

REFLECTIONS ON FIFTY YEARS OF UTILITY LINE CLEARANCE¹

by Richard E. Abbott

Abstract. Utility line clearing has developed into a major industry. Many utilities today employ professionals (arborists, foresters, etc.), to direct their programs. Increased federal and state regulations have changed work procedures, tools, methods, equipment, etc. Basically the line clearance industry, with the exception of telephone/telegraph, has reacted to crisis. There is a need for a research coordinating committee to establish priorities, goals and ultimately stabilize or reduce maintenance line clearing cost.

Today, utility line clearance is big business. Expenditures according to the 1978 Census of Agriculture by the U.S. Bureau of Census, for public utility lines tree trimming performed by independent contractors were \$358,000,000; 70% increase from the previous survey, four years before. This is the most recent information available and does not include tree trimming performed by utility company employees.

Trees and wires conflicted from the beginning when they both tried to occupy the same space. In the early days, linemen would go up the trees with their climbing spurs and remove interfering limbs. Some of the pictures of early line clearance trimming remind me of hat racks or trees topped before felling.

Our industry today is characterized by: 1) increasing mechanization, 2) reduction in labor requirements per work unit, 3) substantial investment per employee, 4) more government regulations, 5) increased technical developments, and 6) rising rates for insurance and workmen's compensation.

Utility line clearing operations can generally be divided into three principle parts: transmission, distribution and telephone/telegraph. These usually are further separated into construction and maintenance functions. Each of these phases has changed in substantial and different ways during these fifty years of progress.

Transmission Construction

At one time, there were literally small armies of men out on the new rights-of-way working with

crosscut saws and axes. In some instances, tent cities were set-up to provide housing for this clearing and construction work force. Brush and other debris was burned, and horses were used to skid the logs. All this changed with the development of the lightweight gasoline powered chain saw after World War II. One man with a chain saw could out-produce 10 men with crosscuts and axes. The bulldozer replaced the horses for skidding logs. Brush was burned in large piles pushed together by the dozers. Mechanical equipment has replaced labor as wages have increased.

Then came the Environmental Protection Agency with its Clean Air Laws. No longer was open brush burning allowed. Whole tree chippers were developed for the disposal of brush and small logs. Sophisticated combustion devices such as the air curtain destructor were used in closed burning to reduce air pollutant emissions. Today, in many instances, the brush is simply windrowed along the edge of the rights-of-way to provide cover for small game and birds.

The increasing economic value of sawlogs, pulpwood and wood chips has made it possible to utilize much of the woody material that was previously just left along the edge of the right-of-way.

Selective right-of-way clearings which leave the desirable low growing species of shrubs and trees are normal specifications today. I remember when, as a new utility arborist, I drew up specifications for selective clearing of a new transmission right-of-way in 1955. The clearing contractor, a national company, convinced the transmission engineers who ultimately made the decision that selective clearing was unachievable, not necessary, a waste of money, and that furthermore I had read too many books in college and was not aware of the real world.

Reseeding to restore vegetative cover destroyed in clearing operations is standard procedure today. Some utilities disc, plow, lime, fer-

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tilize and plant the entire right-of-way to an acceptable shrub or perennial cover. Many times this is in conjunction with the state wildlife agency or soil conservation service.

Transmission Maintenance

Here again, during the 1920's and 30's, large groups of men with brush axes, hand saws, etc., spread out across the rights-of-way cutting everything in their way. Brush disposal was burning, but in many instances it was just let lay. Reclearing seemed to be a never ending cycle with more stems to cut on each successive operation.

During World War II, the military conducted research on the use of chemical compounds that could kill living plants and thus deprive our enemies of their food supplies. None of these chemicals was ever actually used in the field against the Axis. These chemicals called "selective or phenoxy herbicides" introduced an entirely new technology into right-of-way maintenance. Now it was possible to kill undesirable woody plant stems and roots — either species selectively or non-selectively.

Initially the herbicides used were Ammate and 2,4-D. Ammate is a non-selective herbicide which kills principally by contact effect. It is very corrosive on equipment and has the disadvantage of also killing herbaceous perennials and grass. The selective herbicide 2,4-D provided the opportunity to kill certain broad leaved woody plant species and not affect narrow leaved grasses. Unfortunately 2,4-D is effective against only a narrow range of woody plant species.

The next stage was the development and use of brush killer mixtures of 2,4-D and 2,4,5-T which were effective against a wider range of woody plants. Certain species such as ash were not controlled, and root suckering at a distance from the dead stems was a problem in other species.

It all seems so simple now. However, then there were problems with volatility from ester formulations of 2,4-D and 2,4,5-T. These volatilized fumes were destructive to sensitive species such as grapes, cotton, tomatoes and tobacco. Some really tragic and expensive lessons were learned about volatility. The ester formulations were more

biologically active than the non-volatile amine forms. So the biological effectiveness of ester formulations were traded off for the safety of amine formulations.

Herbicides can be classified as selective, non-selective, and prescription. Today, prescription herbicides are being developed to overcome specific plant species limitations of older materials that had broad spectrum activity.

Picloram (Tordon) arrived on the scene as a herbicide that was extremely effective against root suckering species but with little or no activity on ash. Picloram also introduced new risks of damage to susceptible species and persistence in the soil and lateral soil water movement off right-of-way.

We now have prescription herbicides such as triclopyr (Garlon), which is effective on ash, overcoming some of the limitations of picloram. Krenite effectively kills the brush yet does not cause a brown out, overcoming aesthetic objections to spraying. Dicamba (Banvel) is active against a broad range of woody plants but has soil persistence and lateral movement problems.

Enough about herbicides, let's discuss equipment. An entirely new business developed; the spraying of brush by either hydraulic sprayer, air blast or manual back pack, helicopter, etc. Initially, back-pack sprayers and hydraulic sprayers on used World War II military vehicles were the principal tools for chemical brush control. A workman with 50 pounds of sprayer and herbicide solution on his back tired rapidly in difficult terrain. Parts for repair of World War II vehicles became more difficult to locate as the equipment finally just wore out. Then specialized vehicles were developed, such as tracked bombardiers and articulated modified log skidders. Again, the investment for equipment rose substantially with each new development of specialized equipment for cross country spray operations.

The helicopter with invert emulsion formulations and the "Spray Disc" overcame the difficulties of getting to brush in difficult and inaccessible terrain. Another improvement, the microfoil boom, overcame the difficulties of handling invert emulsions and still restricting the spray within the R/W.

Today we are back, in some instances, to

workmen girdling individual stems and squirting a herbicide mixture in the girdle. We've gone full circle from workmen with back pack sprayer in the beginning, through mechanization aerially and ground, back to the workmen treating individual shrubs and trees.

However, throughout this entire discussion of transmission maintenance we have to recognize the continuing controversy surrounding the use of brush control techniques. One scientific group advocates the individualized treatment of certain specific woody plant species and management of a very diverse plant community. Another scientific group promotes the broad spectrum herbicides and works toward changing the species composition on the rights-of-way to a more uniform manageable plant community.

My experience has been that the utility transmission engineer has finally begun to realize that he does *not need, cannot afford* and *cannot achieve* a grass covered right-of-way. All utility arborists respond to the requirements and needs of the transmission engineers *first*. Today, many low grading species of brush and trees are left that would have been unacceptable 10 to 20 years ago.

Restrictions on herbicides, anti-pesticide sentiments and opposition to new herbicides technology has promoted the re-development of brush cutting as a control technique. Mechanical reclearing of transmission rights-of-way has progressed from farm tractors with large rotary mowers to very expensive large rotary brush mowers which are capable of cutting off small trees up to 5" dbh.

Distribution

The adverse public reaction to the poor work practices of utility linemen trimming trees around the wires created a need for professional trimming. Fifty years ago the line clearing tree trimming industry was just starting within the professional tree expert companies. Davey Tree Expert Company was incorporated in 1909 and began clearing in the 20's and 30's. Asplundh Tree Expert Company was established in 1929. Other line clearing companies of that era are K. Kuemmerling and Associates and Nelson Tree

Service.

A rope, hand saw and pole pruner were the principal tools of the early line clearing trimmer. Brush was piled on a truck or trailer and hauled to the nearest disposal areas. Investment per line clearance tree trimmer workman was minimal.

Distribution primary circuits voltages were 4KV and tolerated a certain amount of tree wire contact prior to the 1960's. Today, distribution line voltages have been raised to 12KV routine and 34KV is not usual. These higher voltages cannot tolerate tree contact, consequently, there is greater necessity for continuous adequate tree and wire line clearance.

Chain saws speeded up the tree removal process, but early chain saws were too heavy or awkward to use up in the trees. Today there are lightweight saws which can be used, one handed, up in the trees.

Ladders attached to trucks were an early device for getting a tree trimmer into working position without having to climb the tree. These had the advantage of reducing labor expended to get into work position and helped on trimming outside edges of the tree. However, they were not moveable and could only provide up and down access.

Bucket trucks provided a more maneuverable device for getting the tree trimmer into work position. Additionally, by using pneumatic or hydraulic powered hand tools, the production capability was increased. The line clearance trimmer's working career was substantially increased by the bucket truck tree; climbing is mostly a young man's occupation. There have been continuous improvements in the design, reliability, performance and safety of the aerial lift device. Among these is the development of insulating sleeves of the lower boom to prevent the truck body from becoming energized.

Brush disposal is a continuing problem. Because brush does not pack well on trucks, there is much wasted space and considerable time was spent hauling brush to the dump in the early days. A mechanical chipper which could be towed behind the truck and could grind the brush into little chips which fit nicely into a dump box was a tremendous labor saver. One load of chips

is equivalent to five or six loads of brush. Chippers have continuously been improved in the speed of chipping and size of brush that they can handle.

Mechanization in the period 1950 to 1980 has reduced the average man hour per tree trimmed from 1.5 to 1.0 for one Ohio utility. However, the tree trimmers wages have, in many instances, increased more than 300% in the last fifteen years, more than offsetting the increased productivity.

Telephone/Telegraph

The application of modern technology has practically eliminated the need for line clearance in this industry. Bell Laboratories, operating on a national basis with vast financial resources, developed new materials and systems that eliminated the need for telephone open wire tree trimming. Unfortunately the electric industry is fragmented into too many individual companies and does not have the resources of a Bell Laboratory and Western Electric (manufacturing subsidiary of Bell Systems) to apply to a tree trimming problem.

At the turn of the century there were crossarms on crossarms of open telephone wire as the public demand for phones increased. First came the development of lead-covered cable which contained many pairs of wires in a water- and air-tight sheath. However, this was too expensive for rural situations. A rural cable which substantially reduced the potential tree contact was developed. This basically is pairs of wires wrapped to form a central support.

Another development was the burial of long distance cables and the establishment of microwave relay towers. These also eliminated the need for tree trimming.

Twenty to thirty years ago there were as many line clearance tree trimmers working on telephone/telegraph as electric wires. Today the telephone/telegraph work force is 5 to 10% of electric line clearing.

This is where we were and are today. Where are we going and what is needed to achieve that objective?

The most effective line clearance for the least dollars. There has not been adequate research on the tools, techniques, methods and equipment

used in electric utility line clearance operations. Most of our techniques are adaptations from other industries. There have been only four significant electric utility line clearance research projects during these fifty years.

1. A comprehensive long term scientific evaluation of the various brush control chemicals, techniques and equipment has been conducted in Pennsylvania by Drs. Bramble and Byrne. This study continues to be updated and subsequent herbicide retreatments have been applied in portions of certain test plots.
2. Electric utilities have sponsored two major growth retardant projects. The research investigations of Edison Electric Institute-Batelle Memorial Institute Project. A growth inhibitor fortified tree paint resulted from approximately \$700,000 of research effort. There are definite limitations to a growth inhibitor fortified tree paint. To be effective, all cuts, irrespective to size, must be treated. This was difficult with large numbers of cuts from the hydraulic pruner in the aerial lift device.
3. In 1973, I developed a 5 year, \$400,000 proposal for additional growth inhibitor research to be conducted at the USDA, Delaware, Ohio laboratory. Leo Creed, Ohio Edison; Bud Swisher, Columbus and Southern Ohio Electric; and Don Ruff, American Electric Institute assisted in getting this project approved by Edison Electric Institute. A two-year \$182,000 extension of the research project provided additional field testing and chemical residue information. A new tree injection technique utilizing Atrinol has resulted. This method has substantial advantages over the growth inhibitor fortified tree paint, but there are limitations to as the time of applications.
4. The Ohio Electric Utilities sponsored a comprehensive street tree evaluation research project at Ohio Agricultural Research and Development Center to determine those species or cultivars most compatible with overhead wires. Eight of various species of trees and cultivars were performance rated

by a committee of horticulturalists. Additionally, actual plantings along city streets were rated. I was chairman of the steering committee on that project for approximately 10 years. An increased publicity effort is necessary to achieve greater use of research results.

The chemical manufacturers have constantly researched the effectiveness of herbicides and developed specialized materials and formulations to overcome specific species resistance to existing materials.

Who is researching transmission brush control methods that does not involve chemical, mechanical or reseeding operations?

An electric device that girdled the stem was investigated in the late 1950's and abandoned. Is there a possibility of electronic brush control?

There are specific natural substances called alleopaths which inhibit the development of invading plant species. Could these be synthesized and applied to the R/W to prevent reinvasion by light seeded species?

The sales dollar volume for a utility growth retardant is limited. Consequently, a chemical company is not going to expend tens of millions of research dollars for a limited return investment. The utilities must subsidize the research.

I am not aware of any research being done on any other non-chemical or alternate growth retardants. In certain trees and plant species, dwarf cultivars will appear. Is it possible to identify the dwarfing mechanism in these trees or plants and transmit it to normal specimens to achieve dwarfing?

There is a tremendous need to train and upgrade our work force at all levels: groundsmen, trimmers, foreman inspectors and supervisors. Regulatory agencies are questioning our decisions as to the adequacy, economics and cost effectiveness of tree trimming programs. Our decisions are now scrutinized by outside authorities. Transmission inspectors who can recognize a wide range of native woody plant species and are

aware of herbicide chemistry are in short supply.

Ed Scanlon with his tailored trees promoted a new aspect of distribution line clearing, the planting of low growing tree species that could grow and mature compatibly with overhead electric lines. At one time, many utilities were providing Master Street Plans specifying use of low growing trees as a public service to municipalities.

Electric Power Research Institute has awarded a new research project on "Development of Improved Tree Trimming Equipment and Techniques" to Asplundh Environmental Services.

A system of work performance, production, measurement, scheduling methods and evaluation criteria that can be applied universally to all utilities needs to be developed. Today, there are many systems, but no one is universally accepted or recognized.

Utility arborists today respond to crisis. When we can't burn brush we'll do something different. When we lose 2,4,5-T we'll look for alternatives. There is a complete lack of established research objectives for improved line clearance and long range planning. I recommend the establishment of a Research Coordinating Committee within the Utility Arborists Association. The committee would be composed of representatives from all parts of the country. It would be large enough to function effectively and not to be so large as to be unwieldy. My suggestion is to have 12 to 18 members representing utilities, line clearance contractors and equipment manufacturers. This committee would establish liaison with Edison Electric Institute and Electric Power Research Institute.

Utility arborists after fifty years must stop being reactionaries to crisis and start planning the long range future of their industry through research!

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