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THE CHALLENGING FUTURE FOR ARBORICULTURAL RESEARCH

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Abstract. The purpose of this presentation is to discuss research needs as they relate to ongoing procedures within the arboricultural field. By outlining present and past examples of need, the paper will show that better communication between practicing arborists and research scientists is a necessity, as is more effective funding and general support. The cutback in federal financial support puts it squarely up to the practicing arborist to support useful field research.

In many research areas, including arboriculture, problems are first recognized by those individuals actively engaged with practical efforts in the field. It would follow that the priorities, guidelines, and criteria as to need are most likely to come from the practitioners. Of course, information can also come from homeowners and from scientists, but we arborists are the practitioners in a new and growing field, and can act as a pipeline through which information can flow to research scientists regarding field problems. Without continuing communication between field and laboratory, it is often difficult for researchers to provide the new or improved skills and procedures which we need to save the trees.

The fight to preserve the American elm may be just one interesting example of insufficient communication between researcher and practicing arborist. It might be helpful to review this communication over the past 30 years, specifically as it relates to Dutch elm disease. Recognition of some of the mistakes and misunderstandings that occurred in that effort could lead to a better understanding of the communication necessary to deal with other problems of shade tree care.

During the late 1940's, I was employed to spray elm trees in the suburban Boston area. I applied DDT spray from a hydraulic machine first as a dormant spray during late March and early April at a concentration of 1% for elm bark beetle control, and a second spray using 1/8% concentration during the month of June as a "cover spray," for elm leaf beetle control. This spray program was not at the concentration recommended by the U.S. Government, but my employer felt that the increased cost of applying government-approved procedures would not be acceptable to our clients.

Russell R. Whitten, entomologist with the USDA, released a comprehensive bulletin in 1956 which explained the necessity of spraying elm trees with a 2% dormant application when using hydraulic sprayers. This new publication also explained the importance of using high-quality xylene in the formulations. He included recommendations for mist blowers using a 12% rate. Mist blowers were just being introduced at that time for elm spraying. In some cases, the results of these mist-spray applications, even when following these recommendations, seemed to damage many elm trees. This damage was found especially in the early spring when the leaves were soft and tender. The principal cause of this damage was thought to be the fact that when hydraulic spray operators shifted onto mist machines, they tended to overspray the trees.

The answer to the mist blower problem was not simple. Upon careful review and analysis, it was found that the quality of the carrying agent, xylene, had been compromised by some manufacturers in order to reduce cost. Kerosene had been used rather than xylene. Many operators trying to deal with this problem did not understand the need for quality materials and so purchased the lowest priced product. Conse-

quently, they reduced their 12% mist spray formulations to lower concentrations in order to stop burning the elm trees. Other operators may have reduced the amount applied in order to save money and to spray faster. While the reduction did alleviate some of the burning, it also reduced the effectiveness of the control of elm bark beetle.

In the late 1950's, a great many cities and towns found that Dutch elm disease had increased in their areas, and the mist blower was blamed. Certainly, the mist blowers of the late 1950's were not as successfully designed as they are today, but if competent scientists had been in the field, I am sure that only improved formulations would have been on the market. The result of this cutting of corners was improper spray applications on elm trees.

Confusion reigned between arborists and researchers. The lack of effective, ongoing communication between scientists and practitioners continued for a period of time, and the elms continued to die with depressing regularity.

Perhaps the more sophisticated procedures arborists were required to use contributed to the problem. Prior to World War II, lead arsenate or Paris green were the principal spray materials used in hydraulic sprayers for leaf-eating insects. However, after the war, arborists were required to pour 4 gallons of oil mixed with DDT into a spray tank for every 1,000 gallons of water. This was a new experience for arborists. It led to more complicated and more expensive spray mixtures. Often, funds were scarce and cities voted only one-third of the sum necessary to spray all the elms. This resulted in one-third of the proper spray mix going into the spray tanks.

Some arborists were not being honest when they made changes in the formulations. This was the main cause for the compromising of the procedures necessary to save the elms, in my view. Since I had been trained at the University of Massachusetts to do the job *per the specifications* as outlined by the USDA, working as an arborist with a cost-conscious company was a different and frustrating experience.

During the late 1950's, the Michlin Chemical Company in Detroit advertised 32.4% emulsifiable formulation of DDT mixed with xylene. This seemed to be a possible answer to the burning problem on the leaves, as less oil would be used. My employer shifted to the 32.4% material. The phytotoxicity problem appeared to be under control, however, the cost of the formula continued to escalate. We were able to sell the program, even though the cost was as much as 200% higher than that of some of the competition. After a few years, the program showed a drop in elm loss to less than 1%. But even with these splendid results, many clients wondered why they should pay 200% more to spray elms when other arborists would do it for so much less. Unfortunately, we found no researcher to call in to review the field results. Perhaps the lack of give and take between the two disciplines contributed to client uneasiness.

We initiated a Dutch elm disease program where we agreed to remove an elm at no charge, if it became infected with Dutch elm disease. We pledged to return to the client the money that had been spent for spraying; a proposal that our clients accepted enthusiastically. This elm guarantee program was unique. It was one of the key factors contributing to the growth of Lowden, Inc., in the late 1950's and early 1960's. Our spray program was not tested by the USDA. Our clients were frustrated when they attempted to discuss the program's merits with researchers at the University of Massachusetts, The Waltham Field Station, or with other arborists. Valuable experience could have been gained if we had had a researcher observing and monitoring our program.

New procedures sometimes create damaging side effects, either to the environment, personnel, or the plants treated. The arborist should report this information immediately to research scientists. During the 1960's it became apparent that DDT had questionable side effects. I became alarmed by the destruction of beneficial insects during the summer months.

Hemlock trees close to sprayed elm trees turned brown and excessive Euonymous scales were found on the Euonymous vines growing under the elms. The late Dr. W.R. Whitcomb of the University of Massachusetts determined that what I thought was insect damage was not due to an insect at all, but was from another pest called red spider. As a control for red spider, Dr. Whitcomb suggested a new material developed in Germany

during the Second World War, called parathion. He recommended that we try parathion where we found new outbreaks of red spider developing. At the time, Dr. Whitcomb suspected the coincidental relationship developing between those areas sprayed with DDT and the areas that seemed to have an excessive outbreak of red spider. Today, we understand this relationship. This experience had positive results. The change in our practice was due to our close working relationship with the scientific community.

There is no reason why practicing arborists cannot carry out experiments on their own within legal limits and with proper licensing. However, their findings should be reported to the appropriate research center and there the information can be developed and field tested in a way that protects the experimenting arborist, as well as the public. During the early 1960's, Lowden, Inc. experimented with methoxychlor as a replacement for DDT. With the cooperation of the Michlin Chemical Company we devised a formula similar to that of DDT in a 32.4% concentration.

Another research study initiated by the Massachusetts Audubon Society was carried out through the Massachusetts Fish & Wildlife Department to study detrimental effects of DDT and methoxychlor upon the environment. This study provided us with enough significant information that we moved our spray programs away from DDT. Greater residues of DDT were found under elm trees that had been sprayed for over 5 years with a 2% dormant spray and a 1% summer cover spray than we had expected. Had there been a closer relationship between lab and field, the damaging side effects of DDT would have become evident much earlier, and some of the damage to the environment could have been prevented.

As an ambitious young arborist, I became disenchanted with the ponderous nature of the USDA and its research on Dutch elm disease. I discussed this situatoin with the late Dr. A.E. Dimond, a noted plant pathologist. Dr. Dimond agreed with me about the lack of communication between the interested parties. He stressed the need for arborists to support the research scientists, not merely with funds, but with carefully documented information, and went on to say that he thought a solution could be found through congressmen and appropriate governmental agencies in order to gain funds for state and federal research efforts.

One thrust to save the elms emanated from tree companies such as ourselves and Bartlett Tree Expert Company. Bartlett Tree developed a material called carolate. The necessity for companies to regain their initial investment by retaining their proprietary interest unfortunately limited the sharing of experience and knowledge. To this day, I do not have a clear understanding of the value of carolate.

Some of us in competition with the Bartlett Tree Company were applying oxyquinoline benzolate as a control for Dutch elm disease. I know of no documented information that solidly supports the use of this material, nor do I know of any information supporting the position that oxyquinoline benzolate is useless. We did not communicate the results of our procedures to researchers, nor, apparently, was there sufficient testing by the scientists so that an adequate evaluation could be made.

During the late 1950's, the esthetic effects of losing the elm trees became apparent to homeowners. They spent millions of dollars, most of it wasted, on compromised programs, crackpot ideas, and procedures not clearly understood by the applicators. Documented information regarding these efforts was not forthcoming. Over 3,000 different research publications on Dutch elm disease have appeared since 1919, averaging one a week since that time. Nevertheless, the end result of poor communication was that many arborists made the judgment that it was easier to take an elm tree down than to undertake a disciplined program of preservation. These arborists felt that future relationships with clients would be jeopardized if time and money were spent on the tree, only to have it die later.

By the middle 1970's, it appeared that methoxychlor was not as effective as DDT. Elms that had been shifted from DDT to methoxychlor spray formulations were being lost. These failures were reported to researchers of state and federal agencies. Serious concern arose as to whether methoxychlor was being properly applied, whether elm bark beetles were becoming resistant to methoxychlor, or whether methoxychlor

was the proper insecticide.

I then turned to Dr. Charles Lincoln and Dr. Roy Cuthbert of the USDA, who were carrying out studies relating to the control of elm bark beetles. They asked Lowden, Inc. to participate in a research program to determine the effectiveness of methoxychlor when used in hydraulic sprayers. We determined that there was not a sufficient residue left on elm trees after they were sprayed with methoxychlor to provide the same degree of protection as had DDT sprays. The reasons for this were not well understood until the late 1970's.

In 1976 and 1977, Lowden, Inc.'s research department developed, with the assistance of arborists and the Michlin Chemical Company, a more effective methoxychlor formulation. This formulation is now in the process of being studied by the USDA (Jack Barger, Principal Entomologist, Northeastern Forest Experiment Station, Delaware, Ohio) in cooperation with the National Arborists Association.

Lowden also was involved in an experiment using the antibiotic ceratocide (2). This study consisted of injecting elms in an urban and suburban environment. The antibiotic was inexpensive and nontoxic. Some elms were saved and some were not. I never knew why this was so. There was no acceptable research to clarify relationship. State and federal researchers stated that they do not have the time or money to test the procedures outlined in our label. We have heard this story before when approaching researchers to determine the efficacy of a particular product we were interested in. The same refrain is used regarding many other newly developed products.

Surely, now is the time to provide funds for research through the International Society of Arboriculture's Research Foundation, the U.S. Forest Service, and other state and federal research organizations. These funds should be channeled to those qualified to research the arborist's needs. It is our responsibility to support this kind of effort so that we can find out what works and what does not. We should band together and support research procedures that show the most promise, rather than take a shotgun approach that dilutes needed research funds. We need the type of honest, effective communication between research scientists and arborists exemplified by Dr. Henry Gilbertson of the Davey Tree Expert Company. How often I remember asking him about a particular procedures, "Henry, do you think it really works?" . . . and that calm, clear, and concise answer, "I do not know because" . . . and there would be a specific reason. It is this type of honest communication that arborists should understand and support, because it leads to the development of answers, either by stimulating financial support, or other kinds of support that could lead to progressive study.

The trade magazines are filled with articles about new approaches to save the elms. Let's not jump on the bandwagon for these products until they have been tested and retested under varying environmental and field conditions. Arborists should not be damaging their image by using unproven products in the care and preservation of valuable shade trees.

This is not to say that we shouldn't experiment in a limited manner with new tools and approaches to services. However, we should pass the results of our preliminary experiments to responsible neutral interests for further study and testing.

The unsatisfactory communications of the past between researchers and arborists should be corrected. The arborist, researcher, and homeowner should work together in a disciplined and organized effort to fund quality research. The leadership must come from the arborists, the practitioners in the field. We see the problems, we understand the needs. Ours is the challenge to initiate the communication and provide the necessary support in this ongoing effort.

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