

from small groves to extensive forests of 64,000 acres. Public spirited citizens, chambers of commerce, and veterans, sportsmen, women's organizations, and others have sponsored or founded them. They are owned by counties, cities, towns, villages, and schools.

VALUES OF TWO TYPES accrue from the public forest—the social-economic benefits and the revenues from forest products. The social benefits are more important; they can be measured in pleasure, health, improved standards of living.

The first cash returns usually come from improvement cuttings, which consist of removal of defective trees left over from previous logging or of inferior species that have taken possession of the land. Next comes the thinning of the new stands. The first thinning may be Christmas trees, which are taken out 5 to 10 years after planting. Subsequent thinnings for pulpwood, fuel, posts, and poles come along at short intervals to release the ultimate crop trees from crowding. And so, from small beginnings, year by year, decade by decade, the forest income builds up if it is managed prudently.

The city of Onconta, N. Y., started a municipal forest of 1,200 acres in 1911. For the first two decades the

value of the cut averaged \$152 a year, but in the third decade the average annual income increased to approximately \$600.

The Troy town forest in Maine, started in 1938, consists of 1,000 acres of abandoned farms. Withdrawn from settlement and devoted to intensive forestry, it has yielded a net income of 89 cents an acre a year, compared to the average tax of 33 cents an acre. Six years after the forest was established, a fund of \$4,000 had accumulated from the forest receipts toward a new school building.

The school forest at Minocqua, Wis., consisted of 240 acres of brush land. The first year the school fund was enriched by \$400 received from an improvement cutting of aspen pulpwood.

The nature of the benefits to be derived from these public forests are such that they deserve a place in modern community planning.

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ARBORETUMS, PLACES OF BEAUTY AND SCIENCE

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To the person who has a piece of ground, a few dollars, a love for trees and nature and beauty, a collector's instinct, and an interest in science, we should like to recommend that he start an arboretum. Few things, we think, are more worthy of effort, more productive of abiding satisfaction and accomplishment, and more enjoyable than a collection of trees of one's own.

An acre is ample for 20 or 25 specimen trees and many beautiful shrubs. Five acres is plenty for a really repre-

sentative collection of trees, which can be underplanted with flowering and fruiting shrubs that will bring bird life and bird songs practically into the home. How much one pays for the trees depends on how much one wants to pay. A few pennies spent for seedlings, to which are added materials started from cuttings and gifts from neighbors, will provide the beginning.

Almost everyone collects something, and enjoyment people get out of their collection—whether trees, stamps, or

first editions—derives in large measure from its completeness. And so the collector of trees and shrubs will do well to set up an objective. It might be to grow one of each of 10, 15, or 20 different species. It might be to grow rare trees, like the franklinia or the offspring of historic trees, such as the Mount Vernon Pecan or the Evangeline Oak. Or it might be to obtain a complete collection of the native trees and shrubs of his county or State. In the Northern States, such a collection will not be excessive in number of specimen plants, but farther south it will entail a great many species. If the objective were to grow all the species of one group of trees, such as pines, maples, or oaks, then the size of the collection would depend upon the group of trees one selects.

Keen enjoyment comes from the search for new specimens to add to a collection. The collector can get some specimen trees from commercial nurseries. But for many rare types—and this is one of the joys of collecting—he will have to get seeds, possibly from some public arboretum, and to grow the seedlings himself. The collector of native trees might collect seed or wild seedlings on trips through his home State, or on his travels anywhere. Some of them, gathered at a distance, will not grow, perhaps, but that is a part of the art.

An excellent example of a personal arboretum is the Hemlock Arboretum in Philadelphia. The owner, Charles F. Jenkins, aims to grow all the various growth forms of the native eastern hemlock, which are mostly slow-growing or dwarfed forms. His collection in 1948 included 190 specimens, representing 40 varieties.

MUCH THE SAME, except in ownership, is the community arboretum, which deserves the consideration of garden clubs, service clubs, and other organizations interested in the enrichment of community life. Undeveloped park areas or other community property is suitable for an arboretum. A

community arboretum should not be confused with a community park that is provided for physical recreation; it cannot become a dual-use area, playground and arboretum.

Sections of new parkways on the outskirts of towns and cities are excellent for arboretums. Such parkways are high-speed arteries, but arboretum areas up to several miles in length can be safely established on long and relatively narrow side strips that need tree planting. Eventually, arboretum areas should be incorporated in the plans for new highways, with provision for additional land where it is required. Visitors to such an arboretum need not interfere with traffic on the main highway; suitable parking areas can be provided in places where the arboretum strip is relatively narrow. A better arrangement for wider strips is to build a gravel side road through the arboretum, parallel to the main line of travel and wide enough to permit parking without interference to traffic.

Many people in towns undoubtedly would enjoy periodic visits to a park or parkway arboretum. School children could be brought out in busses for nature study. If the arboretum is properly identified by signs, many travelers would take time to leave the highway and drive slowly through the arboretum strip.

No arboretum should be started until a plan has been well thought out and formalized on paper. Such a plan should define the purposes to be served, which, in general, determine the space required, what and how to plant, and the costs of establishment and maintenance. The plan should indicate how the project is to be financed. Advice, when it is needed, can be had readily from nurserymen, gardeners, landscape architects, and various other specialists, professional and amateur.

The person, group, or community that establishes an arboretum follows a long and interesting tradition. The dictionary definition of an arboretum as "a botanical garden of trees" indi-

cates that their history is part and parcel of the history of botanical gardens. Such collections of trees, arranged as specimens or in the natural groups and authentically named and maintained for educational, esthetic, reference, and research purposes, have found a place in the botanical gardens of all countries.

WE HAVE RECORDS of some ancient botanical gardens, and it is a safe assumption that trees, and thus arboreta, were an important part of at least some of these gardens.

History records that, 2,800 years before the birth of Christ, the Emperor Shen Ming had a garden in which he grew medicinal plants; and that Thotmes III, the ruler of Egypt, had a pleasure garden planned by the head gardener of the Temple of Karnak about 1500 B. C. Aristotle, the great teacher of antiquity, developed a botanic garden at Athens about 340 B. C. in which he taught his students. It would appear that these ancient gardens were established for three primary reasons—utility, pleasure, and instruction.

A wide historical gap exists between the ancient gardens and the botanical gardens of the Middle Ages. As learning returned to Europe with the close of the Dark Ages, gardens were established for the utilitarian purpose of growing and testing medicinal herbs. One such was a medicinal garden at Salerno, Italy, in 1309, which has long since disappeared. Some of the medicinal gardens eventually became botanical gardens and arboreta. In Italy, botanical gardens were started in Pisa in 1543 and in Padua and Florence in 1545. Botanical gardens were established in Germany at the University of Leipzig in 1542 and at the University of Heidelberg in 1593. A tree planted a few years after the establishment of the botanical garden at Leiden, Holland, in 1587 was still standing a few years ago. One of the oldest botanical gardens in France has been in existence at Montpellier since 1593.

The world famous Royal Botanical Gardens at Kew, London, has a particularly large collection of arboretum material. It originally comprised two royal estates, which were first combined in 1802 and became a national garden in 1841. It has been said that probably the largest number of tree and shrub species which has yet been gathered is to be found at Kew.

Tokyo had a well-established garden in 1684. A botanical garden apparently existed on the outskirts of Manila in the Philippines before 1787.

Although arboreta were usually a part of botanical gardens, some early collectors were primarily interested in trees for purposes of ornament and forestry. René du Bellay, Bishop of Mans, made a collection of trees at Touvoys, France, about the middle of the sixteenth century; the contemporary botanists called the collection the richest and the most beautiful in France, Germany, and Italy, but it has long since disappeared.

About two centuries later, Duhamel du Monceau planted approximately 1,000 species of trees and woody plants from Europe and North America in the first arboretum established for scientific purposes. His arboretum and publications led to the introduction of many exotic trees into French parks and plantations. Some of his specimens are still living.

Pierre Philippe André de Vilmorin was especially interested in the different geographical varieties of the principal timber trees of Europe. In 1825 he started an arboretum at Les Barres, France, which became one of the most important tree stations in Europe. Vilmorin planted the different races and forms of the principal European timber trees and a number of introduced species in large plantations. The property became the Arboretum National des Barres through purchase by the French Government about 1856.

An arboretum was established at Segrez, France, in 1857 by Alphonse Lavallec, which, by 1875, had become one of the largest collections of woody

plants. One of the most interesting collections of the oaks of Europe and southwest Asia was started by G. Alard near Angiers, France, in 1858.

IN THE UNITED STATES, Robert Prince, an early settler at Flushing, Long Island, started a garden and arboretum, which was called the Linnæan Botanical Garden after 1793 and became well known internationally. It was continued until 1870, by five generations of the family. Among other things, Prince is credited with planting the first Lombardy poplar in America. The fame of the garden is indicated by the fact that after the Battle of Long Island, in August of 1776, the British Gen. William Howe placed a guard around the Linnæan Garden to protect the trees and plants from the hazards of war. The Linnæan Garden had a strong influence on American horticulture and forestry.

The first botanical garden in New York City was located on Murray Hill as early as 1656. Little is known of the original garden, but in 1801 Dr. David Hosack purchased 20 acres of land in the locality and established the Elgin Botanical Garden at what is now a corner of Fifth Avenue and Forty-seventh Street. In 1810 the property became the Botanical Garden of the State of New York; it was later transferred to Columbia University and was finally abandoned as a botanical garden for lack of funds.

John Bartram, who was a Pennsylvania farmer and one of the most interesting figures among our early American botanists, is generally credited with the establishment of the first arboretum in the United States. It was Bartram who discovered in Georgia in 1760 the franklinia tree, a beautiful plant that has disappeared from the wild. Today it is to be found only in arboretums and private gardens. He was honored in his own time by appointment as botanist to the King of England for his labors in collecting and forwarding plant material to England. Bartram built a house in 1731 on the

banks of the Schuylkill River at a location now the south end of Fifty-fourth Street, Philadelphia; it was there he started his arboretum. A large ginkgo, or maidenhair-tree, in this garden is said to represent one of the first trees of this species introduced into America in 1784. Bartram's Garden has been restored as a public garden after being neglected for many years.

A RECENT SURVEY of public arboretums of the United States listed almost a hundred. Besides those that are more or less formally established, hundreds of small groves or plantings have specimen plants that are identified and labeled. Given time and sufficient interest, it is entirely possible that some of these "seedlings" may grow into formal arboretums. Many arboretums are started in just this way. Arboretums are not natural steps in ecological successions; to survive, they must have continuous care and attention.

Of present-day arboretums in the United States, the Arnold Arboretum in Boston has exerted great influence on our knowledge of trees and shrubs. It is devoted entirely to materials hardy in that region.

Two of the best known botanical gardens, which also include extensive arboretums, are the Missouri Botanical Garden, which dates from 1859, and the New York Botanical Garden, which was established in 1894.

The Park Department of Rochester, N. Y., has developed its arboretum in the city's Highland Park into one of the large collections of trees and shrubs in the United States. The collection of poplars at Highland Park, one of the best in the country, made possible hybridization work with poplars.

THE VALUE of living collections of plants as an aid to scientific teaching and investigation began to be recognized about the seventeenth century. Interest in the use of trees and plants for decorative purposes and landscaping, and with it the desire to possess rare and unusual forms, developed

even more slowly. It was not until the middle of the eighteenth century that this aspect had become sufficiently popular to interest men of means to become the patrons of horticultural science. Then the world was searched for new and rare species and the patrons financed the publication of some magnificently illustrated volumes. And so, as the functions of botanical gardens and arboretums were gradually multiplied, the scientific and educational aspects became more and more important.

From the writings of several men we have taken ideas on how arboretums should serve the public:

To grow a complete collection of the best hardy plants so that the public may become acquainted with their names and characteristics.

To test and introduce new plants and varieties in order to increase the productivity, economic importance, and beauty of the region.

To maintain research; to provide a laboratory for the students of botany, horticulture, forestry, as well as nature study; and to provide collections of tree species for scientific breeding.

To serve as a laboratory adjunct to the schools, garden clubs, and other organizations; to disseminate knowledge of plants and the culture of plants through lectures and publications; and to provide recreational stimulus to the public.

To conserve the native plant life of the region.

To train gardeners.

To cooperate with related institutions and agencies for the extension of knowledge.

No single arboretum can necessarily fulfill all of those functions; the functions of an arboretum depend on the available area and funds—and sometimes on the conditions under which the funds are granted.

An arboretum should never become a public park, in the sense of a recreational or picnic area where people can wander at will over the land. An arboretum should be laid out with

adequate footpaths leading to specimen plants, and visitors should be required to stay on the paths—extensive trampling results in packing of the soil and finally to degeneration of the trees themselves. Trees and shrubs should be clearly labeled with their name and their native habitat. Additional interesting information may be given for many trees, such as the offspring of historic trees or the special uses of some trees.

Arboretums are of great importance not only to the landscape practitioner but also to the forester. Most of the forest schools and forest research institutions of Europe have arboretums of timber trees and, in the United States, some of the forest schools and forest experiment stations also maintain such collections. The arboretum of the California Forest and Range Experiment Station, near Placerville, Calif., is one of the largest collections of pines in the world. It was established in 1925 as a breeding arboretum for the improvement of this group of timber trees. It is a good example of a highly specialized arboretum containing species of pine from all over the world.

At present, the forest-tree breeding work in the eastern United States is being carried on at Philadelphia, a community that is particularly rich in blooming specimens of many tree species because of its favorable climate and because of the great interest in botany of some of its prominent early settlers. Men like Bartram made Philadelphia a center of botanical studies even before the Revolution, and the continued interest of the owners of estates has given us a heritage of native and exotic tree species that now makes hybridization work possible.

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