
Conservation Scientists and Foresters

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Significant Points

- About 2 of 3 conservation scientists and foresters work for Federal, State, or local governments.
- Workers in this occupation need, at a minimum, a bachelor's degree in forestry, environmental science, range management, or a related discipline.
- Slower than average job growth is projected; most new jobs will be in governments and in private sector forestry and conservation consulting.

Nature of the Work

Forests and rangelands supply wood products, livestock forage, minerals, and water. They serve as sites for recreational activities and provide habitats for wildlife. Conservation scientists and foresters manage the use and development of these lands and help to protect them. Some advise landowners on the use and management of their land. Conservation scientists and foresters often specialize in one area, such as wildlife management, soil conservation, urban forestry, pest management, native species, or forest economics. But most work falls into one of three categories: forestry, conservation science focusing on range lands, and conservation science focusing on farming and soil.

Foresters oversee our Nation's forests and direct activities on them for economic, recreational, conservational, and environmental purposes. Individual landowners, the public, and industry own most of the forested land in this country, and they require the expertise of foresters to keep the forests healthy and sustainable. Often this means coming up with a plan to keep the forests free from disease, harmful insects, and damaging wildfires, for example, planning when and where to plant trees and vegetation and when to cut timber. It may also mean coming up with ways to make the land profitable but still protected for future generations.

Foresters have a wide range of duties, often depending on who they are working for. Some primary duties of foresters include drawing up plans to regenerate forested lands, monitoring their progress, and supervising harvests. Land management foresters choose and direct the preparation of sites on which trees will be planted. They oversee controlled burning and the use of bulldozers or herbicides to clear weeds, brush, and logging debris. They advise on the type, number, and placement of trees to be planted. Foresters then monitor the seedlings to ensure healthy growth and to determine the best time for harvesting. If they detect signs of disease or harmful insects, they consult with specialists in forest pest management to decide on the best course of treatment. When the trees reach a certain size, foresters decide which trees and how many should be harvested and sold to sawmills.

Procurement foresters make up a large share of foresters. Their job is to buy timber, typically for a sawmill or wood prod-

ucts manufacturer, by contacting local forest owners and negotiating a sale contract. This typically involves taking inventory of the type, amount, and location of all standing timber on the property, a process known as timber cruising. They then appraise the timber's worth, negotiate its purchase, and draw up a contract for purchase. The forester next subcontracts with loggers or pulpwood cutters for tree removal and to aid in laying out roads to access the timber. Throughout the process, foresters maintain close contact with the subcontractor and the landowner to ensure that the work meets the landowner's requirements and Federal, State, and local environmental regulations.

Throughout the forest management and procurement processes, foresters are often responsible for conserving wildlife habitats and creek beds within forests, maintaining water quality and soil stability, and complying with environmental regulations. Foresters must balance the desire to conserve forested ecosystems with the need to use forest resources for recreational or economic purposes. For example, foresters are increasingly working with landowners to find ways to generate money from forested lands, such as for hunting or other recreational activity, without cutting down trees. An increasing concern of foresters is the prevention of devastating wildfires. Using a variety of techniques, including the thinning of forests or using controlled burns to clear brush, foresters work with governments and private landowners to minimize the impact of fire on the forest. During fires, they work with or supervise fire fighters and plan ways to attack the fire.

Some foresters, mostly in the Federal Government, perform research on issues facing forests and related natural resources. They may study tree improvement and harvesting techniques; global change; protection of forests from pests, diseases, and fire; improving wildlife habitats; forest recreation; and other topics. State foresters may perform some research but more often work with private landowners in developing forest management plans. Both Federal and State foresters enforce relevant environmental laws, including laws on water quality and fire suppression.

Relatively new fields in forestry are urban forestry and conservation education. Urban foresters live and work in larger cities and manage urban forests. They are concerned with quality of life issues, such as air quality, shade, beautification, storm water runoff, and property values. Conservation education foresters train teachers and students about sound forest stewardship.

Foresters use a number of tools to perform their jobs. Clinometers measure the height of trees; diameter tapes measure tree diameter; and increment borers and bark gauges measure the growth of trees so that timber volumes can be computed and growth rates estimated. Remote sensing (aerial photographs and other imagery taken from airplanes and satellites) and Geographic Information Systems (GIS) data often are used for mapping large forest areas and for detecting widespread trends of forest and land use. Once a map is generated, data are digitized to create a computerized inventory of information required to manage the forest land and its resources. Moreover, hand-held computers, Global Positioning Systems (GPS), and Internet-based applications are used extensively.

Conservation scientists manage, improve, and protect the country's natural resources. They work with landowners and Federal, State, and local governments to devise ways to use and improve the land while safeguarding the environment. Con-

conservation scientists mainly advise farmers, farm managers, and ranchers on how they can improve their land for agricultural purposes and to control erosion. A growing number of conservation scientists are also advising landowners and governments on recreational uses for the land.

Two of the more common conservation scientists are range managers and soil conservationists. Range managers, also called range conservationists, range ecologists, or range scientists, study, manage, improve, and protect rangelands to maximize their use without damaging the environment. Rangelands cover hundreds of millions of acres of the United States, mostly in Western States and Alaska. They contain many natural resources, including grass and shrubs for animal grazing, wildlife habitats, water from vast watersheds, recreation facilities, and valuable mineral and energy resources. Range managers may inventory soils, plants, and animals; develop resource management plans; help to restore degraded ecosystems; or assist in managing a ranch. For example, they may help ranchers attain optimum livestock production by determining the number and kind of animals to graze, the grazing system to use, and the best season for grazing. At the same time, however, range managers maintain soil stability and vegetation for other uses such as wildlife habitats and outdoor recreation. They also plan and implement revegetation of disturbed sites.

Soil and water conservationists provide technical assistance to farmers, ranchers, forest managers, State and local agencies, and others concerned with the conservation of soil, water, and related natural resources. They develop programs for private landowners designed to make the most productive use of land without damaging it. Soil conservationists also assist landowners by visiting areas with erosion problems, finding the source of the problem, and helping landowners and managers develop management practices to combat it. Water conservationists also assist private landowners and Federal, State, and local governments by advising on water quality, preserving water supplies, groundwater contamination, and management and conservation of water resources.

Work environment. Working conditions vary considerably. Some foresters and conservation scientists work regular hours in offices or labs, but others may split their time between fieldwork and office work. Independent consultants and new, less experienced workers spend the majority of their time outdoors overseeing or participating in hands-on work. Fieldwork can involve long hours alone.

The work can be physically demanding. Some conservation scientists and foresters work outdoors in all types of weather, sometimes in isolated areas, and consequently may need to walk long distances through densely wooded land to carry out their work. Natural disasters may also cause foresters and conservation scientists to work long hours during emergencies. For example, foresters often have to work long hours during fire season, and conservation scientists often are called to prevent erosion after a forest fire and to provide emergency help after floods, mudslides, and tropical storms.

Foresters employed by the Federal Government and the States usually work 40 hours a week, but not always on a standard schedule. In field positions, foresters often work for long blocks of time, working 10 days straight, followed by 4 days



Conservation scientists and foresters keep careful data on plant growth to protect natural resources.

off, for example. Overtime may be necessary when working in fire fighting, law enforcement, or natural disaster response.

Training, Other Qualifications, and Advancement

Most forester and conservation scientist jobs require a bachelor's degree. Research and teaching positions usually need a graduate degree.

Education and training. A bachelor's degree in forestry, biology, natural resource management, environmental sciences, or a related discipline is the minimum educational requirement for careers in forestry. In the Federal Government, a combination of experience and appropriate education occasionally may substitute for a bachelor's degree, but competition for jobs makes this difficult. Foresters who wish to do research or to teach usually need an advanced degree, preferably a Ph.D.

Conservation scientists generally have at least a bachelor's degree in fields such as ecology, natural resource management, agriculture, biology, or environmental science. A master's degree or Ph.D. is usually required for teaching and research positions.

Most land-grant colleges and universities offer degrees in forestry. The Society of American Foresters accredits about 50 degree programs throughout the country. Curricula focus on four areas: forest ecology and biology, measurement of forest resources, management of forest resources, and public policy. Students should balance general science courses such as ecology, biology, tree physiology, taxonomy, and soil formation with technical forestry courses, such as forest inventory, wildlife habitat assessment, remote sensing, land surveying, GPS technology, integrated forest resource management, forest protection, and silviculture, which is the care and cultivation of forest trees. In addition, mathematics, statistics, and computer science courses are recommended. Courses in resource policy and administration, specifically forest economics and business administration, are also helpful. Forestry curricula increasingly include courses on wetlands analysis and sustainability and regulatory issues because prospective foresters need a strong grasp of Federal, State, and local policy issues and an understanding of complex environmental regulations.

Many colleges require students to complete a field session either in a camp operated by the college or in a cooperative work-

study program with a Federal or State agency or with private industry. All schools encourage students to take summer jobs that provide experience in forestry or conservation work.

Range managers usually have a degree in range management or range science. Nine colleges and universities offer degrees in range management that are accredited by the Society of Range Management. More than 40 other schools offer coursework in range science or in a closely related discipline. Range management courses combine plant, animal, and soil sciences with principles of ecology and resource management. Desirable electives include statistics, forestry, hydrology, agronomy, wildlife, animal husbandry, computer science, and recreation. Selection of a minor in range management, such as wildlife ecology, watershed management, animal science, or agricultural economics, can often enhance qualifications for certain types of employment.

Very few colleges and universities offer degrees in soil conservation. Most soil conservationists have degrees in environmental studies, agronomy, general agriculture, hydrology, or crop or soil science; a few have degrees in related fields such as wildlife biology, forestry, and range management. Programs of study usually include 30 semester hours in natural resources or agriculture, including at least 3 hours in soil science.

Licensure. Sixteen States sponsor some type of credentialing process for foresters. Alabama, California, Connecticut, Maine, Maryland, Massachusetts, and New Hampshire have licensing statutes. Arkansas, Georgia, Mississippi, North Carolina, and South Carolina have mandatory registration statutes, and Michigan, New Jersey, Oklahoma, and West Virginia have voluntary registration statutes. Both licensing and registration requirements usually entail completing a 4-year degree in forestry and several years of forestry work experience. Candidates pursuing licensing also may be required to pass a comprehensive written exam.

Other qualifications. Foresters and conservation scientists usually enjoy working outdoors, are able to tolerate extensive walking and other types of physical exertion, and are willing to relocate to find work. They also must work well with people and have good communication skills.

Certification and advancement. One option to advance in these occupations is to become certified. The Society of American Foresters certifies foresters who have at least a bachelor's degree from one of the 50 forestry programs accredited by the Society or from a forestry program that, though not accredited by the Society, is substantially equivalent. In addition, the candidate must have 5 years of qualifying professional experience and pass an examination.

The Society for Range Management offers two types of certification: one as a certified professional in rangeland management and another as a certified range management consultant. Candidates seeking certification must have at least a bachelor's degree in range science or a closely related field, a minimum of 6 years of full-time work experience, and a passing score on an exam.

Additionally, a graduate with the proper coursework in college can seek certification as a wetland scientist through the Society of Wetland Scientists.

Recent forestry and conservation scientist graduates usually work under the supervision of experienced foresters or scientists. After gaining experience, they may advance to more responsible positions. In the Federal Government, most entry-level foresters work in forest resource management. An experienced Federal forester may supervise a ranger district and may advance to forest supervisor, regional forester, or a top administrative position in the national headquarters.

In private industry, foresters start by learning the practical and administrative aspects of the business and by acquiring comprehensive technical training. They are then introduced to contract writing, timber harvesting, and decision making. Some foresters work their way up to top managerial positions. Foresters in management usually leave fieldwork behind, spending more of their time in an office, working with teams to develop management plans and supervising others. After gaining several years of experience, some foresters may become consultants, working alone or with one or several partners. They contract with State or local governments, private landowners, private industry, or other forestry consulting groups.

Soil conservationists usually begin working within one county or conservation district and, with experience, may advance to the area, State, regional, or national level. Also, soil conservationists can transfer to related occupations, such as farm or ranch management advisor or land appraiser.

Employment

Conservation scientists and foresters held about 33,000 jobs in 2006. Conservation scientist jobs are heavily concentrated in government where nearly 3 in 4 are employed. Soil conservationists are employed primarily in the U.S. Department of Agriculture's (USDA) Natural Resource Conservation Service. Most range managers work in the USDA's Forest Service, the U.S. Department of the Interior's Bureau of Land Management, and the Natural Resource Conservation Service. A small number are self-employed and others work for nonprofit organizations or in consulting firms.

More than half of all foresters work for Federal, State and local governments. Federal Government foresters are concentrated in the USDA's Forest Service. A few foresters are self-employed, generally working as consultants or procurement foresters. Others work for sawmills, wood products manufacturers, logging companies, and the forestry industry.

Although conservation scientists and foresters work in every State, employment of foresters is concentrated in the Western and Southeastern States, where many national and private forests and parks—and most of the lumber and pulpwood-producing forests—are located. Range managers work almost entirely in the Western States, where most of the rangeland is located. Soil conservationists, on the other hand, are employed in almost every county in the country. Besides the jobs described above, some foresters and conservation scientists held faculty positions in colleges and universities. (See the section on teachers—postsecondary elsewhere in the *Handbook*.)

Job Outlook

Employment of conservation scientists and foresters is expected to grow more slowly than the average for all occupations

Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-2016	
				Number	Percent
Conservation scientists and foresters	19-1030	33,000	35,000	1,700	5
Conservation scientists.....	19-1031	20,000	21,000	1,100	5
Foresters	19-1032	13,000	14,000	700	5

NOTE: Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

through 2016. In addition to job openings from growth, many openings are expected as today's scientists and foresters retire.

Employment change. Employment of conservation scientists and foresters is expected to grow by 5 percent during the 2006-16 decade, more slowly than the average for all occupations. Recent large-scale sales of forestlands by industry has resulted in a loss of jobs within the traditional forest industry while creating limited opportunities with Timber Investment Management Organizations and Real Estate Investment Trusts.

Fire prevention and suppression will become a main activity for some conservation scientists and foresters, especially within the Federal Government, as the human population spreads into previously uninhabited lands. The Federal Government employs more conservation scientists and foresters than any other industry. Overall employment of conservation scientists and foresters in the Federal government is expected to grow more slowly than the average for all occupations, mostly because of budgetary constraints and the trend toward contracting these functions out to private consulting firms. Also, Federal land management agencies, such as the United States Forest Service, have de-emphasized their timber programs and increasingly focused on wildfire suppression and law enforcement, which may require hiring people with other skills.

State governments are the second largest employer of conservation and forest workers, and they are expected to have little or no growth in their employment of conservation scientists and foresters due to budgetary restrictions. A few States are now working to provide market-based incentives to private landowners to encourage them to use forest land for the public benefit by cleaning watersheds, keeping trees, or doing other environmentally focused activities. More State foresters are being asked to design and help implement such eco-management plans.

The management of storm water and coastlines has created demand for people knowledgeable about runoff and erosion on farms and in cities and suburbs. The opening of Federal lands to leasing by oil and gas companies is creating healthy demand for range scientists and range managers, who are finding work with consulting companies to help write environmental impact statements. Additionally, soil and water quality experts will still be needed as States design initiatives to improve water resources by preventing pollution by agricultural producers and industrial plants. A small number of new jobs will result from the need for range and soil conservationists to provide technical assistance to owners of grazing land through the Natural Resource Conservation Service. Salaried foresters working for private industry—such as paper companies, sawmills, and pulpwood mills—will be needed, though in smaller numbers than in

the past, to provide technical assistance and management plans to landowners.

Establishments in management, scientific, and technical consulting services have increased their hiring of conservation scientists and foresters in recent years in response to demand for professionals to prepare environmental impact statements and erosion and sediment control plans, monitor water quality near logging sites, and advise on tree harvesting practices required by Federal, State, or local regulations. Hiring by these firms should continue during the 2006-16 decade.

Job prospects. The Federal Government and some State governments expect a large number of workers to retire over the next decade. This is likely to create a large number of job openings for foresters and conservation scientists in government despite the projection for slower than average growth of this occupation in all State, local, and Federal governments combined. However, the best opportunities for foresters and conservation scientists will be in consulting. Government and businesses are increasingly contracting out forestry and conservation services to companies that specialize in providing them.

Foresters involved with timber harvesting will find better opportunities in the Southeast, where much forested land is privately owned. However, the recent opening of public lands, especially in the West, to commercial activity will also help the outlook for foresters.

Earnings

Median annual earnings of conservation scientists in May 2006 were \$54,970. The middle 50 percent earned between \$40,950 and \$68,460. The lowest 10 percent earned less than \$29,860, and the highest 10 percent earned more than \$80,260.

Median annual earnings of foresters in 2006 were \$51,190. The middle 50 percent earned between \$40,870 and \$62,290. The lowest 10 percent earned less than \$33,490, and the highest 10 percent earned more than \$74,570.

In 2006, most bachelor's degree graduates entering the Federal Government as foresters, range managers, or soil conservationists started at \$28,862 or \$35,752, depending on academic achievement. Those with a master's degree could start at \$43,731 or \$52,912. Holders of doctorates could start at \$63,417. Beginning salaries were slightly higher in selected areas where the prevailing local pay level was higher. In 2007, the average Federal salary for foresters was \$65,964; for soil conservationists, \$64,284; and for rangeland managers, \$60,828.

According to the National Association of Colleges and Employers, graduates with a bachelor's degree in conservation and renewable natural resources received an average starting salary offer of \$34,678 in July 2007.

In private industry, starting salaries for students with a bachelor's degree were comparable with starting salaries in the Federal Government, but starting salaries in State and local governments were usually lower.

Conservation scientists and foresters who work for Federal, State, and local governments and large private firms generally receive more generous benefits than do those working for smaller firms. Governments usually have good pension, health, and leave plans.

Related Occupations

Conservation scientists and foresters manage, develop, and protect natural resources. Other workers with similar responsibilities include environmental engineers, agricultural and food scientists, biological scientists, environmental scientists and hydrologists, geoscientists, and farmers, ranchers, and agricultural managers.

Sources of Additional Information

For information about forestry careers and schools offering education in forestry, send a self-addressed, stamped business envelope to:

► Society of American Foresters, 5400 Grosvenor Ln., Bethesda, MD 20814-2198. Internet: <http://www.safnet.org>

Information about a career as a range manager, and a list of schools offering training, is available from:

► Society for Range Management, 10030 West 27th Ave., Wheat Ridge, CO 80215-6601.

Internet: <http://www.rangelands.org/srm.shtml>

Information on getting a job as a conservation scientist or forester with the Federal Government is available from the Office of Personnel Management (OPM) through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at <http://www.usajobs.opm.gov> or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result. For advice on how to find and apply for jobs, see the Occupational Outlook Quarterly article "How to get a job in the Federal Government," online at: <http://www.bls.gov/opub/ooq/2004/summer/art01.pdf>.