

Going “green”: Environmental jobs for scientists and engineers

Alice Ramey

It’s hard to avoid the word “green” these days. From policies to programs, it seems that green is cool—and red hot.

Green is often used as a synonym for environmental or ecological, especially as it relates to products and activities aimed at minimizing damage to our planet. Scientists and engineers have long had important roles in the environmental movement. Their expertise is focused on a variety of issues, including increasing energy efficiency, improving air and water quality, and sustaining natural resources. And, with interest in such projects growing, there should be additional opportunities for these scientists and engineers in the future.

Alice Ramey is an economist in the Office of Occupational Statistics and Employment Projections, BLS. She is available at (202) 691-5708 or ramey.alice@bls.gov.



Some discussions of these occupations classify workers by environmental issue, such as air quality, solid waste management, or land conservation. Others group them by project category, such as environmental protection, environmental health and safety, and natural resources management. This article uses the latter method to describe the job duties, employment, outlook, wages, and training requirements for conservation scientists, environmental engineers, environmental scientists, and hydrologists. Suggestions for finding more information on these topics begin on page 9.

Science and engineering go green

Conservation scientists, environmental scientists, environmental engineers, and hydrologists are among the workers who apply their specialized knowledge to a variety of environmental issues. This specialized knowledge comes from college study in math

and sciences, including biology, chemistry, geography, and statistics. In addition, good communications skills are essential for writing reports and sharing project results with employers, colleagues, or the public.

These workers gather and analyze information to create solutions to the problems they study. Conservation scientists usually work independently, but environmental engineers, environmental scientists, and hydrologists are often part of a team.

Conservation scientists

Conservation scientists develop strategies to help manage, improve, and protect the Earth's resources. To devise these protective strategies, conservation scientists often collect samples of soil, water, and plants, as well as record data on plant and animal life. After they have analyzed the samples and data, these workers create a conservation plan. Their plan offers strategies for optimizing resources while minimizing damage to the surrounding environment.

There are several types of conservation scientists, and they often have different job titles. One of the most common types is range manager. These workers study and care for rangelands—the open expanses of land located primarily in the Western States and Alaska that contain natural resources, such as wildlife habitats, watersheds, and mineral and energy sources. The overall goal of range managers is to safeguard long-term sustainability of these resources, thereby ensuring a future source of grazing land, clean water, and wildlife.

The specific duties of range managers vary. These duties might include developing plans to manage natural resources, conducting studies to determine an activity's impact on an area, assisting in managing ranches, or restoring damaged ecosystems.

Another type of conservation scientist is soil and water conservationist. These workers study soil and water conditions and offer

advice about maintaining or improving the quality of these and related resources. Soil conservationists help identify causes of soil erosion and develop plans to correct them. The work of water conservationists is similar to that of hydrologists, whose description begins on page 8.

Job market and wages. Conservation scientists held about 15,800 jobs in May 2008, according to the U.S. Bureau of Labor Statistics (BLS). Federal, State, and local governments employed nearly 75 percent of these workers. Other conservation scientists are employed by social advocacy groups, including nonprofit organizations, and by consulting firms. A small portion is self-employed.

Soil and water conservation scientists work throughout the United States, particularly in counties that need help managing their wetlands and other conservation areas. In contrast, range managers work almost entirely

Range managers, a type of conservation scientists, care for open lands that contain natural resources.



in Alaska and the Western States, where most of the Nation's rangelands are located.

In projecting employment, BLS classifies conservation scientists with foresters. This combined occupational group is expected to have employment growth that is slower than the average for all occupations between 2006 and 2016, largely due to expected job losses for foresters in the timber industry and to budgetary restraints at all levels of government. However, these factors will be offset by others that are expected to create opportunities for conservation scientists.

The best opportunities should be in consulting services, as both governments and businesses increasingly rely on consultants for conservation work. Consulting firms are expected to hire additional conservation scientists in response to a growing demand for professionals to prepare environmental impact statements.

Workers will also be needed to develop erosion and sediment control plans and to monitor water quality. And States are expected to employ conservation scientists to design ways to prevent water from being polluted by agricultural producers and industrial plants.

The mean annual wages of conservation scientists in May 2008 were \$60,170, according to BLS. Mean wages were \$69,090 for conservation scientists in the Federal Government and \$51,520 in local government. (BLS does not have wage data for these workers in State government.) Those employed by social advocacy groups had mean wages of \$54,540; those employed in management, scientific, and technical consulting services had mean wages of \$55,320.

Preparation. The most significant source of education for conservation scientists is a bachelor's degree in fields such as ecology, natural resource management, agriculture, or environmental science. Range managers usually have a degree in range management or range science. Few schools offer degrees specifically in soil or water conservation.

Nine colleges and universities offer degree programs in range management that are accredited by the Society for Range

Management. However, many other colleges and universities offer courses in range management and related disciplines. Courses in range management include subjects such as plant, animal, and soil sciences.

Some range managers acquire additional credentials through the Society for Range Management's professional certification programs. Certification is optional, but demonstrates that recipients have met the high standards required for completion of a program.

Environmental engineers

Environmental engineers develop methods, systems, and products to prevent or repair environmental harm. In compliance with numerous laws and regulations, these workers use principles of science and engineering to solve a variety of environmental problems.

Environmental engineers may specialize in the types of problems they solve. Some assess the likely impact of different projects on air and water quality, animal habitats, and other aspects of the natural and human environment and then devise ways to avoid or minimize harm. Others study watersheds and other natural water systems and develop processes, policies, and machinery for maintaining and supplying clean water to the public. Still others develop wastewater treatment or other systems to control or reduce problems associated with disposal of pollutants.

These areas of specialization shape their job tasks. For example, environmental engineers who study the environmental impact of a proposed construction project analyze data and assess the extent of possible harm to the environment. As a result of their evaluation, they may recommend that the construction plans be altered to minimize potential harm.

Job market and wages. Environmental engineers held about 52,590 jobs in May 2008, according to BLS. About 30 percent worked for Federal, State, or local governments. An additional 30 percent worked for engineering services firms. The remaining environmental engineers were employed by management, scientific, and technical consulting services; scientific research and

Environmental engineers use principles of science and engineering to solve a variety of environmental problems.



development services; and remediation and other waste management services.

BLS projects that employment of environmental engineers will grow at a rate that is much faster than the average for all occupations between 2006 and 2016. Increased demand for these engineers will result from a need to comply with environmental laws and regulations and to develop methods for cleanup of existing hazards. In addition, these workers will be needed to help devise ways to prevent future harm to both the environment and public health—such as by developing safe methods for transporting and disposing of toxic waste.

In May 2008, according to BLS, mean annual wages of environmental engineers

were \$77,970. Environmental engineers who worked for the Federal Government had mean wages of \$92,750. State government workers had mean wages of \$65,320, and local government workers had mean wages of \$66,510. Workers employed by engineering services firms had mean annual wages of \$80,450.

Preparation. The most significant source of education for environmental engineers is a master's degree in engineering, although some opportunities exist for workers whose highest level of education is a bachelor's degree. In March 2008, there were more than 60 colleges and universities with environmental engineering programs approved by the Accreditation Board for Engineering and Technology.

All States regulate the practice of engineering through licensure. This pro-

fessional licensure usually requires 4 years of work experience and successful completion of an examination. Recent graduates, however, can start the licensing process by taking the examination in two stages. In several States, engineers must meet continuing education requirements to remain licensed. For environmental engineers, optional certification offered by the American Academy of Environmental Engineers allows them to demonstrate that they have met specified standards established by the academy.

Environmental scientists

Environmental scientists conduct research to help identify and lessen environmental hazards that affect both humans and wildlife.

This research involves collecting and analyzing samples of air, food, water, and soil to determine the state of the environment.

Using their skills and training, these scientists attempt to solve problems ranging from reduction of carbon dioxide emissions to preventing the loss of habitats to monitoring waste disposal. After environmental scientists identify a problem, they come up with ways to reduce or eliminate its negative effects.

Environmental scientists work with people at all levels of government to develop regulations and monitor compliance with environmental laws and regulations. Those who work on policy formation might help to identify ways of changing human behavior to avoid future problems, such as groundwater contamination or ozone depletion.

Some environmental scientists work for consulting firms that help businesses and government agencies comply with environmental

laws and regulations, especially in efforts related to groundwater decontamination and flood control. Some of these workers write risk assessments, for example, to explain the likely environmental effects of construction and other projects.

Job market and earnings. In May 2008, according to BLS, environmental scientists and specialists, including health, held about 80,100 jobs. About 45 percent of environmental scientists worked for Federal, State, and local governments. A significant portion of the remaining scientists were dispersed among management, scientific, and technical consulting services and architectural, engineering, and related services. Other environmental scientists were self-employed.

Employment is projected to grow much faster than average for environmental scientists, according to BLS. Job growth will be driven by the desire to offset environmental



Many degree programs for environmental scientists offer an interdisciplinary approach to natural science.

damage caused by an increase in population. Demand for environmental scientists will also result from the need to comply with complex environmental laws and regulations.

BLS data show that in May 2008, the mean annual wages for environmental scientists were \$65,280. Mean wages were \$58,040 for these scientists in local government; \$70,450 in management, scientific, and technical consulting services; and \$63,990 in engineering services. (No BLS wage data are available for environmental scientists in Federal and State government.)

Preparation. The most significant source of education for entry-level environmental scientist positions is a master's degree. However, some entry-level positions exist for workers whose highest level of education is a bachelor's degree.

Environmental scientists usually have a degree in environmental science, life science, chemistry, geology, geophysics, or atmospheric science. Many of these degree programs offer an interdisciplinary approach to natural

science. Undergraduates also study pollution abatement, ecosystems protection and restoration, hydrology, hazardous-waste management, and environmental legislation. Those interested in doing consulting work may benefit from taking business and marketing classes.

Hydrologists

Hydrologists find ways to optimize our use of water, protect it from contamination, and improve water sources that have been damaged or polluted. Their work helps ensure easy access to safe water for households, businesses, crop irrigation, power generation, and more.

Hydrologists study the quality, quantity, location, and movement of water. They follow water as it travels through rivers, estuaries, and streams; as it seeps into the ground; and as it evaporates into the atmosphere and returns to Earth as precipitation. Hydrologists typically split their time between the office and the outdoors, frequently traveling to field sites and working in all types of weather, climates, and terrain.

Through observation and data collection, hydrologists study water conditions in a particular area.



Through observation and data collection in the field, hydrologists learn about the water in a particular area. These data are used to summarize water conditions and to devise models that simulate these conditions. These models, which can be manipulated to replicate different scenarios, have a variety of applications. For example, models help hydrologists to predict possible floods and droughts, offer design advice for bridges and dams, map efficient allocations of water, and provide guidance on policies for preventing water contamination.

Job market and wages. Hydrologists held about 7,600 jobs in May 2008, according to BLS. Federal, State, and local governments employed about half of these workers. Architectural, engineering, and related services employed about 25 percent of these workers. Other hydrologists worked for management, scientific, and technical consulting services firms or were self-employed.

BLS projects that employment of hydrologists will grow faster than the average for all occupations between 2006 and 2016. Demand for hydrologists should be strong as a growing human population increasingly builds and resides in environmentally sensitive locations. As people continue migrating toward coastal regions, for example, hydrologists will be needed to mitigate the effects of natural hazards such as floods, landslides, and hurricanes. Hydrologists also will be needed to study hazardous-waste sites and to determine the effects of pollutants on soil and groundwater so engineers can design remediation systems.

Increased government regulations—such as those for managing storm water, and on issues related to water conservation, deteriorating coastal environments, and rising sea levels—also will spur employment growth for hydrologists.

In May 2008, according to BLS, hydrologists had mean annual wages of \$73,540. Those in architectural, engineering, and related services had mean wages of \$75,830; workers in management, scientific, and technical consulting services had mean wages of

\$74,760. Hydrologists employed by the Federal Government had mean wages of \$78,470. (BLS does not have wage data for hydrologists in State and local government.)

Preparation. The most significant source of education for hydrologists is a master's degree. A bachelor's degree in hydrologic science is sometimes enough to qualify for consulting jobs related to water quality or waste water treatment.

The American Institute of Hydrology offers optional certification in professional hydrology, which may benefit hydrologists seeking advancement.

For more information

If you're considering a green career with a science or engineering focus, you have options in addition to the occupations profiled here. Botanists, chemists, geoscientists, agricultural engineers, geological engineers, and science and engineering technicians are some examples of occupations that may include work with an environmental focus.

But work in an environmental career isn't limited to science and engineering. Environmental jobs include many types of workers in a variety of occupations. Curators in a nature center, for example, educate visitors about a particular ecosystem. Lawyers might specialize in environmental issues but also work on other kinds of cases. And construction laborers' projects might include retrofitting a building for energy efficiency—and working on traditional buildings, too. Visit your local library and search online to find resources related to environmental careers.

For information about specific occupations, see the BLS *Occupational Outlook Handbook*. In addition to the occupations in this article, *Handbook* data and descriptive information are available for other occupations that occasionally involve green work. The *Handbook* describes the job duties, working conditions, wages, usual training, outlook, and more for occupations ranging from landscape architects to urban planners.



Find the *Handbook* in libraries, career centers, and online at www.bls.gov/oooh.

Another BLS resource is the *Career Guide to Industries*, which provides occupational information from an industry perspective. The *Career Guide* is online at www.bls.gov/oco/cg.

The BLS Occupational Employment Statistics (OES) program also provides details, such as industry concentration and wage information, on the data it collects. For example, for charts showing employment by industry of some environmental occupations, see the data highlight on the OES Web site at www.bls.gov/oes/highlight_environment.htm.

The *Occupational Outlook Quarterly* covers a range of topics, some of which describe occupations with a green focus. Recent articles include “You’re a *what?* Limnologist,” from the winter 2008–09 issue and online at www.bls.gov/ooq/2008/winter/yawhat.pdf, and “On the grid: Careers in energy,” from the fall 2008 issue and online at www.bls.gov/ooq/2008/fall/art02.pdf.

Get general information about environmental careers from the Green Careers Center, formerly the Environmental Career Center. Its employment resources include information about training and degree programs, workshops, and environmental associations. Contact the career center at:

Green Careers Center
2 Eaton St., Suite 711
Hampton, VA 23669
Toll-free: 1 (800) 745-0639
(757) 727-7895
eccinfo@environmentalcareer.com
www.environmentalcareer.com

For online listings of green jobs, searchable by sector (such as climate change or renewable energy), city, or State, visit the Green Jobs Network at www.greenjobs.net.

To learn more about the occupations featured in this article, contact the professional association of the ones that interest you.

For information about conservation scientists, contact:

Society for Range Management
10030 W. 27th Ave.
Wheat Ridge, CO 80215
(303) 986-3309
srmweb@rangelands.org

www.rangelands.org/srm.shtml

For information about environmental scientists, contact:

American Geological Institute
4220 King St.
Alexandria, VA 22302
(703) 379-2480
www.agiweb.org

For information about environmental engineers, contact:

American Academy of
Environmental Engineers
130 Holiday Ct., Suite 100
Annapolis, MD 21401
(410) 266-3311
info@aaee.net
www.aaee.net

For information about hydrologists, contact:

American Institute of Hydrology
Engineering D—Mail Code 6603
Southern Illinois University Carbondale
1230 Lincoln Dr.
Carbondale, IL 62901
(618) 453-7809
www.aihydrology.org

