Report Finds IVM Can Be Greener and Less Costly for ROW Management

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An abundance of compatible, perennial native plants establishes and competes with trees with an IVM-based approach. Photo by James W. Orr. »

A team led by consultant John Goodfellow has developed an economic model to show that integrated vegetation management, or IVM, is both cheaper and greener than simply mowing utility rights of way.

When we flick on the lights, we give little thought to the complex network of generating stations and power lines that instantly supplies our reliable supply of energy. In fact, power

lines are so common that we often don't notice their presence at all. However, electric transmission rights-of-way (ROWs) cross tens of thousands of miles, cutting through forests and over mountains. Gas and oil pipelines occupy further stretches of ROW. In North America, these corridors occupy as much as 13 million acres, an area larger than Vermont and New Hampshire combined.

The importance of maintaining power lines free of interfering vegetation was made clear in August of 2003 when one tree triggered a blackout that affected 50 million people in eastern North America, costing the economies of the U.S and Canada an estimated $10 billion. Federal authorities in both countries quickly enacted new regulations, and utilities responded by mowing and hand cutting miles of overgrown ROW, leaving behind stumps, piles of cut brush and unsightly views of utility infrastructure. Many stakeholders, including local communities, landowners and environmental organizations, objected to what they considered a heavy-handed approach.

Of course, vegetation interference with critical infrastructure is not a new problem, and there is more than one way to prevent trees from causing service interruptions. However, the most economically and environmentally viable choice has always been a matter of debate – until now. While mowing down trees and brush may seem to be the obvious solution, a recent study ("The Cost Efficiency of IVM," by John Goodfellow) clearly demonstrates that IVM, which uses a combination of methods, including the selective use of herbicides, is far less costly and, in fact, provides a range of additional benefits over the long term. Note: An IVM approach applies the optimum treatment in any given situation, whether physical, chemical, cultural or biological, balancing effectiveness with respect to economic and environmental considerations.

Comparing choice of controls

Where ROWs cross areas normally occupied by trees, some form of vegetation management is necessary. For distribution lines serving individual businesses and customers, trees are pruned and removed as necessary to ensure reliable local service. On high-voltage transmission lines that serve entire communities, the choice is usually between physical control, i.e., mechanized mowing and/or hand cutting, or an IVM-based approach.

When trees and brush are mowed, the stored energy in the remaining root system can push up several feet of dense woody growth in a single season. Utilities must mow regularly to keep their ROWs clear and accessible and their service reliable. In addition to the cost, mowers also have a significant environmental footprint in the form of carbon emissions, noise, debris, potential for leaking fuel and fluids and, of course, the complete destruction of existing habitat on the ROW.

Alternatively, with an IVM-based approach that uses herbicides to control the roots of woody

plants, a window of opportunity is opened for compatible grasses and forbs (meadow plants) to establish. Pollinating insects flourish. Small mammals and birds that thrive in meadows consume tree seeds. Rabbits and deer browse stray woody shoots. And the vigorous root systems of perennial plants further discourage the establishment of incompatible trees. In other words, IVM encourages these “biological controls” to actively resist the invasion of unwanted trees.

This natural resistance has direct value by reducing the need for physical control of woody brush. But Goodfellow, along with research team members Carolyn Mahad, Ph.D., Grant Wills and Phillip Charlton, Ph.D., were interested in measuring and quantifying additional factors.

Least-cost model

Earlier analyses of vegetation-management costs have focused largely on the direct operational costs of performing the work. Even under these more limited models, the use of herbicides was shown to save money after the second cycle due to the avoided cost of frequent mowing. Over time, the savings continue to add up. Despite this, many potential users have shied away from herbicides because they are perceived to be dangerous, harmful to the environment or difficult from a public-relations standpoint.

By developing a comprehensive, least-cost economic model, the research team was able to factor in the long-term value – looking out 20 years – of not only the direct cost savings, but also additional variables, including public safety, operational risk, recreational use, aesthetics, public nuisance, site disturbance, water quality, compatible vegetation, incompatible vegetation (density and height) and wildlife habitat.

Conditions across North America vary enormously. Accounting for the variables and projecting future results for different maintenance strategies required a complex model. This was done by analyzing existing peer-reviewed studies (“literature”), applying a least-cost analysis (“logic”) and surveying practitioners with demonstrated experience in implementing utility-vegetation management (“lore”).

Findings of the report

The analysis included both avoided cost, such as not having to mow, and the additional benefits provided by utilizing IVM. In every case – even when data was loaded deliberately against an IVM strategy – IVM proved to be more cost effective. (Figure 1)

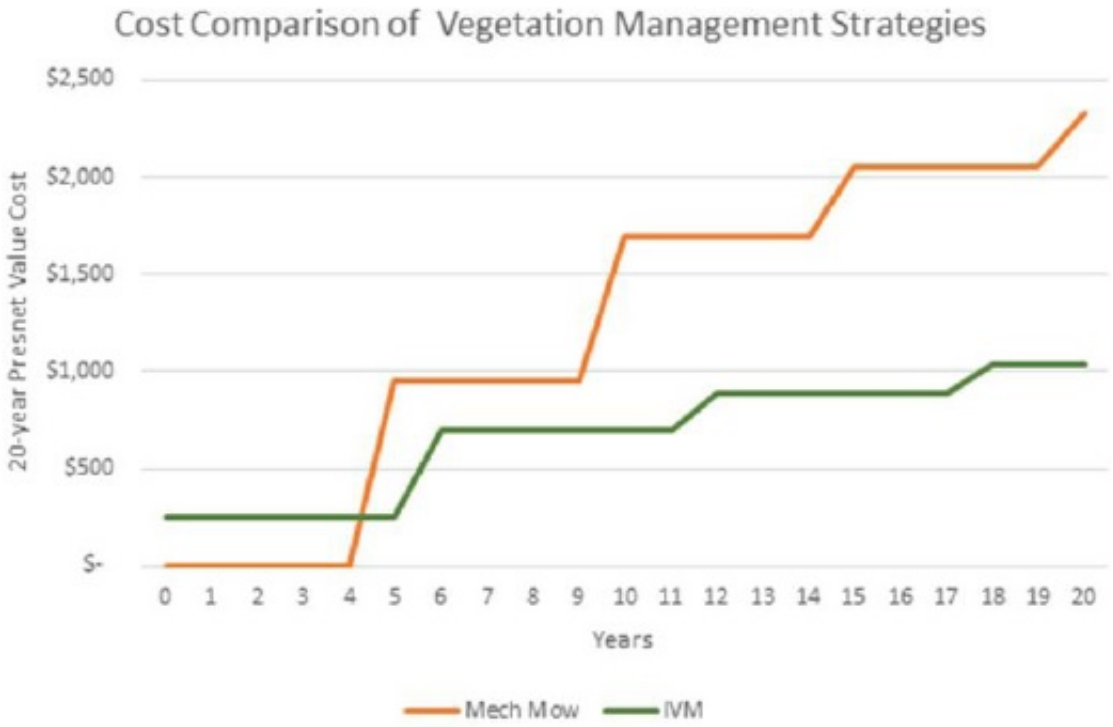

Figure 1: Comparison of long-term costs between mechanical mowing alone vs. an IVM-based approach. Initial cost of IVM is higher because mowing plus additional IVM treatments are needed at the outset. Graphic from "The Cost Efficiency of IVM," by John Goodfellow. »

Safety

Published statistical data comparing safety differences between mowing and IVM is somewhat limited. However, it is well documented that both mowing and IVM are much safer for workers than hand cutting with chain saws. Overall, the study found only minor differences in safety for workers and the public surrounding either method. Practitioners generally favored IVM as a more effective long-term strategy, both in the safety of workers and the overall performance of the system.

Risk to utility facilities

While there is little published data to demonstrate that either mowing or IVM provides greater reliability, the consensus of practitioners is that the use of IVM does not increase the risk of trees causing a service interruption. In fact, over the long term, the density of woody vegetation on the ROW is much lower with IVM, making access and inspection easier and decreasing the likelihood of an incident.

Perception of external stakeholders

Adjacent-property owners, the general public and regulators need to be confident that the

activities performed on utility ROWs are in their best interests. No published literature supports the idea that one method is more acceptable to external stakeholders than the other. Practitioners reported that the public often reacts negatively to the use of herbicides in the short term. However, as the ROW is converted to a more stable and user-friendly environment, public perception improves.

There is perception among practitioners that government regulators look favorably on an IVM strategy, most likely due to its lower long-term costs.

Recreational use of the ROW

The study showed that recreational use is limited during maintenance activities, but that over time an IVM approach is more favorable to recreational users, as there are fewer treatments necessary, less debris left on the ROW following treatments and easier access due to lower, more stable vegetative cover.

Aesthetics

There is little published literature that attempts to measure the aesthetic effect of vegetation-management activities. But there is no question that vegetation-management activities change the appearance of vegetation on the ROW.

Mowing immediately and completely changes the appearance of the ROW. Depending on the combination of treatments and the density of brush, the effect of IVM can be profound or minor. Foliar application of herbicides leaves “browned out” vegetation, but not all herbicides are applied to green foliage.

Over time, the consensus of practitioners is that IVM treatments lead to the establishment of meadow-type cover, which is more stable and visually appealing than brush that emerges following repeated mowing.

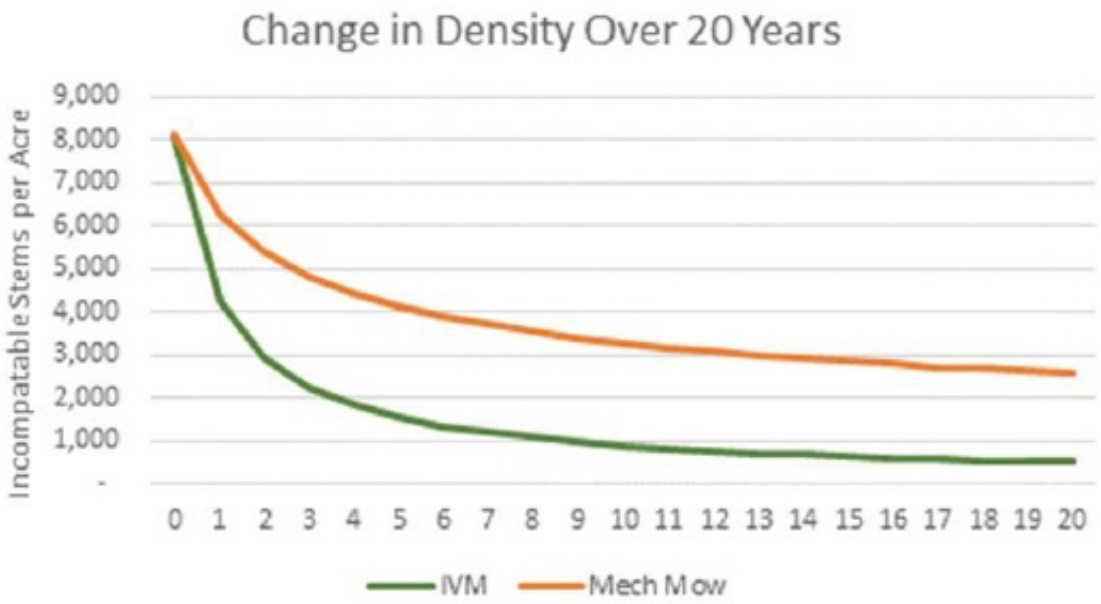

Figure 2: Reduction in density of incompatible trees is greater with an IVM-based approach. Graphic from "The Cost Efficiency of IVM," by John Goodfellow. »

Public nuisance

The presence of a ROW in the landscape is, in and of itself, an intrusion. Very few people buy a property because an electric transmission line or pipeline is near or crosses the property. Once a utility ROW is established, it must be maintained, with associated negative effects such as noise and odor.

Again, there is little published literature that addresses this concern. However, since maintenance activities are relatively infrequent (measured in years rather than days or weeks), the overall impact is minimal for either method. Most practitioners agree that mowing and its associated noise and disruption are a greater nuisance than herbicide applications.

Site disturbance and water quality

Mowing woody vegetation with large machines is very disruptive, grinding existing ROW cover and scattering the remains. Larger machines can leave large ruts, and the weight of the equipment can compact soils. There is potential for erosion, sedimentation and leakage of fuel or other fluids, causing contamination of nearby bodies of water.

On the other hand, an IVM-based approach generally uses smaller vehicles and workers on foot, which has a much lower level of disturbance, provided buffers around water bodies are established and herbicide labels are followed. This was verified by the perception of practitioners in the study.

Over the long term, with less reliance on large machinery when compared to periodic mowing and the increase in biological controls, site disturbances of ROW management are considerably fewer using an IVM-based strategy.

Vegetation on the ROW

Literature supports the fact that woody vegetation sprouts vigorously from remaining root systems following mowing, and that an IVM-based strategy reduces incompatible vegetation. This makes sense, because IVM deliberately targets tall woody vegetation and favors compatible plant species.

Furthermore, the literature supports the idea that established, perennial herbaceous cover resists invasion by incompatible trees through both direct competition and by creating habitat for animals that browse woody vegetation and devour its seeds.

Incompatible trees

Both tree density and height are reduced with an IVM-based strategy, due to selective targeting and ongoing biological controls.

Density

The number of stems per acre of woody vegetation is reduced over time by both exclusive use of mowing and by IVM. However, IVM leads to much lower levels of woody vegetation over time (Figure 2).

Height

Trees from root sprouts grow at a faster rate than trees growing from seed. This is illustrated in Figure 3. Tree growth rates with an IVM approach are lower due to biological controls inherent with this approach.

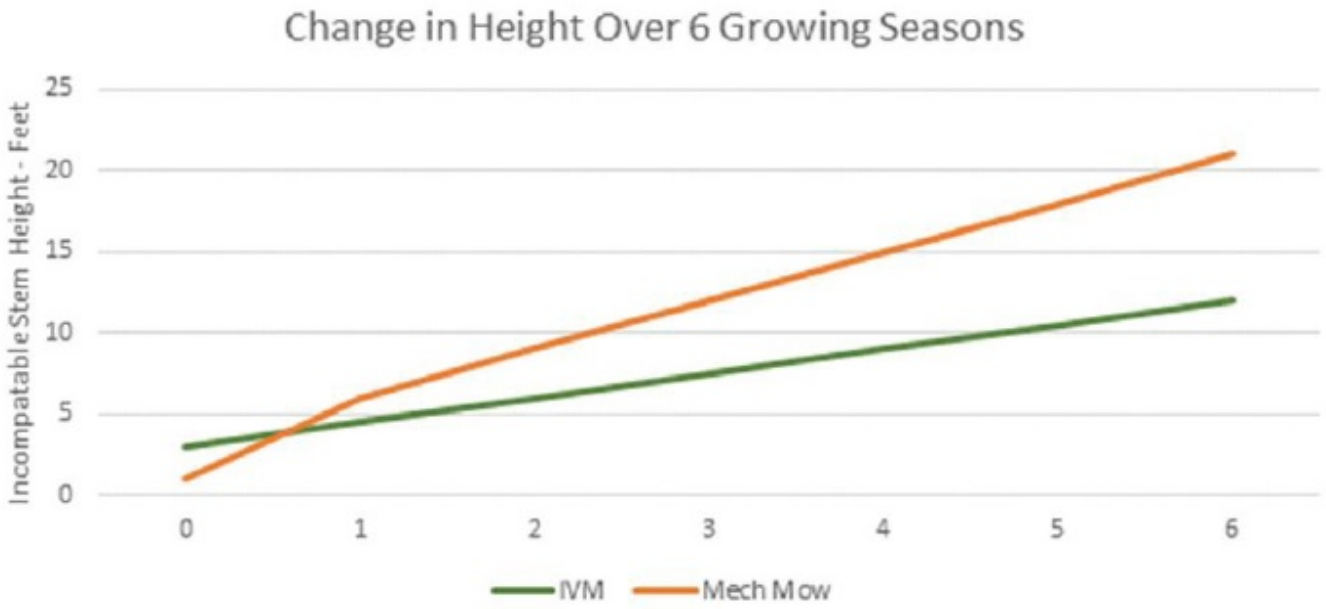

Figure 3: Projected growth rate is slower for an IVM-based approach due to biological controls. Graphic from "The Cost Efficiency of IVM," by John Goodfellow. »

Wildlife habitat

A ROW is only part of the greater ecosystem that includes the land on either side and beyond. Some wildlife moves between the ROW and adjacent land, while other species may inhabit one or the other exclusively. The presence of the ROW may or may not benefit any given species. Therefore, measuring the effects of the ROW and the practices used to maintain it on wildlife populations is a complex proposition.

It is known that the type of wildlife present on a site is largely a function of the vegetative cover. Species that are adapted to disturbed sites, or to sites in early successional stages, generally do well on ROWs. Furthermore, most wildlife prefers relatively stable habitat, regardless of successional stage. For example, mowed ROWs have consistently lower abundancy and diversity of bird populations than areas maintained with IVM. Studies of game species such as deer, and research on the effects of various treatments on pollinators, have yielded mixed results – generally no difference, or a benefit to wildlife from an IVM-based approach. However, when the higher cost of maintaining the ROW with mowing is factored in, the economic advantage of IVM becomes clear.

Conclusion

This study demonstrates that long-term use of IVM is, in general, about half the cost of mowing alone. Furthermore, utilities that utilize this approach gain advantage in a range of environmental benefits and public perception – all at no added cost.

However, achieving these benefits requires many utilities to deviate from long-established practices. Making such a change involves a learning curve for the entire supply chain. Both internal and external stakeholders must be informed about why the change is necessary. These short-term hurdles can be insurmountable barriers without proper planning and a firm commitment from management.

Fortunately, there are industry standards, best-management practices, accreditation programs and now a definitive study for ROW managers who want to realize the value of implementing an IVM program.

The full report, "The Cost Efficiency of IVM," by John Goodfellow, can be found here: http://www.rowstewardship.org/resource_pdfs/IVMCostEfficiency.pdf.

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