

# What Is Horticulture?

## PURPOSE AND EXPECTED OUTCOMES

This chapter is devoted to discussing the operational and scientific boundaries and the importance of horticulture to society. Horticulture is presented as a science, art, and business. This discussion is preceded by a brief history of horticulture. The role of computers and the Internet in horticulture is also highlighted.

After studying this chapter, the student should be able to

1. Define the term *horticulture*.
2. Briefly discuss the history of horticulture.
3. Describe the boundaries of horticulture in relation to other applied sciences.
4. Discuss the importance of horticulture in society.
5. List ten jobs that require training *in* horticulture.
6. List and describe four horticulture-related industries (service industries).

[COLOR PLATES—see *color plate 1* for additional chapter photos]

## OVERVIEW

*Horticulture* is a very important branch of plant science. It accounts for food from three major sources: vegetables, fruits, and nuts. Apart from food, it plays a significant role in other aspects of society. It provides employment and also beautifies the environment. In this introduction, the divisions of professional horticulture are discussed, along with the field's importance to society. Horticulture is presented as an art, a science, and a business. Scientists use knowledge from genetics, physiology, botany, chemistry, and other disciplines to produce elite cultivars of plants and prescribe the best cultural practices to use for success in their production. Horticulture is supported by a variety of service industries that develop and provide chemicals, machinery, and implements for its numerous activities. Many people who do not care to grow food crops often enjoy growing flowers outdoors or indoors for aesthetic purposes.

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## 1.1 WHAT IS HORTICULTURE?

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### **Horticulture**

*Science and art of cultivating, processing, and marketing of fruits, vegetables, nuts, and ornamental plants.*

The term **horticulture** is derived from the Latin *hortus* (garden) and *cultura* (cultivation), which means garden cultivation. Modern horticulture is the science and art of cultivating fruits, vegetables, and ornamental plants (Figure 1–1). Certain institutions of higher learning such as colleges and universities have educational programs in horticulture for training as well as conducting research to advance the area of study. Some of these academic programs are general in their scope of coverage, whereas others are devoted to in-depth research and training in a specific aspect of horticulture. Modern horticulture is also big business. It provides employment for people with a wide variety of skills and is supported by an equally large number of service industries. When considered from both the science and business perspectives, horticulture can be more broadly defined as the “science and art of cultivating, processing, and marketing of fruits, vegetables, nuts, and ornamental plants.”

Horticulture is related to other plant sciences (Figure 1–2). From the four divisions of the horticulture industry shown in Figure 1–3, it is clear that horticulture has two main goals—to provide food and to impact the environment. The relationship between horticulture and other plant sciences is evidenced by the fact that plants cannot be confined strictly to one category distinguished from others by features such as use and cultural practices. For example, an oak tree has great ornamental value in the landscape, but as a forest tree, oaks are excellent sources of lumber for high-quality furniture. Similarly, Bermuda grass may be cultivated as an agronomic crop for feeding livestock and also makes an excellent turfgrass in the landscape.

Generally, growing horticultural plants is more production intensive than growing agronomic and forest plants. The returns on investment per unit area of production are also generally higher for horticultural plants. Further, horticultural plants are largely utilized fresh or as living materials (as ornamentals in the landscape), whereas agronomic and forestry products are generally utilized in the nonliving state (e.g., as grain, fiber, and timber).

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## 1.2 A BRIEF HISTORY OF HORTICULTURE

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The deliberate use of plants by humans for aesthetic and functional purposes has its origin in antiquity. The Hanging Gardens of Babylon were hailed as one of the seven wonders of the ancient world. As society evolved, deliberate cultivation and domestication of edible plants replaced the less efficient food-gathering habits of primitive societies. Agriculture, and for that matter horticulture, is therefore not a modern-day invention but one that continues to be transformed as society advances technologically.

In terms of food production, ancient civilizations, notably that of Egypt, pioneered the basic crop production methods still in use today with modification and modernization. Land was set aside and prepared by plowing; crops were provided with supplemental irrigation for increased productivity in cultivation; crops received appropriate plant husbandry for the best results. Postharvest storage and processing (e.g., drying, fermenting, and milling) were employed to increase the shelf life of the otherwise highly perishable horticultural products. Most of the valued ancient crops are still of interest today. They include fruits (e.g., dates, figs, grapes, pomegranates, and olives), vegetables (e.g., garlic, melons, radishes, lentils, artichokes, and chicory), oil and fiber crops, and medicinal herbs. For aesthetic uses, gardeners were employed to manicure the formal gardens of ancient royalty. As already mentioned, the gardens and landscape designs of the Babylonians were proverbial.



(a)



(b)



(c)



(d)



(e)



(f)



(g)



(h)



(i)

**FIGURE 1-1** The many faces of horticulture. Horticulture's role in society is diverse: (a) horticultural produce is found in the grocery store; (b) greenhouses provide employment and plants for various uses; (c) landscaping enhances urban centers; (d) landscaping residential areas; (e) potted plants are used to enhance the interior and exterior decor of homes; (f) researchers and teachers of horticulture train students and develop improved cultivars of plants; (g) florists cater to a variety of needs in the community where flowers play a role and provide jobs; (h) botanical gardens provide recreational and educational opportunities to visitors; and (i) commercial producers of horticulture crops contribute to the local and national economies.

(Source: For (a), (b), (e-h): George Acquah, (c) Kim Sayer © Dorling Kindersley, (d) Alan Keohane © Dorling Kindersley (i) USDA,



# MYRIAD BOTANICAL GARDENS

## 100 Myriad Gardens

Oklahoma City, OK 73102

**DR. ALLAN STORJOHANN, MANAGER**

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### HISTORY OF THE GARDENS

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The idea of cultivating a garden in downtown Oklahoma City began when world-renowned architect I. M. Pei was commissioned by city leaders, led by oil and gas pioneer Dean A. McGee (CEO of Kerr-McGee Corporation), in 1964 to create a revitalization plan for downtown Oklahoma City. The resulting Pei Plan incorporated parkland for the development of a cultural, recreational, and commercial complex. The area that is now the Myriad Botanical Gardens was originally designed by I.M. Pei to model the Tivoli Gardens in Copenhagen, Denmark.

The development of the Pei Plan, and the gardens in particular, became the lifelong project of McGee. He even motivated a core group of civic leaders to travel to Tivoli Gardens and learn more about the success of the celebrated attraction.

On May 5, 1970, the name Myriad Gardens was officially adopted. Three months later, on August 11, 1970, the Oklahoma City Council established a 19-member Myriad Development Task Force. The principal responsibility of the task force was to assist the City in the successful planning, programming and implementation of the Myriad Gardens. After a national competition in 1971, the task force chose an architect for the Gardens, the New York firm of Conklin & Rossant.

The City of Oklahoma City purchased the site for the Myriad Gardens in 1975 for \$900,000. Investment in the development phase, including initial site clearing and utility relocation, was approximately \$1.2 million. Buildings that originally stood on the Myriad Gardens site included the Biltmore Hotel, City National Bank Building, and the Oklahoma Club.

On September 16, 1975, the Myriad Gardens Authority, a public trust, was created and charged with developing the 17-acre property. McGee continued his leadership role at the Gardens and was appointed as the Trust Chairman. Work began on the Gardens on November 17, 1977, with a ceremonial groundbreaking.

Construction of the garden's infrastructure, including the base of the conservatory, tunnel, water stage, and other core facilities continued over the next four years as funding became available. Oklahoma City-based RGDC was the structural engineering firm heading the project.

In 1981, the Myriad Gardens Foundation was formed to raise private funds for the construction of the conservatory designed by Conklin & Rossant. It was also at this time that Oklahoma City-based architectural firm HTB was hired to design and landscape the west perimeter of the outdoor gardens.

Lippert Brothers Construction began work on the Conservatory in September 1983. Edmond, Oklahoma-based Trafco Constructors Inc. accomplished the difficult task of designing and building the 17 tricorn trusses that make up the framework of the unique conservatory.

The structure was completed in 1985. The interior design of the Crystal Bridge was done by Loftis Bell Downing and Partners, Architects and Planners with the exotic plants being acquired and installed from 1987 to 1988 by Director Mike Bush (Figure 1).

In the summer of 1987, the Oklahoma City Parks and Recreation Department took over the operation and maintenance of the Gardens. The Crystal Bridge opened its doors to the public on March 25, 1988.

The outdoor grounds continued to grow as funding became available. The Herman and LaDonna Meinders Foundation donated two outdoor specialty gardens to the Myriad

(This item omitted from WebBook edition)

Gardens Foundation. The first, located north of the Crystal Bridge, was completed in 1996. The second, representing the largest single donation for the beautification of Oklahoma City, is located on the northeast corner of the Gardens and was completed in 1998.

On June 28, 2001, the Dean A. McGee Center, a 5,000-square-foot, multiuse and meeting facility funded by the Myriad Gardens Foundation, was opened for public use. The facility was named in honor of early Gardens' visionary and benefactor Dean A. McGee.

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## CRYSTAL BRIDGE FACTS

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The Crystal Bridge's unique design has earned attention and praise in the architectural community.

- The Crystal Bridge is 224 feet long and 70 feet in diameter. It is covered by 3,028 sections of translucent, double-layered Exolite acrylic panels.
- It took the largest crane in a five-state region to install the 17 tricorn trusses that form the framework of the Bridge, which resembles a massive steel rib cage.
- The Conservatory includes 13,000 square feet of plant display area.
- April of 1987 marked the beginning of planting inside the Crystal Bridge, with most items purchased from specialty nurseries in Florida and California. Generous donations of plants from local collectors also helped beautify the Conservatory.
- Plants thrive in two distinct climates inside the Crystal Bridge: the Tropical Wet Zone, which is at the south end and is watered daily, and the Tropical Dry Zone at the north end which receives water from April through September, followed by drought from November through March.
- The wide variety of plants requires daily hand watering using purified and pH-adjusted water, which is treated by a specialized reverse osmosis system. The R.O. system removes minerals, such as salt, from the water preventing a buildup that can harm and even kill the plants. The water is just like the tropical rain that the plants would experience in their native habitat.
- Crashing down from a height of 35 feet, the tropical waterfall on the Wet Mountain pushes 60-80 gallons of water over its edge per minute. This is accomplished using two pumps, one 10 horsepower and the other seven.
- Twenty evaporative coolers cool the air inside the Crystal Bridge, each supplying 16,000 cubic feet of air per minute. This keeps the air at a constant temperature for the plants to thrive. Indoor temperatures range from 62–87 degrees Fahrenheit in the south end and 60–95 degrees Fahrenheit in the north end in the summer. In the winter, temperature ranges from 62–78 degrees Fahrenheit, depending on cloud cover outside.

- Applying silicone latex onto actual rock outcroppings created the realistic appearance of the rock walls in the Crystal Bridge. The latex was used to fabricate molds, which were installed onto reinforced steel angle iron.

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## OUTDOOR GARDENS FACTS

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The Myriad Botanical Gardens' outdoor grounds include 17 acres of gently rolling hills.

- Hundreds of trees, including both native and non-native species, are planted throughout the grounds.
- Unique and popular specialty gardens dot the outdoor landscape displaying ornamental plants. The Meinders Gardens, at the northeast corner of the outdoor grounds, includes two extensive water gardens, shaded seating, and a wooden footbridge.
- The Myriad Botanical Gardens' lake covers two acres and is fed by the existing water table 22 feet below street level. The lake is home to several varieties of fish including goldfish and Japanese Koi, some of which reach as large as 20 pounds!
- Situated on the lake next to the Crystal Bridge, the Water Stage provides enough seating for several hundred people. It has become a popular spot for concerts, theatrical productions, weddings, and other special events.
- Paths wind their way around the lake and outdoor grounds leading guests through shaded, tree-lined walks, lively fountains, and beds of vibrant flowers ranging from the expertly manicured to the serenely natural. The majority of these paths run throughout the north and west side of the outdoor grounds.
- Dotting the outdoor grounds, amid the lake and gardens, stand several large sculptures. Some were purchased by the City of Oklahoma City and some were donated; all are unique and beautiful.

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## PLANTS IN THE CRYSTAL BRIDGE

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There are more than 1,000 species of plants in the Crystal Bridge, representing plants from every continent except Antarctica. They are located in two habitat regions in the conservatory.

The Tropical Rain Forest Zone, called the Wet Mountain, is located on the south end of the Conservatory. Plants here come from Amazonia, Central Africa, Southeast Asia and the South Pacific Islands where rain falls year-round. These plants are watered every day.

The Dry Tropical Zone, called the Dry Mountain, is on the north end of the Conservatory. These plants are put through a drought from November to March, followed by regular watering during the summer months to simulate the weather patterns in their native areas. Most of these specimens come from South Africa, Madagascar, and Mexico.

While the plant collection in the Crystal Bridge rivals most botanical gardens across the country, several elements are outstanding:

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## PALMS

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There are over 100 species of palms represented in the Crystal Bridge. Palms are the epitome of tropical trees. Found throughout the southern United States, palms only grow in tropical and sub-tropical climates and are often found close to water. There are many unique species growing in the Crystal Bridge. The Old Man's Palm, *Washingtonia filifera*, is a slow-growing palm that has long, pale brown "hair" covering the trunk. The Foxtail Palm, *Wodyetia bifurcata*, has unique leaflets radiating from the stalk giving it a foxtail appearance. On the northeast corner, the young *Bismarckia nobilis* palm, with perhaps the world's largest palm leaves, at a spectacular 10 feet wide, can be viewed.



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## CYCADS

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Many people mistake these prehistoric plants for palms. But these “living fossils” have their own unique identity. Cycads flourished in primeval forests during the time of the dinosaurs. In fact, the Jurassic Period is often dubbed the “Age of the Cycads.” At that time, cycads made up 20 percent of the world’s flora. They still exist today, in much the same form as their ancestors have existed for the past 300 million years, although only about 200 species remain. Many species can be found in Mexico, the Caribbean, and South Africa. Genera to look for in the Crystal Bridge collection include *Cycas*, *Dioon*, *Zamia*, *Bowenia*, *Stangeria*, and *Encephalartos*.

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## GINGERS

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Most people are familiar with the culinary variety of ginger. However, many members of this “spicy” plant family are also quite beautiful and are normally seen only in expensive floral bouquets. The stepladder ginger (*Costus malortieanus*) next to the wooden bridge has furry leaves arranged spirally along the stem. Many of the Conservatory’s *Alpinias* have flower bracts resembling bright red plastic pinecones, which last for months.

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## BROMELIADS

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Bromeliads are typically brightly colored, funnel-shaped plants that hold a surprise for curious guests—in the center of the funnel is a pool of water! This is because most bromeliads are epiphytes, meaning that they attach themselves to trees instead of rooting in soil, so this is how they get their moisture. Of course, not all bromeliads are epiphytes, some are terrestrial like our *Cryptanthus* species (Earth stars), or the most familiar of the family, the Pineapple (*Ananas comosus*). On both mountains, guests can see bromeliads “planted” on the rock slopes; these are clusters of small, green or grey-leaved “air plants,” or *Tillandsias*.

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## ORCHIDS

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Orchids adorn nearly every corner of the Wet Mountain and are easily the most popular plants in our collection. At any time of the year, dozens of varieties of orchids can be seen blooming. With their delicate petal and distinctive look, most orchids are grown for their beauty alone, however, the agriculturally important vanilla orchid, from which vanilla can be extracted, is also featured in the Crystal Bridge. One of the highlights of the orchid collection is the *Dendrobium superbum* var. *alba* which explodes with over 300 blooms each February. So impressive is its show of color that the Orchid Society of America awarded this plant the “Culture of Merit” award and named the variety in honor of the Crystal Bridge.

In February 2002, the Myriad Botanical Gardens received more than 1,200 orchids bequeathed to the Gardens by long-time orchid collector Mr. Fred Strothmann. From his Edmond, Oklahoma, greenhouses, Mr. Strothmann cultivated some of the most exotic orchids in the world. He traveled around the world, collecting orchids in such exotic places as Kenya, Uganda, Burma, Indonesia, the Philippines, Australia, Mexico, and parts of South America. The Strothmann collection is an important part of the Crystal Bridge’s year-round orchid display.

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## EUPHORBIAS

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Visitors to the Crystal Bridge are always surprised to hear that a majority of the spiny plants growing on the Dry Mountain are not cacti, but euphorbias. These varied plants can range in size from mini grass like plants to huge trees. The difference between the cactus and a euphorbia species is slight, the major difference being that cacti only grow in the New World (Western Hemisphere) while euphorbias are native to the Old World (Eastern Hemisphere). Many euphorbias found in Africa and Madagascar survive in much the same way cacti do in the deserts of Central and North America. Thick, succulent stems filled with milky sap and protected by pairs of sharp spines characterize this bizarre group of plants. There are over 40 species of euphorbias in the plant collection.

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## BEGONIAS

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While most gardeners are familiar with begonias as one of the more attractive annuals for a summer garden, few realize there are over 900 different species found throughout the world. Begonias are a plant of the tropics; there are no indigenous species in the United States. These plants come in a variety of succulent herbs, shrubs, and vines, all of which bloom. However, it's the color and texture, not the flower that makes begonias so popular. With over 100 varieties of begonias, the Crystal Bridge provides the best opportunity for our visitors to experience the tremendous beauty of this group of plants.

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## TITAN ARUM

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The world's largest unbranched inflorescence, *Amorphophallus titanum*, also known as Titan arum or corpse flower, bloomed in the Crystal Bridge Tropical Conservatory on June 29, 2005 (Figure 2). The 42-inch tall corpse flower lasted through Tuesday, July 5, before it collapsed. Staff brushed pollen donated by Fairchild Tropical Botanic Garden in Miami onto the female flowers on Thursday, June 30 in hopes the plant will produce seed. With any luck the Crystal Bridge will be home to more corpse flowers in the future. Pollen samples were taken from the plant on July 2.

The Titan arum bulb was donated to the Myriad Botanical Gardens on July 13, 2000, by Baltimore physician Clark T. Riley after visiting the Crystal Bridge. The flowering of a titan arum is a rare and significant horticultural event that has occurred less than 10 times worldwide in 2005.

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## ANIMAL LIFE IN THE CRYSTAL BRIDGE

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Plants aren't the only things to call the Crystal Bridge home. Lizards, fish, and butterflies are among the creatures that dart, swim, and flit throughout the Crystal Bridge's tropical environment. Their free reign means guests never know when a lizard might peek out from a rock or a butterfly might land gracefully on a petal.

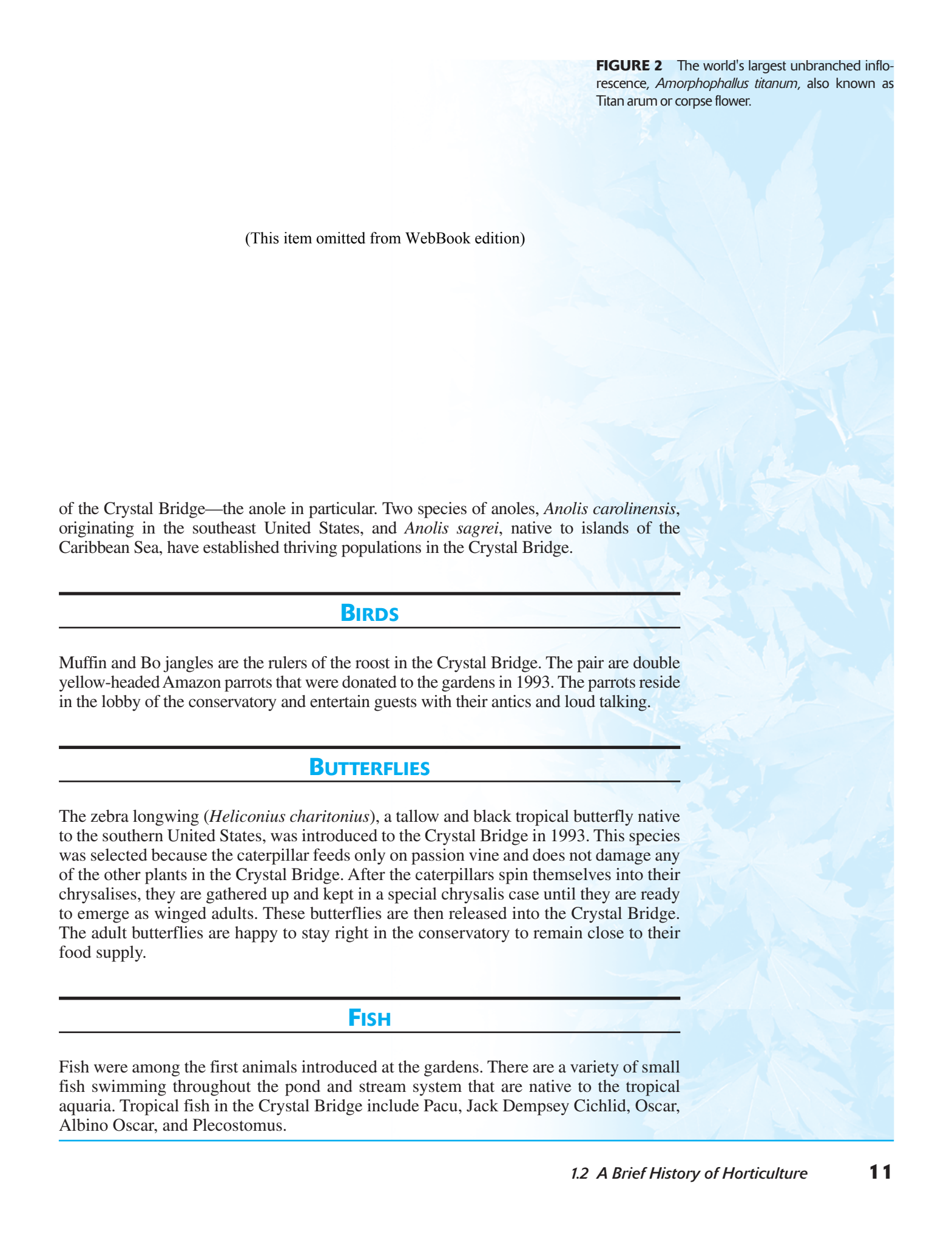
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## REPTILES AND AMPHIBIANS

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Reptiles and amphibians in the Crystal Bridge include the American anole, Cuban anole, day geckos, house gecko, tokay gecko, leopard gecko, bronze frog, green tree frog, and greenhouse frog. The lizards have been extremely successful in adapting to the environment





**FIGURE 2** The world's largest unbranched inflorescence, *Amorphophallus titanum*, also known as Titan arum or corpse flower.

(This item omitted from WebBook edition)

of the Crystal Bridge—the anole in particular. Two species of anoles, *Anolis carolinensis*, originating in the southeast United States, and *Anolis sagrei*, native to islands of the Caribbean Sea, have established thriving populations in the Crystal Bridge.

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## BIRDS

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Muffin and Bo jangles are the rulers of the roost in the Crystal Bridge. The pair are double yellow-headed Amazon parrots that were donated to the gardens in 1993. The parrots reside in the lobby of the conservatory and entertain guests with their antics and loud talking.

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## BUTTERFLIES

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The zebra longwing (*Heliconius charitonius*), a tallow and black tropical butterfly native to the southern United States, was introduced to the Crystal Bridge in 1993. This species was selected because the caterpillar feeds only on passion vine and does not damage any of the other plants in the Crystal Bridge. After the caterpillars spin themselves into their chrysalises, they are gathered up and kept in a special chrysalis case until they are ready to emerge as winged adults. These butterflies are then released into the Crystal Bridge. The adult butterflies are happy to stay right in the conservatory to remain close to their food supply.

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## FISH

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Fish were among the first animals introduced at the gardens. There are a variety of small fish swimming throughout the pond and stream system that are native to the tropical aquaria. Tropical fish in the Crystal Bridge include Pacu, Jack Dempsey Cichlid, Oscar, Albino Oscar, and Plecostomus.

# AALSMEER FLOWER AUCTION – A WORLD LEADER

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## CLARK WILLIAMS

Almost every country in the world produces flowers for domestic consumption. But only a few countries produce enough for export. Of these exporting countries, the world leader is Holland. Historically, Holland is responsible for the export of over half of the world's floral products including cut flowers, foliage, and pot plants.

One of the reasons for Holland's position as the world leader is due to their flower auctions. This includes Bloemenveiling Aalsmeer which is the world's largest flower auction. The Aalsmeer Flower Auction, located outside of Amsterdam, is considered to be the largest commercial facility in the world. Collectively, the buildings used by the Aalsmeer Flower Auction cover over one million square meters which is the equivalent of over 200 football fields. In 2006 the facility utilized 979 full-time employees and 853 part-time employees.

The quantity of flowers and plants sold on a daily basis are staggering. Each day approximately 19 million flowers and 2 million plants are auctioned and sold to buyers worldwide. In 2006, the Aalsmeer Flower Auction sold 4.784 billion cut flowers, 407 million plants, and 157 million garden plants. These numbers gave Bloemenveiling Aalsmeer a 44.7 percent share of the Dutch export market and accounted for 1.756 billion euros (approximately 2.35 billion U.S. dollars) of total sales.

Even though Holland is a world leader in flower production, a large amount of flowers that are sold in the auctions are imported. A very large percentage of these imports came from Africa with Kenya, Ethiopia, Uganda, and Zimbabwe being 4 of the top 5 importing countries. Israel was the only non-African country in the top 5.

The top five cut flowers sold through the Aalsmeer Flower Auction in 2006 were as follows: Roses – 1.762 billion, Tulips – 676 million, Chrysanthemums – 526 million, Transvaal Daisies – 269 million, and Lilies – 131 million. The majority of these flowers were purchased and sent to other European Union countries with Germany, the United Kingdom, and France being the largest customers.

The reason that Bloemenveiling Aalsmeer can sell and export such a large quantity of flowers each day is by using the Dutch auction method and the use of 13 auction clocks. The Dutch auction process involves starting at a high asking price and having the price continually drop until a buyer bids and gets the item at that price. If you wait too long in hopes of a lower price, you get shut out by the other buyers. Trains of carts loaded with flowers continually flow through each of the 13 auction houses (Figure 1). Individual auctions for each cart take a matter of seconds utilizing the 13 large auction clocks. In 2006,

**FIGURE 1** Flower auction in progress at Aalsmeer.

(Source: Clark Williams)



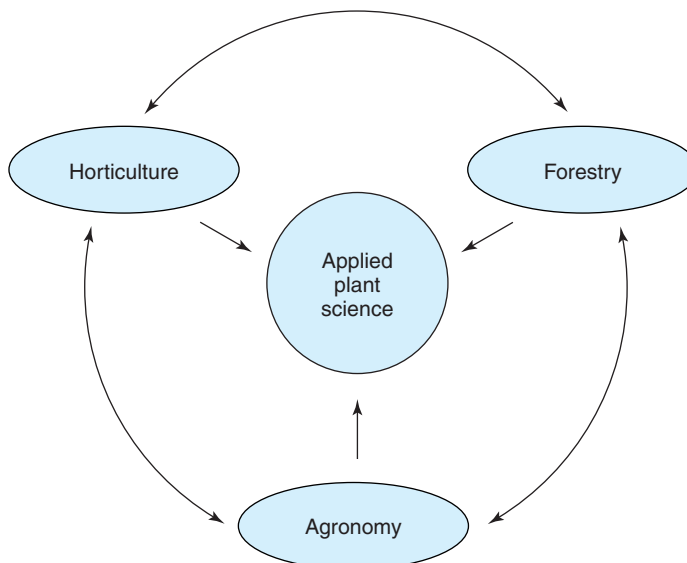


**FIGURE 2** Sold flowers are loaded on carts for shipping to destinations. (Source: Clark Williams)

the Aalsmeer Flower Auction averaged 43,860 transactions per day which works out to an average of 1,076 transactions per clock per hour. The sold flowers are then reorganized on new carts according to who made the purchase (Figure 2). At the end of the auction day, these carts are taken to the nearby airport and shipped worldwide.

Additional information about Bloemenveiling Aalsmeer, the world's largest flower auction, can be found by visiting their website at [www.vba.nl/](http://www.vba.nl/).

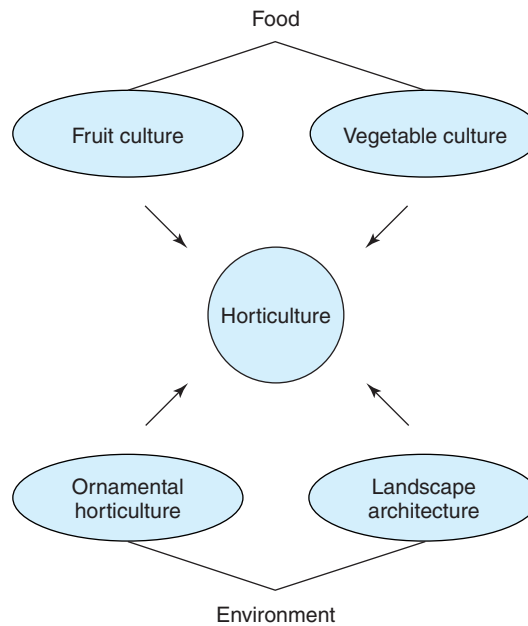
The foundation of agriculture was built upon by civilizations that followed the Egyptians. The Greeks and Romans were next to impact practical agriculture, with the Greeks being noted for their contributions to early botany, as chronicled in some ancient writings—notably those of Theophrastus of Eresos (372–287 B.C.), especially in *Historia Plantarum* (*History of Plants*). However, the Romans were more agriculturally oriented than the Greeks. They refined some of the technologies of their Egyptian predecessors. Records show that the Romans used horticultural practices such as grafting, budding, fertilization, and crop rotation, which are still in use today. In fact, their use of structures that functioned like greenhouses for forcing vegetables to grow indicates that they understood the principles of controlled-environment agriculture. With the advent of the slave trade, commercial production on plantations or large tracts of land was introduced. During this era, ornamental horticulture received great attention; the wealthy and nobility maintained elaborate gardens on their lavish estates. Growing plants in containers and



**FIGURE 1–2** Horticulture is interrelated with other disciplines of applied sciences.



**FIGURE 1-3** The four divisions of professional horticulture. The role of fruit and vegetable culture is to provide food; ornamental horticulture and landscape architecture impact the environment aesthetically or functionally, depending on the goal of the designer.



topiary (plant sculpting) became part of the landscape of these estates, some of which included swimming pools (Figure 1-4a-i).

During the Middle Ages, monasteries became a significant factor in the preservation and advancement of horticulture. Fruit and vegetable gardens became an integral part of monastic life. One of the most significant contributions to science was made by Gregor Mendel (1822–84), an Augustinian monk, while working with plants in a garden monastery. Mendel’s laws provide us with an understanding of how traits are transmitted from one generation to another. With the Renaissance came a resurgence in the interest in horticulture. Gardening not only became popular but also formalized. Landscaping was pursued with great creativity and diligence, resulting in some of the most magnificent designs ever produced, as exemplified by the gardens of the Palace of Versailles in France, designed by André Le Nôtre (Figure 1-5).

Horticulture was further advanced with the discovery of the New World. This advancement came not only in the areas of new and improved technology and an increase in knowledge but also in the introduction of new crops and improvement in trade. New World crops included fruits and nuts (e.g., cashew, avocado, pecan, pineapple, cranberry, and black walnut) and vegetables (e.g., kidney bean, lima bean, tomato, maize, potato, and sweet potato). With the expansion in trade routes and increased profitability of trading in horticultural products, coupled with greater diversity in plant types, various centers of production of specific horticultural crops were established around the globe. For example, the bulb industry flourished in Holland, while the cacao industry blossomed from the introduction into West Africa of this New World crop.

On the American horticultural scene, a number of pioneer practitioners played significant roles in the establishment of the horticulture industry. Robert Prince is credited with establishing the first nursery in the United States in the early 1730s, called the Prince Nursery at Flushing, Long Island. This nursery introduced the Lombardy poplar plant in 1784, a plant that later became the most common tree in America during the post revolutionary era. Andrew J. Downing (1815–52) revolutionized the art of landscaping in the early eighteenth century by emphasizing simplicity, nature, and permanency of exhibits in the landscape. This concept of landscape design was studied by his students, the most famous being Frederick Law Olmstead (1822–1903), whom many acknowledge as the father of landscape architecture. The work of Olmstead is exemplified by the still-popular Central Park in New York City. In the twentieth century, the name that stands out among American horticulturalists is Liberty H. Bailey (1858–1954). He contributed significantly



**FIGURE 1–4** Formal landscaping featuring topiary.

(Source: Steven Wooster © Dorling Kindersley)



**FIGURE 1–5** Landscaped European palace.

(Source: Demetrio Carrasco © Dorling Kindersley)

to horticulture in the areas of nomenclature and taxonomy, among others. His outstanding publications include *The Manual of Cultivated Plants* and *How Plants Get Their Names*.

Up until this period in history, horticultural production benefited primarily from improvements and changes in the production environment. Evidence suggests that genetic improvement (breeding) was conducted in the Middle Ages. The simplest method of breeding entails visual selection and saving seeds from a plant with desirable characteristics for planting in the next planting cycle. Knowledge of categorization or classification of plants according to use and other characteristics existed. With time, additional discoveries were made about the nature of things. Curiosity about the nature and response of plants to their environment led to an interest in the practical application of the existing knowledge through formal experimentation such as hybridization. Plant classification was improved with the systematic method developed by Carolus Linnaeus (1707–1778) described in his 1753 landmark publication *Species Plantarum*. One way of displaying the tremendous variability in plants for public enjoyment is through the establishment of botanical gardens. Advances, including modern machinery and equipment for planting and harvesting crops and chemicals to protect crops from harmful pests and to provide supplemental nutrition, have been made through the accumulation of knowledge in a diversity of disciplines.

Modern horticulture continues to see advances in the way crops and other plants are produced. Productivity per unit area has increased, and mechanization makes it possible to grow large acreages of plants. Plant diversity has increased through advanced breeding practices. Modern horticulture also enjoys tremendous support from academic programs in institutions of higher learning, research in public and private sectors, and industry. Advanced processing and storage techniques have extended the shelf life of products.

However, with advances in development and application of technology have come a variety of issues of great social concern. For example, increased use of agricultural chemicals has produced serious environmental consequences such as groundwater pollution. Production of crops under controlled environments (greenhouses) has expanded

production of plants, making it possible to produce plants in and out of season. New production techniques such as hydroponics, tissue culture, and other biotechnological advances promise to take horticulture to a new height. However, biotechnology is embroiled in a variety of safety and ethical debates.

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## 1.3 DIVISIONS OF HORTICULTURE

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Horticultural activities may be divided into several broad categories based mainly on the kinds of plants involved. These divisions form the basis of certain academic programs in horticulture:

1. *Fruit culture.* Fruits vary in numerous ways. Some are borne on trees, others on bushes. Some fruits are succulent and juicy, whereas others are dry. Growing fruits is a long-term operation. *Fruit trees* take a long time (several years) to come into bearing. They also require more growth space per plant than vegetables. An area of land on which fruit trees are grown in a significant concentration is called an *orchard*. The branch of horticulture involved with the production (including growing, harvesting, processing, and marketing) of fruit trees (including nuts) is called **pomology**. Fruit trees such as apple, orange, and pear are operationally distinguished from *small fruits* such as grapes, blueberries, and strawberries.
2. *Vegetable culture.* Vegetable production is one of the most popular horticultural activities indulged in by homeowners, often in the backyard or private section of the property. The branch of horticulture involved with the production of vegetables is called **olericulture**. Some vegetable plants are grown for their fruits (e.g., tomato), leaves (e.g., spinach), roots (e.g., carrot), or pods (e.g., bean). Unlike fruits, vegetables are generally short-duration plants that need to be restarted each growing season. Vegetables may be harvested and used fresh. However, they are also processed in a variety of ways.
3. *Ornamental horticulture.* The production and use of ornamentals is the branch of horticulture generally called **ornamental horticulture**. The term *use* is included in the definition because it is an integral part of this branch of horticulture. Ornamentals may be cultivated in open space (or landscape) or in indoor containers. They may also be grown, arranged, and displayed in a variety of ways. Subdivisions of this branch of horticulture involve distinct activities. **Floriculture** is the production and use of flowering plants and one of the areas most readily identified with when horticulture is mentioned. An important aspect of the landscape is the ground covering, which is usually grass. *Turfgrass science* has developed into a full-fledged program at many colleges. A lawn is the basic landscape element in most cases. Other plants are then added to this ground cover. Turfgrasses can be found on football fields, golf courses, playgrounds, and home grounds. Flowers in the landscape may be herbaceous or woody. The branch of horticulture involved with the production of trees is called **arboriculture**. Trees are perennial elements in a landscape design. They usually are large in size and hence require more space than annual plants.
4. *Landscape architecture.* *Landscaping* is the use of ornamental plants in conjunction with other elements to beautify a given area. The professionals who design such plans are called **landscape architects**. Since landscaping can enhance a property, it has become an integral part of home construction. Commercial facilities and other public areas are also appropriately landscaped. Malls, playgrounds, boulevards, and parks are examples of public places where ornamental plants are used to enhance the environment aesthetically and make it more functional. The use of plants indoors is called *interiorscaping* (as opposed to landscaping).

### **Pomology**

*The science and practice of fruit culture.*

### **Olericulture**

*The science and practice of growing vegetables.*

### **Ornamental Horticulture**

*The branch of horticulture that deals with the cultivation and use of plants for their aesthetic value.*

### **Floriculture**

*The science and practice of cultivating and arranging ornamental flowering plants.*

### **Arboriculture**

*The science of growing and caring for ornamental trees.*

### **Landscape Architect**

*A professional who designs landscape plans.*



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## 1.4 ROLE OF THE NURSERY AND SEED INDUSTRIES IN HORTICULTURE

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Horticulture as a modern industry is heavily dependent on the *nursery industry* and *seed industry*.

### 1.4.1 THE NURSERY INDUSTRY

The growth in the horticultural industry today is attributable in part to the growth in the nursery industry. Nurseries provide seedlings for growers who do not want to raise plants from seed and prefer to take advantage of their convenience (Chapter 16). In fact, certain plants are difficult to propagate without special conditions that the homeowner ordinarily cannot provide. Nurseries also grow and sell mature plants in containers for use indoors and outdoors (Figure 1–6). Nurseries facilitate the work of landscape architects and contractors by providing materials that are ready to be installed on-site, enabling a bare ground to be instantly transformed into a lawn with trees and other ornamental plants. Commercial nurseries are equipped to provide ideal conditions for plant growth. By growing plants under a controlled environment, nurseries provide growers a head start on plant production for the season. They start the plants in the greenhouse in winter when growing them outside is impossible. These plants are timed to be ready for transplanting into the field when spring conditions arrive. Nurseries produce a variety of plants—bushes, trees, tubers, roots, and other succulent and woody plants. They can handle tropical and temperate (warm- and cool-season) plants because they are equipped to control the plant growth environment. The small-scale home grower can purchase portable plant growth chambers for use at home.

### 1.4.2 THE SEED INDUSTRY

Researchers (geneticists and breeders) are continually developing new plant cultivars. These new types may be higher yielding, more resistant to environmental stresses (such as moisture, temperature, and light) and diseases, higher in nutritional value, or aesthetically more pleasing, among other qualities. Seeds from the research domain reach the consumer after going through several steps in the seed release process. Once the seed is certified and released as a cultivar, seed growers in the seed industry become responsible for multiplying the seed of the new cultivar, processing it, and packaging it for sale. The role of the seed industry is crucial to the success that the horticultural industry currently enjoys (Figure 1–7). Seed packets come with instructions about how the plant should be raised to maturity. These instructions are of tremendous help,



**FIGURE 1–6** Nurseries grow trees, shrubs, and various plant types in a variety of containers for sale to the general public.  
(Source: George Acquah)

**FIGURE 1–7** Seed packets.  
(Source: George Acquah)



**TABLE 1–1** Sample of Seed Companies

Abbott & Cobb, Inc., PO Box 307, Trevoise, PA 19053, Phone: 215-245-6666, Fax: 215-245-9043, Specialty: Sweet corn, watermelon, pepper, cantaloupe, squash
American Takii, Inc., Contact: Rick Falconer, 301 Natividad Rd, Salinas, CA 93906, Phone: 831-443-4901, Fax: 831-443-3976, Specialty: Vegetable seed
Arteco-USA, Contact: Shamim Zaidi, 3150 Hilltop Mall Road, Richmond, CA 94806, Phone: 510-970-7676, Fax: 510-758-7001, E-Mail: arteco@pacbell.net, Specialty: All vegetables, field planting seeds
Asgrow Seed Co., 1081A Harkins Rd, Salinas, CA 93901, Phone: 408-424-6905, Fax: 831-422-1417, Specialty: Full line
Asgrow Vegetable Seeds, Contact: Robert Zagajeski, 1905 Lirio Avenue, Saticoy, CA 93007-4206, Phone: 805-647-5912, Fax: 805-672-1939, Specialty: fresh market tomato, carrot, snapbean, cantaloupe; full product line
Atlee Burpee Co., W, Contact: George C. Ball, Jr., 300 Park Avenue, Warmster, PA 18974, Phone: 215-674-4900, Fax: 215-674-7170, Specialty: All varieties
Ball Seed, 622 Town Road, West Chicago, IL 60185-2698, Phone: 317-577-9917, Fax: 317-577-9918, Email: dross@ballseed.com , <a href="http://www.ballseed.com">http://www.ballseed.com</a>
Burrell Seed Growers Co., D. V., Contact: Richard Burrell, PO Box 150, Rocky Ford, CO 81067-0150, Phone: 719-254-3318, Fax: 719-254-3319, Specialty: watermelon, cantaloupe, squash, pumpkin
Crop King, Inc., 5050 Greenwich Rd, Seville, OH 44273-9413, Phone: 330-769-2002, Fax: 330-769-2616, E-Mail: cropking@cropking.com, Specialty: Tomato, lettuce, cucumber, pepper
Global Seeds, Inc., Contact: Richard Gomer, PO Box 207, Hollister, CA 95024-1207, Phone: 408-637-8251, Fax: 408-637-8254, Specialty: Vegetable crops
Johnny's Selected Seeds, 955 Benton Avenue, Winslow, Maine 04901-2601, Commercial Phone: 207-861-3902, Fax: 800-437-4290, Web: <a href="http://www.johnnyseeds.com">www.johnnyseeds.com</a> Specialty: Fresh market varieties for direct marketers
Harris Seeds, Contact: Mark Willis, 60 Saginaw Drive, PO Box 22960, Rochester, NY 14692-2960, Phone: 800-544-7938, Fax: 716-442-9387
Novartis Seeds, Inc., Contact: John Sorenson, PO Box 4188, Boise, ID 83711-4188, Phone: 208-322-7272, Fax: 208-322-1436, Specialty: Large and small seeded vegetables
Rupp Seeds, Inc., 5-17919 Co Rd B, Wauseon, OH 43567, Phone: 419-337-1841, Specialty: All vegetables, herbs
Seminis Vegetable Seeds, PO Box 4206, Saticoy, CA 93007-4206, Phone: 805-647-1188, Fax: 805-656-4818, Specialty: All varieties
Syngenta Seeds, Inc. Rogers brand, P.O. Box 4188, Boise, ID 83711

especially to novice growers. The seed industry has eliminated the need for growers to produce their own seed for planting, unless they so desire. The price of commercial seed is reasonable, and mail-order purchases are possible in many cases. Seed production is usually concentrated in areas where the growing season is most favorable for cropping. A list of some of the major companies is presented in Table 1–1.

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## 1.5 HORTICULTURE AND SOCIETY

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Horticulture is important to society in a variety of ways, including as a source of food, ornamentals, and jobs.

### 1.5.1 SOURCE OF FOOD

Society depends on horticulture for a substantial portion of its food needs in the form of vegetables, fruits, and nuts. These types of food sources are high in complex carbohydrates and rich in vitamins and minerals. Leguminous vegetable plants are high in both carbohydrates and protein. Horticultural products are hence part of a balanced diet for humans.

Commercial producers account for most of the horticultural products in the nation. However, numerous homeowners are engaged in gardening on their property as a source of fresh produce for the table and as a hobby for recreation and exercise. Horticultural products may be purchased fresh or processed. For example, certain vegetables (such as carrots, lettuce, tomatoes, and peppers) may be eaten fresh and raw in salads, and fruits (such as apples, oranges, and grapes) may be eaten fresh or processed into beverages.

### 1.5.2 ECONOMIC IMPORTANCE OF HORTICULTURE

The United States imports significant amounts of fruits and vegetables from all over the world (Table 1–2). This indicates the potential for growth in the horticultural industry. In 2007, an estimated 25.5 percent of U.S. agricultural exports comprised fruits and vegetables (Table 1–3). On the local scene, horticultural products, both food and ornamentals, are widely consumed by the public, on regular as well as festive occasions. The top five producers of horticultural products in 2006 were California, Florida, Michigan, Texas, and New York (Table 1–4). Most vegetables and fruits are produced in the West, Northwest, Midwest, Northeast, and Southwest United States (Figure 1–8).

### 1.5.3 ORNAMENTALS

As previously indicated, landscaping has become an integral part of home construction. Ornamentals are found both indoors and outdoors. Plants in the landscape include trees, shrubs, bedding plants, and grasses. Ornamentals are formally displayed for public enjoyment in places such as arboretums, parks, and botanical gardens. Botanical gardens are designed to exhibit a large variety of plant types for the pleasure and education of visitors. Public areas such as malls, playgrounds, and cemeteries are places where plants are displayed for specific purposes. In many societies, certain flowers are associated with specific social events. For example, roses are associated with Valentine's Day, carnations with graduation and Mother's Day, poinsettias with Christmas, and lilies with Easter, which is not to say that these flowers cannot be used for other purposes. Flowers feature very prominently at funerals and weddings. The golf course industry is a major horticultural enterprise that involves not only turfgrasses but also a wide variety of trees, shrubs, bedding plants, and other ornamentals.

### 1.5.4 JOBS

The ornamental industry provides a wide variety of jobs for many categories of people, directly or indirectly. Conducting a computer search via the Internet reveals a wide variety of advertised jobs.



**TABLE 1–2 U.S. Fruit and Vegetable Imports, 2007*****Fruits – fresh or frozen***

<i>Country of origin</i>	<i>Value (Million \$)</i>
Chile	759
Mexico	435
Costa Rica	273
Guatemala	160
Canada	141
Ecuador	141
European Union	133
Colombia	71
Honduras	68
Argentina	56
<b>World total</b>	<b>2,440</b>

***Fruits – prepared or preserved***

<i>Country of origin</i>	<i>Value (Million \$)</i>
China	135
Thailand	90
Mexico	69
Philippines	55
European Union	51
Canada	46
Turkey	22
Indonesia	13
Chile	13
Brazil	11
<b>World total</b>	<b>589</b>

***Vegetables – fresh or frozen***

<i>Country of origin</i>	<i>Value (Million \$)</i>
Mexico	1,463
Canada	549
Peru	03
China (Mainland)	64
European Union	55
Guatemala	29
Costa Rica	27
Ecuador	15
Dominican Republic	12
Honduras	11
<b>World total</b>	<b>2,390</b>

***Vegetables – prepared or preserved***

<i>Country of origin</i>	<i>Value (Million \$)</i>
European Union	241
China (Mainland)	130
Mexico	108
Canada	91
Peru	61
Turkey	32
India	27
Chile	19
Thailand	16
Morocco	13
<b>World total</b>	<b>842</b>

**TABLE 1–3 U.S. Horticultural Exports, 2007**

<i>Commodity</i>	<i>Value (Million \$)</i>
Total agricultural export value	33,515
Fruits and products	1,580
Fruits, fresh	1,182
Fruits, prepared or preserved	398
Fruits, juices	385
Vegetables and products	1,709
Vegetables, fresh	740
Vegetables, processed or preserved	969
Tree nuts and preparations	1,587

**TABLE 1–4 Top Five Producers of Horticultural Products, 2006**

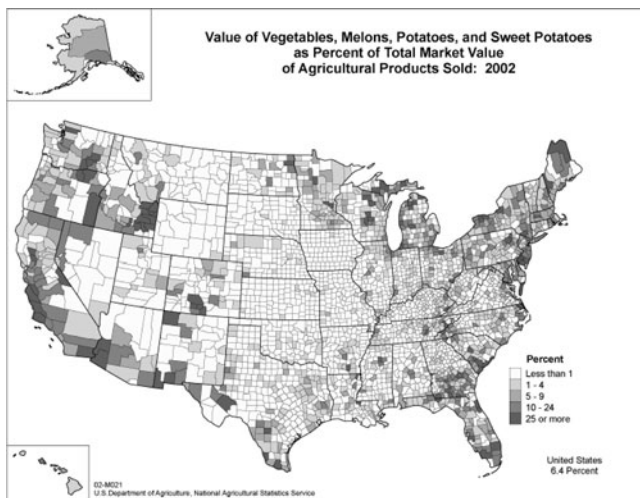
<i>Commodity</i>	<i>Rank</i>	<i>Value (\$)</i>	<i>Percent of U.S. total</i>					
Total whole sale		5,08,421		19.4	18.9	7.2	5.4	3.6
Annual bedding plants	1	1,904,921	State	CA	FL	MI	TX	NY
				12.6	9.6	9.4	7.6	4.9
Potted houseplants	2	808,941	State	CA	MI	TX	FL	MO
				24.6	11.7	6.1	5.8	4.9
Foliage indoor plants	3	721,049	State	CA	FL	NY	TX	MO
				69.8	16.2	2.8	2.4	1.0
Herbaceous perennials	4	708,865	State	FL	CA	TX	HI	MO
				11.2	8.9	7.6	6.7	6.6
Cut flowers, greens	5	601,860	State	CA	SC	MI	IL	NJ
				67.6	18.6	8.7	8.4	2.0
			State	CA	FL	WA	HI	OR

## Direct Jobs

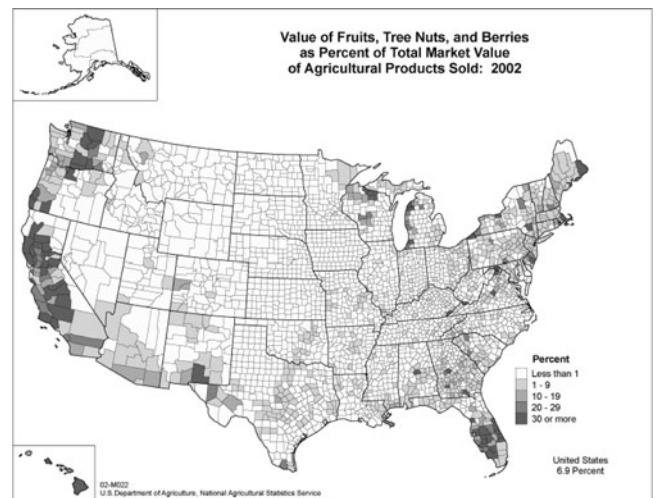
A large number of jobs require knowledge and training in horticulture. The level of training could be vocational or at the college level. The work may be indoors or outdoors. Intense manual labor or paperwork in the office may be involved. Many jobs in horticulture require a high school diploma and a short course in horticulture or agriculture. A college education provides more in-depth knowledge of the field and offers job opportunities at supervisory or managerial levels and to conduct research. The following are selected categories of jobs that require varying degrees of familiarity with horticulture:

## Nursery Operation

1. Nursery manager—responsible for coordinating the whole nursery operation; oversees personnel; develops operational budget; develops production and marketing plans
2. Propagator—responsible for raising planting materials using various methods of propagation (e.g., cutting, grafting)
3. Field supervisor—oversees fieldworkers; making work schedules; and ensuring that fieldwork is done properly and on time
4. Salesperson—promotes nursery operation; sells plant materials to customers
5. Garden center manager—handles the retail section of the nursery (inventory, sales, advertising, etc.)
6. Plant technician—knowledgeable in plant problems and advises on proper plant care for highest-quality products



(a)

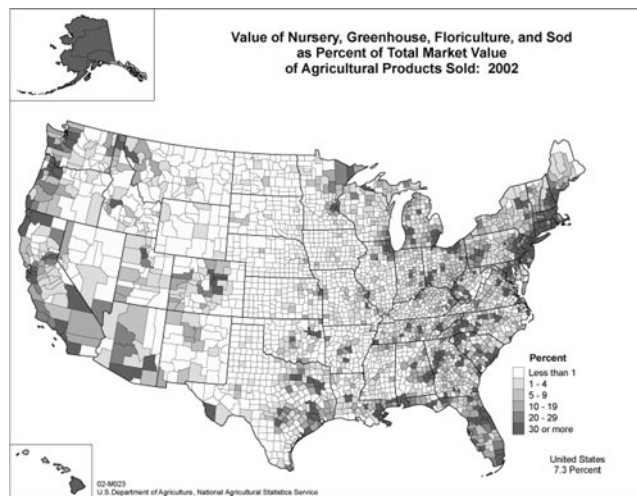


(b)

**FIGURE 1-8** Geographic distribution of horticultural production in the U.S.:

a) Vegetables, b) Fruits and nuts,  
c) Nursery and greenhouse production.

(Source: USDA)



(c)

### Greenhouse Operation

1. Greenhouse manager—similar duties as those of nursery manager
2. Sales manager—coordinates product sales and inventory
3. Nursery manager—(see nursery operation)
4. Technician—provides technical support to greenhouse operations, including equipment operation and maintenance
5. Sales assistant—provides assistance to customers to help in choices

### Landscape Operation

1. Architect/designer—develops landscape designs for customers
2. Construction supervisor—oversees the installation of a landscape according to landscape drawings
3. Groundskeeper/landscape maintenance technician—responsible for maintenance of a landscape
4. Tree surgeon—responsible for tree management (pruning, etc.)



### **Turfgrass Operation**

1. Landscape technician—oversees installation and maintenance of landscape
2. Golf course architect—designs golf course
3. Golf course superintendent—supervises construction and maintenance of golf course

### **Crop Production**

1. Farm manager—oversees production of vegetable or fruit production operation
2. Vegetable/fruit grower—owns vegetable/fruit production operation

### **Florist Operation**

1. Floral designer—creatively arranges flowers for various occasions
2. Store manager—in charge of business operation, makes arrangements for special events (e.g., weddings)

### **Education**

1. Teacher—teaches horticulture in formal or informal settings
2. Researcher—conducts research to develop new products (e.g., plant varieties) and to provide solution to agronomic problems
3. Extension person—provides information to general public to promote horticultural industry

As mentioned earlier, certain jobs do not require any familiarity with horticulture by way of formal training. For example, one can find numerous jobs in the greenhouse that require only an ability to follow directions and instructions and a sense of responsibility. Many workers in the greenhouse perform jobs such as watering, transplanting, filling pots with media, harvesting produce, and so on. Job prospects for those who pursue formal training in agriculture or horticulture are very bright.

### **Indirect Jobs**

The ornamental industry has spawned a number of supporting or service industries, including the following:

1. *Research.* Many scientists are engaged in developing new and improved types of vegetables, fruits, and ornamentals. These new cultivars may have wider and better adaptation, be higher yielding and of higher nutritional quality, and have other qualities depending on breeding objectives. Research is conducted in both private and public sectors (at universities, research institutes, and research companies) to find solutions to problems in the horticultural industry. College-level training (often graduate level) is required to adequately prepare for a career in research. Research institutes invest a great amount of human and financial resources in developing new cultivars, which is why commercial seed companies sell their improved seed (such as *hybrid* seed) at premium prices. Apart from improving the agronomic and nutritional qualities of plants, horticultural scientists also devote considerable time to improving the aesthetics of ornamentals and the quality of products.
2. *Chemical industry.* The horticulture industry depends on large amounts and varieties of chemicals, including fertilizers, pesticides, and growth hormones. Many companies are involved in producing chemicals that are used to enhance plant production and the quality of produce. Chemicals (called agrochemicals) are an integral part of modern high-input production practices. The increasing

trend toward ensuring a safer environment has been the impetus for the creation and enforcement of laws and guidelines for the judicious and safe use of chemicals. Crop production using little or no chemicals, called *organic farming*, is gradually gaining popularity.

3. *Machinery.* Engineers design and produce tools and machinery for use in the production of horticultural plants. Machinery and implements are available for preparing land, planting, cultivating, spraying, harvesting, storing, and packaging. These aids enable large-scale production of horticultural plants to be undertaken. Home garden versions of some of this machinery and equipment are available.
4. *Distribution.* Horticultural products are transported from the areas of production to marketing outlets. Because of their largely perishable nature, horticultural produce and products require special handling in transportation to retain their quality for a long time. Certain items require refrigeration during storage. Horticulture has spawned an elaborate transportation and distribution network. Because most horticultural products are harvested and used fresh, the ability to preserve quality in transit is critical to the industry. In certain cases, the produce is harvested before it ripens in order to increase its shelf life. Home gardeners have the advantage of ready access to vine-ripened and fresh produce.

Numerous jobs are available in these four general areas at various levels. These jobs can be obtained by persons trained in fields other than horticulture, such as basic science, engineering, economics, marketing, agribusiness, genetics, and postharvest physiology.

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## 1.6 THERAPEUTIC USE OF HORTICULTURE

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Horticulture is known to have therapeutic value that can be derived by participating in it or simply enjoying what has been created by others. Walking through a botanical garden can be very relaxing and healthy.

Also called therapeutic horticulture, horticultural therapy uses plants and horticultural activities to improve the well-being of people of all ages. It is used especially to improve the psychological and physical adjustment of persons with physical disabilities, mental illness, developmental disabilities, and the elderly.

People with emotional and mental problems have been helped when they were deliberately exposed to ornamental plants. For the visually impaired, horticulture can be enjoyed by touching the plant parts and enjoying the sweet scents.

Gardening can be undertaken by people to keep fit or to relieve boredom and other negative emotions. People who are incarcerated or severely limited in their movement are prone to frustration. For such individuals, horticultural activities can be helpful in better managing their emotions.

Throughout horticultural therapy, people recovering from long-term illness and who have been at the receiving end of care can be assigned the care of a plant in a role reversal to boost their confidence and to give them a renewed sense of purpose.

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## 1.7 HORTICULTURE ON THE INTERNET

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This section is designed to provide the reader a quick overview of horticulture as an industry and academic discipline. The sites featured were selected for their content as well as the effective use of visuals to enhance the presentation. These sites also show how faculty, students, and all who are interested in horticulture may search the Internet to find information to supplement what has been presented in this book. Selected sites are as follows:

## What Is Horticulture?

This site provides a detailed account of the history of horticulture by Professor Jules Janick of Purdue University. It presents an account of how the industry has evolved over the ages, and discusses the contributions of key horticulturalists in the development of horticulture as a science and a business.

*<http://www.hort.purdue.edu/newcrop/history/default.html>*

## Botanical Gardens

Botanical gardens are places where the general public may go to view a variety of horticultural displays. While some displays involved common plant species, these facilities often have unique exhibits such as tropical gardens and rare specimens.

Myriad Botanical Gardens, Oklahoma City, <http://www.myriadgardens.com/index.html>

Missouri Botanical Gardens, <http://www.mobot.org/>

Kew Botanical Gardens, <http://www.rbgekew.org.uk/>

## Horticultural Societies

There are professional societies devoted to promoting a forum for professionals in academia for exchange of ideas in a formal setting. There are other societies whose membership is more open to the general public, and that focus on specific species (e.g., the Rose or Orchid Societies), among other purposes.

American Horticultural Society, <http://www.ahs.org/>

## Overview of Horticulture

This site is an excellent source of information on various aspects of horticulture. Such information is presented in visual forms through photos and videos.

*<http://webgarden.osu.edu/>*

## Growing Houseplants

Growing houseplants is one of the most common ways in which the public participates in horticulture. Many sites provide excellent information on selecting and growing houseplants.

*<http://www.urbanext.uiuc.edu/houseplants/>*

## Landscape Plants

The use of ornamentals in landscaping is another popular and visible application of horticulture in society. Many sites provide guidelines to selecting and using landscape plants.

*<http://oregonstate.edu/dept/ldplants/gardem-p.htm>*

## The Science of Horticulture

Horticulture is a science, an art, and a business. The Internet is an integral part of modern classroom instructional delivery system. Many instructors post excellent teaching materials on the Web that can be accessed to supplement teaching by others. Here is a sample of such materials:



### *Classifying and naming plants*

Very good and well-illustrated discussion of plant classification

<http://www.dmtturner.org/Teacher/Library/4thText/PlantsPart1.html#classification>

### *Inflorescence types*

A well-illustrated discussion of the floral structure

<http://www.pssc.ttu.edu/pss1411cd/STRUCTUR/inflores/inflores.htm>

### *Plant anatomy*

Excellent and comprehensive collection of slides on plant anatomy; electron microscopy

<http://botweb.uwsp.edu/anatomy/>

Excellent photos of plant structures

<http://www.pssc.ttu.edu/pss1411cd/CDROM/DEFAULT.HTM>

### *Hydroponics system*

Excellent discussion on types; line diagrams to show differences

<http://www.simplyhydro.com/system.htm>

### *Flower arranging*

The site presents a good introduction to the art of floral arranging

[http://interiordec.about.com/od/arrangingflowers/How\\_To\\_Arrange\\_Flowers.htm](http://interiordec.about.com/od/arrangingflowers/How_To_Arrange_Flowers.htm)

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## **SUMMARY**

Horticulture (garden cultivation) is the branch of agricultural plant sciences that deals with the production of fruits, vegetables, nuts, and ornamentals. It is a major source of food and employment in society. Operationally, there are several divisions of horticulture: pomology (tree fruit production), olericulture (vegetable production), ornamental horticulture, floriculture (flower production), turfgrass science (turf production), arboriculture (tree production), and landscape architecture (design and use of plants in the landscape). Horticultural foods are rich in minerals and vitamins. Horticulture can be undertaken on a small scale by homeowners on their property, producing flowers and food plants. As an industry, horticulture is supported by a large number of service providers that supply equipment, chemicals, and implements. Nurseries provide plant materials for growers. Numerous jobs are available to persons with formal training in horticulture, but an equally large number of jobs in this branch of agriculture requires little or no formal training.

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## **REFERENCES AND SUGGESTED READING**

Janick, J. 1986. *Horticultural science*, 4th ed. San Francisco: W. H. Freeman.

American Horticultural Societies

<http://www.ahs.org/>

American Horticultural Therapy Association

<http://www.ahta.org/>

Examples of botanical gardens

<http://www.myriadgardens.com/index.html>

<http://www.mobot.org/>

<http://www.rbgkew.org.uk/>

Excellent overview of the history of horticulture.

<http://www.hort.purdue.edu/newcrop/history/default.html>

General information on various aspects of horticulture.

<http://webgarden.osu.edu/>

Jobs in horticulture as advertised by the American Society of Horticulture Science

<http://www.ashs.org/hortoport/index.html>

US Horticultural trade reports

[http://www.fas.usda.gov/htp\\_arc.asp](http://www.fas.usda.gov/htp_arc.asp)

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## PRACTICAL EXPERIENCE

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1. Consult the commercial edition of your local telephone book (the yellow pages) and list up to ten businesses each in the following categories:
  - a. Florists
  - b. Nurseries or greenhouses
2. Visit a local business in each of the following categories. During the visit, obtain information about the following: plants cultivated (or plants and flowers used), educational level or training of the owner or manager, size of the operation, and profitability.
  - a. Florist shop
  - b. Greenhouse
  - c. Vegetable farm
  - d. Fruit farm
3. Visit the library for the following exercise.
  - a. Select a local periodic publication. For a period (e.g., three months), count the number of advertised horticultural and allied jobs.
  - b. Find the job description of each of the following jobs from, for example, the *Occupational Outlook* publication.
    1. Golf course manager
    2. Greenhouse manager
    3. Three other horticultural jobs
4. Internet search. Search the Internet to find out the number of jobs advertised in the area of horticulture. You may want to search according to categories (e.g., teaching jobs, greenhouse jobs, floriculture, turfgrass, and so on).

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## OUTCOMES ASSESSMENT

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1. Briefly trace the history of horticulture.
2. Discuss, giving specific examples, the benefits of horticulture to society.
3. What is horticulture?
4. Discuss the roles of the seed and nursery industries in modern horticulture.

5. Give specific reasons for the distribution of horticultural production in the United States.
6. Horticulture is a science, an art, and a business. Discuss.
7. Distinguish among the divisions of the disciplines of horticulture.
8. Discuss, giving specific examples, how horticulture can be used in society to positively impact the environment.
9. Discuss specific ways in which horticultural applications are manifested on your campus or residential neighborhood.