EXPERTS DISCUSS NEW FINDINGS, TECHNOLOGY TO DIAGNOSE TREES

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Tree diagnosis and evaluation has become a technical, scientifically based profession. Electronic equipment, pathologic expertise, and a total knowledge and background of trees has replaced any "I guess..." or "It looks like..." comments from the professional. Experts presented a thorough review of factors affecting health and monetary value of trees at the Tree Diagnostic and Evaluation Workshop in Columbus, OH. Speakers came from 11 states to address an audience of more than 100, representing 21 states and Canada. Here is a summary of what was said.

Ken Reisch, associate dean of the College of Agriculture and Home Economics at Ohio State University welcomed the group to the O.S.U. campus. He was followed by his former mentor, Dr. L. C. Chadwick, retired O.S.U. horticulture professor and current chairman of the Council of Tree and Landscape Appraisers. Dr. Chadwick entreated the audience to follow some basic guidelines of tree evaluation which would lead to both more realistic evaluations and narrower differences among evaluators. He reviewed some of the evaluation procedures outlined in the Guide for Establishing Values of Trees and Other Plants (Available from the International Society of Arboriculture, c/o E. C. Bundy, Executive Secretary, P. O. Box 71, 5 Lincoln Square, Urbana, Illinois 61801). He also emphasized the importance of proper identification of the subject plants and familiarity with the suitability of each species in all sorts of environmental situations. As examples, Dr. Chadwick mentioned that sugar maple would be evaluated much more highly in the category of species quality when it is grown in a non-urban environment. He also said that pin oak should be rated more highly when grown in an acid soil than when grown in an alkaline one.

Ray Gustin, Jr., a Maryland consulting arborist, spoke next. He encouraged the group to take steps to improve the professionalism of tree evaluators. Among the recommendations made by Mr. Gustin were suggestions that arborist consultants should be accredited and full-time evaluators and should improve their skills in the most difficult category of tree evaluation—condition. He encouraged the development of state-by-state evaluations of each tree species in each state.

Erik Haupt of Massachusetts shared with the group a review of the elaborate array of accessories he carries to tree evaluation jobs. A few of these include telephoto and wide angle camera lenses, binoculars, increment hammer and borer, Shigometer, pH and moisture meters, reference books, compass, hand saw, soil profile tube, paint, disinfectant, and pruners.

The workshop was particularly blessed by a pair of entomologists and a pair of plant pathologists who discussed a wide variety of specific tree ailments and their opinions of how the ailments would affect the value of the trees.

Don Shuder, an entomologist at Purdue University, was the first to speak. He listed many specific examples of insect problems and tree species particularly *susceptible to attack.* Many trees are generally free from insect attacks (e.g., Zelkova and Philodendron) and many are free from gypsy moth predation (e.g. Fraximus, Juglans, Catalpa, Juniperus, Liriodendron and Cornus). Others are not so lucky. Sunburst honeylocust is the honeylocust cultivar most susceptible to mimosa webworm. Honeylocusts in general are susceptible to a variety of problems, including mites, especially when under moisture stress, and borers. Larch sawfly can be a serious threat in the northern parts of its range but is only a minor pest in areas to the south. Lilac borers are especially a problem when the lilacs are grafted to privet roots. Red pine is especially susceptible to scale when it is grown outside of its natural range. Tulip trees, which have few pests otherwise, will occasionally have problems with tulip tree collar borer (tiny round holes at the base of the tree and apical dieback are symptomatic). Pin oak can have severe problems with obscure scale. Spruce budworm can be a severe problem when they venture away from their normal range. European pine shoot moth is a real problem on two needle pines north of the 40th parallel. Nantucket pine moth is often found on pines in xeric sites.

High nitrogen fertilization, especially ureaforms, can promote the growth of mites. Monocultures promote tremendous population growth of pests, such as walking stick in pure stands of oak in Indiana. While most galls on oaks do not seriously threaten a tree's health, horned oak gall can be very destructive. Through these few topics discussed, it seemed clear that good tree evaluators need to be familiar with a great number of variables affecting insect damage in trees.

John Weidhaas, an entomologist from Virginia Polytechnic Institute, followed with many more specifics about pests, especially sucking insects. Some examples: Oak red mites should not be considered a serious problem because they don't build up in population until late in the season and they confine themselves to the lower branches. Honeylocust plant bug injures the leaves as they emerge from bud. White pine aphid can cause bark and phloem injury that become noticeable after the aphids are gone. The damage can easily be mistaken for a canker disease. Rhododendron twig beetle is a borer which attacks only the twigs on rhododendron, leaving tiny pinholes in the bark and causing damage which can easily be mistaken for Phytophtora twig blight. Bark beetles detect and invade weakened pines before visible stress signs appear on the trees. It is therefore necessary to control the insects before a tree is obviously stressed or carefully monitor potential stresses in important trees. While peach scale has a wide range of hosts, it has become especially severe on Kwanzan cherry. Dr. Weidhaas summarized by stating that the ultimate aim is to evaluate pests before they are a problem.

Pathologists were next on the program with Spencer Davis of Rutgers being the first to speak. Dr. Davis initi-

ated his talk by pointing out a general rule of thumb concerning the degree of severity of disease problems. He noted that rusts, leaf spots, and powdery mildews are not nearly as severe as are leaf problems caused by abiotic factors. Diplodia tip blight on Austrian pine, at least in New Jersey, was one exception to his rule. Unless there was selection for resistance he would give Austrian pine a very low rating. On the other hand, disease is a much more serious problem on trunks and branches than is mechanical injury.

Concerning trunk ailments, several examples of mechanical injury to trunks (such as parking lot damage) were cited which were not considered serious, especially when the trees were callusing well. On the other hand, trunk diseases were considered to be more serious. He stated, however, that it is important to distinguish between diseases as causes of tree maladies as opposed to secondary invaders. Whether the disease is primary or secondary, many are indicators of terminal illness in trees. A tree with Fomes or *Polyporus sulphureus* or most any tree with bracket fungus with the possible exception of black locust has a real problem.

Eugene Himelick, a pathologist with the Illinois Natural History Department, spoke about wilt diseases and root problems. He outlined some of the methods of distinguishing oak wilt from other problems such as scorch. The fact that the fungus doesn't survive trips to the laboratory for culturing makes positive identification difficult. Fortunately, oak wilt is not common in urban areas and is confined primarily to the red oak subgenus. Among the other wilt diseases discussed, Verticillium wilt was given a good deal of attention. He cautioned that other problems can be confused with the disease and that only laboratory culturing can give a positive identification of the disease. For example, Phomopsis on Russian olive can be mistaken for Verticillium. Phomopsis can be pruned out, but Verticillium cannot. When discussing root problems, Dr. Himelick laid heavy blame on land developers for improper care of the soil. He noted that most root problems are symptoms of some sort of physical damage or improper care of the tree.

Next on the agenda, Bob Felix, executive vice president of the National Arborists Association, noted examples of how proper pruning and cabling can increase the value of trees while poor pruning and cabling can reduce a tree's value.

At the evening program, Elton Smith, an extension agent with The Ohio State University Department of Horticulture, discussed nutritional deficiencies and herbicide damage. On the topic of nutrition, he was mainly concerned with species which are chronically deficient and cited some species as potentially problem trees. Red and sometimes silver maple can have chronic manganese deficiencies that appear to be nitrogen problems. White oak and pin oak are notorious for iron chlorosis but river birch, star magnolia, sweetbay magnolia, sweetgum, flowering dogwood, kousa dogwood, and European birch are also susceptible to the problem. Several potentially damaging herbicides were discussed, including soil sterilants, simazine, Casoron, 2,4-D, and related products, such as dicamba, Amino Triazole, Dowpon, paraquat, and Roundup. Injury from dicamba was given special attention due to the increase in its use and the increased rate at which it is applied. Little leaf linden and sycamore were two plants listed as particularly susceptible. Cupping of the leaves and brittle margins were said to be symptomatic of dicamba damage. Taxus is perhaps the most susceptible to dicamba. On that shrub the damage looks like a late frost. Dr. Smith warned that dicamba persists in the soil and can move to and accumulate in low areas. This could be a problem particularly for golf courses. While lauding Roundup, Dr. Smith warned that if it is sprayed on basal suckers or on trunks of green barked trees it can cause damage.

The evening program was concluded with an interesting series of case histories of consulting jobs performed by Frederick Micha, consulting arborist. Mr. Micha was primarily involved in establishing the value of the damage done to trees and shrubs. In addition to reviewing the procedure he followed in each case, potential pitfalls and problem areas in the business were discussed.

The second day of talks was initiated by the return of Spencer Davis to the podium to discuss pollution damage. While noting the many types of damage done by various air pollutants, Dr. Davis felt that soil pollutants posed a more acute threat to plant material. Among the comments made about air pollution, he said that often a small percentage of trees in a population (about 7 to 10 percent) will be especially susceptible while the others are not. He recommended the removal of the susceptible members and selection of non-susceptible forms. In attempting to establish the cause of pollution damage he recommended the interesting technique of finding indicator plants. For example, when hydrogen fluoride is suspected as a cause of damage, gladioli, which are extremely susceptible, could be used to help with the investigation by serving as indicator plants. Soil pollution, unlike most air pollution, often causes the death of the affected plants. Veinal chlorosis is often evident in contrast to interveinal chlorosis in nutritional problems. On conifers the base of the needle is damaged, unlike tip damage caused by air pollution. Oil, natural gas, methane from landfills, and pentachlorophenol were some of the soil pollutants mentioned.

The conference was particularly fortunate to have Walter Shortle, a pathologist and research associate of Alex Shigo of the Northeast Forest Experiment Station in Durham, New Hampshire. Results of research done on tree wounding and the use of the Shigometer were discussed. Concepts of tree wound healing revolved primarily around the idea that trees have four types of barriers that can be established to block the progress of rotting. Ray cells which are aligned throughout the trunk of a tree in radial patterns provide one line of defense. Another line involves the dense cluster of very small cells laid down by the cambium as the seasonal growth of the tree slows to a stop. The third line of defense prevents vertical penetration by plugging the vascular system, and finally there is a barrier zone in tissue which grows over wounds. Dr. Shortle emphasized the need to respect the zones when treating a tree. He particularly noted the danger involved in cutting through a barrier and thereby permitting the spread of decay along the area of penetration and into the rest of the tree.

Use of the Shigometer for diagnosis of a tree's condition, particularly the physical structure of the trunk, was discussed next. By using the Shigometer, the existence and/or location of sapwood, heartwood, decay,

Continues on page 44

EQUIPMENT *from page 42*

— Tighten loose hardware on attachment mounting structure.

Antifreeze

In cold weather, cooling systems must be protected by adding antifreeze—usually an ethylene-glycol type. When extremely cold weather is expected you might think the more ethylene-glycol antifreeze you add, the lower the freezing point of the coolant. Not so!

The lowest freezing point obtainable is when the water-antifreeze solution contains about 67 percent antifreeze (protects to -94° F, -70° C).

General inspection

Some miscellaneous items should be inspected if equipment is to be operated in winter weather.

— Check tires and rims for damage. A tire with a rim that was nicked or bent during the summer may retain air during warm weather but leak in subzero temperatures. Replace or repair damaged tires or rims as necessary.

— Replace broken windows and seals around doors and console (cab equipped machines). Snow that enters control areas could cause icing as temperatures fluctuate. Cold air results in operator discomfort.

— Make sure brake lights, turn signals, rotating beacon, and warning lights operate properly if machine is to be used for snow removal.

— Check operation of heater (if so equipped). Since heater is not used during summer, controls may corrode or bind up and heater will not function properly when needed.

EXPERTS *from page 29*

and hollowness can be detected. Even relative growth rates can be measured. Dr. Shortle emphasized that the most difficult aspect of using the Shigometer is interpreting the results. Only by understanding how the relative conductivity and not the absolute conductivity varies can the readings be properly interpreted.

The afternoon session of the second day turned to the mechanics of tree evaluation. James Kielbaso of the Department of Forestry at Michigan State University quickly outlined the procedures to be followed. The entire group then went outside and made practice evaluations of six trees in the Ohio State University Campus. A thorough discussion of the results occupied the morning hours of the next day.

On the evening of the second day, Jack Siebenthaler, horticultural consultant, discussed nursery appraisal. Through case histories, Mr. Siebenthaler gave the audience an idea of the type of problems involved and the methods he used to make a usable and accurate evaluation. **WTT**