing the suggested learning activities and while you were observing outdoor recreation workers?

c. What personal needs do you feel you could meet by doing this kind of work?
d. What abilities do you feel you have for doing these kinds of activities?

SOIL

BACKGROUND

Soil is the part of the earth's surface that supports plant growth. Typical soil is made up of three layers or "horizons": topsoil, subsoil, and parent material. In the course of soil development, plant and animal remains accumulate in the surface layer.

Man has usually taken soil for granted. Early civilizations of the Middle East, North Africa, and China flourished as long as they had an abundance of productive soil, but when the soil was destroyed by overuse and erosion these early civilizations declined.

When the early settler in this country found that the land became less productive with use, he pushed westward where the open prairies provided a soil that produced bigger and better crops. As these lands became more densely populated and the farms smaller, he moved still farther west.

Most of the arable land in the United States is now being used. Some of it needs better use and protection with soil and water conservation practices; other land will be used more intensely as the increasing population demands more products.

Soil is a basic natural resource that must be maintained and used wisely to give the greatest benefit to all who depend upon it for food, clothing, shelter, and the many other things that add to the joy and comfort of living.

OCCUPATIONS

Federal and state government agencies sponsor programs to help land managers to plan and carry out soil conservation practices. Some private businesses and industries hire soil conservation workers. Some of these occupation titles are listed below. Complete descriptions can be found in Section B of this guide.

Skilled and Technical Positions
- Soil Conservation Aide
- Soil Conservation Technician

Professional Positions
- Soil Conservationist
- Soil Scientist

SUGGESTED LEARNING ACTIVITIES

The following activities are suggested to help you learn about soils, the workers who help protect our soils, and their work.

1. Obtain information from the Soil Conservation office or school library on Land Capability Classes and prepare a written report on this topic.
2. Visit two farms in the local area:
   a. One not using good conservation practices (in the teacher's judgment)
   b. One following good conservation practices

3. Select a local stream and observe the water condition, volume, color, etc.:
   a. During normal weather conditions
   b. Following a heavy rain
4. Check a sample of water from a local stream under different flow conditions for the amount of sediment.
5. Arrange with the Soil Conservation office to see and discuss several soil profiles.
6. Collect samples of several typical soils in the local area and prepare a written description of each.
7. Have members of the class make soil displays including soil samples, pictures, soil profiles, parent materials, composition, nutrients, soil tests, etc., and display their work in a public place.
8. The teacher should encourage students to speak at clubs, PTA's, church groups, school assemblies, etc., about the need for soil conservation.
9. Have students make individual surveys of serious erosion problems and prepare a class report. Select several best reports for publication in the local news media.
10. After you have completed several of the suggested activities, discuss the following questions:
    a. When on field trips, what did you see soil conservation workers doing? What were their job conditions?
    b. How did you feel about yourself while you were doing the suggested learning activities and while you were observing soil workers?
    c. What personal needs do you feel you could meet by doing this kind of work?
    d. What abilities do you feel you have for doing these kinds of activities?

WATER

BACKGROUND

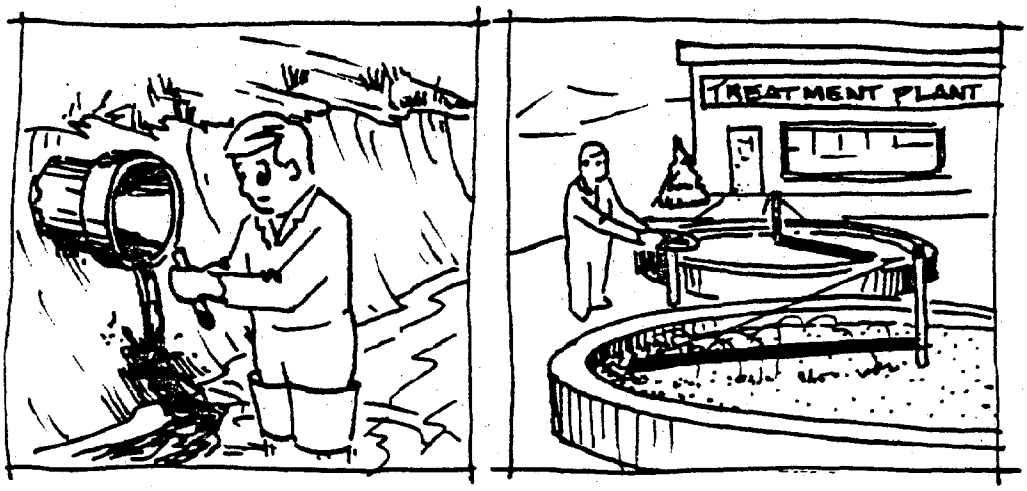
There is no form of life that can live without water. Therefore, the conservation of this natural resource has become a very important concern for man all over the world.

Nature does renew our water supply through natural means by rain, hail, sleet, and snow. However, when water supplies are misused, wasted, or polluted, it can become a very expensive process to restore water or obtain new supplies.

When people live close together in cities, local supplies of good water run out. This requires expensive systems to bring water from far away sources to meet the needs of the people. The used water, called sewage, must then be treated by equally expensive treatment plants before the water is returned to the rivers and streams.

Water and waste treatment plants are needed for people and for industry and farms. It is also important to have clean water for recreation purposes such as swimming, boating, and fishing.

As our population grows, the needs for clean water will increase. The needs for treatment facilities for wastewater will increase also.



OCCUPATIONS

Demands for clean water and the need for treating waste water will continue to increase. Streams, rivers, and lakes that are already polluted must be cleaned. Many opportunities for employment exist in the area of water resources management. Some job titles are listed below. Descriptions of these occupations can be found in Section B of this guide.

Skilled and Technical Positions

Water Well Inspector

Water Treatment Plant Technician
Wastewater Treatment Plant Technician
Water Resources Investigator

Professional Positions

Hydrologist
Oceanographer

SUGGESTED LEARNING ACTIVITIES

The following activities are suggested to help you become better acquainted with the natural resource of water, the workers who protect it, and their work.

1. Using sources in the school or community library, find the average rainfall for the local area over the last 25 years.
2. Plan a class field trip to several of the following:
   a. Water treatment station
   b. Sewage treatment plant
   c. Water recreation area of a park
   d. Water storage facility
   e. Water testing laboratory
   f. Farm where crops are irrigated
3. Prepare a map of the area and locate the following facilities:
   a. Water reservoirs, storage facilities, wells, etc.
   b. Main water lines
   c. Treatment stations
   d. Wastewater treatment plants
   e. Large demand water users
4. Construct a rain or snow gauge and record the amount of precipitation for one school year. Plans may be found in your science textbook.
5. Make a community survey of polluted ponds, lakes, streams, and dams. Locate the sources of pollution and prepare a news release of the class findings.
6. Have a local plumber talk to the class about common water-wasting practices in the home. Demonstrate to the class how certain minor repairs can be made in the home to save water. Suggest that some students talk with parents about these water-saving practices.
7. Visit a rural home that has its own water supply and septic tank system. Talk with the owner about its operation and the good and bad points.
8. Invite the local soil conservation technician to talk with the class about county-wide water conservation practices. Urge individual class members to visit the conservation office for individual projects or special interests.
9. Check with the local newspaper or community library for reports of the latest flood in this county. A student should make this report to the class.
10. Have a student contact the local water authority to learn the amount of water consumed annually by this community.
11. After you have completed several of these suggested activities, discuss the following questions:
    a. When you were on field trips, what did you see the workers doing? What were their job conditions?
    b. How did you feel about yourself while you were doing the suggested learning activities and while you were observing the water resource workers?
    c. What personal needs do you feel you could meet by doing this kind of work?
    d. What abilities do you feel you have for doing these kinds of activities?

WILDLIFE

BACKGROUND

Early settlers of this country depended on mammals, birds, and other wild things for food and livelihood. Today, these wild animals are primarily a recreational resource. Even so, the total value of the game harvest in terms of food, hide, and pelts contributes significantly to the national economy. Hunters and fishermen spend more than $3 billion annually in pursuit of their sports. Many additional billions are spent by those who use clean water and open country for other recreational activities.

Millions of Americans hunt each year, and their numbers are increasing at a faster rate than the national population. Others enjoy bird watching, wildlife photography, and other forms of nature study.

This public interest makes greater demands upon stocks of wildlife. At the same time, animals are being crowded out of their living areas by urban growth, expanding industrial areas, dredging of shorelines and rivers, pollution of streams and estuaries, and draining of marshes. The problem is to preserve or increase the numbers of wildlife. In the face of an expanding

economy, there is little room for wild things to survive. We need to plan ahead. We are moving quickly into a period of sharper competition for water and living space.

OCCUPATIONS

Wildlife employees are concerned with the conservation of wildlife. They care for the animals and birds, protect them, and maintain their populations. Some job titles are listed below. Descriptions of these occupations can be found in Section B of this guide.

Skilled and Technical Positions
- Game Propagator
- Game Warden
- Wildlife Technician

Professional Position
- Wildlife Biologist

SUGGESTED LEARNING ACTIVITIES

The following learning activities are suggested to help students understand better our natural resources in the wildlife area and to become more aware of the people who are employed in this work.

1. Using the state and national publications available, prepare a report on the birds and animals native to the local area:
   a. Obtain a picture of each
   b. Describe its natural food
   c. Describe its typical shelter
   d. Become acquainted with local or federal laws concerning season, limits, and other requirements for harvesting and control
2. Contact the local game warden or game propagator and arrange for him to visit your classroom or for you to visit his office to become better acquainted with his work.
3. If there are game farms in the area, arrange for a visit either individually or with other interested classmates.
4. Using publications or plans recommended by the game warden, build bird and animal feeders and place them at suggested locations in the area. Keep records on kind and amount of feed material used.
5. Make plaster casts of animal or bird tracks. Refer to publications on wildlife.
6. Build bird houses on school property or at home.
7. Get to know the local sportsmen groups and ask their officers for information about their goals and purposes.
8. Check the school library for books, magazines or other publications on wildlife.
9. Talk with the school guidance counselor about opportunities and training schools available.
10. Visit two local farms, one where the owner permits hunters to use the property and one where he does not; and get the farmers' points of views on wildlife management.
11. After you have completed several of the suggested activities, discuss the following questions:
    a. When you were on field trips, what did you see wildlife workers doing? What were their job conditions?
    b. How did you feel about yourself while you were doing the suggested learning activities and while you were observing wildlife workers?
    c. What personal needs do you feel you could meet by doing this kind of work?
    d. What abilities do you feel you have for doing these kinds of activities?

Chapter III

PREPARING FOR NATURAL RESOURCES JOBS

SUGGESTED STUDENT PERFORMANCE OBJECTIVES

After completing Chapter III, you can:

1. List the educational opportunities available in your high school and area vocational school which will enable you to prepare for an occupation in the natural resources.
2. Describe how knowledge and skills acquired in different subject matter areas are applied in several different occupations.
3. List the kinds of natural resources educational opportunities available to you after you complete high school, the nature and purpose of each, and the possible outcomes of each in terms of occupations.
4. Outline a plan of appropriate high school course work and occupational work experience to prepare you for your vocational preference.

PLANNING THE PREPARATIONAL PROGRAM

You should begin preparing for a career in the natural resources while you are in junior high school. This may be done by planning and selecting the right courses for attaining your career goal. If you plan to go directly to work or enter a 2-year technical training program, then you should plan to take vocational courses which will prepare you for a skilled job. On the other hand, if you plan to go to a 4-year college, then take academic (college preparatory) courses to qualify for admission to a school of your choice, together with as many appropriate vocational courses as possible.

HIGH SCHOOL

Discuss your plans with your counselor and teachers. They may help you in choosing courses which will be beneficial. Take courses which will prepare you for your career goal.

Many high school vocational courses include work experience as a part of the program. You may attend classes in the morning and work in the afternoon. The work experience is performed in an approved business which relates to your field of study. In other programs, you may attend classes for six months, then work for six months.

Participation in a youth group such as the Future Farmers of America (FFA), will give you opportunities to develop leadership, citizenship, and cooperation. FFA activities encourage members to learn through actual experience. As a member, you will learn to conduct and take part in public meetings, to speak in public, and to assume civic responsibility.

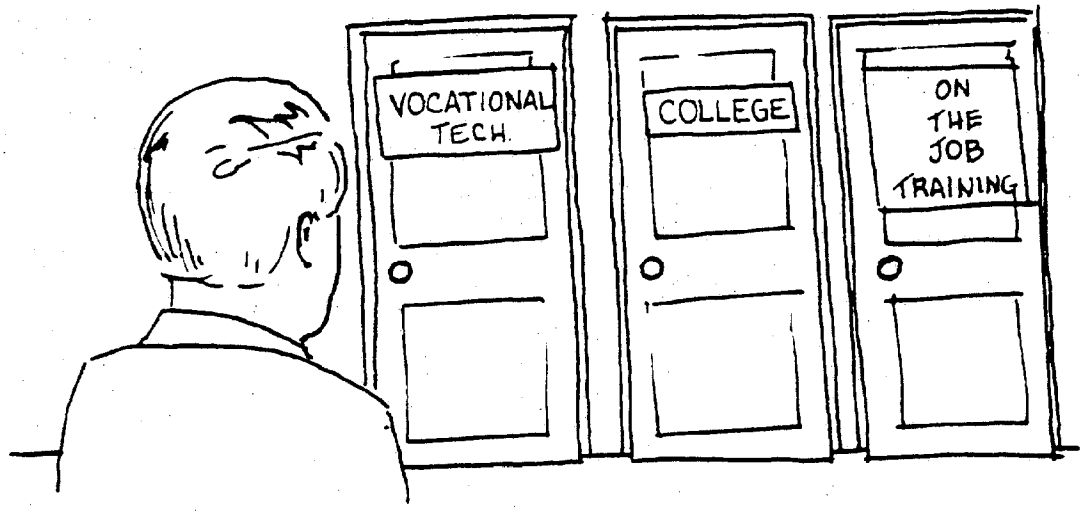
You may be able to obtain a part-time or summer job in the natural resources while you are in high school. This is an excellent way to help you to reach a conclusion about your career and to prepare you for a full-time job after graduation.

EDUCATION BEYOND HIGH SCHOOL

There are many area vocational schools and 2-year technical schools throughout the United States which offer continuing education. Some of them award associate degrees.

As jobs change and times change, you will need to keep up to date. You may decide to continue your education at one of these schools so that you may work at a more responsible level, and probably at a higher salary.

You also may have the option of pursuing a 4-year B.S. degree program either directly after high school graduation or as transfer student from a 2-year program. Future plans may include continuing on to graduate degree programs. Which plan you follow depends on your abilities and interests, what kind of job you want, and requirements for filling the job.



OUT-OF-SCHOOL TRAINING

On-the-job work experience is an excellent way of preparing for a natural resources job. The best way to learn something is by doing it. In other words, a teacher can explain how to do something, but you may not fully understand it until you actually do the work.

On-the-job work experience will give you a realistic impression of an occupation. It will help you to understand your abilities. You will discover whether you like the kind of work you plan to enter.

In many instances, an employer will consider a year of work experience an important factor when he hires new workers.

An apprenticeship is one form of out-of-school, on-the-job training. An employer may wish to hire an individual as an apprentice. He then trains the apprentice for a particular job or jobs. The employer and employee have an agreement, guaranteeing that the employee will be formally trained in a supervised work experience program.

As the apprentice progresses, he is trained in many complex processes, skills, and tasks. At all times, he is closely supervised by qualified workers sometimes called journeymen. He is instructed in the theoretical and technical aspects of his work. The apprentice receives wage increases throughout his training until he becomes a journeyman and qualified for full salary privileges.

Many businesses and industries offer on-the-job training programs to prepare their new employees. These work experience programs are very helpful to the person who has completed a lot of course work in school and now must apply his knowledge to practical work.

Preparation for a natural resources career should begin while you are in junior high school. This includes the selection of appropriate high school courses and obtaining on-the-job work experience. As you think about the future, discuss your plans and goals with your parents, counselor, and teachers. Their advice should be helpful in guiding you.

SUGGESTED LEARNING ACTIVITIES

1. Visit the area vocational school and find out what courses are offered in agribusiness and natural resources education.
2. Interview the high school teacher(s) of agriculture and become acquainted with the agriculture department's offerings in natural resources education.
3. List the kinds of employment and educational opportunities available to you after you complete high school.
4. If you are considering formal education after high school, write to post secondary technical schools or colleges offering programs in the natural resources and request a copy of their catalogs. If you plan to continue your education beyond high school, use these catalogs as guides, and determine the entrance requirements to the post secondary institutions or colleges of your choice. Plan your high school course of study to meet these admission requirements.

SECTION B

SELECTED NATURAL RESOURCES OCCUPATIONAL BRIEFS

OCCUPATIONS IN AIR POLLUTION CONTROL

AIR POLLUTION CONTROL AIDE

USUAL DUTIES

The Air Pollution Control Aide serves as a helper to higher level employees. Many duties are learned by doing routine jobs. Assistance is given to others in jobs such as: analyzing air pollutants, checking air sampling equipment, keeping daily records, and fixing things. The Air Pollution Control Aide loads, unloads, and moves equipment; unpacks and stores equipment; collects, cleans, and distributes laboratory glassware; and keeps working areas neat and clean.

CHARACTERISTICS OF THE JOB

The Air Pollution Control Aide works under close supervision. Through training, observation, and practice, the aide develops an understanding of the job. This person must be able to perform routine tasks, follow directions, follow safety precautions, and work with others. Work may be in a laboratory, or outdoors.

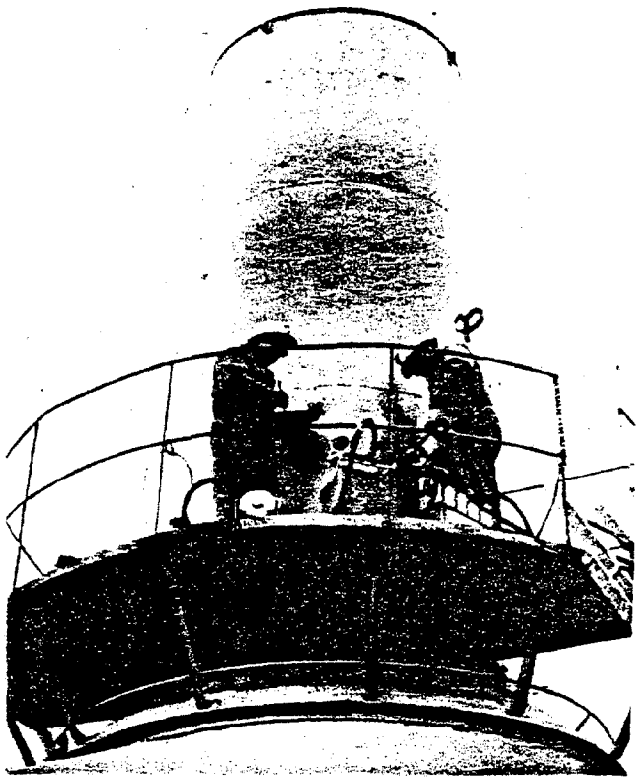
QUALIFICATIONS

A high school diploma is essential, including a background in basic mathematics, reading, and speaking.

EMPLOYMENT PROSPECTS

The job outlook for the new and emerging occupation, Air Pollution Control Aide, looks good. Many aides will be needed to assist technicians in their work. Many new programs in pollution control are developing.

Air Pollution Control Aides may be employed by the large agencies of the federal government. Large numbers of aides are employed by the Environmental Protection Agency (EPA). Aides also are employed by the Public Health Service of the U.S. Department of Health, Education, and Welfare, and the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce.



Air Pollution Control Aide adjusting controls on exhaust monitoring equipment under the direction of his supervisor. Courtesy Pennsylvania Department of Environmental Resources.

Air Pollution Control Aides may find employment at the state level with agencies such as the Department of Environmental Protection, Department of Environmental Resources, or Department of Health.

Employment opportunities also exist with many county or municipal governments because of increasing problems with air pollution from motor vehicles, industries, power plants, and high density urban population.

In the future, there should be more employment opportunities for Air Pollution Control Aides with businesses and industries that produce equipment to control air pollution. Also, industries are now employing air pollution personnel to operate, maintain, and repair their air pollution control equipment.

OPPORTUNITIES FOR ADVANCEMENT

With additional on-the-job experience or post high school education, the Air Pollution Control Aide may advance to Air Pollution Control Technician or other positions of greater responsibility.

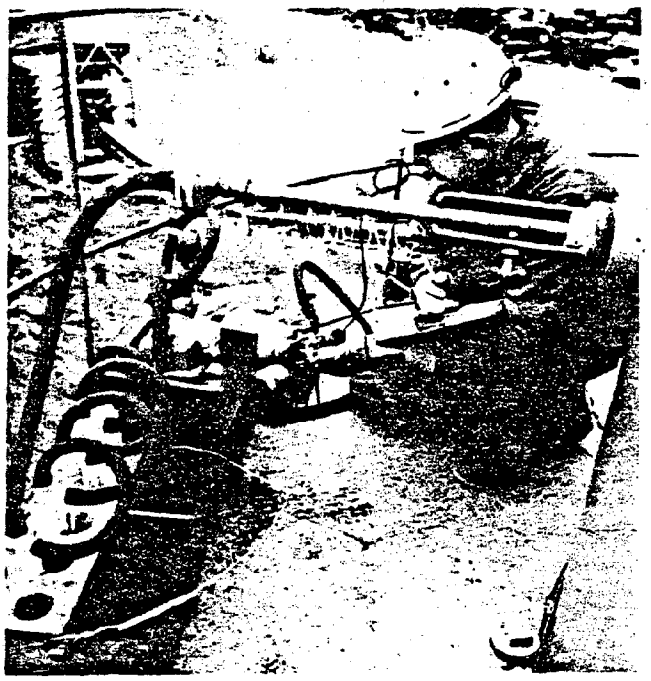
AIR POLLUTION CONTROL TECHNICIAN

USUAL DUTIES

The Air Pollution Control Technician is trained to inspect industrial sites and enforce air pollution control laws. The technicians may install, operate, calibrate, maintain, and repair air sampling equipment. Technicians may conduct smokestack sampling tests, gather data for source and emission tests, and conduct standardized analyses of air pollutants. The job also includes record-keeping, drawing charts, and making graphs of data obtained from air sampling equipment, meteorological equipment, and laboratory analyses. Other duties include assisting higher-level staff in conducting complex tests, preparing oral and written reports of activities, and assisting lower level employees. The job also includes maintaining an effective relationship with representatives of public and private agencies. The Air Pollution Control Technician may attend air pollution control hearings to present data and may be called as a witness in court cases.

CHARACTERISTICS OF THE JOB

The Air Pollution Control Technician periodically uses air sampling devices in special areas to analyze the air quality. In performing some of the duties of the job, the technician uses methods described in equipment operating manuals, technical reports and journals, and in documents prepared by professional societies. The Air Pollution Control Technician works in the field as well as in a laboratory. Work is done with people from the government, industry, and the general public.



An Air Pollution Control Technician collecting and recording data. Courtesy Pennsylvania Department of Environmental Resources.

QUALIFICATIONS

The Air Pollution Control Technician must have a 2-year associate degree in air pollution control or a related field, or three years of experience in air pollution control of a related environmental program. Good health is necessary for field assignments, as well as ability and interest in mathematics, chemistry, and physics. Problem-solving skills are essential.

The Air Pollution Control Technician will come in direct contact with people representing various interests. Therefore, this person must be able to communicate effectively and work well with others.

EMPLOYMENT PROSPECTS

The employment of technicians, one of the fastest growing occupational groups, is expected to continue expanding. The seriousness of environmental problems has caused government agencies and industry to start programs at ever-increasing rates, making the future in air pollution control very promising.

Air Pollution Control Technicians may be employed by the large agencies of the federal government. Large numbers of technicians are employed by the environmental Protection Agency (EPA). Technicians also are employed by the Public Health Service of the U.S. Department of Health, Education, and Welfare, and the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce.

Air Pollution Control Technicians may find employment at the state level with agencies such as the Department of Environmental Protection, Department of Environmental Resources, or Department of Health.

Employment opportunities also exist with many county or municipal governments because of increasing problems with air pollution from motor vehicles, industries, power plants, and high density urban population.

In the future, there should be more employment opportunities for Air Pollution Control Technicians with businesses and industries that produce equipment to control air pollution. Also, industries are now employing air pollution personnel to operate, maintain, and repair their air pollution control equipment.

OPPORTUNITIES FOR ADVANCEMENT

Air Pollution Control Technicians may advance to higher positions after performing satisfactory work for a number of years. A B.S. degree at a college or university is necessary to qualify for the more advanced positions, such as Air Quality Controller, Sanitarian, or Air Pollution Control Supervisor.

AIR POLLUTION CONTROL SUPERVISOR

USUAL DUTIES

The main job of the Air Pollution Control Supervisor is to plan a major segment of an air pollution control program. This involves supervising the operation of air monitoring equipment and reviewing requests for construction and operating permits. The supervisor also is responsible for investigating complaints, inspecting buildings and equipment, and conducting surveys and special studies. The supervisor also recommends new and better laws and regulations. This individual may appear in court to give evidence in legal violations, or speak to public and private groups to give general information or advice.

The Air Pollution Control Supervisor is responsible for all those working under him, and is in charge of recruiting new employees and organizing training programs.

CHARACTERISTICS OF THE JOB

The Air Pollution Control Supervisor has a lot of responsibility. The job involves a variety of experiences – visiting industrial sites, attending lectures, or testifying in court hearings. Much of the work is done in an office. The chief responsibility is supervising others, and keeping up-to-date on the progress of their work.

QUALIFICATIONS

The Air Pollution Control Supervisor must have a degree from a 4-year accredited college or university plus at least three years of professional experience in an environmental program.

EMPLOYMENT PROSPECTS

This is a job of great responsibility. The candidate for this position must have an excellent record of past work, including administrative ability, excellent public relations, and considerable knowledge and experience in this field.

Air Pollution Control Supervisors may be employed by the large agencies of the federal government. Many supervisors are employed by the Environmental Protection Agency (EPA). Supervisors also are employed by the Public Health Service of the

U.S. Department of Health, Education, and Welfare, and the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce.

Air Pollution Control Supervisors may find employment at the state level with agencies such as the Department of Environmental Protection, Department of Environmental Resources, or Department of Health.

An Air Pollution Control Supervisor conducting a public hearing on environmental regulations. Courtesy Pennsylvania Department of Environmental Resources.

Employment opportunities also exist with many county or municipal governments because of increasing problems with air pollution from motor vehicles, industries, power plants, and high density urban population.

In the future, there should be more employment opportunities for Air Pollution Control Supervisors with industries that produce equipment to control air pollution.

OPPORTUNITIES FOR ADVANCEMENT

The Air Pollution Control Supervisor may advance to a higher level administrative position. Requirements for these positions usually include several years of experience in the field of air pollution control and often a graduate degree.

OCCUPATIONS RELATED TO FISH

FISH HATCHERY WORKER

USUAL DUTIES

The Fish Hatchery Worker, under the direction of a Fisheries Scientist, cares for the fish while they are at the hatchery until they are released in a pond, lake, or stream.

One of the main jobs of the Fish Hatchery Worker is the preparation of the hatchery tanks for spawning. This includes cleaning the tanks by draining out the water, removing the muck and debris, and scrubbing the tank. Other duties involve overseeing the treatment of the spawn, caring for and feeding small fish, regulating the temperature of the indoor tanks, and sorting the fish according to size, color, and species. When the fish grow large enough, the Fish Hatchery Worker transfers them to outside tanks.

The Fish Hatchery Worker sees that all tanks are properly maintained and that the fish are fed the proper diet.

The Fish Hatchery Worker operates and maintains hatchery equipment and facilities. This includes the pumps, seines, aerators, mowers, trucks, ponds, tanks, dams, and raceways.

The Fish Hatchery Worker counts and sorts fish species to be delivered to farm ponds, lakes, streams, or rivers. This individual also loads and transports the fish to designated sites and then releases them.

CHARACTERISTICS OF THE JOB

Work is relatively steady throughout the year, but may vary somewhat according to the season. Work is performed both indoors and outdoors. There is usually a fishy odor around the hatchery but a worker soon becomes used to it.

QUALIFICATIONS

A high school education is preferred. A deep interest in fish, wildlife, and outdoor living is desirable. Such courses as mathematics, biology, chemistry, general science, English, and argiculture may be helpful.

A Fish Hatchery Worker feeding fish. Courtesy Bureau of Sport Fisheries and Wildlife.

A worker may have to pass a civil service examination if employment is sought with a state or federal fish and wildlife agency. Part-time summer employment will provide valuable experience and later may lead to full time employment.

EMPLOYMENT PROSPECTS

Prospects look fairly good for the future. The increasing popularity of recreational fishing will result in an increased demand for individuals in this field.

OPPORTUNITIES FOR ADVANCEMENT

The Fish Hatchery Worker may advance to the position of Fish Hatchery Manager after several years of satisfactory work performance. Further education may be necessary for this advancement.

FISHERIES TECHNICIAN

USUAL DUTIES

The Fisheries Technician assists the Fisheries Scientist in fish studies and management. These studies include fish nutrition, behavior, and reproduction. Fisheries Technician personnel capture fish for studies, marking, and transfer from one area to another, and record information such as age, size, and stomach contents of fish. Daily and seasonal movements and feeding habits of fish populations are also studied.

The Fisheries Technician assists in the management of fish and shell fish populations by collecting and organizing fisheries resources data and preparing reports of findings for the Fisheries Scientist.

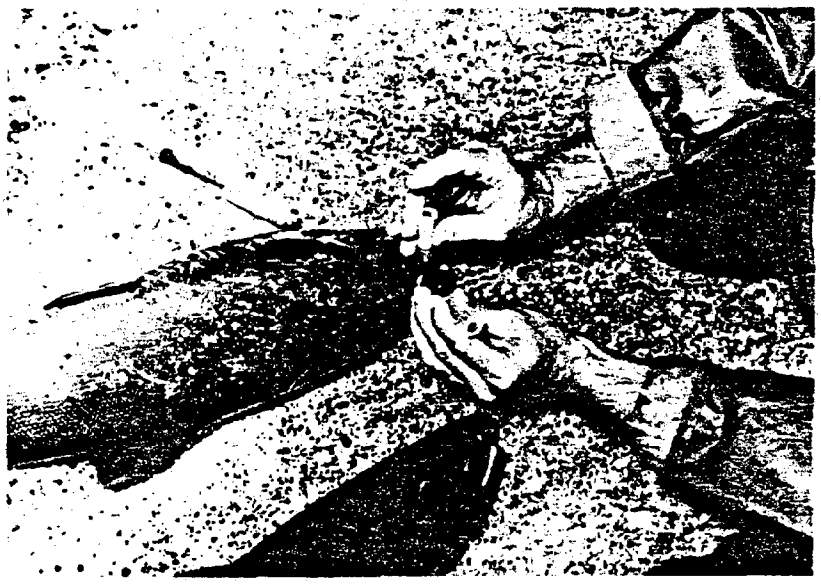
CHARACTERISTICS OF THE JOB

Work is steady throughout the year. The work week varies according to the seasonal work being done. Work usually is outdoors, in all climatic conditions.

QUALIFICATIONS

A Fisheries Technician should have an associate degree in fish management or a related field, or the equivalent in work experience. This individual must be able to write reports and interpret field notes. Because most work is outdoors and may require carrying equipment, good physical condition is a requirement.

The applicant may have to pass a civil service entrance examination if employment is sought with a state or federal agency. Part-time summer employment will provide valuable experience and later may lead to full-time employment.



Fisheries Technician collecting salmon blood sample. Courtesy Bureau of Commercial Fisheries.

EMPLOYMENT PROSPECTS

Employment prospects are good for the future. Opportunities for employment exist in federal and state government agencies, educational institutions, and private organizations and industries.

Some federal agencies that employ technicians are: Bureau of Commercial Fisheries, Bureau of Sport Fisheries and Wildlife, Army Corps of Engineers, Bureau of Outdoor Recreation, Forest Service, National Park Service, Public Health Service, Soil Conservation Service, and the Environmental Protection Agency.

State governments are the largest employers of Fisheries Technicians. These positions are located in state conservation agencies such as the Department of Natural Resources, Department of Fish and Game, Department of Environmental Resources, Department of Parks and Recreation, and Department of Agriculture.

OPPORTUNITIES FOR ADVANCEMENT

The Fisheries Technician may advance to the postion of Fisheries Scientist after several years of satisfactory work performance and further education.

FISHERIES SCIENTIST

USUAL DUTIES

The Fisheries Scientist studies fish and their habitat. When changes in fish growth rates and population are noted, this individual uses scientific methods to determine reasons for the changes.

The Fisheries Scientist looks for ways to improve fishing. By studying fishing pressure and fish harvests, the scientist tries to determine if more fish should be stocked in certain areas. Effects of stream pollution on age, growth, and feeding habits of various fish species are also studied.

The Fisheries Scientist collects, identifies, and preserves fish specimens. Other duties include the preparation of reports and articles for books and magazines, and presenting educational programs to interested groups. This individual may assist in enforcing laws during peak periods of sports activity.

A Fisheries Scientist marking fish for identification in a research project. Courtesy Washington State Game Department.

CHARACTERISTICS OF THE JOB

Work is steady throughout the year with a 40-hour work week. However, the Fisheries Scientist may conduct studies which require irregular working hours. Work is mostly outdoors.

QUALIFICATIONS

A Fisheries Scientist needs a college degree in fisheries management, biological science, forestry, or a related field.

An individual in this field must enjoy working outdors. Skills are necessary in handling fishing equipment - nets, fishing tackle, boats and boating equipment--and the scientific equipment now being used, such as fish shockers.

EMPLOYMENT PROSPECTS

Employment prospects for Fisheries Scientists are expected to be good and to increase in the future. The increasing interest in fishing and the development of environmental programs will require additional personnel in this field.

OPPORTUNITIES FOR ADVANCEMENT

The Fisheries Scientist may advance to positions of greater responsibility after a year or more of satisfactory work performance. This may involve lake or stream management or conducting research experiments.

OCCUPATIONS IN FORESTRY

FORESTRY AIDE

USUAL DUTIES

The job of the Forestry Aide is to help to inventory, protect, and reforest timberlands. Personnel in this field observe, measure, and record information such as the kinds of trees, how much lumber certain groups of trees will produce, what the ground surface is like for logging or other purposes, and the death rate of seedling trees.

A staff compass and chain for measuring and mapping land areas are standard equipment in this job. The Forestry Aide also collects and reports the readings of instruments such as the rain gauge, thermometer, stream flow recorder, and soil moisture gauge. This individual helps to enforce the rules and regulations of recreation areas and answers questions about the forest and its wildlife. This job carries the responsibility to patrol for forest fires and help fight fires if they occur. In season, part of the job is to plant, spray, prune, and thin trees.

CHARACTERISTICS OF THE JOB

Work is steady throughout the year, usually with a regular 5-day, 40-hour work week. Work is performed indoors and outdoors in all kinds of weather.

QUALIFICATIONS

To qualify as a beginning worker for this job, the individual should have at least a high school education. Courses in biology, botany, drafting, mathematics, and agriculture (including plant science and forestry) will be very useful. The applicant may be required to pass a competitive civil service examination for state or federal employment.

The Forestry Aide must be physically able to walk over rough ground, participate in fighting forest fires, and work alone in quiet places for long periods of time. This individual must be able to work rapidly and accurately with his hands when using hand tools to plant, spray, prune, and thin trees. Good eyesight is necessary to report accurately on the readings of instruments such as a rain gauge, thermometer, stream flow recorder, and soil moisture gauge. The Forestry Aide must be able to communicate with forest and park visitors in answering questions about the forest and its wildlife and when explaining rules and regulations of recreation areas. The Forestry Aide must be friendly, patient, tactful, and courteous to get along well with the public.

A Forestry Aide planting trees in a reforestation project. Courtesy Weyerhaeuser Company, Tacoma, WA.

EMPLOYMENT PROSPECTS

There should be many job openings for Forestry Aides in the future. These job openings will come about because of the increasing demand for forest products and recreation facilities and the trend toward more scientific management of forest land. As a result, your chances of getting a job are good.

Jobs are found in many communities and in many establishments. Good chances for finding employment exist at private and government forestry services in the southeast, northeast, and Pacific northwest areas of the United States.

OPPORTUNITIES FOR ADVANCEMENT

As an experienced Forestry Aide, you may advance to a job as Forest Technician.

FOREST TECHNICIAN

USUAL DUTIES

The Forest Technician assists the professional forester on federal, state, municipal, and private lands. This involves marking trees, measuring and calculating timber volumes, and recording the tree data for timber sales and timber stand improvement. The job requires the individual to survey and mark land areas with boundary lines, and to lay out truck and logging roads.

Forest Technician collecting information to prepare a forest improvement survey report.

The Forest Technician helps in forest inventory and field planning work by inspecting and administering leases, right-of-way agreements, and special use permits. The technician also supervises timber sale contract operations.

The Forest Technician prepares maps and uses aerial photos to locate and map forest areas in need of harvesting, planting, thinning, or other special attention. This individual also supervises the shipping of tree seedlings in designated forest areas.

The technician plans and organizes the field work necessary to combat forest pests. This job involves the investigation of areas of forest pest infestation and supervision of spraying or other treatment.

The Forest Technician assists in forest fire protection, detection, and actual fire fighting or suppression measures. Other duties include mapping forest fires, estimating damage, assisting in fire law enforcement, and issuing permits for burning.

Another area of concern for the Forest Technician is the construction, maintenance, and repair of buildings, facilities, and equipment. The technician's job is to operate and/or direct the use of equipment and facilities used in the following activities: timber appraisal, scaling and sales, site preparation, seeding, planting, pruning, thinning, and protecting trees from fire, insects, and disease.

CHARACTERISTICS OF THE JOB

Work is steady throughout the year, usually with a regular 40-hour work week. Work is performed indoors and outdoors in all kinds of weather.

QUALIFICATIONS

The Forest Technician needs a high school education with courses in biology, drafting, mathematics, and agriculture. In addition, a 2-year degree in forestry or a related field may be required.

The Forest Technician must be in good physical condition.

EMPLOYMENT PROSPECTS

Employment opportunities for Forest Technicians are expected to be good and to increase in the future. Technicians have been one of the fastest growing occupational groups. This rapid growth should continue as the nation's demands increase for wood products and recreational areas.

OPPORTUNITIES FOR ADVANCEMENT

The Forest Technician may advance to the position of Forester after a year or more of staisfactory work performance. Further education may be necessary to qualify for the new position.

FORESTER

USUAL DUTIES

The Forester works with the management of forest lands and their resources. This individual is in charge of the use of forest lands and their products. In this job it is necessary to estimate the volume and value of timber, and to plan and direct the cutting, logging, and reforestation of the forest land. A compass, measuring and mapping devices, and forest maps and charts are standard equipment for the Forester.

The Forester protects forest land from fire by active programs of fire prevention (fire danger posters and signs, and removal of fire hazards such as trash piles and garbage dumps). Part of the Forester's job is to supervise fire fighting crews and equipment. This individual may also be called upon to do engineering work to reduce fire hazards.

The Forester works to prevent or treat damage to timber resulting from insects, disease, or the environment. Chemicals, tree cutting, or area burning may be prescribed as a cure or preventive measure.

Using knowledge of surveying, mapping, and road building, the Forester makes forest areas available to industry, the public, and forest fire control equipment. Other duties include management and protection of wildlife, and possibly responsibility for recreational activities such as hunting, fishing, camping, and hiking.

Foresters determine the best ways of cutting timber and then plan reforestation. They decide which tree species are best for an area and what soil erosion prevention programs are needed.

Improvement of the quality of the forest is another concern. The Forester studies trees and ground cover and tries to develop new and better varieties for the forest. This individual often works with Wildlife and Fisheries Scientists to develop an environment desirable for animal and plant life.

A Forester inoculating a branch as part of a controlled research experiment. Courtesy West Virginia Pulp and Paper Co.

QUALIFICATIONS

The Forester is expected to have a college education and possibly graduate courses in specialized fields of forestry. Part-time summer work with a Forester is an excellent opportunity to prepare for future employment in this field.

The Forester should be able to accept responsibility and issue instructions to those working under him.

EMPLOYMENT PROSPECTS

Employment prospects are expected to be good and to increase in the future. The necessity of providing the nation with a large amount of wood products from forests means that the job prospects should be good.

OPPORTUNITIES FOR ADVANCEMENT

The Forester may advance to a position of greater responsibility such as Chief Forester of a large area after several years of satisfactory work performance.

OCCUPATIONS IN LAND USE PLANNING

PLANNING AIDE

USUAL DUTIES

A Planning Aide position is the beginning level of paraprofessional work. The aide assists in land use planning research work at the local, regional, or state level. This includes assisting in the collection, organization, and analysis of data required in the development of new land use planning programs. The work of the aide involves providing technical assistance to higher level professional personnel in both office and field work.

CHARACTERISTICS OF THE JOB

The job of the Planning Aide may consist of assignments working with superiors out in the field, or it may be confined to office duties. Supervision is conducted by a professional who reviews the aide's work for accuracy.

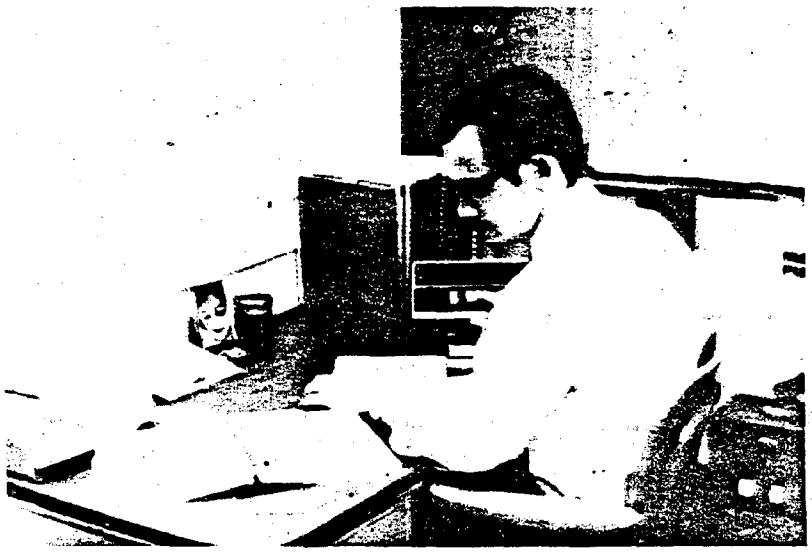
QUALIFICATIONS

A high school diploma is recommended for this position. The Planning Aide should have a basic knowledge of rural or urban planning, and must be able to work effectively with other people, including his superiors and the general public.

EMPLOYMENT PROSPECTS

City, county, and regional planning is a growing field. Many aides will be needed to assist the planners with their work.

The Planning Aide may find federal employment with the U.S. Department of Housing and Urban Development. Also, job openings may exist with the state planning agency. Local municipalities are joining in regional planning agencies more often, so job prospects on the local level should be very good.



A Planning Aide assembling information that he had previously helped collect out in the field. Courtesy Local Government Research Corporation, State College, PA.

OPPORTUNITIES FOR ADVANCEMENT

The Planning Aide may advance to a planning Technician after one or more years of satisfactory performance on the job. Some form of technical education may help the individual prepare for the increased responsibility.

PLANNING TECHNICIAN

Planning Associate, Planning Analyst

USUAL DUTIES

The Planning Technician is an individual who must be capable of collecting, organizing, and analyzing data required in the development of urban planning techniques. Personnel in this job are responsible for both office and field work necessary

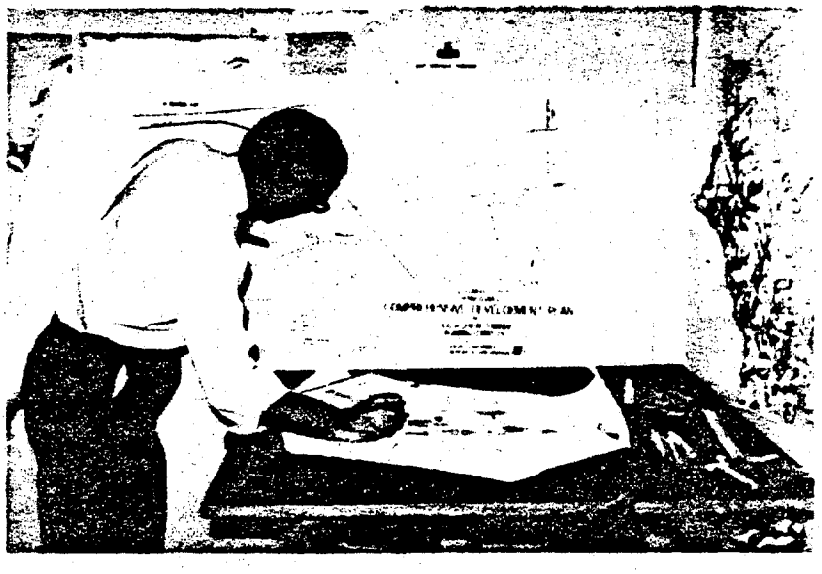
for carrying out the programs. Work may include the application of statistical analyses to projects. Work is performed independently and is subject to review by professional superiors. The technician may supervise and train Planning Aides.

CHARACTERISTICS OF THE JOB

The Planning Technician performs moderately difficult jobs in the carrying out of planning programs. Assignments may be indoors in an office setting or out in the field, collecting data and working with other planners. The technician may interview local officials concerning community planning and development. This individual may advise agency officials on various aspects and requirements of the federal planning assistance program.

QUALIFICATIONS

A minimum of a 2-year technical degree in urban planning or equivalent work experience is required for the position of Planning Technician. A considerable knowledge of the principles, practices, and objectives of city, regional, and state planning is essential. Background in government administration, research techniques, and involvement in urban development is



A Planning Technician making refinements on a map he prepared. Courtesy Local Government Research Corporation, State College, PA.

essential. The technician must be able to plan, organize, and carry out assignments and present results of his work effectively. This individual must be able to work well with associates and the general public.

EMPLOYMENT PROSPECTS

City, county, and regional planning is a growing field. Many technicians will be needed to assist the planners with their work.

The Planning Technician may find federal employment with the U.S. Department of Housing and Urban Development. Also, job openings may exist with the state planning agency. Local municipalities are joining in regional planning agencies more often, so job prospects on the local level should be very good.

OPPORTUNITIES FOR ADVANCEMENT

The Planning Technician may rise to the position of Urban Planner as positions become available. Several years of experience, additional formal education, and excellent performance in his present job are three essential factors for promotion.

URBAN PLANNER

City Planner, Regional Planner,
Land Planner, Town Planner

USUAL DUTIES

The Urban Planner is concerned with the physical, social, and economic growth and development of cities and regions. However, the major emphasis is on the physical aspects. Comprehensive plans are developed to show the proposed uses of the land (residential, commercial, industrial, open space, recreation) as well as the distribution of public facilities such as roads, rapid transit, schools, and parks.

Some Urban Planners specialize in specific areas: transportation, urban renewal, urban design, economic and resource development planning, and social service (public services such as education, health services, criminal justice, environmental health, and social welfare).

CHARACTERISTICS OF THE JOB

The Urban Planner is most likely to be employed in regions having high populations. Some of the planner's work is done in the office. The job may require field trips where the individual visits residential communities, industries, recreational facilities, etc., to gather information. Public presentations are a necessary and important part of the planner's job.

QUALIFICATIONS

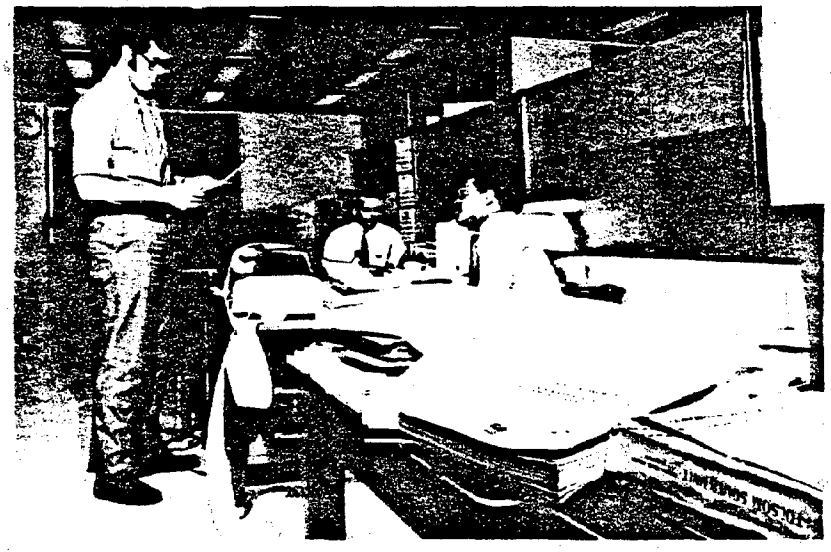
Minimum education requirements are a B.S. degree or professional experience. The planner should be able to speak well to community groups and cope with conflicts among various groups proposing differing opinions. An individual in this position should have considerable knowledge of planning principles and practices, as well as creativity in developing proposals to preserve society's scare resources. A sound background in the social sciences is also necessary.

EMPLOYMENT PROSPECTS

Planning is a relatively new profession and future employment opportunities look promising. Larger urban areas and regional planning agencies hold the greatest possibility for employment. There are positions for rural planners in less populated regions.

Experience has shown the need for minority groups to take part in the decision-making process. Local governments today have a keen interest in bringing promising young members of minority groups into the planning profession.

The Urban Planner may find federal employment with the U.S. Department of Housing and Urban Development. Also, job openings may exist with the state planning agency. Local municipalities are joining in regional planning agencies more often, so job prospects on the local should be very good.



Urban Planners working a reclamation project to improve environmental quality. Courtesy U.S. Bureau of Reclamation.

There were 7,000 Urban Planners in the United States in 1968. Estimates project 8000 job openings per year throughout the 1970s.

OPPORTUNITIES FOR ADVANCEMENT

The Urban Planner can rise quickly to levels of higher responsibility. This individual's services are in demand all over the country and in other parts of the world. Advancement to a larger city or employment as a private consultant may be the next promotion for the Urban Planner. This individual could also advance to Chief Planner, or a Plan Director, positions requiring more experience and responsibility.

ZONING TECHNICIAN

USUAL DUTIES

The Zoning Technician works under the supervision of a Zoning Inspector. Responsibilities include helping to prepare zoning maps, answering questions about zoning laws, writing reports, and keeping records. The Zoning Technician may work in the city, checking buildings to see that zoning regulations are followed. The technician helps the Zoning Inspector in handling zoning change requests and issuing permits.

CHARACTERISTICS OF THE JOB

This job is primarily a 40-hour-a-week office job, with some work in the city doing building inspections.

A Zoning Technician preparing zoning maps. Courtesy Local Government Research Corporation, State College, PA.

QUALIFICATIONS

A minimum of a 2-year technical degree in zoning or urban planning or equivalent work experience is required for the position of Zoning Technician. Ability in speaking, working with people, and map-making is essential.

EMPLOYMENT PROSPECTS

The field of zoning looks good for the future. An increasing number of Zoning Technicians will be needed to aid the Zoning Inspectors.

The Zoning Technician may find federal employment with the U.S. Department of Housing and Urban Development. Also, job openings may exist with the state planning agency. Local municipalities will need more Zoning Technicians as urban land development continues to expand, so job prospects on the local level level should be very good.

OPPORTUNITIES FOR ADVANCEMENT

The Zoning Technician may be promoted to Zoning Inspector following a year or more of satisfactory performance in the job. A baccalaureate degee may also be required.

ZONING INSPECTOR

USUAL DUTIES

Zoning Inspectors must check to see that land and buildings are used only for the purposes allowed in the zoned district. Regulations such as lot size, location, and size of the buildings must be enforced. The Zoning Inspector works with building owners before they fix up old buildings to make sure all laws are followed. Permits are issued so that the owner can begin work. Occupacy permits are also given by the inspector. The Zoning Inspector checks new buildings to see that they will be used properly and that they meet all structural engineering standards, including safety regulations. Other duties include supervising technicians in map work or zoning inspections, and handling zoning change requests. Zoning Inspectors work closely with the local government body.

CHARACTERISTICS OF THE JOB

Although much time is spent out in the city, the Zoning Inspector generally works a regular work week in an office. The job involves a lot of contact with people – consulting property owners in working out zoning problems, or working with lawyers and courts to negotiate legal problems.

A Zoning Inspector viewing the construction of a new building to see that the builders are in compliance with zoning laws. Courtesy Local Government Research Corporation, State College, PA.

QUALIFICATIONS

Several years of successful on-the-job experience as a Zoning Technician plus a baccalaureate degree from an accredited college are necessary for this position.

EMPLOYMENT PROSPECTS

Employment prospects in the zoning field are good. Individuals are needed to fill these positions as urban areas grow. More buildings are under construction and many old buildings are being renovated. Zoning Inspectors are needed to issue permits and watch that no laws are being violated.

The Zoning Inspector may find federal employment with the U.S. Department of Housing and Urban Development. Also, job openings may exist with the state planning agency. Local municipalities will need more Zoning Inspectors as urban land development continues to expand, so job prospects on the local level should be very good.

OPPORTUNITIES FOR ADVANCEMENT

The Zoning Inspector may advance to a position of greater responsibility, such as Zoning Administrator, after several years of satisfactory work performance.

OCCUPATIONS RELATED TO MINERALS AND MINERAL FUELS

OPEN PIT MINE CONSERVATION TECHNICIAN

USUAL DUTIES

The Open Pit Mine Conservation Technician assists the Open Pit Mine Conservation Inspector to see that state open pit mining laws are followed. The job includes checking all mine accidents to find out what caused them. The Open Pit Mine Conservation Technician keeps records on the condition of the mines, inspects machinery that miners use, and makes stream surveys to see that acid mine drainage water does not pollute rivers and lakes.

CHARACTERISTICS OF THE JOB

The Open Pit Mine Conservation Technician must be in excellent physical condition since a lot of the work is done in mines. This work involves working with machinery, walking through mines, and talking with miners.

QUALIFICATIONS

The Open Pit Mine Conservation Technician should have a 2-year associate degree in mine technology or equivalent work experience. This individual should know open pit mining laws, how mining machinery works, and safety and first aid methods. The Mine Conservation Technician should be able to use conservation practices in his work and interpret maps of open pit mines. In addition, this individual must be able to write and to work well with others.

EMPLOYMENT PROSPECTS

Future opportunities for the Open Pit Mine Conservation Technician look good. Technicians are needed to see that mining operations are done safely and without destroying our natural resources.

OPPORTUNITIES FOR ADVANCEMENT

The Open Pit Mine Conservation Technician may advance to Open Pit Mine Conservation Inspector which is a position of greater responsibility. Minimum requirements are a 2-year degree in mine technology plus one year of experience.

An Open Pit Mine Conservation Technician examining soil material to determine treatment for establishing ground cover.

MINING AREA RESTORATION TECHNICIAN

USUAL DUTIES

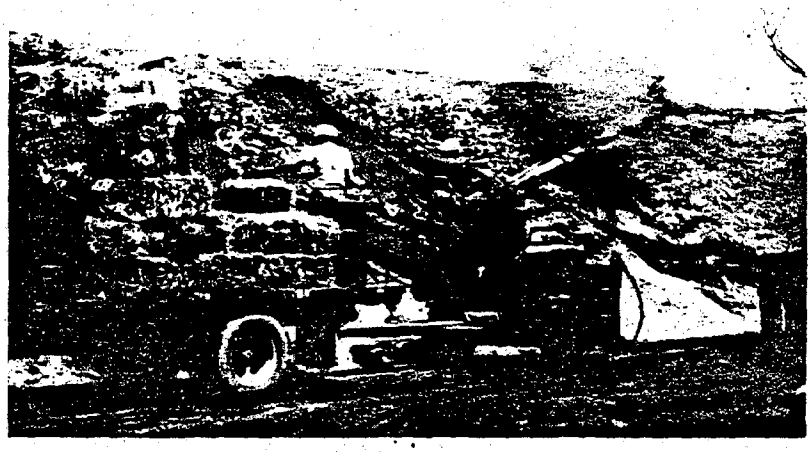
The Mine Area Restoration Technician works under the supervision of the Mining Area Restoration Supervisor. This job involves a program to discover and stop dangerous, unhealthy, and ugly environmental conditions caused by poor mining practices. This individual checks land, water, and air to see if the mine is causing pollution and works to help the miners stop the pollution. The Mining Area Restoration Technician works in programs to close old mines for safety to the public, stop mine fires, and clean up acid mine water.

CHARACTERISTICS OF THE JOB

The Mining Area Restoration Technician must be in excellent physical condition. In addition to inspecting mines, this individual also does desk work which includes recording information for supervisors.

QUALIFICATIONS

The Mining Area Restoration Technician should have a 2-year associate degree in mine technology or equivalent work experience. In addition to understanding mining and mine safety and conservation laws, the candidate should have a background in methods of dust control, mine ventilation, acid mine water treatment, air and water pollution, and the control of mine fires. A Mining Area Restoration Technician should know how to run mine equipment and must be able to work well with others.



Mining Area Restoration Technicians mulching a strip mine spoil bank to establish ground cover.

EMPLOYMENT PROSPECTS

Jobs should be available for Mining Area Restoration Technicians in the future. Many agencies are concerned with restoring mined land to a safer, more beautiful condition.

OPPORTUNITIES FOR ADVANCEMENT

The Mining Area Restoration Technician may advance to the position of Mining Area Restoration Supervisor. This requires a minimum 2-year associate degree in mine technology and at least one year of on-the-job experience.

OIL AND GAS INSPECTOR

USUAL DUTIES

The Oil and Gas Inspector works for environmental safety by enforcing laws dealing with oil and gas resources. In addition to checking oil and gas fields to insure that all drilling and production facilities are complying with state laws and regulations, this individual also checks gas producing and gas sales facilities to prevent waste of this natural resource.

In some states, the inspector checks pipeline connections and gas measuring devices. The Oil and Gas Inspector also performs production capability tests on oil and gas wells, to determine accuracy of production reports submitted by the oil and gas companies.

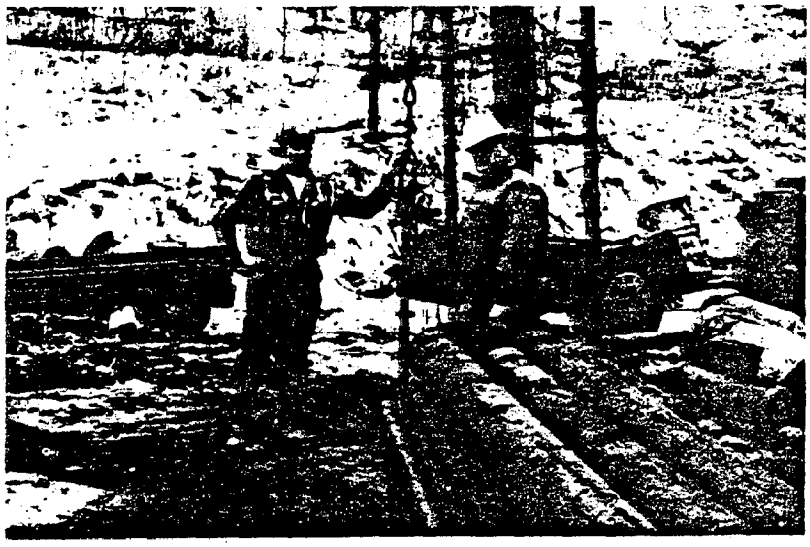
The inspector checks and inspects oil and gas producing facilities to insure that waste by-products from the oil and gas are not polluting the environment, and assists superiors in conducting any special field investigations deemed necessary.

The inspector's reports of all field inspections and investigations constitute official records that can be used in court hearings. At times, this individual may be called to appear in court to present evidence against an oil or gas company accused of violating oil and gas producing laws and regulations.

The inspector is constantly checking production facilities to find fire hazards. The Oil and Gas Inspector checks facilities to make certain that drilling permits have been secured and safety equipment is being used. This individual also inspects for proper installation of mud pits and inspects waste oil disposal. The inspector is in charge of all wells.

CHARACTERISTICS OF THE JOB

Work is steady throughout the year, usually with a 5-day, 40-hour week. Work is performed indoors and outdoors.



An Oil and Gas Inspector supervising the abandonment of an oil well. This close supervision is necessary to protect the ground water reserves and the oil reservoir. Courtesy Pennsylvania Department of Environmental Resources.

QUALIFICATIONS

The Oil and Gas Inspector should have a minimum of a high school diploma with courses in chemistry, mathematics, English, agriculture, and shop practices. Previous experience as a production worker in the oil and gas field is required.

College training in geology or engineering is helpful and will increase advancement opportunities.

EMPLOYMENT PROSPECTS

Future employment prospects for Oil and Gas Inspectors are needed in the field, and only moderate increases in employment are expected.

OPPORTUNITIES FOR ADVANCEMENT

The Oil and Gas Inspector may advance to a position of greater responsibility after several years of satisfactory work experience. This may require further education. Advancement to a new position may mean that the individual will supervise other inspectors.

PETROLEUM GEOLOGIST

USUAL DUTIES

The Petroleum Geologist has the important responsibility of finding economic deposits of oil and gas. This work includes a field study of rock outcrops, studying fossils, and making maps which show the structure or alignment of the surface rock formations. After collecting and studying data, the Petroleum Geologist makes subsurface maps which show the alignment, thickness, and likely areas for oil or gas deposits in subsurface rock formations.

After all data are analyzed and presented to the management, the Petroleum Geologist recommends areas for land purchase or rental upon which exploratory wells will be drilled for oil or gas.

During the drilling operation the geologist "sits on the well"; that is, the individual lives at the well site or may visit it periodically to study the rock cores and to run the necessary tests to evaluate the various rock formations encountered.

CHARACTERISTICS OF THE JOB

The Petroleum Geologist, when in charge of a drilling operation, is responsible 24 hours a day for its progress. He may supervise several wells at one time. The work can be permanent as an employee of an oil company or it can be temporary work as a consultant.

A Petroleum Geologist's work is performed both indoors and outdoors.

QUALIFICATIONS

A college degree in geology is necessary to perform the work of a Petroleum Geologist. Along with the degree the candidate needs skills in mapping and drafting. The Petroleum Geologist also needs the ability to prepare clear and concise technical reports.

A Petroleum Geologist making a subsurface reading at a test site.

The Petroleum Geologist must also have the ability to meet and deal with people as well as to establish and maintain effective working relationships with fellow workers, property owners, and the general public.

EMPLOYMENT PROSPECTS

In the past, employment has fluctuated with the demand for energy sources. Today, our energy supply will decrease unless new sources are found by the Petroleum Geologist. Work opportunities are very good and should remain good in the foreseeable future. Many are employed by the U.S. Geological Survey.

OPPORTUNITIES FOR ADVANCEMENT

Prospects for advancement within the petroleum field are excellent for any well qualified geologist. Being a professional person, a Petroleum Geologist may go into business for himself and become a consultant.

OCCUPATIONS RELATED TO RANGELAND MANAGEMENT

RANGE AIDE

USUAL DUTIES

The Range Aide is the Range Scientist's helper. Under the scientist's guidance, this individual works in planting, spraying, road building, fire fighting, and counting numbers of animals in a given land area.

The Range Aide operates farm machinery on rangeland, sets markers to indicate grazing land boundaries, checks fences and reports on their condition.

Range Aides building fence on a range allotment. Courtesy U.S. Forest Service.

CHARACTERISTICS OF THE JOB

Work is seasonal. The Range Aide is most likely to be employed in the spring, summer, and fall months. Work is outdoors and the job assignments vary with the location and season.

QUALIFICATIONS

As a Range Aide, high school courses in biology, botany, agriculture, and shop practices may be helpful. Mechanical ability is an asset. The Range Aide needs to be in good physical condition.

EMPLOYMENT PROSPECTS

Future employment prospects for rangeland workers are expected to be very good. The need to maintain rangelands to provide water, forage, wildlife, and recreation makes job prospects promising.

The Range Aide may be employed by the large public agencies of the federal government. For example, the aide may be employed by the Forest Service of the U.S. Department of Agriculture, or by the Bureau of Land Management, bureau of Indian Affairs, and Fish and Wildlife Service of the U.S. Department of the Interior. Some Range Aides may be employed by the U.S. Department of Defense, U.S. Department of Commerce, and the Tennessee Valley Authority.

Job openings also may be found at the state level with agencies such as the Department of Agriculture, Department of Environmental Resources, or Department of Fish and Game.

Employment opportunities also exist with many county or city governments which own rangelands managed for park or watershed protection purposes.

OPPORTUNITIES FOR ADVANCEMENT

The Range Aide may move up to the position of Range Technician after a year or more of satisfactory work performance. Further education may be needed in preparation for advancement.

RANGE TECHNICIAN

USUAL DUTIES

The Range Technician supervises skilled workers in controlling undesirable plants and animals. This involves seeding, fertilizing, and other management operations. Improvement of wildlife surroundings and maintaining watersheds are part of the Range Technician's job. Surveys of the rangeland are conducted to determine numbers of plants and livestock and to see how many people are using the land for recreation.

CHARACTERISTICS OF THE JOB

The Range Technician works throughout the year, but is busiest during the spring, summer, and fall months. At these times work is outdoors. Work may involve using map and survey equipment, often in an airplane. During the winter most of the time is spent indoors, planning future activities and presenting educational programs.

Range Technicians determining plant population as part of an evaluation of range conditions. Courtesy U.S. Forest Service.

QUALIFICATIONS

The Range Technician should have an associate degree in range management, agronomy, forestry, or a related field, or equivalent work experience. The technician must enjoy working outdoors.

EMPLOYMENT PROSPECTS

Future employment prospects for rangeland workers are expected to be very good. The need to maintain rangelands to provide water, forage, wildlife, and recreation makes job prospects promising.

The Range Technician may be employed by the large public agencies of the federal government. He may be employed by the Forest Service of the U.S. Department of Agriculture, or by the Bureau of Land Management, Bureau of Indian Affairs, and Fish and Wildlife Service of the U.S. Department of the Interior. Some Range Technicians may be employed by the U.S. Department of Defense, U.S. Department of Commerce, and the Tennessee Valley Authority.

Job openings also may be found at the state level with such agencies as the Department of Agriculture, Department of Environmental Resources, or Department of Fish and Game.

Employment opportunities also exist with many county or city governments which own rangelands managed for park or watershed protection purposes.

OPPORTUNITIES FOR ADVANCEMENT

The Range Technician may advance to the position of Range Manager after a year or more of satisfactory work performance. This may require a baccalaureate degree in range management or a related field.

RANGE SCIENTIST

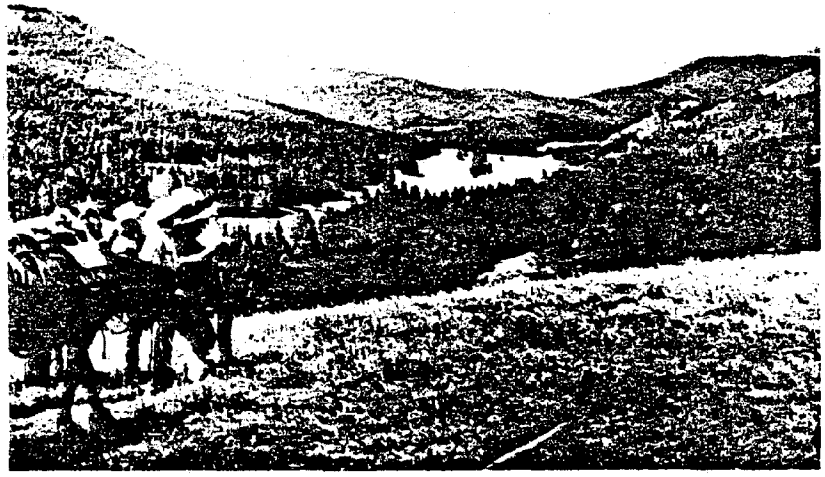
USUAL DUTIES

The Range Scientist has the responsibility of managing, developing, and protecting rangelands. Use of rangeland must be planned to gain the most benefit for all. To do this the manager must consider all uses – livestock and wildlife, timber and grasses, watershed protection, and use by people for recreation.

The Range Scientist decides how many animals can graze on the rangeland and what types of animals are most suitable. For example, the scientist may decide that 200 sheep can graze on one area of land and 100 cows can graze on another area. Seasons of the year that rangelands can be used for grazing are determined by the Range Scientist.

The Range Scientist develops and restores rangeland which has been overgrazed or burned. This may involve reestablishing grazing areas with grass or planting trees.

The Range Scientist is constantly on the alert for fires and must know techniques of fire prevention and fire fighting. Pests and diseases on the range are also a major concern, and the scientist must know how to control them.



Range Scientists determining how many animals can graze on this rangeland. Courtesy U.S. Forest Service.

In order to conserve rangelands, the Range Scientist plans for planting grasses and trees to protect against soil erosion and water loss.

Other duties include helping private land owners with range management practices and offering educational programs to school and local organizations. The Range Scientist also conducts research on the rangeland and writes reports.

CHARACTERISTICS OF THE JOB

Work is steady throughout the year. The work week varies according to the season and the type of work being done. In the spring, summer, and fall, work is mostly outdoors. In the winter much time is spent planning future activities and presenting educational programs to interested groups.

QUALIFICATIONS

As a Range Scientist you are expected to have a college degree in range management, forestry, agronomy, or related fields. You should be able to accept responsibility and work well with others.

EMPLOYMENT PROSPECTS

Future employment prospects for rangeland workers are expected to be very good. The need to maintain rangelands to provide water, forage, wildlife, and recreation makes job prospects promising.

The Range Scientist may be employed by the large agencies of the federal government. There are positions in the Forest Service of the U.S. Department of Agriculture, and in the Bureau of Land Management, Bureau of Indian Affairs, and Fish and Wildlife Service of the U.S. Department of the Interior. Some Range Scientists may be employed by the U.S. Department of Defense, U.S. Department of Commerce, and the Tennessee Valley Authority.

Job openings also may be found at the state level with such agencies as the Department of Agriculture, Department of Environmental Resources, or Department of Fish and Game.

Employment opportunities also exist with any county or city governments which own rangelands managed for park or watershed protection purposes.

OPPORTUNITIES FOR ADVANCEMENT

After several years of work experience, the Range Scientist may move into a position of greater responsibility such as having a greater area of land to manage. Further education may be necessary to qualify for a new position.

OCCUPATIONS IN OUTDOOR RECREATION

PARK FOREMAN

USUAL DUTIES

The Park Foreman works in many locations, including municipal, state, and national parks, college campuses, public and private golf courses, cemeteries, school grounds, and land around municipal institutions. One major responsibility is the supervision of crews who are involved in the maintenance, operation, and development of grounds, buildings, equipment, trails, campsites, and roads.

Another area of responsibility is the acquisition of equipment and supplies. This would include assignment of these materials to the proper crews for day-to-day use.

The Park Foreman is often called upon to assist in the development of landscape and building plans and maintenance schedules. This individual routinely inspects grounds, facilities, and equipment and sometimes acts as park guard, patrolman, fire fighter, and interpreter.

CHARACTERISTICS OF THE JOB

Park Foremen work mostly outdoors as supervisors. Working hours and conditions depend on seasonal weather and the number of persons using park facilities.

The Park Foreman is not really the same as the foreman of a work crew. A work crew foreman in a park, sometimes called a crew chief, is usually in charge of one crew whereas the Park Foreman is in charge of many crews and individuals.

QUALIFICATIONS

A high school education is needed and courses in horticulture, general science, mathematics, and agriculture are desirable. Applied vocational shop skills in carpentry, plumbing, and electricity are helpful.

A Park Foreman (left) supervising the maintenance of facilities at Grand Canyon National Park. Courtesy Loretta Neumann, National Park Service.

Depending upon the type of park one might work in, a 2-year technical course in horticulture, forestry, or turfgrass management may be helpful. Any preparation for the position of a Park Foreman should include training in the effective supervision of people. This is what will distinguish the Park Foreman's role as different from that of the park workers under his direction.

Good physical condition, patience, tact, courtesy, and the ability to get along well with others are all prerequisites for the Park Foreman.

Those desiring state or federal employment must pass a competitive civil service examination.

EMPLOYMENT PROSPECTS

Prospects for employment in parks generally are good. Employment as a Park Foreman, however, will depend on the background experience, and/or education of the person.

OPPORTUNITIES FOR ADVANCEMENT

An experienced Park Foreman may advance to positions such as Park Maintenance Supervisor, Park Ranger, or Park or Golf Course Manager, depending on the type of park and the particular requirements for each position.

CAMPGROUND CARETAKER

USUAL DUTIES

The Campground Caretaker is involved in the maintenance, development, and protection of areas that are used for camping. These areas may be the grounds and physical facilities used for resident, day, and overnight camps, as well as camping areas used by tent and trailer campers on an overnight basis.

Maintenance of campsites, roads, and other physical facilities usually includes repair, cleaning, painting, and simple plumbing and electrical work. Landscape maintenance, including mowing, pruning, fertilizing, and planting are also a part of the maintenance duties performed by the Campground Caretaker.

Most Campground Caretakers become involved in development projects such as constructing new buildings and landscaping new trails and campsites.

Another area of responsibility for the Campground Caretaker is the protection of the camp through the enforcement of campground rules and regulations. However, this area of responsibility may be supervised by Rangers in the larger parks.

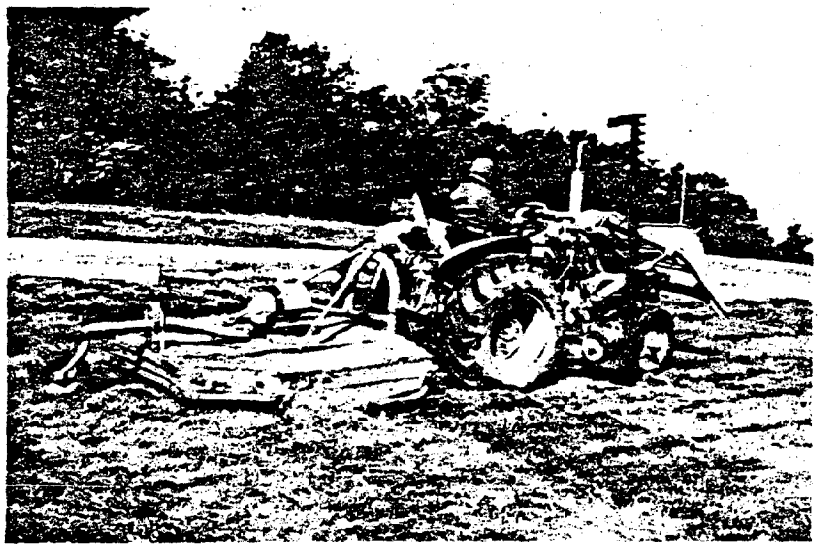
The Campground Caretaker also may be in charge of collecting fees, operating camp stores, renting equipment, and working in food service areas.

CHARACTERISTICS OF THE JOB

Work as a Campground Caretaker may be steady or seasonal. There are some campgrounds that are open 12 months a year. There are some resident camps that may retain a caretaker for the full year, even though the camp is only open for 2 to 2½ months. The work is generally outdoors.

QUALIFICATIONS

Qualifications depend on the kind of camp in which the Campground Caretaker will work. A high school education with courses in agriculture and applied vocational shop skills would be beneficial for most Campground Caretaker positions.



A Campground Caretaker maintaining the grounds. Courtesy Shawnee State Park, Schellsburg, PA.

Skills are needed in the care and operation of power and hand tools, tractors, lawnmowers, and other landscape equipment. The Campground Caretaker also should have skills in carpentry, electricity, and plumbing. Many caretakers in resident camps also are required to have skills in the maintenance of waterfront areas and facilities.

In positions where the Campground Caretaker is required to deal with the people using the campground, he should be tactful and courteous. In resident camp situations, he should enjoy being with small children.

EMPLOYMENT PROSPECTS

Future employment prospects for Campground Caretakers look good. Prospects for employment in overnight campgrounds depend upon the number of campers and amount of campground services needed. Campers and campgrounds have been on the increase in the past 15 years. Prospects look better in overnight campgrounds than in resident camps.

OPPORTUNITIES FOR ADVANCEMENT

Opportunities for advancement exist after a year or more of satisfactory work performance. The Campground Caretaker may advance to a position of greater responsibility, possibly as a Park Maintenance Supervisor, Park Ranger, or Park Foreman.

HUNTING AND FISHING GUIDE

USUAL DUTIES

The Hunting and Fishing Guide provides assistance to sports hunters and fisherman by finding game and fishing areas which offer recreational enjoyment. The guide organizes and leads hunting and fishing parties. This individual can also help by suggesting types of equipment to use or techniques useful in catching the prey.

The Hunting and Fishing Guide may lead the hunting party along trails or by boats, horses, motor vehicles, or possibly airplanes. It is the job of the guide to make outdoor living as comfortable as possible, working closely with the party to pick suitable campsites and to keep the pace of travel suited to the ability of the customers.

CHARACTERISTICS OF THE JOB

Work is seasonal, depending on the hunting and fishing seasons in the geographical area. Work is entirely outdoors and requires strenuous activity in all types of weather.

A Fishing Guide assisting a lady in locating an area for fishing. Courtesy U.S. Department of the Interior.

QUALIFICATIONS

The job of the Hunting and Fishing Guide is rigorous and varied. In order to live and work in all types of weather, the guide must master the skills and crafts necessary to survive in wilderness areas. This individual must know the geographic area, be acquainted with animal and fish species in the area, and be familiar with all hunting and fishing laws.

The Hunting and Fishing Guide must know how to use, maintain, and repair the various hunting, fishing, and camping equipment the customers will be using. Ability to handle boats and canoes and knowledge of the care of livestock are helpful.

The Hunting and Fishing Guide should be able to handle emergency situations and guide others to safety. This requires leadership ability, knowledge of first aid, ability to construct temporary shelters, and other survival techniques. Field care and/or cleaning of fish or game is as essential as the ability to cook.

EMPLOYMENT PROSPECTS

There will be a limited number of job openings for Hunting and Fishing Guides in the next ten years. These job openings will come about mostly because of the need to replace workers who will retire or leave their jobs for other reasons.

OPPORTUNITIES FOR ADVANCEMENT

Some Hunting and Fishing Guides advance to become managers of hunting and fishing camps and properties. Others become owners of these properties.

PARK NATURALIST

USUAL DUTIES

The job of the Park Naturalist is to bring people and the natural world together. This usually is accomplished in four ways: guided tours, audio-visual presentations, natural history lectures and exhibits, and the publication of written material about the particular area.

A Park Naturalist prepared to conduct guided tours to a park. Courtesy U.S. Department of the Interior.

In order to accomplish these tasks, the Park or Interpretive Naturalist must keep an up-to-date inventory of the natural history of the park. The Park Naturalist keeps records of what plants are growing where, when they bloom, and their size, numbers, and condition. The same kind of records are kept on animal populations in the park. A continuous record is kept on geological formations and weather conditions.

Interesting presentations depend upon the Park Naturalist's ability to share knowledge about natural resources and the history of an area. The Park Naturalist therefore must know what has gone on in the past, what is likely to happen in the future, and how man has affected the environment.

The Park Naturalist may be in charge of planning trails and campsites, collecting and maintaining natural history specimens, and planning exhibits. This person also may be responsible for conducting research, maintaining weather records, developing a library, promoting public relations, taking pictures, and enforcing laws.

CHARACTERISTICS OF THE JOB

The Park Naturalist works an average of five days a week through the year, but there are peak and slack periods. The day may start at 12 noon and go until 9 p.m. if there is an evening program to present. Seasonal variations in park attendance also will affect this schedule. Park Naturalists generally give presentations every weekend and many evenings during the summer months. Work is both outdoors and indoors.

QUALIFICATIONS

Communication skills in speaking, writing, graphic arts, and knowledge about natural history are the kinds of qualifications that the Park Naturalist must have. Usually, this person has a 4-year college degree in one of the natural sciences or interpretive services, or has had a great amount of experience as a part-time naturalist. The job involves scientific research, keeping accurate records, and using and maintaining audio-visual and photographic equipment. Interest in and curiosity about nature, creativity, and ability to get along with people are qualities a Park Naturalist should possess.

Much of the interpretation done today is in an urban setting, either in parks, museums, or on the street. Persons interested in urban interpretation should have a special interest in urban problems and the relationship of urban development to natural history and people, as well as the general qualifications mentioned above.

EMPLOYMENT PROSPECTS

Job opportunities in the interpretive services are found in federal, state, and local park departments, private museums, public and private schools, and wildlife agencies. The present emphasis at the federal level is for Urban Naturalists. There are still opportunities in other areas for those who may prefer a rural or suburban atmosphere.

OPPORTUNITIES FOR ADVANCEMENT

An experienced Park Naturalist may become a Nature Center Director, Park Supervisor, Director of Environmental or Outdoor Education Programs, or the Chief of Interpretive Services in a park. Advancement depends upon experience, qualifications, and the structure and location of the agency or institution where the Park Naturalist is employed.

OCCUPATIONS IN SOILS

SOIL CONSERVATION AIDE

USUAL DUTIES

Under supervision, the Soil Conservation Aide helps collect different kinds of information on natural resources for use in developing conservation plans. This individual assists in the application of soil conservation practices and in conducting demonstrations and tours on soil and water conservation.

CHARACTERISTICS OF THE JOB

Most of the work of the Soil Conservation Aide is performed outdoors. The work week is usually 40 hours. Some positions are full time and others are seasonal.

A Soil Conservation Aide assisting a Soil Conservation Technician determining the slope of a diversion ditch for water runoff control. Courtesy U.S.D.A. – Soil Conservation Service.

QUALIFICATIONS

The Soil Conservation Aide should have a high school diploma, an interest in the use and care of natural resources, and agriculture-related experience. The candidate should be able to work well with others.

EMPLOYMENT PROSPECTS

Job opportunities are fairly good. Local offices of the Soil Conservation Service of the U.S. Department of Agriculture; the Bureau of Indian Affairs of the U.S. Department of the Interior; and state and local government agencies employ Soil Conservation Aides.

OPPORTUNITIES FOR ADVANCEMENT

With additional on-the-job experience or post high school education that includes some course work in biology, physical science, forestry, engineering, or agriculture, the Soil Conservation Aide may advance to Soil Conservation Technician or other positions of greater responsibility.

SOIL CONSERVATION TECHNICIAN

USUAL DUTIES

The Soil Conservation Technician advises and assists land owners and managers in carrying out soil and water conservation plans. This individual goes to farms, ranches, municipal watersheds, construction sites, and other locations to gather information on past and present land use, apparent water management problems, severity of erosion, etc. The Soil Conservation Technician helps develop inventories and evaluations of natural resource data and assists the Soil Conservationist in preparing conservation plans. Among the conservation practices which the technician may help to install and maintain are ponds, cover crops, tree windbreaks, strip-cropping, terraces, contour planting, rotation grazing, wildlife habitat improvement, and many others.

CHARACTERISTICS OF THE JOB

Much of the work of the Soil Conservation Technician is done outdoors and involves working with the general public. This individual works in close cooperation with the Soil Conservationist. Work may be in any part of the United States, usually in rural areas.

QUALIFICATIONS

The Soil Conservation Technician must have a practical knowledge of methods and techniques of soil and water conservation. Entry level jobs require 2 years of agriculture-related experience or 2 years of appropriate post high school study which includes courses in biology, mathematics, physical sciences, engineering, or agriculture. The job requires the ability to communicate well with others.

A Soil Conservation Technician collecting data for land use planning. Courtesy U.S.D.A. Soil Conservation Service.

EMPLOYMENT PROSPECTS

With the current emphasis on environmental and resource conservation, job opportunities should be fairly good for Soil Conservation Technicians. Employers include the Soil Conservation Service in the U.S. Department of Agriculture; the Bureau of Indian Affairs in the U.S. Department of the Interior; state and local governmental agencies, such as conservation districts; and a few private land developers.

OPPORTUNITIES FOR ADVANCEMENT

After successful on-the-job experience and training, the Soil Conservation Technician may advance to positions of greater responsibility. Upon earning a B.S. degree in soil conservation or a closely related natural resource or agricultural field, the technician may advance to the position of Soil Conservationist.

SOIL CONSERVATIONIST

USUAL DUTIES

The Soil Conservationist works with land owners and managers to develop and carry out soil and water conservation plans for farms, ranches, housing developments, schools, air ports, recreation areas, and land used for other purposes. This individual provides professional conservation leadership and helps officials of a conservation district and other local leaders make and carry out community and area natural resource conservation and development plans.

The Soil Conservationist supervises technical help on the use and installation of natural resource management systems that usually include a wide variety of conservation practices, such as those listed under Soil Conservation Technician. Planning is done for watershed protection and flood prevention projects and coordinating multipurpose rural development projects.

The Soil Conservationist works with people, including planning commissioners, citizens and civic groups, school boards, employees of many other government agencies, farmers and ranchers, land developers and contractors, and many others who use or manage land and water resources.

A Soil Conservationist working with a land manager on soil tillage problems.

CHARACTERISTICS OF THE JOB

The Soil Conservationist works both indoors and outdoors and usually has headquarters in a small town or city in any part of the United States. The work is steady and normally involves supervising a small staff of engineers and technicians. A large proportion of the work involves contacts with other people.

QUALIFICATIONS

A candidate for the position of Soil Conservationist must have a B.S. or higher degree from an accredited college or university with a major in soil conservation or one of the closely related natural resources or agricultural fields, such as agronomy, forestry, wildlife biology, regional planning, agricultural education, or agricultural engineering. Because of the interdisciplinary nature of this occupation, experience that involves the use of techniques, principles, and methods from a variety of agricultural and natural resource disciplines is especially valuable. This individual should have the ability to get along well with others and possess well developed communication skills.

EMPLOYMENT PROSPECTS

The future looks promising for Soil Conservationists, for more and more people are becoming concerned about the quality of the environment and recognize that proper use and care of soil and water resources are the foundation for environmental improvement and economic development. Most positions are with government agencies: Soil Conservation Service in the U.S. Department of Agriculture; Bureau of Indian Affairs and Bureau of Land Management in the U.S. Department of the Interior; Tennessee Valley Authority; and state and local government agencies which are involved in conservation, land planning and development, or pollution control programs.

OPPORTUNITIES FOR ADVANCEMENT

The Soil Conservationist may advance to higher levels of responsibility after demonstrating leadership and supervisory ability, developing specialized knowledge and skills through graduate level education and on-the-job experience, and above average performance in daily work. This individual may be placed in charge of the soil and water conservation programs for a large area and supervise a sizable professional staff or may be given technical leadership for a specific program.

SOIL SCIENTIST

USUAL DUTIES

The Soil Scientist tends to specialize in one of three areas: making soil surveys, doing special purpose soil investigations, or teaching and research.

By direct examination in the field, the Soil Scientist collects information about the soil and records it on maps and as field notes. Among the kinds of soil information noted are physical and chemical characteristics, slope, erosion, geological

A Soil Scientist conducting experiments in a soil laboratory.

formations, vegetation, and other features. This individual helps present this information to landowners and operators and to technical specialists. More than 70,000 different kinds of soil have been identified in the United States. The Soil Scientist uses the scientific information gathered in the field to predict a soil's physical behavior and identify its capabilities and limitations for different uses.

The Soil Scientist may do special purpose investigations on specific soil problems to develop new management practices for particular soils. For instance, this individual might make a special study to forecast the behavior of soils under irrigation. The Soil Scientist works with technical specialists in other fields to integrate the findings in order to help develop recommendations for proper use and care of the soil.

The Soil Scientist who engages in research may perform a broad array of investigations into methods of improving use and management of soil and water resources. This individual might conduct experiments to improve knowledge of soil-water-plant-animal relationships; investigate methods of classifying, mapping, and evaluating soils; or do experimental work to determine the effects on the soil of tillage, fertilization, crop rotations, drainage, and other management practices.

CHARACTERISTICS OF THE JOB

Some of the work of the Soil Scientist is done outdoors and some in laboratories and officers. Work is steady. A beginning soil scientist works under the close guidance and supervision of experienced personnel.

QUALIFICATIONS

The individual must have earned a B.S. or higher degree from an accredited college or university with a major in soil science or a related field of biological, physical, or earth sciences, including at least 15 credit hours in soils. The candidate should be capable of doing independent research.

EMPLOYMENT PROSPECTS

Opportunities for employment for the well trained Soil Scientist should be excellent. Among federal agencies that employ Soil Scientists are: U.S. Department of Agriculture, U.S. Department of the Interior, and the Tennessee Valley Authority. Jobs with federal agencies come under the U.S. Civil Service Commission classification system.

State universities and agricultural experiment stations employ Soil Scientists. A few are self-employed, some work for industrial or other private organizations, and a few work for cities.

OPPORTUNITIES FOR ADVANCEMENT

By demonstrating competence and capacity for doing independent work, the Soil Scientist can advance to increasing levels of responsibility. Advancement may require advanced training as well as keeping up-to-date in the field. The Soil Scientist might eventually be placed in charge of all soil science work in a state or at a university.

OCCUPATIONS RELATED TO WATER RESOURCE MANAGEMENT

WATER RESOURCE INVESTIGATOR

USUAL DUTIES

It is the job of the Water Resources Investigator to study the sources of water pollution in an assigned area. Dumps, rural sewage systems, sawmills, industrial plants, restaurants, and motels are checked for stream pollution.

The investigator uses dye tests and collects samples to determine pollution and pollution sources. Those persons responsible for the pollution are then contacted. The Water Resources Investigator explains the water laws and suggests corrective measures to stop violations.

Reports of the investigator's studies are prepared and constitute official records. This individual attends hearings as directed and appears in court when necessary. Another duty involves monitoring industries for the quality and quantity of discharges.

CHARACTERISTICS OF THE JOB

Work is steady throughout the year, usually with a 5-day, 40-hour work week. Most work is outdoors but some office work and report writing is required.

QUALIFICATIONS

The Water Resource Investigator should have a high school diploma. Courses in chemistry, mathematics, science, and English are helpful. A college degree in an appropriate field also is helpful and may lead to advancement and promotion.

Since the Water Resource Investigator needs to find the causes and effects of water pollution, this individual should be able to conduct investigations, gather data, and prepare comprehensive reports. Knowledge of laws and policies applicable to water supplies and pollution control is helpful. It is also necessary for the investigator to establish tactful relations with property owners and those causing pollution.

EMPLOYMENT PROSPECTS

The future job situation for the Water Resource Investigator is excellent. There should be many opportunities for people interested in this area.

A Water Resource Investigator making a water quality test at a landfill operation.

OPPORTUNITIES FOR ADVANCEMENT

Advancement opportunities are good. The Water Resource Investigator may move up to a position of greater responsibility after a year or more of satisfactory work. An associate or baccalaureate degree may be required to meet the qualifications of advancement.

HYDROLOGIST

USUAL DUTIES

The Hydrologist works in the area of water resources, conducting scientific surveys and field investigations on water supplies and water use in connection with current and future needs. In some states where water is in short supply, the Hydrologist assists in the issuing of permits and licenses for water use.

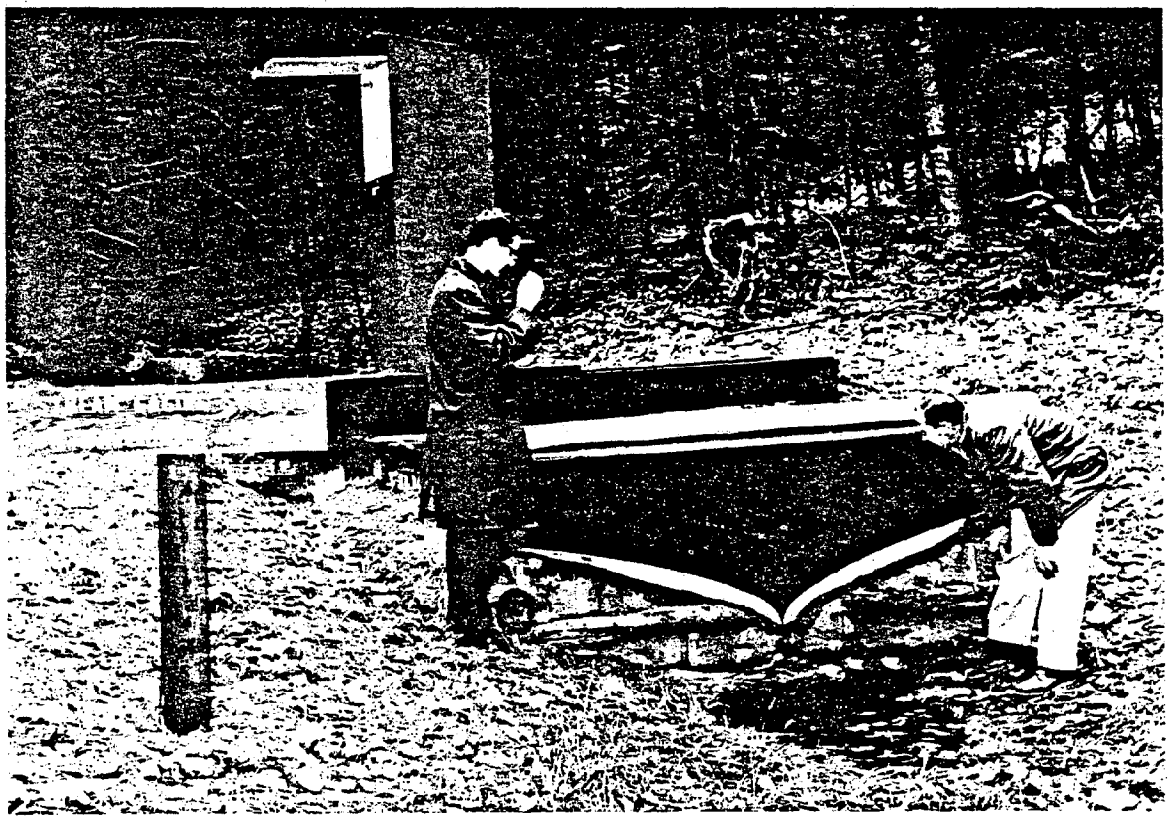
In some situations, applicants for water use permits may have conflicting interests. When this happens, the Hydrologist conducts hearings to inform the permit applicants of the state laws relating to water use and priorities. An attempt is made to work out a satisfactory settlement between conflicting interests. This may mean additional investigations, and if a settlement cannot be made, reports are prepared and further action recommended.

Hydrologists are also involved in water storage. They obtain or verify general reservoir information and make safety inspections during and/or after construction. A check is made on water flow into and out of the reservoir to make sure it follows water use permit requirements.

The Hydrologist acts as an information person between a state's water resource board and other state or federal agencies and private individuals concerned with water resources.

CHARACTERISTICS OF THE JOB

Work is steady throughout the year with a 40-hour, 5-day week. Work is performed indoors as well as outdoors. Work is at a professional level.



A Hydrologist checking a water flow measuring station.

QUALIFICATIONS

The Hydrologist needs a baccalaureate degree in civil, hydraulic, or hydrological engineering or other closely related field. Work in water quality control and water pollution control would be helpful.

Skill and ability is needed in hydrological survey methods and equipment. Also necessary is knowledge of the principles of surface water hydrology and laws and regulations concerning water use and water rights.

EMPLOYMENT PROSPECTS

The future job situation for an Hydrologist is excellent.

OPPORTUNITIES FOR ADVANCEMENT

Advancement opportunities for better positions are good. The Hydrologist may move up to a position of greater responsibility after a year or more of satisfactory work. An advanced degree may be required to meet qualifications of the new job.

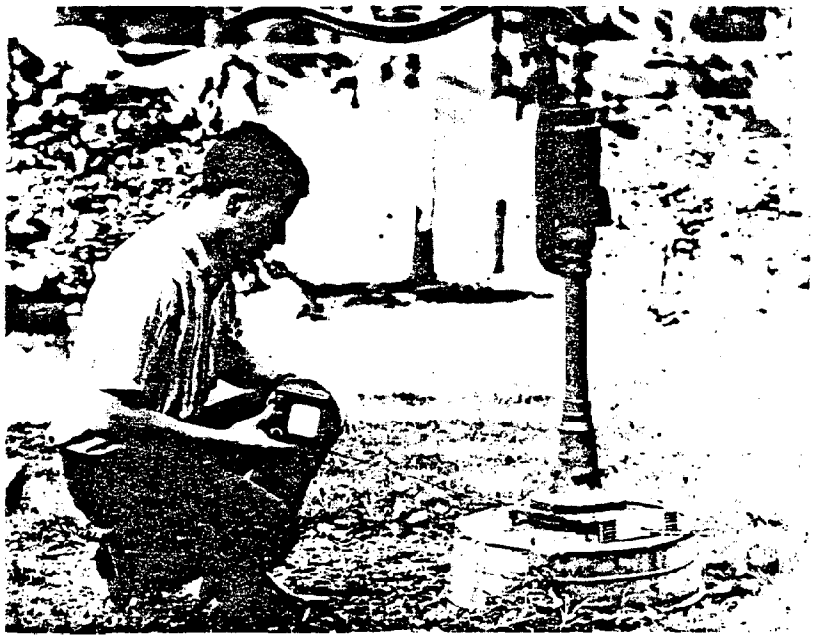
WATER WELL INSPECTOR

Environmental Health Technician

USUAL DUTIES

The Water Well Inspector checks well water to make sure it is safe for human consumption. Samples are taken from the well and tested for harmful or unwanted chemicals or minerals. Tests are also run for microorganisms which are harmful to human or animal health.

If the tests indicate the well water is safe, the inspector issues a permit for its use. If the tests indicate harmful or unwanted chemicals or minerals in the water, the inspector suggests methods to remove them. If the tests indicate disease-causing organisms, the inspector must determine the source of the pollution. The source may be a wastewater system close to the well site. The inspector may have to make dye tests to determine the actual cause of pollution. If the cause of pollution cannot be found or corrected, the inspector may suggest methods to make well water potable.



A Water Well Inspector taking a water well depth measurement.

CHARACTERISTICS OF THE JOB

Work is steady throughout the year with the usual 40-hour, 5-day week. Work is indoors in the laboratory and outdoors at the well site.

QUALIFICATIONS

The minimum requirement for a Water Well Inspector is a high school diploma. Courses in chemistry, mathematics, English, science, agriculture, or shop practices are helpful. Water Well Inspectors need to know how to use and maintain mechanical and electronic equipment.

The Water Well Inspector should be able to express ideas clearly in oral and written reports and know how to recognize possible problem areas in well water testing.

The inspector also needs to know how to establish and maintain effective working relations with the employing agency and the public.

EMPLOYMENT PROSPECTS

Employment prospects should improve in the future. The Water Well Inspector may be employed by state or local sanitation departments, boards of health, and commercial companies. He also may be employed at the federal level by the Public Health Service.

OPPORTUNITIES FOR ADVANCEMENT

The Water Well Inspector may advance to positions of greater responsibility after several years of satisfactory work performance. These positions may be with federal, state, or local agencies as a Public Health Supervisor or Environmental Health Supervisor. Further education may be necessary for these new positions.

WATER TREATMENT PLANT TECHNICIAN

USUAL DUTIES

The Water Treatment Plant Technician operates a water treatment plant. The job involves supervising the maintenance and repair of water treatment equipment, and the collecting and testing of water samples to check for water quality. The technician checks to see that the water is safe to drink, including the oxygen level of the water, mineral content, and amount of pollutants. This individual directs the application of chemical treatments when needed. Other duties include reading meters, keeping records, and keeping the plant operating properly.

CHARACTERISTICS OF THE JOB

This is a paraprofessional position requiring the individual to direct and supervise skilled workers. The Water Treatment Plant Technician works around equipment both indoors and outdoors, depending on the plant set-up. Some of the work involves reading instruments and keeping records.

QUALIFICATIONS

The Water Treatment Plant Technician should have training in water treatment technology, or equivalent work experience. An understanding of the water system and its importance to the community is necessary, along with knowledge of the equipment used to test water. The technician must be able to use tools and follow safety rules. This individual must be able to give directions to other workers.

EMPLOYMENT PROSPECTS

The future looks very promising for Water Treatment Plant Technicians. Opportunities exist for employment in federal, state, and local government agencies. Other government agencies which may hire a Water Treatment Plant Technician include: U.S. Department of the Interior, U.S. Department of Housing and Urban Development, U.S. Department of Health, Education, and Welfare, and the U.S. Department of Defense.

State agencies also may employ Water Treatment Plant Technicians. Some agencies are: Department of Agriculture, Department of Environmental Resources, and the Department of Urban Development. State positions usually are classified civil service posts and require a rating on a competitive entrance examination.

Employment opportunities also exist with many county or municipal governments which are involved with water treatment.

Many employment opportunities for technicians may be found with private industries which manufacture water pollution control and monitoring equipment and with consulting engineering firms.

Water Treatment Plant Technician operating valves in a water treatment plant. Courtesy Shawnee State Park, Schellsburg, PA.

OPPORTUNITIES FOR ADVANCEMENT

The Water Treatment Plant Technician may advance to the position of Water Treatment Plant Operator or Filter Plant Supervisor after a minimum of one year of experience. A 2-year associate degree in the field of water treatment technology or the equivalent in time or education will enhance one's opportunities for advancement.

WASTEWATER TREATMENT PLANT TECHNICIAN

USUAL DUTIES

The job of the Wastewater Treatment Plant Technician is to help operate a wastewater treatment plant. This means working with water purification chemists, sanitarians, purification plant operators, and sewage-disposal engineers to add chemicals that will purify wastewater. The job also includes reading and understanding meters and gauges, keeping daily records, and related duties. The technician supervises skilled workers in controlling the flow and processing of wastewater.

CHARACTERISTICS OF THE JOB

Wastewater Treatment Plant Technicians do physical work both indoors and outdoors. They may also work at a desk recording meter readings and keeping daily records. Wastewater Treatment Plant Technicians do a lot of work with machinery.

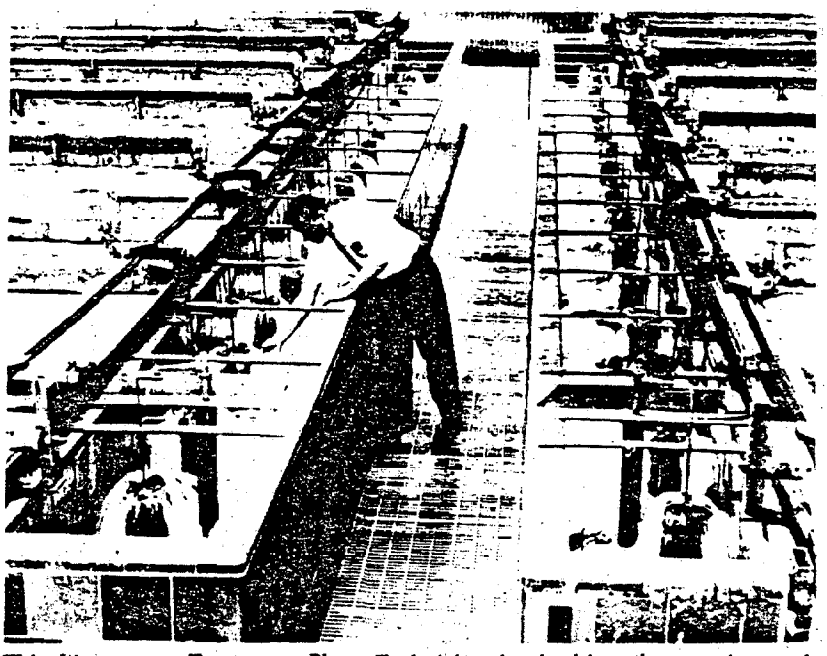
QUALIFICATIONS

The Wastewater Treatment Plant Technician should have a 2-year associate degree or certificate in water and wastewater treatment technology or equivalent work experience. This individual should have an understanding of water pollution control, and be able to follow instructions and perform duties carefully. The technician has to work with tools and equipment and must be able to read and understand meters and gauges. The ability to supervise others is helpful.

EMPLOYMENT PROSPECTS

Many Wastewater Treatment Plant Technician jobs should be available in the future. This area is expanding because of federal orders to upgrade the treatment of wastewater. There are a lot of positions opening in federal, state, and local government agencies. There also are job openings with wastewater equipment manufacturing companies.

Federal government agencies which may employ Wastewater Treatment Plant Technicians include: U.S. Department of Agriculture, U.S. Department of the Interior, U.S. Department of Housing and Urban Affairs, U.S. Department of Health, Education, and Welfare, and the U.S. Department of Defense.



This Wastewater Treatment Plant Technician is checking the aeration and flotation chambers in a wastewater treatment plant. Courtesy Environmental Protection Agency.

State agencies also may employ Wastewater Treatment Plant Technicians. Some agencies are: Department of Agriculture, Department of Environmental Resources, and the Department of Urban Development. State positions usually are classified civil service posts and require a rating on a competitive entrance examination.

Employment opportunities for technicians may be found with private industries which manufacture water pollution control and monitoring equipment and with consulting engineering firms.

OPPORTUNITIES FOR ADVANCEMENT

The Wastewater Treatment Plant Technician may advance to the position of Wastewater Treatment Plant Operator after at least one year's work experience. A 2-year associate degree in the field of water and wastewater technology may be necessary. Other positions to which the technician may advance are: Water Purification Chemist, Sanitarian, or Sewage-Disposal Engineer. In many of these cases, a baccalaureate degree is required for advancement.

OCEANOGRAPHER

USUAL DUTIES

The Oceanographer studies the ocean and its contents, movements and shorelines. Since this is such a large field, there are many areas in which an Oceanographer may specialize.

Some Oceanographers specialize in studying plant and animal life in the seas. The Oceanographer observes how these living things grow, live, and die and how they relate to the total ecology of the ocean. Some Oceanographers study the structure of the ocean floor, tides, water movement, and other physical characteristics. The Oceanographer observes waves and their effects on the ocean floor and shorelines. Water currents and the movement of sediment in the ocean are studied.

CHARACTERISTICS OF THE JOB

Work is steady throughout the year. The Oceanographer works primarily outdoors. Work may be on a ship, and duties may include diving and swimming.

Since the ocean is so large, working conditions may vary from arctic cold to tropical heat, and from the calm water of bays to the rough open waters of oceans.

QUALIFICATIONS

A baccalaureate degree in Oceanography or Marine Biology is essential. Physical stamina is important since a lot of the work is rigorous. You may be out on sea voyages or you may be diving into unknown waters. Skin diving is an important part of Oceanography.

The Oceanographer must be able to work well with others, think creatively, and carry out projects. In addition, the Oceanographer must record and analyze data, write reports and papers, and present project results to other people.

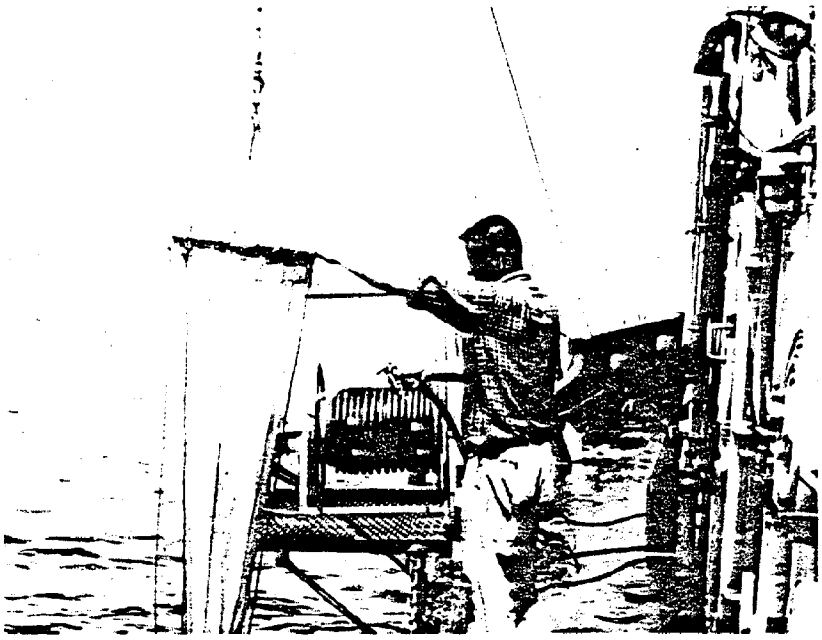
EMPLOYMENT PROSPECTS

The future job outlook for Oceanographers is excellent. They generally are hired by marine industries, marine laboratories, or various state or federal government agencies. Many Oceanographers are hired by the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce.

There is a rapidly growing demand for Oceanographers in many industries associated with marine science and engineering. Industries such as petroleum, natural gas, and precious stone mining conduct marine operations. Oceanographer consulting firms and fishing industries employ Oceanographers.

OPPORTUNITIES FOR ADVANCEMENT

Opportunities for advancement to better positions are excellent. The Oceanographer may move up to a position of greater responsibility after a year or more of satisfactory work. Further education may be necessary for advancement.



This oceanographer is collecting minute waterway plant life for laboratory study. Courtesy Environmental Protection Agency.

GAME PROPAGATOR

USUAL DUTIES

The Game Propagator may manage a state game farm or work for a private farm. One responsibility is to conduct programs of game propagation and distribution of quail, pheasant, and other game. The propagator supervises the work of Gamekeepers and Game Farm Workers and does technical work on the game farm. This work includes hatching, brooding, feeding, and caring for the game birds and animals. There is some field work in growing crops to feed the game.

The Game Propagator supervises work crews in the operation of incubators, hatcheries, brooders, and other farming and game propagating equipment. Schedules must be arranged so that operations are conducted at the proper times. Other duties are to direct the plowing and soil preparation procedures, planting, and finally harvesting of the grain which later is used as game feed.

The Game Propagator participates in the statewide distribution of game and waterfowl releases. This individual receives and raises new types of game birds, waterfowl, and animals which the state wishes to use for experimental purposes.

The Game Propagator patrols the game farm to enforce game laws. Other duties include keeping records and writing reports on game farm activities.

CHARACTERISTICS OF THE JOB

Work is relatively steady throughout the year, but may vary according to the season. Work is mostly outdoors, but there is some indoor work such as record keeping and brooder operations.

QUALIFICATIONS

The Game Propagator is expected to have two to three years of experience on game farms or college work in agriculture, game management, or biological science.

A Game Propagator preparing pheasant eggs for hatching. Courtesy Washington State Game Department.

The Game Propagator should be interested in farming, enjoy working with animals, and have a working knowledge of common game bird diseases and methods of treatment.

The Game Propagator needs skill and ability to operate and repair game farm equipment including regular farm tools and equipment, incubators, brooders, hatchers, and similar devices.

The Game Propagator must be in good physical condition and able to handle responsible duties.

EMPLOYMENT PROSPECTS

The future employment prospects for the Game Propagator look good. The increased popularity of recreational hunting will result in an increased demand for persons in this field.

OPPORTUNITIES FOR ADVANCEMENT

The Game Propagator may advance to the position of Game Farm Superintendent after several years of satisfactory work performance. Further education may be necessary to qualify for this position.

GAME WARDEN

Conservation Officer, Game Protector

USUAL DUTIES

Game Wardens patrol assigned areas of land and watch for violations of the fish and game laws. They check for illegal possession of fish and game, investigate complaints, question possible suspects, and issue warnings or make arrests. Claims for damages by wild animals to crops and livestock are investigated, and the Game Warden often assists in the settlement of these claims.

Another duty is to explain fish and game laws, rules, and regulations to sportsmen both in the field and in group meetings. The Game Warden may also be asked to speak on hunter safety in school programs.

The Game Warden also helps with conservation practices such as stocking fish in streams and releasing wild animals and birds.

CHARACTERISTICS OF THE JOB

Work is steady throughout the year, but there is no set work week. Days and hours vary according to the patrol schedule. Work is mostly outdoors in all weather conditions.

U.S. Game Management Agent and Maryland Game Warden checking with duck hunter. Courtesy Bureau of Sport Fisheries and Wildlife.

QUALIFICATIONS

To qualify, the candidate should be a high school graduate. Courses in biology and language arts are necessary.

An interest in hunting, fishing, and outdoor living are essential. The Game Warden must be strong and willing to work in many climatic conditions. The candidate must be friendly, patient, tactful, and courteous to the public. This individual must be able to enforce all rules and regulations strictly.

EMPLOYMENT PROSPECTS

Prospects look fairly good for this position. All states require the services of Game Wardens. The increased popularity of recreational hunting will result in an increased demand for individuals in this field.

OPPORTUNITIES FOR ADVANCEMENT

Advancement opportunities exist in the field and at division headquarters for positions of greater responsibility. The Game Warden may move into one of these positions after several years of satisfactory work performance.

WILDLIFE TECHNICIAN

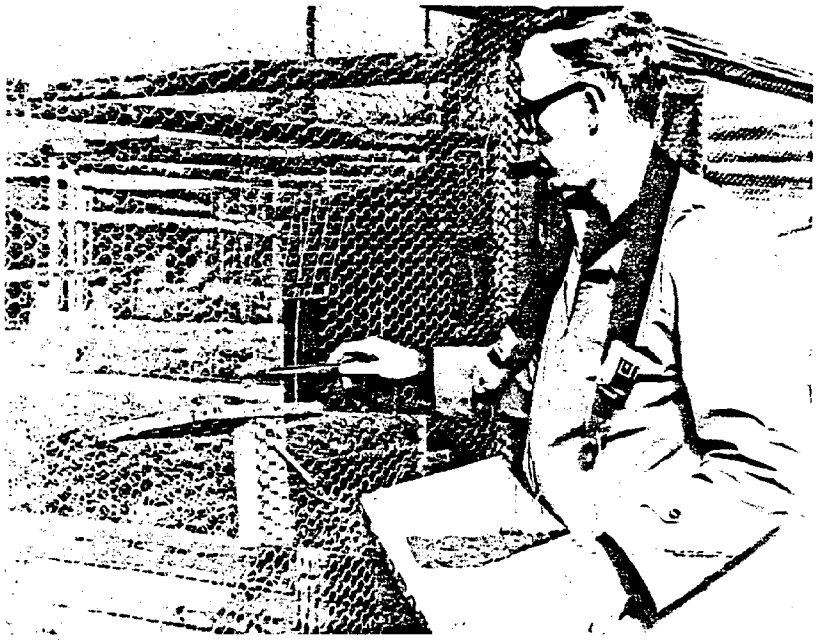
USUAL DUTIES

The Wildlife Technician assists the Wildlife Biologist in wildlife management and studies of wildlife nutrition, behavior, and reproduction. The technician captures the wildlife species for study, marking, and transfer from one area to another. Opinion surveys may be conducted with visitors to park and wildlife preserves. Special equipment is used by the Wildlife Technician to follow movements of individual animals. Wildlife data are then summarized and written up in report form.

The Wildlife Technician may be in charge of maintaining experimental wildlife cages. Another responsibility is to assist in enforcing game laws during peak periods of sports activity.

CHARACTERISTICS OF THE JOB

Work is steady throughout the year. The work week varies according to the seasonal work being done. Work usually is outdoors, in all climatic conditions.



A Wildlife Technician feeding hawks and owls in these specially constructed cages. Courtesy Bureau of Sport Fisheries and Wildlife.

QUALIFICATIONS

A Wildlife Technician should have an associate degree in wildlife management, biological science, forestry, or a related field, or the equivalent in work experience.

This individual must enjoy working in the outdoors and should be able to handle equipment such as live game traps, tracking equipment, and firearms. A background in orienting (map and compass work) is helpful.

EMPLOYMENT PROSPECTS

Opportunities for employment exist in federal and state government agencies, educational institutions, and in private organizations and industries.

Some of the federal agencies are: Bureau of Land Management, Bureau of Outdoor Recreation, Bureau of Indian Affairs, Bureau of Sport Fisheries and Wildlife, and the National Park Service of the U.S. Department of the Interior. Also, employment prospects exist in the U.S. Department of Agriculture with the Forest Service, Soil Conservation Service, and Extension Service.

State governments are the largest employers of Wildlife Technicians. These positions are located in state conservation agencies such as the Department of Natural Resources, Department of Fish and Game, Department of Environmental Resources, Department of Parks and Recreation, and the Department of Agriculture.

OPPORTUNITIES FOR ADVANCEMENT

The Wildlife Technician may advance to the position of Wildlife Biologist after several years of satisfactory work performance. Further education also may be necessary.

WILDLIFE BIOLOGIST

USUAL DUTIES

The Wildlife Biologist's work is centered on conducting wildlife research and management activities to maintain healthy wildlife. This involves field and laboratory work in game population surveys and autopsies of dead animals. Studies are done on food habits and the harvesting of game.

These Wildlife Biologists and banding geese for habitat studies. Courtesy Washington State Game Department.

The Wildlife Biologist checks hunters in the field, operates game checking stations along highways, and provides technical assistance in setting hunting limits and in the management of game farms.

Another concern for the biologist is to help engineers and agronomists coordinate water resources and land use development so wildlife won't be affected. This individual is often asked to present wildlife conservation programs to camps and schools. Training sessions are offered to other branches of the Fish and Game Commission as well as to interested groups such as sportsman clubs.

CHARACTERISTICS OF THE JOB

Work is steady throughout the year, usually with a non-standard work week. Work is performed both indoors and outdoors in all weather conditions.

QUALIFICATIONS

The Wildlife Biologist should have a baccalaureate degree in wildlife management, zoology, ecology, or a closely related field. The candidate should enjoy the outdoors, have an interest in animals, and be physically able to work a non-standard work week under various weather conditions. The ability to communicate well with others is necessary, especially in the educational programs.

EMPLOYMENT PROSPECTS

Somewhat limited employment opportunities for Wildlife Biologists exist in state and federal agencies, state universities, and community colleges. Some states require an advanced college degree to qualify for the position. A very limited number of positions exist in private companies.

OPPORTUNITIES FOR ADVANCEMENT

The Wildlife Biologist may move up to a position of greater responsibility after a year or more of successful work performance. After meeting the required educational qualifications plus several years of practical experience, the Wildlife Biologist may merit the position of Division or Bureau Chief.

Appendix A

SELECTED LIST OF REFERENCES

An Introduction to Agricultural Business and Industry. J.T. Weyant, N.K. Hoover, D.R. McClay. Danville, IL: Interstate Printers and Publishers, Inc., current edition.

Career Opportunities, Ecology, Conservation, and Environmental Control. Edited by J.G. Ferguson and others. Chicago, IL: J.G. Ferguson Publishing Co., 1969.

Chronicle Occupational Briefs. Moravia, NY: Chronicle Guidance Publications, Inc.

Cooperative Occupational Education and Work Experience in the Curriculum. R.E. Mason and P.G. Haines, Danville, IL: Interstate Printers and Publishers, Inc., 1972.

Dictionary of Occupational Titles, Volume I, II. U.S. Department of Labor. Washington, DC: U.S. Government Printing Office, 1965.

Directory of Postsecondary Schools with Occupational Curriculums: Public-Nonpublic 1971. U.S. Department of Health, Education, and Welfare Publication No. (OE) 73-11410. Washington, DC: U.S. Government Printing Office, 1973.

Directory of Secondary Schools with Occupational Curriculums: Public-Nonpublic 1971. U.S. Department of Health, Education, and Welfare Publication No. (OE) 73-11409. Washington, DC: U.S. Government Printing Office, 1973.

Guidance in Agricultural Education. H.M. Byram. Danville, IL: Interstate Printers and Publishers, Inc., current edition.

Handbook of Agricultural Occupations. N.K. Hoover. Danville, IL: Interstate Printers and Publishers, Inc., 1969.

Help Yourself to a Job, Parts I, II, III. Y. Dogin. Minneapolis, MN: Finney Co., 1969.

Largo Career Briefs. Largo, FL: Career Publication.

Making a Living in Conservation. A.M. Day. Harrisburg, PA: Stackpole Books, 1971.

Occupational Guidance for Off-Farm Agriculture. The Center for Research and Leadership Development in Vocational and Technical Education. Columbus, OH: The Ohio State University, 1965.

Occupational Outlook Handbook, 1972-73 Edition. U.S. Department of Labor, Bureau of Labor Statistics Bulletin No. 1700. Washington, DC: U.S. Government Printing Office.

Opportunities in Environmental Careers. O. Fanning. New York, NY: Universal Publishing and Distributing Corp., 1971.

Opportunities in Geology and Ecological Engineering. A.K. Snelgrove. New York, NY: Universal Publishing and Distributing Corp., 1970.

SRA Occupational Briefs. Chicago, IL: Science Research Associates, Inc.

Vocational Guidance and Career Development in the Schools: Toward a Systems Approach. E.L. Herr and S.H. Cramer. New York, NY: Houghton Mifflin Co., 1972.

Appendix B

SELECTED LIST OF PROFESSIONAL AND TECHNICAL SOCIETIES AND ORGANIZATIONS CONCERNED WITH THE NATURAL RESOURCES

The following natural resources and conservation societies and organizations are a source of occupational information and reference data. If you would like information from any of these organizations, address your letter to the executive secretary at the address shown.

AIR POLLUTION CONTROL ASSOCIATION, 440 Fifth Avenue, Pittsburgh, PA 15213
AMERICAN CONGRESS ON SURVEYING AND MAPPING, 733 15th Street, N.W., Washington, DC 20005
AMERICAN FISHERIES SOCIETY, 1040 Washington Building, 15th and New York Avenues, N.W., Washington DC 20005
AMERICAN FOREST INSTITUTE, 1835 K Street, N.W., Washington, DC 20006
AMERICAN FOREST PRODUCTS INDUSTRIES, 1816 N Street, N.W., Washington, DC 20006
THE AMERICAN FORESTRY ASSOCIATION, 1319 18th Street, N.W., Washington, DC 20036
AMERICAN GEOLOGICAL INSTITUTE, 2201 M Street, N.W., Washington, DC 20037
AMERICAN GEOPHYSICAL UNION, 2100 Pennsylvania Avenue, N.W., Washington, DC 20037
AMERICAN INSTITUTE OF PLANNERS, 917 15th Street, N.W., Washington, DC 20005
AMERICAN METEOROLOGICAL SOCIETY, 45 Beacon Street, Boston, MA 02108
AMERICAN PETROLEUM INSTITUTE, 1271 Avenue of the Americas, New York, NY 10020
AMERICAN PULPWOOD ASSOCIATION, 605 Third Avenue, New York, NY 10016
AMERICAN SOCIETY OF PHOTOGRAMMETRY, 644 Leesburg Pike, Falls Church, VA 22044
AMERICAN WATER RESOURCES ASSOCIATION, P.O. Box 434, Urbana, IL 61801
AMERICAN WATER WORKS ASSOCIATION, 2 Park Avenue, New York, NY 10016
ASSOCIATION OF INTERPRETIVE NATURALISTS, 1251 E. Broad Street, Columbus, OH 43205
CONSERVATION EDUCATION ASSOCIATION, Box 450, Madison, WI 53701
ECOLOGICAL SOCIETY OF AMERICA, Oak Ridge National Laboratory, Radiation Ecology Division, Oak Ridge, TN 37831
ENTOMOLOGICAL SOCIETY OF AMERICA, 5603 Calvert Road, College Park, MD 20740
INCINERATOR INSTITUTE OF AMERICA, 60 East 42nd Street, Suite 1914, New York NY 10017
INSTITUTE OF ENVIRONMENTAL SCIENCES, 34 South Main Street, Mt. Prospect, IL 60057
NATIONAL ASSOCIATION OF SANITARIANS, University of Denver, Denver, CO 80203
NATIONAL COAL ASSOCIATION, Coal Building, 1130 Seventeenth Street, N.W., Washington, DC 20036
NATIONAL PARKS AND CONSERVATION ASSOCIATION, 1701 18th Streeet, N.W., Washington, DC 20009
NATIONAL RECREATION, AND PARK ASSOCIATION, 1700 Pennsylvania Avenue, N.W., Washington, DC 20006
NATIONAL WILDLIFE FEDERATION, 1412 16th Street, N.W., Washington, DC 20036
THE SOCIETY OF AMERICAN FORESTERS, Suite 300, 1010 16th Street, N.W., Washington, DC 20036
SOCIETY FOR RANGE MANAGEMENT, 2120 South Birch Street, Denver, CO 80222
SOIL CONSERVATION SOCIETY OF AMERICA, INC., 7515 NE Ankeny Road, Ankeny, IA 50021
SOIL SCIENCE SOCIETY OF AMERICA, 677 South Segoe Road, Madison, WI 53711
WATER POLLUTION CONTROL FEDERATION, 3900 Wisconsin Avenue, Washington, DC 20016
WILDLIFE MANAGEMENT INSTITUTE, 709 Wire Building, Washington, DC 20025
THE WILDLIFE SOCIETY, Suit S-176, 3900 Wisconsin Avenue, N.W., Washington, DC 20016

Appendix C

SELECTED LIST OF AUDIOVISUAL AIDS

The following audiovisual materials are suggested to supplement instruction for career exploration in the natural resources. They are organized by natural resource areas, however, some audiovisual aids may be applicable to several areas.

Because there is considerable interest across the nation in natural resources and environmental education, the demand for these materials is enormous. When borrowing films, always give a second and third choice of show dates. Some materials may go out of print; others are being revised; some new ones are being developed. For these reasons, it is suggested that teachers when writing to a given source, ask for a list of new resource materials.

AIR

"Agricultural Science Protects Our Environment." No. C-140. 49 frames, color mounted slides $8, filmstrip $5.50. Photography Division, Office of Information, U.S. Department of Agriculture, Washington, DC 20250.

"Air Pollution and You." Filmstrip, color, 46 frames, sale. Current Affairs Films, 527 Madison Avenue, New York, NY 10022.

"Air Pollution: Take a Deadly Breath." Film, 16mm, color, 54 minutes, sale $610, rental $40. Contemporary Films/McGraw Hill, 327 West 42nd Street, New York, NY 10036.

"Answer is Clear, The." Film, 16mm, color, 14 minutes, free loan. Modern Talking Pictures Service, Inc., 2323 New Hyde Park Road, New Hyde Park, NY 11040.

FISH

"Brook Trout—Fact and Figures." Film, 16mm, color, 45 minutes, service charge $15.70. Audio-Visual Services, 7 Willard Building, University Park, PA 16802.

"Reservoir Fisheries of the Future." Film, 16mm, color, 20 minutes, service charge $7.30. Audio-Visual Services, 7 Willard Building, University Park, PA 16802.

"Trout Hatchery." Film, 16mm, color, 15 minutes, service charge $6.60. Audio-Visual Services, 7 Willard Building, University Park, PA 16802.

"Trout U.S.A." Film, 16mm, color, 10 1/2 minutes, service charge $3. NACD Environmental Film Service, Box 855, League City, TX 77573.

FORESTRY

"Forest, The." Film, 16mm, color or black and white, 28 minutes, service charge.*

"TreeFarm, The." Film, 16mm, color, 13 1/2 minutes, free loan. American Forest Institute, 1835 K Street, N.W., Washington, DC 20006.

"Vision In The Forest." Film, 16mm, color or black and white, 5 1/4 minutes, service charge.*

"Working Forest. A." Film, 16mm, color, 18 minutes, service charge.*

"Your Friend Is The Forest." Film, 16mm, color, 7 minutes, service charge $4.10. Audio-Visual Services, 7 Willard Building, University Park, PA 16802.

"Yours Is The Land." Film, 16mm, color, 20 minutes, service charge $7.50. Audio-Visual Services, 7 Willard Building, University Park, PA 16802.

LAND USE PLANNING

"Challenge of Urban Renewal." Film, 16mm, color, 28 minutes, service charge $10.30. Audio-Visual Services, 7 Willard Building, University Park, PA 16802.

"Cities, The: A City Is To Live In." Film, 16mm, color, 54 minutes, service charge $18.90. Audio-Visual Services, 7 Willard Building, University Park, PA 16802.

"Peace and Voices in the Wilderness." Film, 16mm, color, 10 minutes, service charge $4.10. Audio-Visual Services, 7 Willard Building, University Park, PA 16802.

"Place To Live." Film, 16mm, color, 17 minutes, service charge $5. NACD Environmental Film Service, Box 855, League City, TX 77573.

"Urban Sprawl." Film, 16mm, color, 15 minutes, service charge $6.10. Audio-Visual Services, 7 Willard Building, University Park, PA 16802.

"Urban Sprawl vs Planned Growth." Film, 16mm, color, 21 1/2 minutes, service charge $5. NACD, Environmental Film Service, Box 855, League City, TX 77573.

MINERALS AND MINERAL FUELS

"Coal and Water." Film, 16mm, color, 23 minutes, sale $200. Stuart Finley, 6926 Mansfield Road, Falls Church, VA 22041.

"Grain of Salt, A." Film, 16mm, color, 28 minutes, free loan. Modern Talking Pictures Service, Inc., 2323 New Hyde Park Road, New Hyde Park, NY 11040.

"Greatest Good, The." Film, 16mm, color, 28 minutes, free loan. Colorado Mining Association, 402 Majestic Building, 290 South 16th Street, Denver, CO 80202.

"Ravaged Earth, The." Film, 16mm, color, 27 minutes, service charge $15. NBC Rockefeller Plaza, New York, NY 10020.

RANGE

"Home on the Range." Film, 16mm, black and white, 9 minutes, service charge.*

"Range Grazing Practices." Film, 16mm, color or black and white, 6 1/2 minutes, service charge $3. NACD Environmental Film Service, Box 855, League City, TX 77573.

"Rebuilding With Grass." Film, 16mm, color, 25 minutes, service charge $5. NACD Environmental Film Service, Box 855, League City, TX 77573.

"Renewal of Our Rangelands." Film, 16mm, color, 25 minutes, service charge $5. NACD Environmental Film Service, Box 855, League City, TX 77573.

RECREATION

"Camping–Key to Conservation." Film, 16mm, color, 22 minutes, service charge $8.30. Audio-Visual Service, 7 Willard Building, University Park, PA 16802.

"Community Action For Recreation." Film, 16mm, color, 27 minutes, service charge $9.30. Audio-Visual Service, 7 Willard Building, University Park, PA 16802.

"Community Lake." Film, 16mm, color, 27 minutes, service charge $5. NACD Environmental Film Service, Box 855, League City, TX 77573.

"Heritage of Splendor." Film, 16mm, color, 18 minutes, service charge $6.10. Audio-Visual Service, 7 Willard Building, University Park, PA 16802.

"Rural Holidays," Film, 16mm, color, 25 minutes, service charge $5. NACD Environmental Film Service, Box 855, League City, TX 77573.

"Woodland Manners," Film, 16mm, color or black and white, 19 1/2 minutes, service charge*

SOIL

"Food and Soil." Film, 16mm, color, 11 minutes, service charge.*

"Problems of Conservation: Soil." Film, 16mm, color, 14 minutes, service charge $5. NACD Environmental Film Service, Box 855, League City, TX 77573.

"This Is Our Land." Film, 16mm, color, 28 1/4 minutes, service charge $5. NACD Environmental Film Service, Box 855, League City, TX 77573.

"Topsoil." Film, 16mm, black and white, 11 minutes, service charge $3. NACD Environmental Film Service, Box 855, League City, TX 77573.

"Water Movement in the Soil." Film, 16mm, color, 25 minutes, service charge $5. NACD Environmental Film Service, Box 855, League City, TX 77573.

WATER

"Adventures of Junior Raindrop." Film, 16mm, color, 8 minutes, service charge $3. NACD Environmental Film Service, Box 855, League City, TX 77573.

"How To Make a Dirty River." Film, 16mm, color, 27 minutes, sale $330, rental $15. NBC Educational Enterprises, Inc., 30 Rockefeller Plaza, New York, NY 10020. (Room 1040)

"It's Your Decision: Clean Water." Film, 16mm, color, 14 minutes, free loan. Associate Films, Inc., Regional Film Centers: 600 Grand Avenue, Ridgefield, NJ 07657; 561 Hillgrave Avenue, LaGrand, IL 60525; 324 Delaware Avenue, Oakmont, PA 15139.

"River Must Live, The." Film, 16mm, color, 21 minutes, free loan. Shell Film Library, 450 North Meridian Street, Indianapolis, IN 46204.

"Water For Farm and City." Film, 16mm, black and white, 13 minutes, service charge $5. NACD Environmental Film Service, Box 855, League City, TX 77573.

"Water, Let's Keep It Clean." Film, 16mm, color, 20 minutes, service charge $7.50. Audio-Visual Services, 7 Willard Building, University Park, PA 16802.

WILDLIFE

"Making Plaster Casts of Animal Tracks." No. C-174, 29 frames, slide set $11, filmstrip $5.50. Photography Division, Office of Information, U.S. Department of Agriculture, Washington, DC 20250.

"Once Upon a Time." Film, 16mm, black and white, 10 minutes, service charge $3. NACD Environmental Film Service, Box 855, League City, TX 77573.

"Patterns of the Wild." Film, 16mm, color, 26 minutes, service charge.*

"Some Game Birds of North America." 48 frames, color mounted slides $11, filmstrip $5.50. Photography Division, Office of Information, U.S. Department of Agriculture, Washington, DC 20250.

"Realm of the Wild." Film, 16mm, color, 25 minutes, service charge $5. NACD Environmental Film Service, Box 855, League City, TX 77573.

"We Share This Land." Film, 16mm, color, 14 1/4 minutes, service charge.*

"Wildlife and the Human Touch." Film, 16mm, color or black and white, 18 minutes, service charge.*

"Wildlife and Timber." Film, 16mm, color or black and white, 6 1/2 minutes, service charge.*

MISCELLANEOUS

"Alone In The Midst of The Land." Film, 16mm, color 27 minutes, sale $330, rental $15. NBC Educational Enterprises, Inc., 30 Rockefeller Plaza, New York, NY 10020. (Room 1040)

"Careers In Government Services." No. 178, 48 frames, color, filmstrip, sale $7.95. Vocational Education Productions, California State Polytechnic College, San Luis Obispo, CA 93401.

"Careers In Natural Resource Management." No. 180, 53 frames, color, filmstrip, sale $7.95. Vocational Education Productions, California State Polytechnic College, San Luis Obispo, CA 93401.

"Conservation/A Job For Young America." Film, 16mm, color, 19 minutes, sale $250, rental $15. Contemporary Films/McGraw Hill, 330 West 42nd Street, New York, NY 10036.

"Our Part In Conservation." Film, 16mm, color, 11 minutes, sale $125, rental $10. Contemporary Films/McGraw Hill, 330 West 42nd Street, New York, NY 10036.

"Our Vanishing Lands." Film, 16mm, color, 24 minutes, sale $325, rental $18. Contemporary Films/McGraw Hill, 330 West 42nd Street, New York, NY 10036.

*U.S. Department of Agriculture film available from state film libraries. Write Motion Picture Service, Office of Information, U.S. Department of Agriculture, Washington, DC 20250 for locations of these lending libraries.

Appendix D

A CHECKLIST OF POTENTIAL RESOURCE PERSONS WITHIN A COMMUNITY

The following checklist may be used as a guide to survey community resource people who would be available to assist teachers with planning field trips, to serve as resource speakers or to assist students with individual projects.

I. Local, State, and Federal Resource Person(s)

_____ Agriculture Stabilization and Conservation Service Personnel
_____ Community Planning Personnel
_____ County or Parish Recorder of Deeds
_____ Fish Conservation Officer (Warden)
_____ Forest Ranger
_____ Forestry Service Personnel
_____ Game Conservation Officer (Warden)
_____ U.S.D.A. Soil and Water Conservation Service Personnel

II. Local, State, and Federal Inspector(s)

_____ Building
_____ Environmental
_____ Mining (Minerals and Metals)
_____ Oil and Gas
_____ Range
_____ Safety
_____ Sanitation

III. Supervisors, Managers, and Caretakers

_____ Camp grounds
_____ Forests
_____ Flood Control Facilities
_____ Garbage Disposals
_____ Historic Sites and Monuments
_____ Libraries
_____ Museums
_____ Nature Trails
_____ Power Generating Stations
_____ Parks
_____ Recreation Facilities
_____ Science Centers
_____ Sewage Plants
_____ Tour Services
_____ Water Works
_____ Wildlife Sanctuaries
_____ Zoos

IV. Community Leaders

_____ Clubs
_____ Youth Groups
_____ Historic Societies
_____ Veteran Organizations
_____ Government Officials
_____ Professional Leaders

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