Introduction

Utilities manage vegetation for several performance reasons: safety, service reliability, and accessibility being among the key factors. Managing vegetation is critical because it can be the single greatest contributor to customer satisfaction. In addition, failure to maintain vegetation can result in significant costs to restore power and economic loss for both the utility and customers.

This paper summarizes key issues regarding the funding of electric utility line clearance programs. Properly funded and well-managed line-clearance programs play an important role in the safe, reliable transmission and distribution of electricity.

The routine management of trees growing along power lines is a significant expense to utilities. In fact, "...Utility Vegetation Management (UVM) programs represent one of the largest recurring maintenance expenses for electric utility companies in North America," according to the *Utility Vegetation Management Final Report* (Final Blackout Report) [(1)] to the Federal Energy Regulatory Commission in March 2004. As a result of the 2003 Blackout and major storms (hurricanes, ice, heavy wet snow) in various jurisdictions, federal and state regulators have increased the focus on, and scrutiny of, utility vegetation management programs.

The Utility Arborist Association (UAA) System Forester Task Force has researched and evaluated the many factors that influence the cost and management of line clearance programs and provides these Best Management Practices for their peers and the utility line clearance industry.

While vegetation managers recognize that economic conditions and the fiscal performance of utilities can influence budget levels, it is also important for vegetation managers to inform and educate their corporate leadership and other stakeholders of the impacts of budget cuts and inconsistent funding. In the words of Rick Johnstone, IVM Partners: "The industry's biggest challenge will be continually educating agencies, lawmakers, regulators, other land managers, and upper management with utilities about the benefits of integrated vegetation management and the consequences of deferment." [(2)]

Problem Statements

1. Inconsistent funding of utility line clearance programs results in higher cost and lower efficiency.
2. The cooperation of utility decision-makers, regulators, and customers is an often-overlooked aspect by vegetation managers.
3. Data supporting the need for consistent, sustainable funding is limited due to the lack of applicable research.
4. Changes in laws and regulations have forced utilities to abide by standards imposed by regulatory agencies; these changes have increased costs.

Overview

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Cost/Benefit analysis of routine and deferred maintenance

Trees are one of, if not the biggest cause of outages for many utilities in the U.S. The cost to maintain vegetation for utilities is often the largest O&M expenditure funded by the company. Therefore, the combined cost of routine tree maintenance and storm restoration should make utility executives and regulators very interested in VM programs. Unfortunately, many utilities view the vegetation management budget as the first place to cut when it is necessary to reduce expenditures. Budget cuts not only delay required maintenance but also increase future costs because vegetation continues to grow despite budget levels.

To date, there have been relatively few studies examining the impacts of deferring line clearance. The studies that have been performed have demonstrated numerous negative impacts on line-clearance programs and utility performance. Examples of negative impacts include:

- service reliability degradation
- rising service restoration costs
- increased threats to the nation's electric grid and infrastructure
- loss of revenue when outages occur
- significant cost increases as trees grow closer to electric facilities due to clearance issues
- increased potential penalties from regulatory agencies
- rising disposal costs as biomass increases
- increase in time and dollars spent on off-cycle work
- increased costs of line repair and equipment damage
- energy loss due to cumulative effects of high impedance and low currents as a result of vegetation contacts
- environmental clean up for oil spills
- public relations impacts as customer complaints increase along with the cost to respond to those issues
- increased liability from customer claims for damages when outages and operations occur
- increased insurance premiums to cover the risks

A study examining the cost of deferring maintenance was performed by Environmental Consultants, Inc. (ECI) in 1997. [(3)] Results showed that deferring maintenance beyond the optimum cycle length will have a "substantial impact" on maintenance costs as vegetation grows beyond conductors and other electric facilities. In fact, the study showed that every dollar spent on an optimum cycle will have to be replaced with $1.21 (not including inflation), when maintenance is deferred for just one year. A delay of two years results in an increased cost of $1.39. Costs continue to escalate as work is further deferred and the VM program continues to lose ground as hot-spot emergency work increases and routine maintenance decreases. The study went on to state that deferments of line-clearance programs frequently result from corporate decisions to reduce budgets.

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The following graphs are from the ECI study and show the impact of deferred maintenance on vegetation management programs with cycles varying from two to six years.

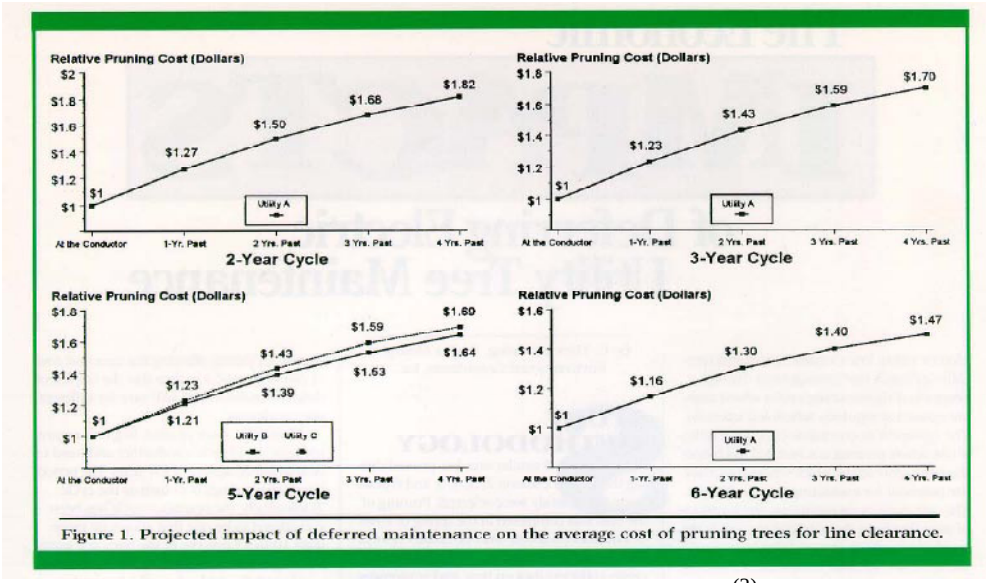


Figure 1. Projected impact of deferred maintenance on the average cost of pruning trees for line clearance.

Environmental Consultants, Inc. [3]

The study makes it clear that it is important for vegetation managers to demonstrate the impacts of budget reductions on safety, reliability, and cost. It is also vital that information and data be available for VM Managers to justify funding increases when current budgets funds are insufficient to properly manage vegetation and when system performance is eroding.

The Final Blackout Report [1] notes, “UVM budgets have been routinely reduced to fund other maintenance activities...” Unfortunately, the effects of these cuts are not manifested until years later when these short term fixes translate into higher costs as the trees continue to grow toward power lines. The Report states, “A common industry complaint is that UVM budgets are somewhat unstable. This includes annual unpredicted budget spikes (up and down) for reasons not related to actual workload.”

The Final Blackout Report [1] goes on to state that “...initial improvement will cost more money, though we believe that over time a more consistent and systematic approach will result in lower costs.” In fact, one of the key recommendations of the Report is that utilities should “ensure adequate and consistent UVM funding based on actual work required.” When necessary, VM Managers must be able to provide detailed reports of the VM workload (pole miles of line, trees/mile, tree maintenance, and removal costs/mile).

Line Clearance impact on reliability

It is well-recognized that poor service reliability negatively impacts customer satisfaction. Service reliability is becoming increasingly important as demands for

uninterrupted service are growing as a result of new appliances and internet business and communication devices powered by electricity.

However, while there are many studies linking vegetation and power line outages, there are few studies documenting the economic impact to the utility and its customers in lost production, revenues and worker wages. Without hard data to illustrate the broad scope and cost of tree-caused outages to businesses, it is difficult to grasp the attention of financial managers and other decision-makers.

One of the ways vegetation managers can focus decision-makers on the impact of VM programs is to communicate the requirements for adhering to federal, state, and local laws and regulations, and national standards (OSHA, ANSI, ISA). For example, the National Electric Safety Code (NESC) directs utilities to keep trees from damaging ungrounded electric supply conductors. Also, to control the potential for widespread power outages on lines connected to the national grid, the North American Electric Reliability Corp. (NERC) mandates that transmission owners establish minimum clearances between vegetation and transmission lines serving the grid. Compliance with these standards requires not only adequate, but also consistent funding.

State utility regulators are taking an increasing interest in service reliability and major storm response with some requiring that performance be significantly improved. While this places a burden on the utility to perform, it also provides an opportunity to request additional funding through the state's rate structure.

Best Management Practices s that reinforce long-term sustainable programs
ANSI A300 Part 1 and Part 7 are standards that have been developed by industry experts to provide a standardized, scientifically-based approach to vegetation management. The standards and Best Management Practices (BMPs) were developed by multiple stakeholders including the International Society of Arboriculture and the Utility Arborist Association.

Vegetation managers recognize that line-clearance programs that follow best management practices using ANSI A-300 standards result in not only higher quality work, but also help reduce future maintenance costs. For example, a long-term research study on an off-road utility right-of-way in central Pennsylvania showed that use of the wire zone/border zone concept, which is included in the ANSI A300 standards as a best practice, results in forbs/grass/shrub cover types that require less maintenance and thereby reduce costs.[5] The study showed that the ROW maintenance cycle could be increased, thereby reducing maintenance costs of labor, equipment, and materials. In addition, these cover types remain relatively stable over time, further reducing future costs and providing benefits to the environment via a sustainable cover type on the ROW.

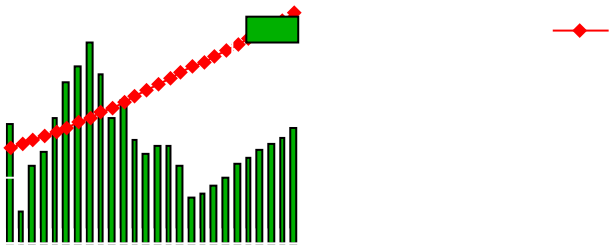
The Final Blackout Report [1] reports the "Wire Zone / Border Zone" concept of UVM has "...proven effective in reducing and/or eliminating outages related to vegetation on transmission ROWs. In addition, this research has proven that the Wire Zone – Border

Zone model generates a great many more benefits...(that) include reduced long-term maintenance costs, improved habitat for wildlife, biodiversity, and wildland fire mitigation."

Other studies have shown that maintaining adequate clearances between vegetation and electric facilities on a regular basis through tree pruning is a cost effective strategy to abate or reverse the negative results of deferred maintenance. Such cover types provide resistance to aggressive, fast-growing tree species that become an issue for utilities.

After a few cycles of selective herbicide application, grasses and herbaceous growth flourish in the ROW. This growth competes culturally and biologically with the tall-growing species for water, light, and nutrients. Over time, by selectively maintaining the ROW, this early succesional cover type will be nearly self-sustaining.
As a result of the early successional habitat, maintenance costs go down over time. For example, the Wildlife Habitat Enhancement Council in a 1992 study on Delmarva Power documented how the average maintenance costs decreased from an initial cost of $260 per acre down to $113 per acre (1992 dollars).[4] The decrease was attributed to the progression from trees to shrubs which required less herbicide and fewer man-hours to maintain.

The chart below illustrates the long-term savings that occurred on Delmarva Power continued beyond 1992. The graph begins with work in 1980 and ends in 2004. The bars represent the cost per year of maintenance, while the sloped line represents inflation. Costs of maintenance initially were high, but as the benefits of IVM took effect, costs decreased significantly and then generally followed the path of inflation.



Wildlife Habitat Enhancement Council [4]

Solutions

To make the case for consistent or increased funding, vegetation managers must have a game plan. Those utilities that have consistent, adequate funding have determined that the following steps are necessary to meet the challenge.

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First, the vegetation manager must know his/her system and needs. Managers must have verifiable data that describes the current situation and helps quantify future requirements. Some of the data necessary includes the following:

a. Safety data
b. Reliability data (SAIFI, SAIDI, CAIDI)
c. Customer complaints
d. Workload
    i. Miles
    ii. Work units
e. Corporate priorities
f. Current cycle
g. Past, current, and projected future budgets
h. Impacts of deferred maintenance
i. Knowledge of regulatory requirements
j. Knowledge of penalties for failure to meet regulatory requirements
k. Expected benefits of budget increases
l. Demonstrate ways the Forestry team is currently stretching budget dollars
m. Well-defined objectives
n. Development of a long-term strategy including measured objectives and milestones
o. Potential issues: easement rights, legal limitations, land ownership

Next, the manager must develop a team of internal stakeholders. These relationships are key elements in developing sustainable line-clearance programs. Successful vegetation managers have included the following departments in their internal team:

a. Operations
b. Regulatory
c. Customer relations
d. Safety
e. Legal
f. Corporate communications
g. Finance

Finally, the manager must develop external support. All too often this step is neglected; as a result, substantive issues of concern to stakeholders outside the utility are not considered by utility decision-makers.

a. Regulators
b. Contractors
c. Residential customers
d. Commercial accounts
e. Industrial customers

In order to be successful, a vegetation manager must utilize the data to inform, and hopefully, influence the decision-makers of the need for adequate, consistent program

funding. Rather than concentrating on operational aspects of the program, the vegetation manager must develop a strategy that addresses the concerns of the stakeholders. For example, customers want reliable service, regulators expect compliance with established standards, and financial managers expect fiscal responsibility. The vegetation manager must be prepared to address these issues as he/she develops a funding strategy.

As part of that strategy, the vegetation manager must also demonstrate the expected benefits of funding and then follow-up with reports on results. The manager must be prepared to adapt and challenge him or herself to improve operations even when current, accepted practices are shown to be in need of improvement.

The development of a long-term strategy needs to emphasize program efficiencies, improved service reliability, and value for the stakeholders. The vegetation manager must remain committed to these goals and must be able to gain the support of their company's upper management. It is crucial that all stakeholders realize the short term costs will result in long-term gains; the vegetation manager must be prepared to help the stakeholders maintain a focus on this for the long haul.

Gaps

1. The most easily identified gap is the lack of current research demonstrating the value of consistent, sustainable line-clearance funding.

2. While there are numerous studies and a significant volume of internal utility information linking vegetation with outages, there is little or no recognized data that calculates the cost of vegetation-related outages to utilities and their customers.

Summary

Utilities manage vegetation for several key performance reasons: safety, electric reliability, and accessibility. Failure to maintain vegetation can result in increased liability, customer inconvenience and dissatisfaction, and economic losses.

However, inconsistent funding of the line-clearance program is a problem that results in higher long-term costs, inefficient use of resources, and poor system performance. Unfortunately, the data supporting consistent, sustainable funding is limited due to the lack of applicable research. The few studies that have been performed have demonstrated numerous negative impacts on line-clearance programs and utility performance; however, these studies are now dated.

Many utilities are becoming increasingly aware and concerned about long-term sustainability. In order to help meet long-term goals, the System Forester Task Force believes that scientifically-based vegetation management programs following ANSI A300 Part 1 and Part 7 standards result in sustainable programs while also reducing vegetation-related outages.

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To make the case for consistent or increased funding, vegetation managers must have a game plan. The vegetation manager must know his/her system, have verifiable data and develop teams of internal and external stakeholders.

Sources:

1. "Utility Vegetation Management Final Report"; CN Utility Consulting, LLC; March 2004
2. "Beyond Status Quo"; Rick Johnstone; *Vistas* (a trade publication); undated
3. "The Economic Impacts of Deferring Electric Utility Tree Maintenance"; D. Mark Browning; Environmental Consultants, Inc.; April 1997
4. "The Economic Benefits of wildlife Habitat Enhancement on Corporate Lands"; Wildlife Habitat Enhancement Council; November 1, 1992
5. "Integrated Vegetation Management on an Electric Transmission Right-of-way in Pennsylvania, U. S."; Richard H. Yahner and Russell J. Hutnick; *Journal of Arboriculture*; September 2004