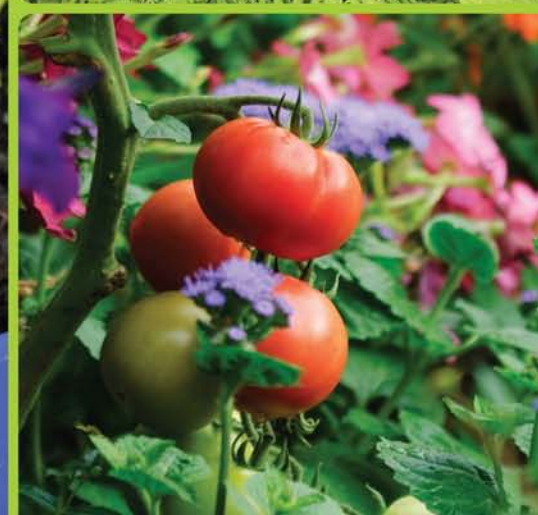




9TH EDITION

Introductory Horticulture

Carroll L. Shry Jr. • H. Edward Reiley



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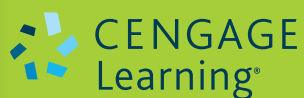
Introductory Horticulture



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Australia • Brazil • Mexico • Singapore • United Kingdom • United States

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Preface

Introductory Horticulture is intended for agriculture programs in high schools offering an introduction to horticulture, agriculture, or plant science course, and presents a comprehensive review of relevant horticulture topics, activities, and tips for success within the field. Continuing in the tradition of previous editions, this all-new *Ninth Edition* offers many avenues for students to explore the horticulture field and remain on the cutting-edge of the industry with the latest technology and trends information.

Why We Wrote This Text

One of the most rapidly growing areas in the field of agriculture is that of horticulture. This interest is due in large part to an increasing awareness by the general public, as people look inwardly at a need to be closer to nature and outwardly at a world in which efficient and green methods of food production, healthier eating habits, eco-friendly aesthetic landscapes and conservation of land are increasingly important.

Consequently, starting a horticultural business that is not only profitable but also *green* and *sustainable*, is certainly a noble decision, but it also requires knowledge of the alternative methods used in biodynamic agriculture. This all-natural approach to crop production, such as the use of composted animal manures, ground dried leaves, straw, wood chips, and grass clippings for fertilization; crop rotation; mechanical cultivation; and biological pest control, allows one to produce beautiful and consumable horticultural plants that inspire and provide healthy, nutritional foods for current generations, while enabling our environment to grow and prosper for future generations. If one has the knowledge,

the experience, and the drive to properly execute this effort, it will pay off in the future.

This awareness and the resulting growth of the field have generated a need for a broad-based, first-level text that explores the basic principles of horticulture and methods of practical application of these principles. *Introductory Horticulture, Ninth Edition*, offers varied multisensory applications, from group, crew, to individual, and a hands-on approach in the modalities of learning, offering myriad avenues for all students to experiment with the green industry. As agricultural educators, we must be role models to share the enthusiasm and curiosity to explore the environment through horticulture.

How This Text Is Organized

Foremost in the text is a presentation of fundamental horticulture principles, from careers in the field to the cultivation of specific crops, and from the processing and sale of ornamental plants, vegetables, fruits, nuts, flowers, and garden supplies to enhancing the living environment. Special care has been taken to treat highly technical subjects, such as plant propagation and taxonomy, in a comprehensive yet understandable manner. A section on pesticides includes up-to-date information on the subject, with special emphasis on personal safety, the protection of humans and the environment, and the use of biological control of pests whenever possible. Certain topics, such as the creation of holiday arrangements; basic floral design; the construction of dish gardens, terrariums, fairy gardens, and bonsai plantings for beginners to create a beautiful visual image; the design and care of houseplants; creating landscapes with curb appeal; and designing with basic CAD software, have been added especially for student

appeal. All of these topics are arranged in a logical sequence in the following sections:

Section 1 explores the horticulture industry, reviewing career opportunities in the field and explaining plant taxonomy.

Section 2 dives into the specifics of basic plant science. This section stresses the importance of determining the nutrients in the soil, the appropriate potting mixes to use in the greenhouse, and the benefits of green practices such as high tunnels in nurseries, landscapes, and commercial and residential properties. Also covered is plant anatomy, how the environment has an effect on plant growth, and various methods for stimulating or slowing down plant growth, including a section on plant growth regulators and the use of the smartphone to calculate the correct parts per million (PPM) to ensure the optimum growth of each plant.

Section 3 covers plant propagation, including starting seeds, softwood and hardwood cuttings, grafting fruit trees, ornamentals, heirloom tomatoes, budding, and layering.

Section 4 provides an overview of the production of specific crops in the greenhouse setting: poinsettias, chrysanthemums, and Easter lilies.

Section 5 talks specifically about pest management, including important safety information in handling pesticides, insecticides, fungicides, rodenticides, molluscicides, nematocides, and herbicides.

Section 6 focuses on container-grown plants, including the increasing popularity of terrariums. Everything is covered in this section—from interior dish gardens to the artful design of fairy gardens in creating outdoor gardens with interest and appeal for all ages. Design and construction of the bonsai and interior landscapes are also addressed.

Section 7 explores the aspect of designing an exterior landscape, including an emphasis on the application of organic nutrients and compost to be more environmentally friendly. Different plants are explored, as well as pruning techniques, and the principles of landscaping, maintenance, xeriscaping, water gardens, irrigation,

and green roofs. Techniques used in computer-aided landscape designs are also discussed.

Section 8 offers an overview of lawn and turf-grass practices, including establishing and maintaining a healthy lawn. It stresses the importance of soil analysis in determining the specific needs of the soil prior to establishing the lawn, as well as how eco-friendly practices, including organic applications, in maintaining the lawn can help protect the environment. This section also discusses how to renovate lawns when good maintenance practices are not followed or healthy grass is affected by environmental challenges.

Section 9 highlights the vegetable garden, including new varieties in the market and grafting heirloom tomatoes, and other vegetable plants, to increase production and disease and pest resistance. It also explains what is involved in planning and preparing the site, as well as the requirements of planting and caring for the garden. Additionally, this section provides an overview of favorite garden vegetables and herbs.

Section 10 shifts focus over to fruit and nut crops. This section includes information on planting and caring for strawberries, along with the implementation of high tunnels for extended production, blueberries, brambles, grapes, and nuts.

Section 11 inspires holiday creativity with specific units on wreaths and door swags and creating centerpieces, while also touching on special floral designs, including the design of a kissing ball for the holiday season, floral arrangements, accents, and corsages and boutonnieres.

Section 12 introduces students to the details of owning a horticulture business from how to start up a small business to financial operations, personnel management, customer sales, business communication, and the use of new technology and social media in promoting the efficiency and growth of a business. It also focuses on becoming more environmentally responsible through the use of battery-powered equipment such as chainsaws, power blowers, line trimmers and hedge trimmers, automatic mowers, and robotic plant movers that are reliable, energy efficient, and eco-friendly for a sustainable future. New technology is covered such as the use of drones

in identifying deficiencies throughout a growing area to more efficiently tackle problems with crops. A unit on leadership development is also included within this section, illustrating the importance of this trait in the horticulture industry and how students have many opportunities to develop these skills through organizations such as the National FFA Organization.

Features of This Edition

LEARNING FEATURES such as **Objectives**, **Key Terms**, and **Competencies to Develop** frame the unit and help students identify key concepts and information. Additionally, **Review Questions** and **Student Activities** at the end of the unit encourage students to evaluate and apply what they have learned. Specific units also feature a **Materials** list that provides information on the tools and equipment required to complete the activities described in that unit.

GREEN TIPS offer practical advice on a wide range of subjects from recommendations for cultivating plants to eco-friendly and sustainable practices.

FAST FACTS provide additional engaging information that furthers understanding of the topics under discussion.

NEW! TRY THIS activities in each unit highlight a specific experiment or exercise that students can perform to apply what they have learned in a specific section.

CAUTION notes keep students safe by relaying important information about the hazards associated with using certain tools and equipment, while **SAFETY FIRST** at the end of each unit reminds students to keep apprised of the latest information from OSHA for occupational health and safety.

PROCEDURES combine visuals and step-by-step instructions to demonstrate specific techniques in the cultivation and care of plants.

NEW! SUGGESTED SUPERVISED AGRICULTURAL EXPERIENCE (SAE) ACTIVITIES at the end of each unit encourage students to seek

out opportunities within the horticulture field outside of the classroom thereby broadening their knowledge and experience in various facets of the industry.

NEW! ADDITIONAL RESOURCES at the end of each unit provide a list of relevant websites that students can navigate to if they want to learn more about a specific topic.

All-New FULL-COLOR DESIGN, IMAGES, AND ILLUSTRATIONS bring the beauty of horticulture to life by engaging students in learning and inspiring them to further explore the horticulture field.

ROBUST APPENDICES provide students with valuable reference material, such as the identification of scientific and common names of plants; a guide to professional, educational, and trade organizations; a review of tools and equipment for the trade with specific care and maintenance guidelines; and listings of deer-resistance plants. Also, new to this edition, is a combined **GLOSSARY/GLOSARIO** that provides terms and definitions in both English and Spanish.

New to This Edition

In addition to the new activities and visual enhancements included in the *Ninth Edition* to facilitate learning, many revisions to the technical content have also been integrated into the text to keep students apprised of the latest information from the horticulture field:

- ▶ Statistics were thoroughly researched and current data integrated into the text where appropriate.
- ▶ New plant varieties were identified throughout the units, where applicable, so that students are well versed in the latest information related to plants.
- ▶ A focus on the use of organics and harnessing natural elements in the environment to cultivate crops and prevent disease is emphasized throughout the units as an eco-friendly, sustainable practice for both the individual and the entrepreneur.

- ▶ Cutting-edge tools and equipment, such as the driverless nursery seeder, the robotic grapevine pruner, and drones, are featured throughout to keep students apprised of the latest technology in the industry.
- ▶ The inclusion of industry-related apps, such as the PGR Mix Master calculator, demonstrates to students how technology can be useful for facilitating tasks in the field.
- ▶ The *QR code* is also investigated as a helpful marketing tool for the entrepreneur.
- ▶ An all-new section on the *agricultural educator* was added to the unit that explores career opportunities.
- ▶ An all-new section on *genetically engineered plants* and the facts surrounding this controversial topic was integrated into the information under plant science.
- ▶ An all-new section was added, including a step-by-step procedure, related to *grafting tomatoes*.
- ▶ An all-new section on *terrariums* revisits the construction and care of these miniature gardens, recognizing this as a revived popular trend.
- ▶ An all-new section on *rain gardens* to help manage the drainage of surface water illustrates another resourceful way to combat an environmental challenge through thoughtful landscaping.
- ▶ *High tunnels* are explored as an effective method to protect high-value crops from pests and environmental challenges in an economical way.
- ▶ The information on *nut crops* was moved from the Appendices, thoroughly revised, and integrated into the units.
- ▶ A thoroughly revised section on business operations covers new information on financial opportunities, marketing strategies, responsibilities to employees, current technology, best practices for business communications, and career development.
- ▶ Current information on the National FFA Organization and related activities in the unit on leadership development provides

horticulture students with the tools they need to prepare for their future.

Extensive Teaching and Learning Package

Companion Site

NEW! The companion site to accompany *Introductory Horticulture, 9E*, features tools to support learning and facilitate teaching:

- ▶ *Answers to Review Questions* appearing at the end of each chapter allow teachers to track and validate student learning.
- ▶ *Lesson Plans* provide an outline of the key topics in each chapter, and correlate to the accompanying PowerPoint presentations.
- ▶ *PowerPoint* presentations align with the Lesson Plans and include photos and illustrations to visually reinforce the key points in each chapter.
- ▶ *Testing powered by Cognero*, a flexible online system, provides chapter-by-chapter quizzes, and enables teachers to do the following:
 - Author, edit, and manage test bank content from multiple sources
 - Create multiple test versions in an instant
 - Deliver tests from teacher/school-specific learning management system (LMS) or classrooms
- ▶ *Image Gallery* offers full-color photos and illustrations from the text to enable teachers to further enhance classroom presentations.

For these instructor-specific resources, please visit CengageBrain.com at <http://login.cengage.com>, and follow the prompts for obtaining access to this secure site.

Lab Manual

Revised for the ninth edition, the lab manual contains a variety of exercises to help students retain and apply key concepts and information presented in the book. Labs are organized by book sections, and this edition features new exercises related to tomato grafting, designing gardens, the safe operation of power equipment, and using apps as horticultural tools.

MindTap for Introductory Horticulture, 9E

NEW! The MindTap for *Introductory Horticulture, 9E*, features an integrated course offering a complete digital experience for the student and teacher. This MindTap is highly customizable and combines assignments, videos, interactivities, and quizzing along with the enhanced ebook to enable students to directly analyze and apply what they are learning and allow teachers to measure skills and outcomes with ease.

- ▶ **A Guide:** Relevant interactivities combined with prescribed readings, featured multimedia, and quizzing to evaluate progress, will

guide students from basic knowledge and comprehension to analysis and application.

- ▶ **Personalized Teaching:** Teachers are able to control course content by hiding content, rearranging existing content, or adding and creating their own content to meet the needs of their specific program.
- ▶ **Promote Better Outcomes:** Through relevant and engaging content, assignments, and activities, students are able to build the confidence they need to ultimately lead them to success. Likewise, teachers are able to view analytics and reports that provide a snapshot of class progress, time in course, engagement, and completion rates.

About the Authors

The authors of *Introductory Horticulture*, H. Carroll L. Shry, Jr. and Edward Reiley, were both involved in agriculture education in Maryland.

Carroll L. Shry, Jr. is a Certified Professional Horticulturist (CPH) with the Maryland Nursery and Landscape Association and is principal and owner of Brandywine Landscaping, a business that offers horticulture/landscape consulting services and snow removal. Professor Shry is presently retired after teaching for 44 years as the landscaping/nursery production instructor at the Frederick County Career and Technology Center, Maryland. He holds a bachelor of science degree in Agricultural Education/Horticulture from the University of Maryland and a master of science degree in Agricultural Education/Horticulture from West Virginia University. Mr. Shry was named Vocational Educator of Maryland in 1980 and Outstanding Vocational Educator of the Year in Region 1—American Vocational Association in 1981. He is also active in many professional organizations, including as the past president of the National Association of Agricultural Educators, and as member of the President's

Council of the American Horticultural Society, the Associated Landscape Contractors of America, the American Nurserymen Association, and the National FFA Alumni Association. He is past president and currently serves as a member of FALCAN (Frederick Area Landscape Contractors and Nurserymen) and is the Eastern Region representative of the National FFA Landscape/Nursery Career Development Event. In addition, he is the past president and currently serves on the board of directors of the University of Maryland College of Agriculture & Natural Resources Agricultural Alumni, College Park, Maryland, and president of the Glade Valley Lions Club. In addition to participating as a member of the Frederick Career and Technology Center FFA Alumni, a member of the Frederick Memorial Hospital 1902 Club, a member of Elks Lodge 684, and serving as President and on Board of Directors of the Forest Grove Methodist Church, and on Board of Directors of the Edward F. Fry Memorial Library. Professor Shry has attended American Hort Cultivate 13 & 14, Columbus, Ohio; ICG, Washington DC & Baltimore, Maryland; MANTS Show, Baltimore, Maryland, for 15 years.

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AND FOR Mary Reiley and Judy Shry.





SECTION 1

Horticulture: An Introduction

- 1 Exploring the Horticulture Field
- 2 Plant Taxonomy: How Plants Are Named

UNIT

1

Exploring the Horticulture Field

Objective

To obtain an overview of the horticulture industry and jobs available in the field so that a career choice can be made.

Key Terms

Certified Professional Horticulturists (CPH)

Certified Landscape Professional (CLP)

floriculture

horticulture

landscape and nursery industry

olericulture

pharming

pomology

Competencies to Develop

After studying this unit, you should be able to:

- ▶ discuss the scope, size, and economic importance of the horticulture industry in the United States.
- ▶ describe five careers in the horticulture industry, including working conditions and educational and personal requirements.
- ▶ use the Job Analysis Chart, Self-Analysis Table, and job descriptions to make a career choice in horticulture.
- ▶ survey the local job market, and select a job that is compatible with your interests and preferences. List skills needed for the job. Describe how to prepare for the job.
- ▶ prepare a résumé for submission prior to a job interview.

The word **horticulture** is derived from a Latin word meaning “garden cultivation” (hortus [garden] + culture [cultivation]). Over the years, the horticulture industry has developed far beyond this simple definition, however. Today, horticulture includes the cultivation, processing, and sale of fruits, nuts, vegetables, ornamental plants, and flowers as well as many additional services. A market analysis by the United States Department of Agriculture (USDA) shows all horticultural sales for 2009 in the United States at \$11.7 billion.

The horticulture industry consists of four major divisions:

- ▶ **Pomology.** The science and practice of growing, harvesting, handling, storing, processing, and marketing tree fruits.
- ▶ **Olericulture.** The science and practice of growing, harvesting, storing, processing, and marketing vegetables.
- ▶ **Floriculture.** The science and practice of growing, harvesting, storing, designing, and marketing flowering plants.
- ▶ **Landscape and nursery industry.** The science and practice of propagating, growing, installing, maintaining, and using grasses, annual plants, shrubs, and trees in the landscape.

Additional specialized areas include the following:

- ▶ **Seed production.** The science and practice of producing, processing, and selling high-quality seed crops for use in growing a wide range of horticultural crops that grow true from seed.
- ▶ **Sustainable horticultural occupations.** The science and practice of using an integrated system of plant production processes that makes the most efficient use of nonrenewable resources, sustains the economic viability of horticultural operations, and enhances both environmental quality and quality of life for society as a whole. Topics within this specialty include biodynamic (organic) horticulture, which uses compost for plant nutrient resources, beneficial insects, crop rotation,

and low-input systems; and permaculture, which is ecological and environmental design, enhancement landscaping, and hydroponics.

- ▶ **Related occupations.** Those areas that provide products and services necessary in the production of horticultural crops. Such resources include goods (e.g., fertilizers, pesticides, and containers) and machinery (e.g., education and research).

Jobs in Horticulture

Agricultural services is an ever-expanding area of employment. Firms offering landscape and horticultural services employ almost half of the wage and salaried workers in the horticultural industry. Such firms provide landscape planning and installation, landscape architecture, lawn care, and grounds maintenance services.

Individuals trained in horticultural practices can access various sources of employment. These occupations include positions in greenhouses, nurseries, garden centers, golf courses, parks, orchards, floral design shops, and grounds maintenance operations, along with positions as vegetable and fruit growers and agricultural educators. Figure 1–1 is a Job Analysis Chart that explains positions in these areas of employment. The following job descriptions, adapted from the *Handbook of Agricultural Occupations* (published by the US Department of Agriculture), provide a more detailed account of the most common positions in the industry.

Job Title: Greenhouse Employee

JOB DESCRIPTION A greenhouse employee grows plants in a temperature-controlled glass or plastic greenhouse (Figure 1–2). The plants that are grown may be vegetables or flowers. The work involved may include the propagation of trees or ornamental shrubs from seed or cuttings. Greenhouse activities include the production of out-of-season vegetables such as tomatoes, cucumbers, or leaf lettuce; the growing of cut flowers, potted plants, and bedding plants in preparation for sale; and the starting of plants for outdoor nursery beds. When a greenhouse is

JOB TITLE	DOES IT ENTAIL YEAR-ROUND WORK?	ARE THERE REGULAR HOURS?	IS MOST OF THE WORK OUTDOORS OR INDOORS?	DOES IT OFFER VARIETY?	IS THE WORK IN ONE PLACE?	ARE THERE FRINGE BENEFITS?	DOES THE JOB INVOLVE WORKING WITH OTHERS?	WHAT ARE THE EDUCATIONAL REQUIREMENTS?	IS THERE AN OPPORTUNITY FOR PROMOTION?
greenhouse worker	yes	Generally, but some overtime is usually required.	indoors	yes	yes	yes	Yes, to some extent.	high school diploma with a course in agriculture or horticulture	yes
nursery worker	in many cases	Yes, but there are peak seasons.	mostly outdoors	yes	yes	some	yes	high school diploma with a course in agriculture or horticulture	yes
garden center employee	yes	Yes, but there are peak seasons.	both indoors and outdoors	yes	yes	some	yes	high school diploma with a course in agriculture or horticulture	yes
golf course employee	no	Yes, during the golfing season.	outdoors	yes	yes	not to a great extent	yes	high school diploma with a course in agriculture or horticulture	yes
assistant grounds keeper	yes	Yes, some overtime is required on occasion.	mostly outdoors	yes	yes	There may be some.	not necessarily	high school diploma with a course in agriculture or horticulture	yes
park employee	yes	yes	outdoors	yes	yes	not to a great extent	yes	high school diploma with a course in agriculture or horticulture	yes
vegetable grower	depends upon grower	no, seasonal	outdoors	yes	yes	some	yes	high school diploma with a course in agriculture or horticulture	yes
orchard employee	depends upon grower	no, seasonal	outdoors	yes	yes	some	yes	high school diploma with a course in agriculture or horticulture	yes
employee of small fruit grower	depends upon grower	no, seasonal	outdoors	yes	yes	some	yes	high school diploma with a course in agriculture or horticulture	yes
employee of floral design shop	yes	yes, with some overtime	indoors	no	yes	yes	yes	high school diploma with a course in agriculture or horticulture	yes
agricultural educator	yes	yes	indoors and outdoors	yes	yes	yes	yes	college education	yes

Figure 1-1 Job Analysis Chart.



▲ **Figure 1-2** A greenhouse worker grooming plants in the greenhouse.

part of a nursery operation, a worker may have the duties of a nursery employee as well as those of a greenhouse worker. Employees in greenhouses place growing medium in containers for growing plants. They sow seed, start cuttings, and transplant seedlings and plants. They water, weed, thin, prune, fertilize, and spray growing plants. They are also responsible for maintaining the greenhouse structure and equipment.

WORKING CONDITIONS Most of the work of a greenhouse employee is done indoors. Outdoor jobs are usually done during favorable weather. This work requires a great deal of walking, stooping, and bending over plants or seedbeds. Hands and clothing may be stained from soil and plant sap or juices.

A job in a greenhouse involves a great deal of manual labor, but the labor is not usually difficult. Working hours are usually regular, with work generally steady throughout the year. Seasonal demands sometimes require working overtime.

PERSONAL AND EDUCATIONAL QUALIFICATIONS For individuals to really enjoy greenhouse work, they must be interested in watching plants grow and develop. Good health is important, but certain types of physical disabilities will not prevent an interested individual from entering the field. A high school education with a course in agricultural education or horticulture is preferred for one interested in this vocation.

Closely related to greenhouse work is flower arranging (Figure 1-3).



▲ **Figure 1-3** A flower designer finishes a floral arrangement.

Job Title: Nursery Employee

JOB DESCRIPTION The nursery employee grows seedlings and plants for landscaping, fruit production, and replanting in forests (Figure 1-4). The employee may work in one of several different types of nurseries. Some nurseries specialize in producing fruit trees and small fruit transplants, some in ornamental trees and shrubs, and some in forest replanting materials. Some nursery employees operate greenhouses and produce their own seedlings and plants from cuttings. Others produce planting stock of two or more major lines of plants, trees, shrubs, and perennials.

Individuals employed in nurseries prepare seedbeds; plant seedlings; prepare cuttings for



▲ **Figure 1-4** Nursery equipment operator digging a deciduous tree with a Pizzaglia vibratory digger.

rooting; and weed, cultivate, water, and prune plants. They also perform other cultural practices such as spraying and grafting. They dig, grade, and pack plants for shipment. They may cut, lift, and lay sod. They also transplant perennials, shrubs, and trees and, in a tree nursery, gather and process forest tree seeds. Helping maintain and repair buildings and equipment is usually also a part of the job.

WORKING CONDITIONS Most of the nursery worker's time is spent outdoors. If a greenhouse is a major part of the employer's business, the employee will naturally spend a considerable amount of time in the greenhouse. Planting and cultivating must be accomplished when weather conditions are good, but much outdoor work at a nursery can be done in rather bad weather.

Most of the work is considered manual labor; some of it involves heavy lifting. Working hours are regular. Employment may be for the entire year, depending on the skills of the worker.

PERSONAL AND EDUCATIONAL QUALIFICATIONS The nursery employee should enjoy working with plants and being outdoors. A truck driver's license may be required. Employees may operate equipment, such as loaders, tree spades, spray equipment, trucks, and skidsteers. The ability to identify plants and the knowledge of how plants are used in the landscape are very desirable. A high school education with a course in agricultural education or horticulture is preferred.

Job Title: Garden Center Employee

JOB DESCRIPTION The employee of a garden center has many jobs, including caring for ornamental plants, moving plants and supplies into selling areas, arranging plants and supplies for display purposes, and selling the various products handled by the center. A garden center may be a part of a large retail store, a part of a nursery or greenhouse operation, or a retail store operated independently of other business.

Garden center employees clean, stock, and arrange garden supply displays on shelves, on counters, and in windows. They water, spray, and trim ornamental plants and control environmental conditions. They unload and unpack supplies as they arrive from wholesalers, make deliveries,

and load orders onto trucks and into customers' cars. They also give information and advice to customers concerning plants and lawns and their care.

WORKING CONDITIONS Garden centers are built and arranged to attract customers. As a result, a garden center employee usually works in a clean, pleasant, and comfortable environment. Parts of the work area are usually heated during cold weather. Other areas are unheated but protected from rain, snow, and wind. Some of the work may be outdoors during the season in which ornamental shrubs and trees are sold. The work is fairly regular but has seasonal peaks. Some garden centers close completely or operate with only a small crew during the winter months.

PERSONAL AND EDUCATIONAL QUALIFICATIONS Employees of garden centers should enjoy working with people and caring for ornamental plants. They must be good salespeople and must therefore be able to talk easily and in a friendly way. A high school education with a course in agricultural education or horticulture is desirable.

Job Title: Grounds Maintenance Employee

JOB DESCRIPTION A grounds maintenance employee cares for the area surrounding an industry, business, church, school, airport, apartment building, private estate, cemetery, or shopping center. These employees plant and care for lawns and ornamental plants. The work entails mowing grass, reseeding, controlling weeds, and planting and spraying ornamental plants. They also rake grounds and dispose of leaves and other refuse. A year-round job is provided through maintenance and repair of walks, driveways, and equipment. The work may involve making minor repairs to buildings and providing for snow removal.

WORKING CONDITIONS The grounds maintenance employee works outdoors and deals mainly with ornamental plant materials. The work does provide variety but is not extremely strenuous. The environment in which the employee works is usually very pleasant, although

certain jobs must be done under a variety of weather conditions. The work is steady throughout the year. Employees work regular hours, but there are some peaks in the work load.

PERSONAL AND EDUCATIONAL QUALIFICATIONS The grounds maintenance employee should not mind working alone and should enjoy working with plants, tools, and small garden equipment. The demand for high school graduates specializing in this area is increasing as job opportunities expand in the landscape industry.

Job Title: Golf Course Employee

JOB DESCRIPTION Golf course employees are responsible for the overall maintenance of golf courses. They care for the turf on both the greens and fairways. They install and use irrigation and drainage equipment, clean and maintain sand traps or bunkers, change the locations of cups, and aerate the soil. They may also prune shrubs and trees, replace soil as needed, and repair equipment and buildings.

WORKING CONDITIONS The work of the golf course employee is usually done outdoors and mostly during fairly good weather. The workday is usually 8 hours long. In the southern part of the United States, employment is steady throughout the year. In sections of the country with cold winters, employment is from March or April through October or November.

PERSONAL AND EDUCATIONAL QUALIFICATIONS Because a great deal of walking is done in golf course maintenance, the employee should have good health, but certain physical handicaps will not interfere with one's success. The employee should enjoy working outdoors and be able to get along well with others. A high school education with a course in agricultural education or horticulture is desirable.

Job Title: City, State, or National Park Employee

JOB DESCRIPTION The park employee does whatever work is needed for the proper maintenance of parks. This includes maintaining the trees, shrubs, flowers, and lawns that make up

the planting area. The city park worker deals mainly with formal flower beds and lawn areas, whereas the state or national park worker is usually concerned with the care and maintenance of natural woodlands or forests.

The work of the park employee includes mowing grass; trimming the edges of walks and drive-ways; planting, pruning, and caring for trees, shrubs, hedges, lawns, and flower beds; controlling insects, diseases, and weeds; and caring for the soil. Other jobs include the removal of trash and snow, maintenance of swimming pools, care of boating facilities, general maintenance of buildings and equipment, and repair of roadways and drives.

WORKING CONDITIONS The park employee is outdoors a great deal of the time. Most of the work is manual labor and is accomplished in a healthy, pleasant environment. At times, park improvement jobs must be done in bad weather conditions. This occupation usually provides year-round employment, and working hours are regular. In certain types of state park work, there may be peak periods.

PERSONAL AND EDUCATIONAL QUALIFICATIONS A high school education with a course in agricultural education or horticulture is desirable.

The average hourly rate for city, state, or national park employees varies widely from region to region.

Job Title: Agricultural Educator

JOB DESCRIPTION Agricultural educators (Figure 1–5) can be found in public schools, technical schools, adult and business education programs, colleges, universities, and state-run farmer training programs. They teach a variety of subjects, such as horticulture, animal and plant science, agricultural chemicals, and agricultural technology, and they serve as advisors for Future Farmers of America (FFA). Career requirements generally include a college degree, teacher licensure and specialty certification, and agricultural experience.

WORKING CONDITIONS Agricultural educators work primarily indoors. Teachers work with a variety of people, including students,