

the average kills more people each year than hurricanes and tornadoes; certainly it causes millions of dollars of damage. One should never seek shelter under a tree during a thunderstorm. If one is caught in an open area, he should squat as low as possible and always keep feet close together. Campers should surround their tents with a loop of wire and not have upward projecting metal tent poles; it would be far better to collapse the tent. Cabins should not be built on high rocky points unless they are very well protected with a lightning rod system. In urban quarters one should stay away from electrical appliances and telephones, and stay out of the bath

tub during a thunderstorm. One should always stay off of open water because you become the highest object and will be more charged than the water surface. One could go on and on with many more specific rules but a little understanding of how lightning behaves allows for best reasoned judgment on what is best to do during a thunderstorm. If all necessary precautions have been taken, then simply sit back and enjoy the storm.

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PRINCIPLES OF EDUCATION IN ARBORICULTURE¹

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Arboriculture, as defined in many dictionaries, is the culture of trees and shrubs. It is inter-related with horticulture, landscape architecture, forestry, pomology, agrostology, plant pathology, botany, and others. My comments will be confined primarily to Massachusetts; however, I will attempt to make observations that are common to other parts of the country.

It is best that we spend a few moments on the history of arboriculture, but not as complete as Dr. L.C. Chadwick's *3000 Years of Arboriculture — Past, Present and Future*. The knowledge of care and use of shade and ornamental trees probably arrived in this country with plantmen who came in the 1600-1800's from Europe and Asia, and their information was passed on. There were many prominent educators and practitioners during the first 200 years, but Dr. George E. Stone, Head of the Botany Department at Massachusetts State Agriculture College certainly was one of the first and foremost. He did a great deal of research, extension, and teaching in shade tree management as early as the late 1800's. A formal course was devoted to shade tree management and some of his earliest pupils were founders of our largest private tree companies. Dr. Stone continued his interests long after leaving the state college.

We certainly must not forget Professor Karl Dressel with his Municipal and Recreational Forestry at Michigan State University. His program was diversified yet complete, since he relied on the teaching and research of many departments. Even as a student, I was aware of his struggle with the traditional forest service concept, which had no patience with what they now call "urban forestry."

At the same time many other schools, disciplines, and governmental agencies were focusing their attention on tree problems in the urban environment. Dr. L.C. Chadwick, Head of the Horticulture Department of Ohio State University contributed a great deal and still does. The entire hour could easily be devoted to those who have contributed and are contributing directly and indirectly to this field, but this is not my task.

However, I would like to mention that efforts are being made to catalog the contributions related to arboriculture in Canada, the British Isles, and the United States. The first effort is by J.W. Andreson, *Community and Urban Forestry, A Selected and Annotated Bibliography*, published by the U.S. Forest Service, Atlanta, Georgia.

At present, the Bureau of Outdoor Recreation, a federal agency, has directed a focus on the ur-

¹ Presented at The Annual Meeting of the International Society of Arboriculture in St. Louis, Missouri in August of 1976.

ban environment, which includes arboriculture, parks and recreation, land planning and others, by cost sharing to states, cities, and towns. This organization has been able to cause the National Park Service and the United States Forest Service and other federal agencies to concentrate more on the urban environment.

There is also a trend within cities and towns to combine park and tree departments and often recreation, within one department. This has resulted in a greater need for qualified personnel. Private arboriculture, primarily a service-oriented industry, has been expanding, and will continue to expand. This too places a need on qualified personnel and a demand for learning opportunities. Regarding educational efforts related to arboriculture, I wish now to confine most of my remarks to Massachusetts. Not that we have all the answers to the educational question.

We have 12 vocational high schools that teach arboriculture or horticulture with a heavy emphasis on shade trees, nursery management, and landscape contracting. The cooperation between the schools, private industry, and other organizations, and the cooperative extension service is very good.

The community colleges offer related courses and this fall, we may have several terminal programs related to the plant material industry. Again, the cooperation between industry and education is good. Some evening courses are offered in arboriculture, shade tree pathology, and shade tree entomology.

At the Stockbridge School of Agriculture, a two-year school offering an associate degree was founded in 1918, at the University of Massachusetts in Amherst. We have had supportive programs since its founding. In 1946, a formal major was established, called Arboriculture (please accent the first syllable when pronouncing). This program has grown and is now called Arboriculture and Park Management. We have about 120 students in this major. Students who reside in other New England states pay in-state tuition, so it acts in part as a regional program.

We require students to work a minimum of three months before entering as freshmen, with five months of placement between the two years. This indicates the excellent cooperation we have

with private and municipal arborists.

The following is a list of primarily technical courses offered. For a detailed description of each course, send for a catalog.

ARBORICULTURE AND PARK MANAGEMENT

Associate Degree (2 years)

Courses and Credits

First Year

First Semester

Arboriculture and Park Management, Principles & Practices (4)
 Landscape Operations, Plant Materials (4)
 Mathematics (2 or 3)
 Plant and Soil Sciences, Botany (4)
 Plant and Soil Sciences, Soil Management (4)
 Plant and Soil Sciences, Fine Turf (4)

Second Semester

(Eight weeks resident instruction followed by five months placement training)
 Arboriculture and Park Management, Principles and Practices (2)
 Entomology, Insects (2)
 Landscape Operations, Plant Materials (2)
 Plant and Soil Sciences, Plant Propagation (2)
 Plant Pathology, Diseases (2)
 Arboriculture and Park Management, Recreation/
 Open Space Survey (2)
 Arboriculture and Park Management (4)

Second Year

First Semester

Arboriculture and Park Management, Tree Problems (3) or
 Arboriculture and Park Management, Park Fiscal and Personnel Management (3)
 Entomology, Shade Tree Insects (3)
 Forestry, Forest Management (4)
 Landscape Operations, Topographical Mapping (3)
 Plant Pathology, Tree Pathology (3)
Electives: 2 of the following:
 Agricultural and Food Economics, Business Management (3)
 Psychology (3)
 Rhetoric, Speech (3)

Second Semester

Plant and Soil Sciences, Herbicides (1)
 Arboriculture and Park Management, Tree Laws
 and Utilities (3) or
 Arboriculture and Park Management, Park
 Management (3)
 Rhetoric (3) or
 Communication Methods (3)
 Landscape Operations, Construction (3)

Electives: 3 or 5:

Food and Agricultural Engineering, Structures (3)
 Plant and Soil Sciences, Orchard Pruning (3)
 Wildlife Management (2)

A student must have 64 credits to graduate with a minimum of 2.0 quality point average (C). The student may transfer to a four-year major if accepted. About 65% of our graduates continue their education. Statistically this may be interpreted that we are doing a poor job and students must continue to make up for what they weren't taught, or, it may be that we are doing an excellent job in encouraging further learning. Our students transfer to a bachelors degree major primarily in park administration, plant and soil science, forestry, entomology, and plant pathology, all of which are closely related. Some have continued on to masters or doctors degrees in the same areas of concentration.

In the fall of 1977 our Park Administration and Leisure Services (formerly Recreation) will be integrated. A student choosing the plant material tract and obtaining experience during the three summers would have a good education foundation in both municipal and private arboriculture.

Besides the formal credit type courses mentioned above, the Federal and State Cooperative Extension Services, in conjunction with related professional organizations, offer tree workshops and conferences. *Tree News*, a Cooperative Extension Publication, appears regularly during the spring, summer, and fall, and keeps the reader posted on all current problems and solutions. The University Shade Tree Laboratory publishes an annual *Tree Disease and Pest Handbook*. Hardly a month goes by without one or more meetings related to our field. There are many educational opportunities in New England for those who are interested. The home-study program offered by

the National Arborists Association is an excellent educational service, and is used in conjunction with in-service training program by some companies.

Maybe one of the reasons for so many educational opportunities in New England in our field is that five of the six states have a certification or licensing of arborists. Many companies require their salesmen and foremen to pass such a test. This further increases the demand for educational opportunities. Also many positions in park and tree departments require an arborist certification or license.

What makes a good educational program in arboriculture? The following are what I consider to be important principles:

1. A student, male or female, who is inquisitive, interested, and who wishes to learn. Good health, and enjoyment of the out-of-doors are also important.
2. A series of courses that are people as well as plant oriented, presented by different departments and faculty.
3. On-the-job training before coming to school, as well as during summers of the school program. This must be competitive and for pay.
4. Professional organizations that do most of the hiring should be brought into the curriculum review. It can be pathetic when teachers determine the entire program. However, some employers, if given their choice, would pick only a few noncontroversial technical courses. There must be good communication and cooperation between the educators and the employees.
5. It is imperative that students evaluate each course when completed and the entire program upon graduation. These evaluations usually are constructive and serve as a useful guide to the teacher as well as the department head.
6. Those educators involved with the program should be concerned for the student and his future.
7. The teacher, depending upon his desire and ability, should also be involved with extension or research, so he will be better informed. To have to publish at the expense of teaching is a poor policy.
8. There should be no accreditation of this educational program since this may narrow the

program by the accreditors.

Summary

Beginning in Colonial times, with the skills of the plantsmen from Europe, arboriculture has spread to include the care of shade and ornamental trees and shrubs wherever they are used in the landscape, whether on private property, in parks, city streets, along country roads and superhighways, and in wooded reservations.

These days you may hear arboriculture referred to as "urban and recreational forestry." The demand for personnel educated and trained in this widening field is growing. Educational facilities of many kinds are rising to meet the need. We have looked at some of these today,

and checked some of the standards for a good educational background in arboriculture.

There is need for a wide range of educational experience in our field: in-service training, vocational high schools, associate degree programs, bachelor and masters degrees, and even a number of Ph.D.'s.

Finally, it should be said, that those basic principles that make for good educational procedures in arboriculture are the same as those for any other field. We have tried to incorporate these in Massachusetts wherever young people are being prepared to enter the field of arboriculture.

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ABSTRACTS

Lapping, M.B. and W.B. Kurtz. 1976. **Protecting privately owned urban woodlands: trends in municipal tree ordinances.** J. Forestry 74(9): 622-624.

The aesthetic, economic, and environmental benefits of urban and suburban forests and tree groupings are well recognized, but until recently little public effort was directed to the enhancement of such areas not within the public domain. Now, however, there is a movement to protect the values and benefits derived from those woodlands and trees in private ownership. The number of ordinances being developed is increasing as more and more communities confront the conflict between continued development and the preservation of urban and suburban woodland resources. Many communities are developing land-use controls which regulate urban woodlands and trees in private as well as public ownership. Analysis indicates that the ordinances are becoming increasingly sophisticated and suggests the provisions that can usefully be incorporated when new regulations are formulated.

Aubertin, G.M., B.C. Thorner, and J. Campbell. 1976. **A precipitation collector and automated pH-monitoring system.** USDA Forest Service Research Note NE-220, 8 p.

There is more to rain than water. Rain is generally acidic and contains varying amounts and types of ionic, molecular, and particulate substances. Evidence is accumulating that our rains are becoming more acidic and that their content of nonwater substances is increasing. These changes may influence plant growth. We need to know the relative quality of the precipitation and how the quality changes with time and storm characteristics. To obtain this information we need to collect and analyze precipitation samples. A sensitive precipitation collector and automated pH-monitoring system are described. This system provides for continuous monitoring and recording of the pH of precipitation. Discrete or composite rainwater samples are manually obtainable for chemical analyses. The system can easily be adapted to accommodate flow-through monitoring components.