*Chapter 15*

# Trees, Utilities, and Municipalities

Robert F. Lee and Richard S. Wolowicz

## 1. Introduction

The purpose of this chapter is to investigate the problem-prone relationship between utility companies and municipalities. The nature of the controversy stems from the placement, planting, or location of trees and the presence of utility conductors. The dispute can be mitigated by the utility and municipality working together to promote a robust environment. By working together, both parties will contribute to the survival of the urban forest, to healthier trees, and will have citizens and consumers having their needs met with an uninterrupted power supply.

Trees, whether overgrown or falling down, are one of the major causes of power interruptions. This chapter will explore different cooperative ventures that promote the coexistence of each party's programs.

## 2. Background

People live in a complex world of fast-paced advancement in technology. Life has progressed to a degree that has converted nonessential conveniences to mandatory standards. Look at some of the changes over the past 20 years in manufacturing: Processes have improved, efficiency has increased, and new advancements in automation have revolutionized the industry. Office environments also have changed. They are filled with multiple computers with the latest technological advantages. Homes as well have been influenced. While not all homes have

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computers, most have appliances with digital circuitry and computer chips to provide value-added features. All these progresses have put new emphasis on the need for reliable electrical power.

The demand for electricity has increased greatly with technological advances in industry and home. This increased demand along with resistance to build new transmission lines has resulted in taxing the existing facilities built many years ago. In response to this, utility foresters have a greater responsibility to manage the right-of-ways to insure reliability of the electrical system.

Today's utility customers demand nothing less than an uninterrupted power supply that is both safe and inexpensive. Any slight variation in that supply can result in a loss of data, can shut down synchronized manufacturing processes, and can require digital equipment to be reset.

The local utility plays a vital role in delivering this reliable electrical energy. Electricity is transmitted and distributed along underground cables and/or overhead wires. In the deregulated environment of the utility companies, electrical conductors will continue to be maintained but not necessarily by the same utility that generates the power.

## 3. Distribution and Transmission

Distribution circuits and transmission lines are the basic components of the electrical delivery system. Classification of each is determined by the line voltage. The transmission system delivers high voltage power over long distances from one geographic area to another. The Distribution system uses lower voltages to deliver power to businesses and residences. Construction also varies between the two systems, with overhead distribution circuits normally supported by wooden poles.

Transmission right-of-way agreements (easements) have documented language granting the utility the right to remove trees. Utility Companies have the right to remove trees to provide safe and reliable electrical service. Unlike the distribution system, contacts or close proximity to vegetation can have a catastrophic effect on the electrical system. The last three major cascading outage events in North America, including two major western US power failures and the August 2003 Northeast Blackout, involved trees. The latter was the largest power failure in the country's history (Guggenmoos, 2004).

## 4. Tree and Wire Conflict

Tree and wire conflict with each other. This conflict raises serious safety and reliability concerns that need to be addressed. There are customers whose lives depend on the uninterrupted flow of energy. There are commercial customers who cannot tolerate a single momentary blip or interruption without suffering enormous damage to their products. Consequently, the utility must maintain a consistent clearance around energized conductors through vegetation management. This minimizes damage to trees and conductors, and helps to ensure safe, reliable electrical energy.

Closer examination of this tree and wire conflict shows that electricity takes the path of least resistance along conductive materials to reach the ground. Nothing magical; it simply wants to reach the earth. When a tree makes contact with energized conductors, electrical energy will use that tree as pathway to the ground. This may cause the fuse to operate, which will disrupt the electrical circuit. Trees can also rub against the wires, causing wires to burn down. When this occurs, there is physical damage to the conductors and the tree. Along with the interrupted circuit, a safety hazard is created to people and property, since the wire may have fallen on the ground or may be hanging off an insulator.

In delivering electrical energy, the utility must perform various maintenance operations. Maintenance of lines includes the inspection of poles and an assortment of electrical equipment. Probably the most visible maintenance program performed by utility companies is tree trimming around electrical conductors. Because of the hazards involved, specialized crews must be used. The line clearance tree trimmer has the basic knowledge of electrical safety and how to prune the trees safely without endangering himself or herself. Federal regulations stipulate the need for a strict regimen of training and techniques involved in these operations.

## 5. Regulations

If a tree is within 10 feet of an energized wire, a qualified tree trimming company that has the proper expertise and training to work around energized wires must be used (Allard and Johnson, 1996). However, even these qualified line clearance tree trimmers must follow strict safety rules in personal proximity. Table 1 gives the minimum

**Table 1. Line Clearance Tree Trimmer Minimum Approach Distances***

| | OSHA 1910.269 | | |
|---|---|---|---|
| Nominal voltage phase-to-phase (kV) | Elevation factor sea level to 5,000 feet (feet/inch) | Elevation factor, 5,001 to 10,000 feet (feet/inch) | Elevation factor, 10,001 to 14,000 feet (feet/inch) |
| 0.05–1.0 | Avoid direct or indirect contact | Avoid direct or indirect contact | Avoid direct or indirect contact |
| 1.1–15.0 | 2′4″ | 2′8″ | 2′10″ |
| 15.1–36.0 | 2′9″ | 3′2″ | 3′5″ |
| 36.1–46.0 | 3′0″ | 3′5″ | 3′9″ |
| 46.1–72.5 | 3′9″ | 4′3″ | 4′7″ |
| 72.6–121.0 | 4′6″ | 5′2″ | 5′7 ″ |
| 138.0–145.0 | 5′2″ | 5′11″ | 6′5 ″ |
| 161.0–169.0 | 6′0″ | 6′10″ | 7′5 ″ |
| 230.0–242.0 | 7′11″ | 9′0″ | 9′9 ″ |
| 345.0–362.0 | 13′2″ | 15′0″ | 16′3 ″ |
| 500.0–550.0 | 19′0″ | 21′9″ | 23′6 ″ |
| 765.0–800.0 | 27′4″ | 31′3″ | 33′10 ″ |

*Minimum separation in various voltage classes (Abbott, 1994).

**Table 2. Persons Other Than Qualified Line Clearance Tree Trimmers Minimum Approach Distances**[**]

| Nominal voltage phase-to-phase (kV) | OSHA 1910.3333 and ANSI Z133—1994 (feet/inch) |
|---|---|
| 0.0–1.0 | 10′00″ |
| 1.1–15.0 | 10′00″ |
| 15.1–36.0 | 10′00″ |
| 36.1–50.0 | 10′00″ |
| 50.1–72.5 | 10′09″ |
| 72.6–121.0 | 12′04″ |
| 138.0–145.0 | 13′02″ |
| 161.0–169.0 | 14′00″ |
| 230.0–242.0 | 16′05″ |
| 345.0–362.0 | 20′05″ |
| 500.0–550.0 | 26′08″ |
| 765.0–800.0 | 35′00″ |

[**]Indicates the proximity of nonline clearance tree trimmers to energized conductors (Abbott, 1994).

separation distances stipulated by the Occupational Safety and Health Act (OSHA) regulations for these personnel when working on different voltage classifications. American National Standards Institute (ANSI) and OSHA regulations also stipulate that at 12,000 V, nonqualified personnel must maintain at least 10 feet of distance from any energized conductor. Table 2 shows how this distance changes as voltages increase.

Should a private property owner, municipality, or contractor be required to work on a tree within 10 feet of an energized conductor? The local utility can be contacted for assistance. The electric company has three options in this case: deenergizing the line, covering up the conductors, or providing the trimming clearance to the requesting party. Deenergizing the line is a last resort and undesirable solution. Covering up the liens provides a false sense of security. It is impossible for a utility to guarantee that the area is safe from electrical hazards. Therefore, the utilities most often provide the necessary clearance to the customer. More utilities will probably be charged for this type of service in the future.

## 6. Myths About Utility Line Clearance Programs

Lack of trust is often a problem between municipalities and utility contractors. Utilities have been blamed for doing unprofessional work. To be perfectly truthful, there has been much unprofessional work done by all groups, including municipalities, private tree companies, and homeowners. It is not only the utility that should be blamed for poor arboricultural techniques. Major emphasis and conscientious efforts are being made by most, if not all, utilities to manage vegetation in a professional and scientific manner. There are benefits from this method: it is the correct way to do things; generates good results in public relations, and is financially prudent. It must be realized that pruning trees in the vicinity of power lines does not have the same

objectives as standardized pruning categories (see Chapter 14, this volume). The intent of utility line clearance is to direct growth away from the wire zone and remove limbs that may pose a safety hazard.

A sense of professionalism is increasing among the line clearance contractors. Through the Utility Arborist Association, which is a chapter of the International Society of Arboriculture, a utility tree trimmer certification is being developed (McNamara, 1995). This plan involves a thorough testing process, resulting in a certification for those trimmers who pass the test. This ensures that the trimmer is aware of the latest and best methods to trim for wire clearance and tree health. Figures 1 and 2 are examples of modern methods utilized in line clearance.

A line clearance training manual has been developed by an arboricultural consulting and training company, ACRT, Inc. (Abbott, 1994). The Ohio firm developed the manual with the cooperation of a Pennsylvania utility (Abbott, 1994). These two certification programs, which do not compete with one another in any way, are examples of how professional advancement is gathering momentum. This will promote quality workmanship in the industry.

Another example of industry advancement can be seen within the utility companies themselves. Many companies have hired foresters to manage tree growth. This adds credibility to the utility's reputation in vegetation management activities. Customers, citizens, and the public observe that the utility is serious about environmental issues.

Trimming work done by the utilities also serves as a testimony to improvements in arboricultural industry standards (Kempter, 1996). Sincere efforts are made to trim

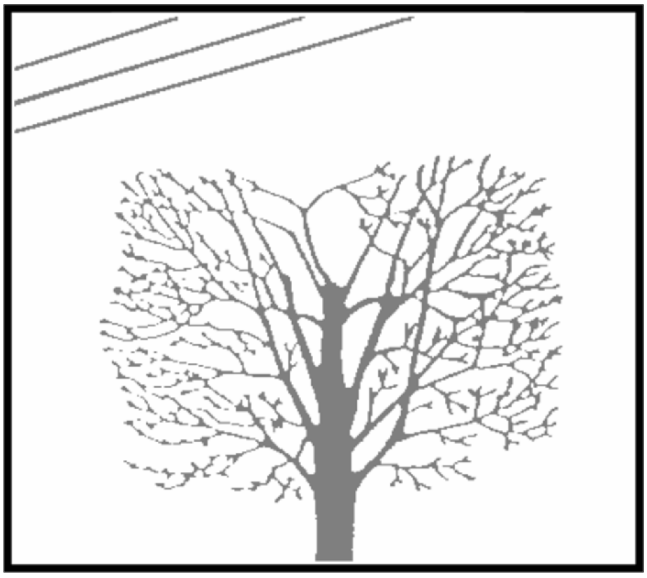

**FIGURE 1.** Natural trimming—promotes growth of existing branches rather than rapid growth of many new suckers. (Courtesy of Environmental Consultants, Inc.)

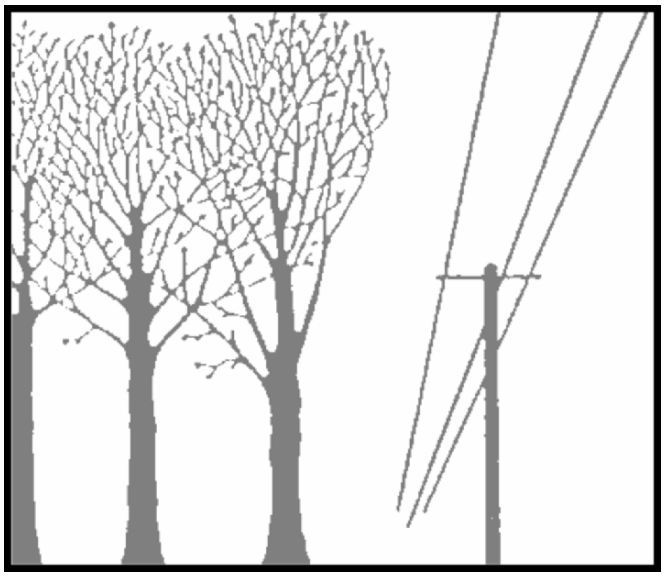

**FIGURE 2.** Natural pruning. This technique also lends itself to side trimming. This pruning will promote the growth of existing branches rather than rapid growth of new suckers. (Courtesy of Environmental Consultants, Inc.)

trees to provide wire clearance, yet not hinder the tree from healing. Tree branches are cut to lateral branches rather than stubbed. Trees are directionally pruned to direct growth away from the lines. Trimmers are using drop crotch pruning methods to avoid topping. As in private tree care, final cuts are not being made flush with the stem, but are in accordance with the latest techniques. Trees also are not being rounded-over, a practice that produces superfluous shoot growth and weak branch attachments. Figures 3 to 5 show examples of improper line clearance techniques.

## 7. Utilities and Municipalities Working Together

When you think about it, municipal and utility arborists have a lot in common. Although they trim trees for very different reasons, both are in the business of managing tree resources in the best interest of the communities they serve (Todd, 1992).

Utility and municipal arborists maintain trees in an effort to maximize their benefit to the community. Just as a street tree that is full of deadwood and decay may be of little value; so too is the tree that has grown into the electrical wires to the extent that it causes power outages. It is the responsibility of the respective arborist to schedule and perform the appropriate corrective maintenance. In either case, such maintenance, whether pruning deadwood or performing line clearance trimming, will increase the value of that tree to the community.

It is also the responsibility of the utility and municipal arborist to minimize the liability that trees may present through maintenance programs. Certainly, a tree that

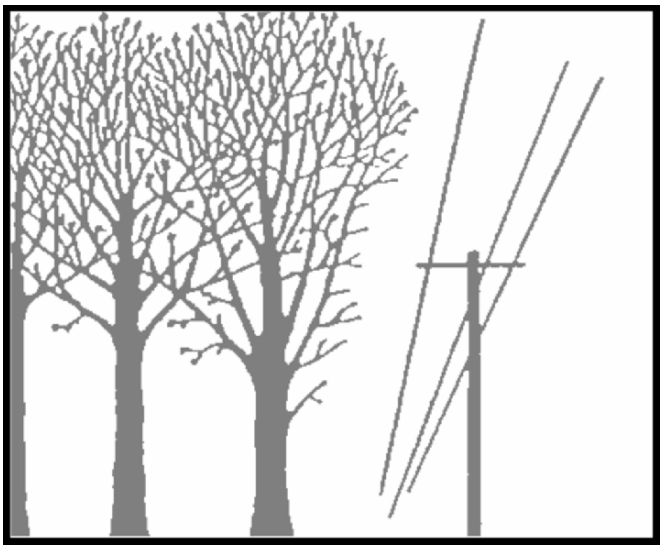

**FIGURE 3.** Side trimming stubbing. This undesirable work is done by stubbing off portions of limbs along the side of the tree to obtain clearance. Cutting off portions of limbs (leaving stubs) creates many fast-growing suckers that become a serious line clearance problem. Additionally, stubbing off branches is not conducive to wound healing after the pruning operation. (Courtesy of Environmental Consultants, Inc.)

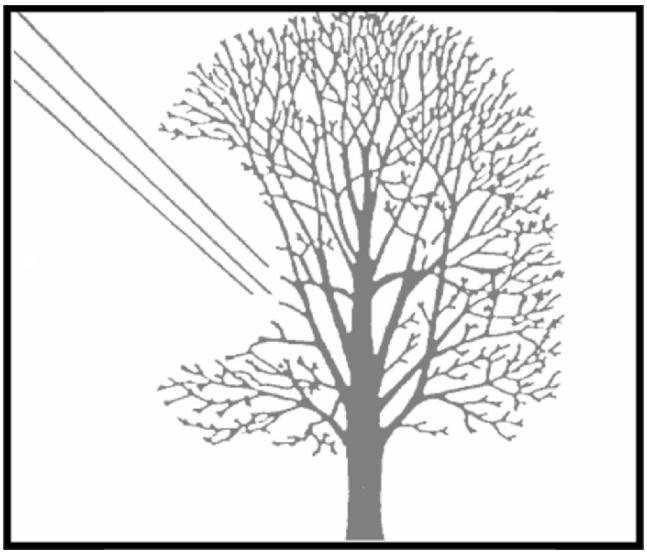

**FIGURE 4.** "Shaping" around lines. This is accomplished by trimming limbs in an arc to obtain clearance. This pruning method leaves branches above the conductors that could bend or break, causing outages. Shaping also creates many fast-growing suckers. (Courtesy of Environmental Consultants, Inc.)

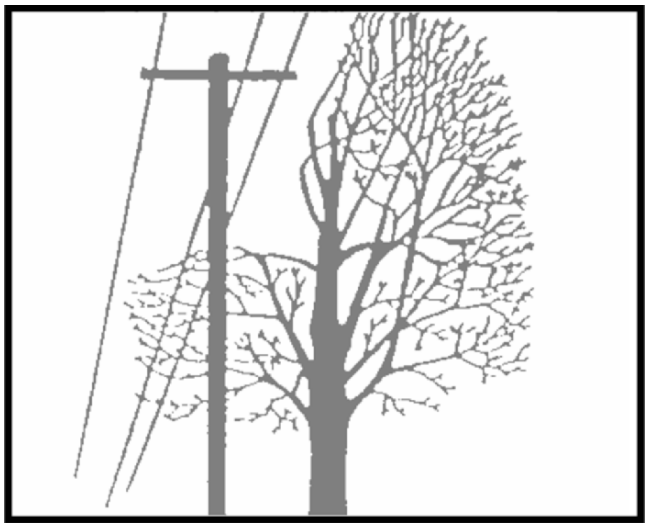

**FIGURE 5.** Side trim "shelf." Leaving a "shelf" below the conductors when side trimming allows the branches to grow back toward the lines. While not always possible, these limbs should be removed to minimize future trimming. (Courtesy of Environmental Consultants, Inc.)

blocks a traffic sign, or causes a sight obstruction at a traffic intersection has the potential of becoming a public liability. By the same token, trees that are in direct contact with energized lines may cause arcing and sparking with the very real possibility of catching fire. Again, in both cases, the utility and municipal arborists have the responsibility of minimizing these types of tree liabilities through adequate maintenance programs.

Keep in mind that utilities and municipalities share the same client base. The taxpaying citizens of a municipality, who fund the shade tree program, can be the same rate-paying customers who are served by the local utility that provides line clearance. Both the municipality and utility are working in the customers' and citizens' interests. By working together, we can serve them better.

## 7.1. Avoiding Municipal–Utility Conflicts

In many cases, utilities perform line clearance tree trimming on planned maintenance cycles. Most often, this work includes entire-circuit trimming that covers a large geographic area. Planned maintenance cycles are usually scheduled well in advance, and the scope of the cycle is easily identified through reviewing the circuit maps and project specifications. Circuit or grid maps are a kind of electrical road map that details the location of the electrical circuit (Shriver, 1979).

Often, conflicts between municipality and utility line clearance operations can be avoided by conducting joint meetings prior to the start of any major planned line clearance program. At the meeting, the utility arborist is given the opportunity to present the project to the concerned municipal representatives. He or she should address such key points of information as: where the maintenance work will be done,

proposed start date, and what type of work will be needed (trimming, removals, chemical treatments, etc.). The municipality also should be provided with the names and numbers of the contractor and/or utility representatives. The municipality is given the opportunity to go over any parameters that may exist, such as morning start-up time restrictions, road flagging and signage requirements, or issues related to the municipal shade tree ordinance.

The practice of holding a preproject start-up meeting has many benefits. It allows all involved parties to develop personal relationships that create open lines of communications. The most significant benefit of these prework meetings is that it eliminates the element of surprise. When the call comes into the municipal official from a resident questioning why tree trimmers are working in the neighborhood, it is always nice to have the answers.

Utility arborists have learned that conflicts often arise where there is a lack of knowledge about utility line clearance practices. It is incumbent on the utility to educate its customers, municipal representatives, and public work employees to communicate the how and why of utility line clearance. This may be accomplished through model electrical hazard demonstrations performed at schools, firehouses, public works garages, or wherever needed. Utility arborists must be available to shade tree commissions to go over line clearance policies and procedures and answer any questions or concerns. It is also important that utility arborists attend and speak at various shade tree conferences and conventions. These are ideal settings to meet with industry professionals, municipal representatives, and concerned citizens. Utility arborists are always searching for a soapbox from which to disseminate line clearance information to the public.

## 7.2. Joint Ventures

Speaking and educating the public on utility programs are means to promote positive municipal and utility relationships (Barnes, 1988). Action steps in which the two can work together are equally important to promote the urban forest. Quite often, utilities and municipalities work jointly on projects that require mutual cooperation, such as road or housing projects, or during emergency conditions brought on by storms or catastrophic events. Mutual benefits also can be derived through working jointly on tree maintenance programs. A joint street tree program may involve a municipal beautification project or Arbor Day program that would call for interest from the local utility. Or it could be a part of a capital improvement project where curbs and sidewalks are to be installed, and mature trees located in the wire zone need to be removed and replaced. If a municipal project involves electrical wires, contacting the local utility can prove to be a win-win situation.

It is in the interest of everyone to ensure that the "right tree in the right location" rules are followed. To this end, many utilities offer small tree replacement programs (Rossman & Harrington, 1986). The programs will vary in detail, but the objectives usually involve removal of large, overpruned trees that are located directly under primary electrical wires and replacing them with more suitable low-growing trees (Dirr, 1990) (Table 3 lists tree species compatible with overhead power lines that have proven successful in areas with climatic conditions similar to that of New Jersey). Tree replacement programs enable the utility to remove a costly nuisance tree from its

**Table 3. List of "Low-Growing" Species, Which are Compatible with Overhead Conductor Lines**

| Low-growing trees | Species |
|---|---|
| Amur Maple | *Acer ginnala* 'Flame' |
| Hedge Maple | *Acer campestre* |
| Serviceberry Hybrids | *Amelanchier x grandiflora* (Tree Form) |
| American Hornbeam | *Carpinus caroliniana* |
| Hawthorne | *Crataegus* (spp.) Tree Forms |
| Goldenrain Tree | *Koelreuteria paniculata* |
| Flowering Crabapple | *Malus* (spp.) |
| Amanogawa Oriental Cherry | *Prunus serrulata* 'Amanogawa' |
| Kwanzan Oriental Cherry | *Prunus serrulata* 'Kwanzan' (High Branched) |
| Shubert Chokecherry | *Prunus virginiana* 'Shubert' |
| Cumulus Shadblow | *Amelanchier cumulus* |
| Pink Shadblow | *Amelanchier canadensis* 'Robin Hill Pink' |
| Ivory Silk Tree Lilac | *Syringa amurensis japonica* 'Ivory Silk' |
| Dogwood | *Cornus* (spp.) |
| Ruby Red Horsechestnut | *Aesculus carnea briotti* |
| Redbud varieties | *Cercis* spp. |
| Carolina Silverbell | *Halesia carolina* |

Other low-growing trees may be available in different geographic areas.

maintenance cycle. The municipality enjoys the aesthetic improvement of having a street lined with trees in their natural form (New Jersey Shade Tree Federation, 1990). Replacement programs are financially flexible and may include cost sharing, which may be direct dollar contribution or in-kind costs, such as providing workers and equipment to assist in the removal and planting of trees.

Another example where utilities and municipalities can work together is in the coordination of the pruning cycle for street trees. This can provide safer working conditions and many cost benefits. Municipalities that have regular planned maintenance cycles should contact their local utility prior to beginning work to find out whether there are any plans to do line clearance in the near future within the same area. If the project can be coordinated, it would be best to have the local utility provide the line clearance prior to normal street tree maintenance pruning. Although there are functional differences between utility and municipal tree pruning practices, having the utility remove dangerous trees and timber and clearing limbs from the wire zone will provide not only a much safer work environment but also substantial cost saving to the municipality.

There are certain principles to follow in any joint venture to enhance the chances of success:

1. Keep the project simple. With current downsizing of staff levels in both the utility industry and the municipalities, arborists can ill afford to get involved in a major, time-consuming project not directly related to their daily duties and responsibilities. Keep the project cost as low as possible. The more funding that is required, the higher up the management structure you need to go for approval. This involves more time and getting more people to sign on.

2. The joint project proposal should be presented to the community by a member of the community. The utility is often viewed as an outsider. A utility representative proposing a project to the community would most likely be met with hesitancy and suspicion. The community would be much more open to one of its own.
3. Finally, there must be open lines of communication. One of the major benefits of a joint program is to improve communication between the utility and municipality. Working together allows us to get to know one another and builds relations that benefit the entire community.

## 8. Summary

Trees and wires will continue to be a source of complaints if municipalities and utilities hinder one another from resolving mutual conflicts. The only sure way to prevent a conflict between municipalities and utilities is to avoid it in the first place. Specifically, for the utility this means do not place wires in or around trees, and for the municipality it means do not plant tall-growing trees under or near the wires. Certainly, this is a very simple solution with a difficult degree of complexity to carry out. Be realistic, and recognize that neither the municipality nor the utility will go away. Make a commitment to work with one another and resolve the problem. There will never be a resolution if two agents use their muscles to hinder true solutions.

Positive changes are taking place in the utility industry and gaining momentum. More electrical facilities and conductors are being placed underground, primarily in new construction areas. More people are understanding the need to plant small trees under overhead wires. Planting trees beside the conductors and not directly underneath the wires is another avenue that can be explored. Trees planted alongside the conductors will only require their side branches to be trimmed. This is a better, albeit no perfect solution. This also gives added future benefits of minimizing sidewalk and curb upheavals caused by tree roots (see Chapter 16, this volume). Planting the right tree in the right location makes a lot of sense, and is a practical solution to avoid future conflicts and frustrations with overhead conductors. See Fig. 6 for practical planting locations.

Fast-growing and high-maintenance trees are a problem to both the municipality and the utility if the conductors are in close proximity. For a municipality, these trees require more frequent trimming and cleanup. For the utility, these trees have a tendency to be weak natured and pose threats to the abutting power line. A selective tree replacement program can prove a benefit to the utility and municipality. Such a program will avoid drawing the battle line every time the utility trimmers appear on the scene. Creative thinking can achieve positive results.

It is important for the town to have an active shade tree program. This promotes a link to the utility to seek out and hopefully work together to address each group's mutual problems. It is neither the responsibility nor it is possible for the utility or the municipality to work by itself and arrive at a solution without the other's participation.

It is doubtful whether the tree and wire conflict will go away in the near future. If constructive energies are put in place, opportunities will exist to make the best of a

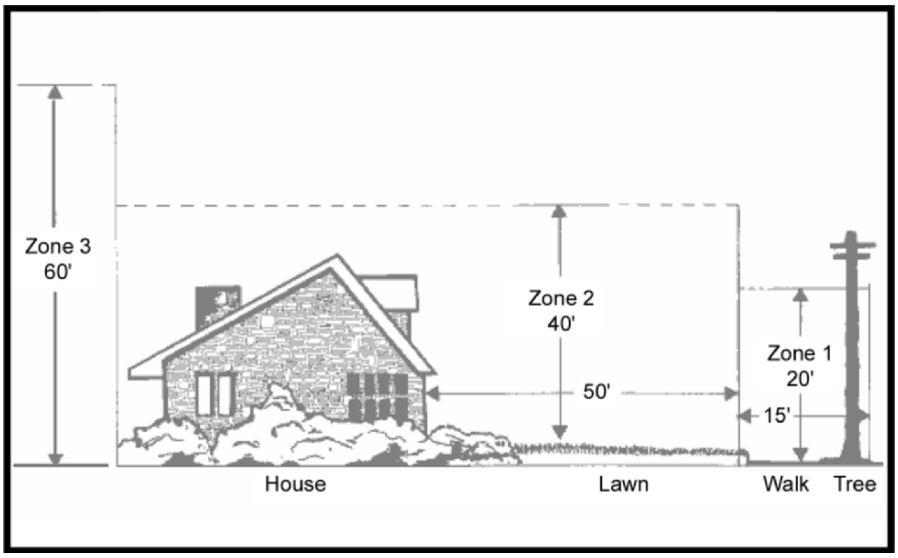


**FIGURE 6.** Showing the relationship between three planting zones. Zone 1 will accommodate ornamental trees to avoid a conflict between trees and power lines. In Zone 2, medium sized trees are suggested as the best for improving the way the house and the property look. Zone 3 is the land behind the house, which is suitable for a wide selection of trees, including larger kinds not recommended for the other zones. (Diagram courtesy of GPU Energy Co., 1990.)

tough situation. Some battles will be won and some will be lost. But many will hopefully produce a compromise responsive to customers and citizens.

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