Botanist

Snapshot

Career Cluster: Agriculture; Environment & Conservation; Food & Natural Resources; Science
Interests: Plant life, plant biology, environmental studies, nature, working outdoors
Earnings (Yearly Average): $62,610
Employment & Outlook: Slower Than Average Growth Expected

OVERVIEW

Sphere of Work

Botanists are scientists who study and conduct basic and applied research on plants and plant characteristics, such as physiology and reproduction, as well as the environments in which plants grow, including soil, climate, and elevation. Some botanists specialize in the study of plant life processes or cultivate useful plants for food, while others focus on the structure of plants, species hierarchy, or how different plants react to adverse environmental conditions. Botanists are employed by universities, government agencies, and private organizations. In addition to their research and study of plant life, botanists frequently share their knowledge with the general public at botanical gardens and other venues.

Work Environment

Botanists study plant life and the environment in which they grow. Much of the work that is performed is conducted in the field, over time, and often in remote locations. Field botanists are accustomed to taking long walks, hikes, or drives in order to view research specimens. Botanists also spend time in the laboratory, conducting experiments and analyzing data. Many botanists are university and college professors, working in offices at institutions of higher learning. Additionally, a large number of botanists work in public settings, such as botanical gardens, zoos, and museums.

Profile

Working Conditions: Work both Indoors and Outdoors
Physical Strength: Light Work
Education Needs: Bachelor's Degree, Master's Degree, Doctoral Degree
Licensure/Certification: Usually Not Required
Physical Abilities Not Required: No Heavy Labor
Opportunities For Experience: Internship
Holland Interest Score*: IRS

* See Appendix A

Occupation Interest

ABotanists enjoy the study of plant species and how plants interact with their environments. Because of their knowledge of trees, algae, and many other forms of plant life, botanists are often consulted in the study of how pollution and other elements affect the air, ground, and water. Economic botanists research the effectiveness of certain plant species in fighting human hunger and disease, as well as supplementing a healthy diet. Botanists contribute to the understanding and stewardship of a wide range of important industries, such as agriculture, conservation, and forestry. First and foremost, botanists are individuals who love nature and the outdoors, and as such, they spend a great deal of time during their careers working outdoors, usually away from urban settings.

A Day in the Life—Duties and Responsibilities

Botanists conduct basic or applied research on trees, mosses, flowering plants, fungi, algae, and other types of plants. In basic research, inquiry is driven by curiosity; in applied research, study is geared toward testing a specific theory or advancing the development of a product. Applied research has a specific purpose.

In order to conduct their research, whether it is basic or applied, many botanists live in remote locations for long periods of time. During this time, they will take samples, study growth and distribution patterns, and take environmental readings. When they return to the laboratory or their base of operations, botanists will carefully study samples and data and write reports and scholarly papers to share their findings with the scientific community. Many botanists work for non-profit institutions such as universities and scientific foundations. To fund their research, they must spend time applying for grants, fellowships, and other private and public funding programs.

Many botanists are also employed by government agencies, such as the US Department of Agriculture and the US Department of the Interior. In these settings, botanists help the government gain a better understanding of current trends in environmental degradation, the impact of droughts and crop disease outbreaks, and other environmental incidents and trends.

A large number of botanists work in museums, botanical gardens, and zoological institutions. These botanists present scientific information about plant life to daily visitors, helping the general public to better understand the natural world. Botanists who are members of university faculties present this type of information to undergraduate and graduate students, conduct classes and seminars, and perform independent research.

Duties and Responsibilities

- **Conducting research in the field and in laboratories and greenhouses**
- **Observing and analyzing plant specimens**
- **Examining environmental conditions, including soil, water, and air quality**
- **Understanding plant habitats and potential threats to those habitats**
- **Being knowledgeable about plant diseases and methods for managing them**
- **Publishing research papers and teaching students**

OCCUPATION SPECIALTIES

Plant Pathologists

Plant Pathologists conduct research into the nature and control of plant diseases and the decay of plant products.

Plant Scientists

Plant scientists work to improve crop yields and give advice to food and crop developers about techniques that could enhance production efforts. They develop ways to control pests and weeds safely and effectively.

Paleobotanists

Paleobotanists study fossilized remains of plants and animals found in geological formations to trace evolution and development of past life.

Mycologists

Mycologists study all types of fungi to discover those that are useful to medicine, agriculture, and industry.

WORK ENVIRONMENT

Physical Environment

Botanists conduct frequent research, examining species in forests, in farm country, and other locations. A great deal of time is also spent in the laboratory, studying samples and analyzing data. Additionally, botanists often work in classroom settings, museums, botanical gardens, and similar venues, where they present to students and the general public.

Relevant Skills and Abilities

Analytical Skills
- Analyzing specimens and data

Communication Skills
- Speaking and writing effectively

Interpersonal/Social Skills
- Being able to work independently and as a member of a team

Organization & Management Skills
- Organizing information or materials
- Paying attention to and handling details

Technical Skills
- Working with tools and equipment
- Working with your hands

Work Environment Skills
- Working outdoors

Human Environment

In the field, botanists work in teams with other scientists and students. In the laboratory, botanists interact with equipment technicians and other scientists. Government officials, farmers, and foresters, and the general public sometimes contact botanists with questions about local plant and environmental issues.

Technological Environment

Botanists use laboratory analytical equipment such as microscopes, spectrometers, and photometers. They use cameras and similar surveillance equipment to monitor plant life remotely and to document research. Computers and research-related software, such as word processing, spreadsheet, and presentation programs, are typically used to share research results and theories with other scientists.

EDUCATION, TRAINING, AND ADVANCEMENT

High School/Secondary

High school students interested in careers in botany should take classes in biology, chemistry, physics, and geography. Math skills are useful as well, including algebra, calculus, and geometry. Basic writing classes help future scientists learn how to write research papers, a skill they will need throughout their careers.

Suggested High School Subjects

- Algebra
- Biology
- Calculus
- Chemistry
- Earth Science
- English
- Geometry
- Physics
- Science
- Social Studies
- Trigonometry

Famous First

The first DNA bank for plant species was the Tropical Plant DNA Bank, started in 1999 as a joint project between the Fairchild Tropical Botanical Gardens of Coral Gables, Florida, and Florida International University. The bank collects, stores, analyzes, and shares DNA samples from tropical plants worldwide, including more than one thousand species of palm.

College/Postsecondary

Botanists need to obtain, at minimum, a bachelor's degree in botany, biology, or a related natural science. Some individuals supplement their scientific coursework with studies in other disciplines, such as engineering, environmental studies, and agriculture. Most botanists obtain a doctorate in botany, receiving training in plant taxonomy and physiology, as well as other specific subfields of botany. Doctoral work is usually followed by independent research (a post-doctoral position at a college or university).

Related College Majors

- Biology
- Botany

- Ecology/Environmental Science
- Forestry
- Wildlife & Wildlands Science & Management
- Zoology

Adult Job Seekers

No matter the phase of life an individual decides to pursue a career in botany, all botanists must follow the same academic path. For those with the appropriate academic credentials, they may apply directly to universities with open faculty positions. They may also apply to government agency openings, such as the Department of the Interior, or to private organizations posting openings. Furthermore, botanists may join professional botany organizations, such as the Botanical Society of America, where they network with peers and other scientific professionals. They may also find employment by connecting with fellow botany enthusiasts through related associations such as the Torrey Botanical Society.

Professional Certification and Licensure

Botanists seeking positions with government agencies may be required to obtain professional licenses and certification, such as a professional engineer's license or a certificate to operate specific research equipment. Consult credible professional associations within the field, and follow professional debate as to the relevancy and value of any certification program.

Additional Requirements

Botanists should be excellent critical thinkers, with an ability to analyze complex concepts and a strong interest in understanding the natural world. Botanists should also have an understanding of the government regulatory environment, as well as an appreciation of the industries affected by their work (such as agriculture and forestry). They should have strong verbal and written communication skills, and be comfortable with public speaking. Because botanists conduct frequent field research, they should be physically fit, as they may need to hike great distances in challenging weather and terrain to study certain species.

Fun Fact

Plants are amazing! The mature seed pods of impatiens, a shade-tolerant staple of many subur-ban gardens, can explode in your hand. (source: http://www.life123.com/parenting/education/botany/terrifying-freaks-of-botany.shtml). Also, some types of bamboo can grow one meter per day.

Source: wonderweirded.com.

EARNINGS AND ADVANCEMENT

Advancement opportunities and greater earnings come with additional education and experience. Those with a doctoral degree will advance to the highest levels of research and faculty positions. According to a salary survey by the National Association of Colleges and Employers, average annual starting salaries for graduates with a bachelor's degree in biology were $36,338 in 2012.

Botanists had median annual earnings of $62,610 in 2013. The lowest ten percent earned less than $37,000, and the highest ten percent earned more than $95,000.

Botanists may receive paid vacations, holidays, and sick days; life and health insurance; and retirement benefits. These are usually paid by the employer.

Metropolitan Areas with the Highest Employment Level in This Occupation[1]

Metropolitan area	Employment	Employment per thousand jobs	Hourly mean wage
Seattle-Bellevue-Everett, WA	750	0.52	$38.59
San Diego-Carlsbad-San Marcos, CA	610	0.47	$30.21
Portland-Vancouver-Hillsboro, OR-WA	520	0.50	$35.14
Los Angeles-Long Beach-Glendale, CA	430	0.11	$36.33
Sacramento--Arden-Arcade--Roseville, CA	350	0.42	$44.24
Anchorage, AK	290	1.65	$31.56
Tampa-St. Petersburg-Clearwater, FL	290	0.25	$22.09
Minneapolis-St. Paul-Bloomington, MN-WI	280	0.16	$26.57
Boise City-Nampa, ID	240	0.89	$28.27
Olympia, WA	220	2.24	$30.04

[1] Includes Botanists, Wildlife Biologists, and Zoologists. Source: Bureau of Labor Statistics

EMPLOYMENT AND OUTLOOK

Botanists held about 36,000 jobs nationally in 2013. Employment of botanists is expected to grow slower than the average for all occupations through the year 2022, which means employment is projected to increase 3 percent to 9 percent. Jobs will be created by the need for research to discover new sources of medicine from plants and the protection of plants. Specialized fields like plant genetics will be in greater demand

Employment Trend, Projected 2012–22

Total, All Occupations: 11%

Scientific Occupations: 10%

Botanists, Zoologists and Wildlife Biologists: 5%

Note: "All Occupations" includes all occupations in the U.S. Economy. Source: U.S. Bureau of Labor Statistics, Employment Projections Program.

Related Occupations

- Agricultural Scientist
- Biological Scientist
- Forester & Conservation Scientist
- Marine Biologist
- Oceanographer
- Range Manager
- Soil Scientist
- Wildlife Biologist

Conversation With . . .
CHRISTOPHER T. MARTINE

David Burpee Professor of Plant Genetics and Research, 9 years, Bucknell University
Botanist, 18 years

1. What was your individual career path in terms of education/training, entry-level job, or other significant opportunity?

As a child I spent a lot of time outdoors but I didn't really understand that was something I could do as a career until a couple of years into college. I went to Rutgers University and took two courses that really inspired me: dendrology, where we'd identify trees and shrubs, and field ecology, where we went into a different habitat each week. After college I worked for the New Jersey Forest Service and the Mercer County Soil Conservation District and most of what I did was teach kids outside. That really helped me to figure out I loved teaching about plants. Then I did my Master's, then my PhD, and that's when I went from being a person who appreciated nature to a person who wanted to discover new things about it, and that plants were the group of things I really wanted to spend my time working on. I realized how much of the world was right there, right beyond my understanding.

2. What are the most important skills and/or qualities for someone in your profession?

You need to possess a patience and a willingness to unplug and carefully watch things because that's what biological research requires. Also, having a passion and enthusiasm for your work is important.

3. What do you wish you had known going into this profession?

I wish I had realized there are many paths to the same career goal. It's OK to not follow the exact steps you think everybody else has had to follow. Eventually, I learned this lesson by living it.

4. Are there many job opportunities in your profession? In what specific areas?

Botanists, who understand crop development and agriculture, are in the lead in terms of figuring out how to feed more people worldwide. The planet is also facing a

major biodiversity crisis and there is a need to figure out what species are out there, how they all help to maintain the global ecosystem, and how we can best conserve their habitats. The fact that plants are the backbone of most biological systems means there are lots of opportunities for botanists to make a contribution. This takes a certain level of training and a certain ability to see things, but that's perfectly within reach of most people – and then the options open up. There are botanists, like me, who choose to become professors and academic researchers, but there are many other options. Across the U.S., many agencies at the county, state and federal level are doing on-the ground-management of natural habitat, have a mission to protect landscapes, and employ lots of people with botany backgrounds. Non-governmental organizations like The Nature Conservancy are great starting points for internships and seasonal jobs that can help someone get their feet wet; they also permanently employ scores of botanists.

5. How do you see your profession changing in the next five years, what role will technology play in those changes, and what skills will be required?

My work involves genetics and DNA; that area of study is only going to become more important. Having a background in biochemistry and in lab science will help anyone develop a career in botany. That ability to do high tech lab research in addition to being a natural historian who understands how real organisms work, is a perfect combination for folks hoping to make a career as a botanist.

6. What do you enjoy most about your job? What do you enjoy least about your job?

I love what I do. That's good because as a botanist, I'm at work every day — even if I'm working in the garden, or going to the grocery store — and I am seeing plants and observing nature. As a professor of botany, I love teaching and I really like to work with young people. There's a certain level of enthusiasm young people bring to my job every day. I also really appreciate that I get to do biological and botanical research. In the last five or six years, I've been part of teams that discovered six new species. It never gets stale.

On the difficult side, academic research can be a high pressure environment, particularly early in your career. It takes five to eight years to get your PhD and one to three years to get a post-doc before you can become a professor. Then you're trying to get a professorship in a tight job market. You have to be willing to put in the time and work on your skill set. It's totally worth it if you get there but it's not easy and it can be high stakes once you do arrive because of a grueling tenure process and continuous pressure to write grants to attract research money. And you won't become filthy rich. Being a professor and being a botanist is not for somebody who wants to acquire great wealth. You make a good living and enjoy a wonderful lifestyle, but it's a job you do because it's what you want to do.

7. Can you suggest a valuable "try this" for students considering a career in your profession?

Start a garden. Put seeds in the ground, grow some plants, watch them, and see if you can gather a harvest from them. If you're not hooked by this, perhaps botany isn't for you.

I do a lot of field work in the Australian Outback. So when I go out to find the plants I'm looking for, I am in a tent, sometimes for weeks at a time. Have outside experiences and see if that's the sort of thing you would enjoy doing for your career.

I also do a lot of lab work, and for that, it makes sense to work in a lab. Attempt to do an independent study with your high school teacher. Generate a hypothesis, develop a good experiment, collect data, and then synthesize the data. You need to be able to do that in any science field.

SELECTED SCHOOLS

Most colleges and universities have bachelor's degree programs in biology, often with a specialization in plant biology. The student may also gain an initial grounding in the field at an agricultural, technical, or community college. For advanced positions, a doctoral degree is commonly obtained. Below are listed some of the more prominent graduate schools in this field.

Cornell University
Graduate School
Caldwell Hall
Ithaca, NY 14853
607.255.5820
www.gradschool.cornell.edu

Iowa State University
Enrollment Services Center
Ames, IA 50011
800.262.3810
admissions.iastate.edu

Michigan State University
479 W. Circle Drive, Room 110
East Lansing, MI 48824
517.353.3220
www.msu.edu

Penn State University
Plant Biology Program
101 Life Sciences Building
University Park, PA 16802
814.865.8165
bio.psu.edu/graduate-portal

Purdue University
Botany and Plant Biology
915 W. State Street
West Lafayette, IN 47907
765.494.4614
ag.purdue.edu/btny

University of Arizona
Graduate College
Administration 322, PO Box 2106
Tucson, AZ 85721
520.621.3471
grad.arizona.edu

University of California, Berkeley
Graduate Division
Sproul Hall, 3rd Floor
Berkeley, CA 94704
510.642.7405
grad.berkeley.edu

University of California, Davis
250 Mrak Hall
One Shields Avenue
Davis, CA 95616
530.752.0650
gradstudies.ucdavis.edu

University of Missouri
Office of Research and Graduate Studies
210 Jesse Hall
Columbia, MO 65211
gradstudies.missouri.edu

University of Wisconsin
Graduate School
217 Bascom Hall
500 Lincoln Drive
Madison, WI 53706
608.262.2433
grad.wisc.edu

MORE INFORMATION

American Bryological and Lichenological Society
P.O. Box 7065
Lawrence, KS 66044-8897
785.843.1234
www.abls.org

American Phytopathological Society
3340 Pilot Knob Road
St. Paul, MN 55121-2097
651.454.7250
www.apsnet.org

American Society of Plant Biologists
15501 Monona Drive
Rockville, MD 20855-2768
301.251.0560
www.aspb.org

American Society of Plant Taxonomists
University of Wyoming
Department of Botany
1000 E. University Avenue
Laramie, WY 82071
307.766.2556
www.aspt.org

Botanical Society of America
P.O. Box 299
St. Louis, MO 63166-0299
314.577.9566
www.botany.org

Ecological Society of America
1990 M Street, NW, Suite 700
Washington, DC 20006-3915
202.833.8773
www.esa.org

Torrey Botanical Society
P.O. Box 7065
Lawrence, KS 66044-8897
800.627.0326
www.torreybotanical.org

U.S. Botanic Garden
245 First Street SW
Washington, DC 20024
202.225.8333
www.usbg.gov

U.S. Department of Agriculture
1400 Independence Avenue SW
Washington, DC 20250
202.720.2791
www.usda.gov

Michael Auerbach/Editor