Intentional Vegetation Management

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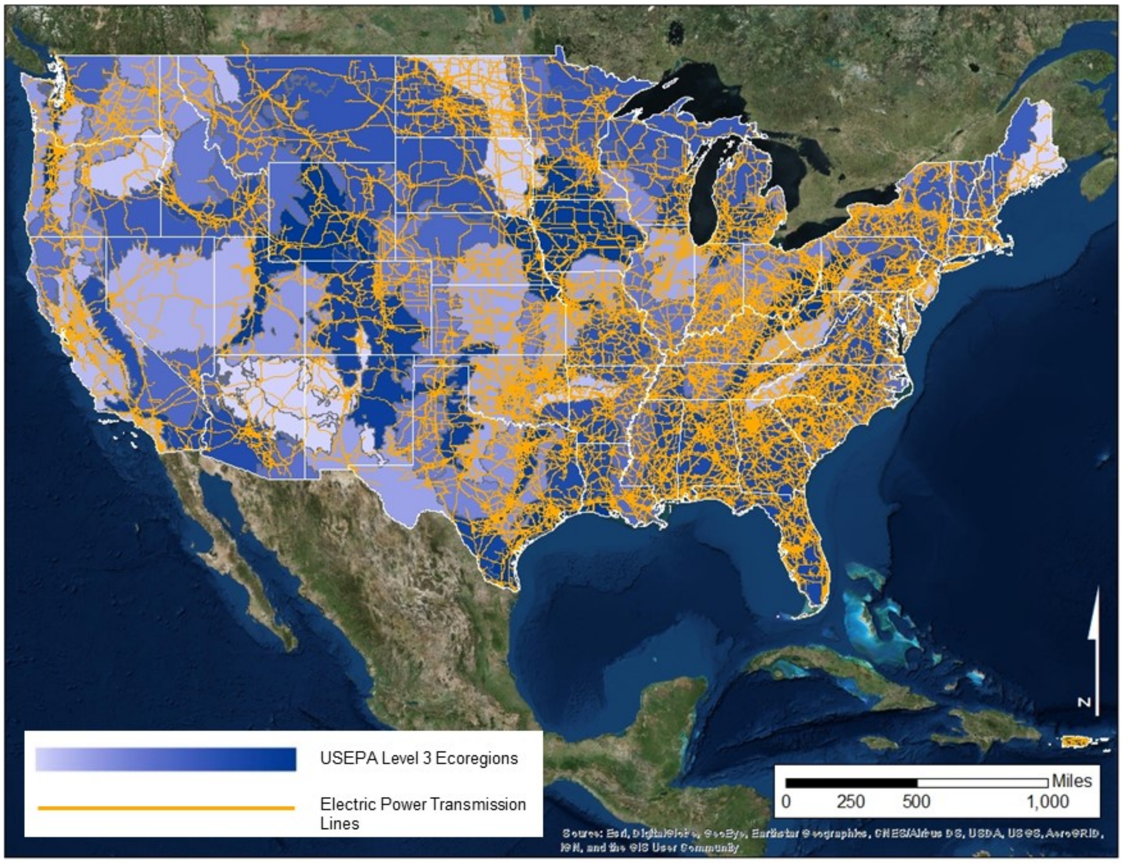
Photo 1 Organic Hydroseeding Lignum ROW, CGVA, with Pollinator Mix (L). Flowering Grasses & Forbs Two Years After Treatment (R)

Often cited as the guiding doctrine of utility vegetation management (UVM) programs, integrated vegetation management (IVM) prescribes a methodology that values diverse, compatible plant communities to achieve long-term management objectives, but, if we're being honest, how widespread is this activity on the North American grid? Many utilities advertise IVM research on their websites and within their corporate social responsibility reports, but what percentage of the national grid do these case studies represent? Utility vegetation managers have grown up with Bramble, Yahner & Byrnes, and Miller et al., but how representative are these studies and standards of the larger energy utility rights-of-way (ROW) network? This question is surprisingly difficult to answer, in part because today the term IVM is often misunderstood and misused to describe standardized cyclic clearing activities like brushing, mowing and broadcasting non-selective herbicides. Application of IVM best management practices (BMPs) does not necessarily result in integrated vegetation management. While BMPs are described by national IVM standards (ANSI A300, Section 7), when they are applied repetitively without the objective of establishing diverse, compatible plant communities, they may fall short of truly integrated programming.

Adding to the confusion, UVM has undergone many changes over the past 60 years since herbicides became mainstream. Today, there's no better time to assess the state of IVM on the North American grid. There is no doubt that UVM is doing an excellent job delivering safe and reliable energy to North American consumers.

Access to energy nearly every second of every day, 24/7 is unimaginable in many parts of the world. Certainly no small feat. Electric and gas transmission and distribution ROW traverse nearly every ecoregion across the lower 48 states (Figure 1) and are estimated to occupy a total land area of 21 million acres, but how many of these 21 million acres are maintained by genuine, honest IVM? And how many more acres could we integrate over the next 10 years? 20 years?

Figure 1 Electric Transmission Lines Traverse Nearly Every Ecoregion Across the United States (Hawaii, Alaska & Pacific Territories Excluded for Scale)



Let's Be Clear on IVM

In order to discuss IVM, we need to begin at the beginning with the definition. Don't skip ahead thinking that you know this part because this is important. Misunderstanding the guiding principles of IVM can lead to misuse of the term and distorted results. Yogi Berra famously said, "If you don't know where you're going, you'll end up someplace else."

IVM is, "…a system of managing plant communities in which managers set objectives, identify compatible and incompatible vegetation, consider action thresholds, and evaluate, select, and implement the most appropriate control method or methods to achieve their established objectives." The ANSI A300 goes on to say that **IVM is not**, "a set of rigid prescriptions based upon set time periods, repeated unselective mowing, or broadcast spraying across entire right-of-way widths without the objective of establishing diverse, compatible plant communities."

Considering this definition, there has been a shift in how some utility vegetation managers and vegetation contractors use the term IVM. Within some work environments, hopefully not too many, the term IVM more closely resembles the latter description rather the former. So, how has this happened? How has IVM come to mean something that it is not? And why are some energy utilities presenting IVM as case studies rather than an industry BMP?

Deviation of Definition

NASA Astronaut Colonel Mike Mullane offers one explanation for the deviation we see between definition and practice. Colonel Mullane describes a disconnect between an expressed standard and actual delivery as *normalization of deviance*. Normalization of deviance is "a natural human tendency, particularly in pressured circumstances, to want to take short cuts. To accept a lower standard of performance." Col Mullane contextualizes normalization of deviance within emergency response and flight situations, but vegetation managers experience similar pressure under regulation. Normalization of deviance occurs when short cutting does not return negative consequences. Deviated delivery normalizes and standard operating procedures change incrementally over time.

For utility vegetation managers, the August 14th, 2003 blackout, purportedly initiated by a vegetation incident, was the watershed moment that began to change how the utility industry applied IVM. Five years after the blackout, regulations were introduced and structural controls dominated the conversation for at least a decade. Utility vegetation managers reacted swiftly to reclaim overgrown ROW that threatened their utilities' continued operation. Today, more than a decade after regulations were introduced, utility vegetation managers should be aware of this timeline and be careful to recognize normalization of deviance in the definition and intent of IVM. Mistaking purely structural controls, like cyclic mowing and broadcasting non-selective herbicides, as IVM results in the loss of IVM's core long-term objective - establishing and maintaining compatible plant communities.

The Deviation Dichotomy

Application of IVM BMPs does not necessarily result in IVM. Reliance on standardized clearing BMPs, like brushing, mowing and broadcasting non-selective herbicides, may be better described as structural vegetation maintenance (SVM). Over time, repetitive use of non-selective BMPs may produce very different plant communities than application of selective BMPs. This is because non-selective BMPs cannot guarantee desirable compositional outcomes. On the other hand, tailoring selective BMPs to site-specific plant communities can encourage compatible compositions by selecting against only incompatible species leaving compatibles to thrive.

It may help to think about vegetation response to treatment as a frequency-intensity function (Figure 2). This frequency-intensity function (solid black line) is bounded by pioneer plant communities (hashed brown line, representing near bare ground) and overgrown plant communities (hashed red line, vegetation approaching clearance thresholds). The solid green line represents a seral sweet spot, an optimal diverse, compatible plant community ideal for long-term maintenance of biological control. Integrated pest management defines biological control as the reduction of pest populations (in this case, woody and weedy species) by natural enemies (occupation of a site by compatible species). Establishing and maintaining biological control is the objective of IVM.

Figure 2 Vegetation Community Response to SVM (A) &. IVM (B)

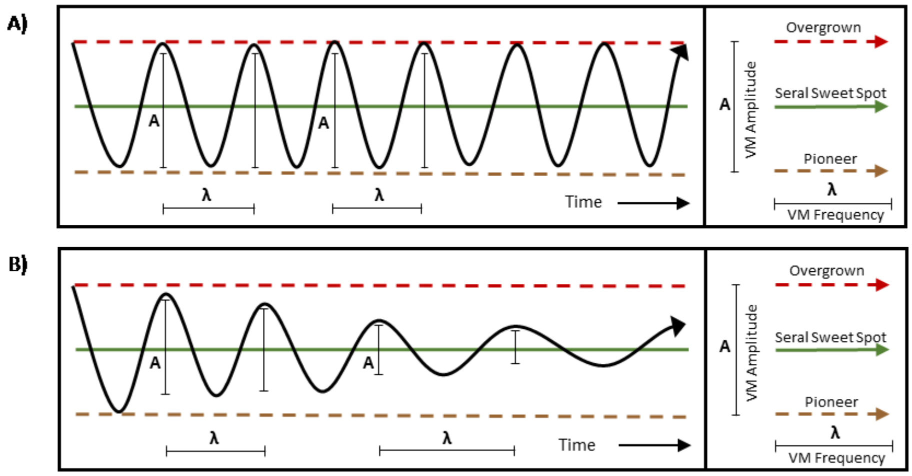
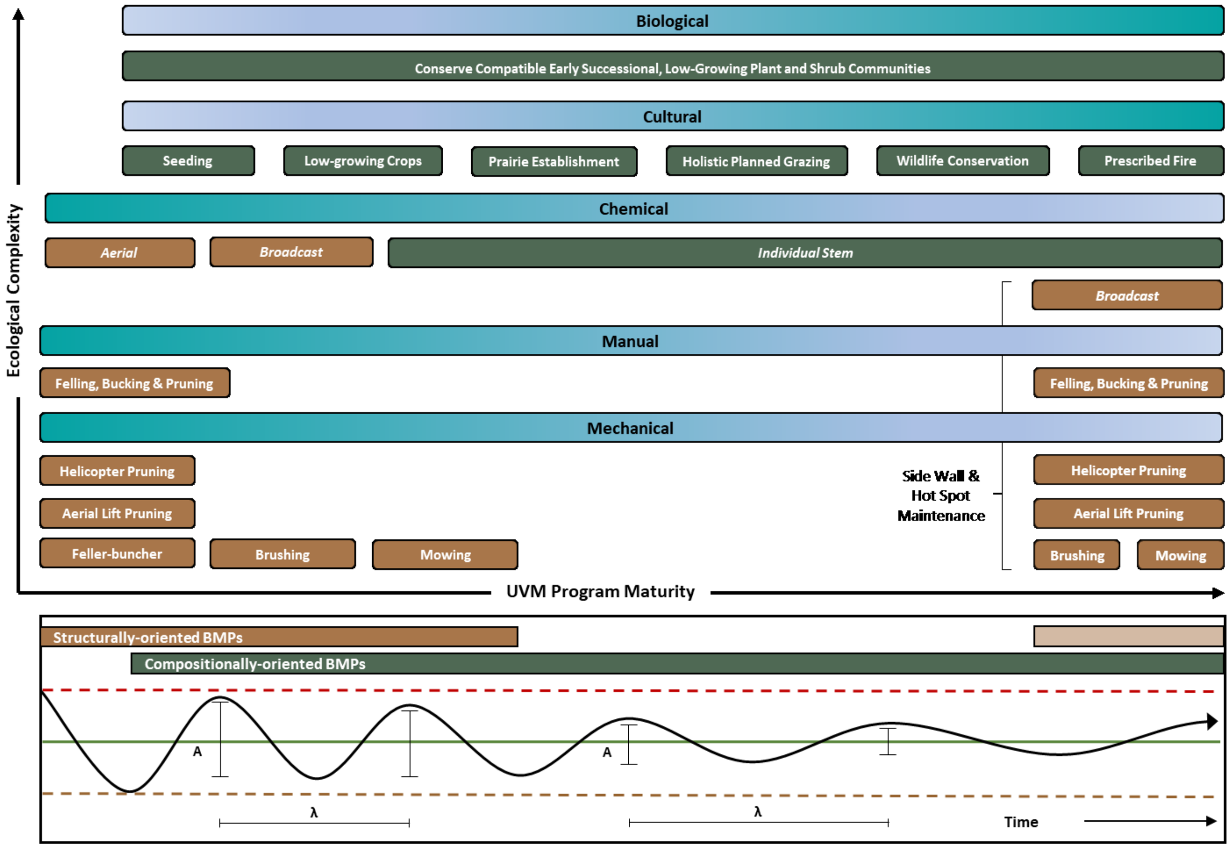


Figure 2 outlines two management regimes, the first, SVM (A), is reactive, responding to vegetation with purely structural methods, while the second, IVM (B), is proactive, tailoring BMPs to select against incompatible species and promoting biological control by the remaining compatible vegetation. Figure 2A describes a repetitive system in which managers prescribe non-selective controls that suppress vegetation until the next cycle is warranted. This system employs “a set of rigid prescriptions based upon set time periods, repeated unselective mowing, or broadcast spraying across entire right-of-way widths without the objective of establishing diverse, compatible plant communities.” Managing purely for structure is attractive for many reasons, but long-term objectives, like biological control, cost-savings, reduction in herbicide use and wildlife habitat conservation, may remain at arm’s length under this regime. Nevertheless, some utilities prefer it because it’s relatively simple, has low short-term costs and requires limited plant identification skills and knowledge of IVM BMPs.

Conversely, Figure 2B describes an adaptive regime in which managers prescribe selective BMPs that inhibit the growth of incompatible species and conserve growing space for compatible plant communities. Within this system, “managers set objectives, identify compatible and incompatible vegetation, consider action thresholds, and evaluate, select, and implement the most appropriate control method or methods to achieve their established objectives.” Managing for composition through IVM harnesses plant community ecology and provides long-term benefits to managers, the environment and society. By shaping plant community composition, managers can maintain structural control while providing resilient early-successional ecosystems that are resistant to encroachment by undesirable woody and weedy species.

This dichotomy between SVM and IVM can be described by grouping BMPs into two categories as seen in Figure 3. Structurally-oriented BMPs (shown in brown) are used to suppress vegetation indiscriminately, while compositionally-oriented BMPs (shown in green) are used to select against incompatible species, conserving compatible vegetation. According to the ANSI A300 Version 2, IVM has five methods (shown in blue) – biological, cultural, chemical, manual and mechanical – each method contains a set of BMPs. Figure 3 provides an overview of how IVM BMPs can be organized through time to facilitate long-term biological control. Ecological complexity is depicted on the y-axis increasing from bottom to top, while UVM program maturity is depicted on the x-axis increasing as IVM programming shifts from reliance on structurally-oriented BMPs to compositionally-oriented BMPs, reintroducing structural controls only as necessary for side wall trimming and hot spot maintenance.

Figure 3 IVM Progression Through Time – Transitioning from Structural to Compositional Controls



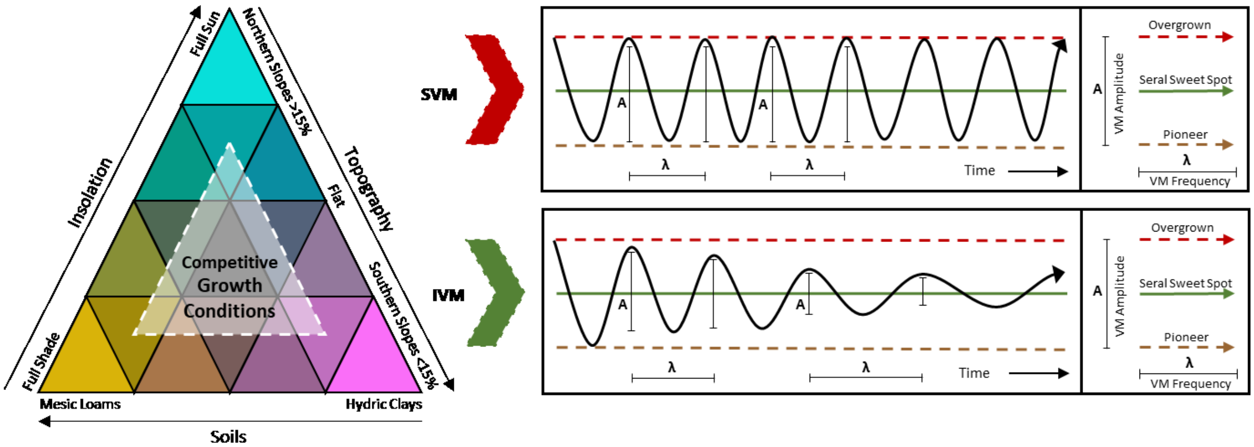
Selection of BMPs from Miller, R. ANSI. 2014. "ANSI A300: Integrated Vegetation Management for Utility Rights-of-Way – Best Management Practices." Second Edition. International Society of Arboriculture. Champaign, Illinois, USA.

IVM BMPs are intended to be applied in sequence, transitioning from structurally-oriented BMPs to compositionally-oriented BMPs. In a sense, the biological method provides an umbrella that the other four methods operate under. The ANSI A300 V2 describes biological control as "management of vegetation by establishing and conserving compatible, stable plant communities, using plant competition, animals, insects or pathogens." In other words, within UVM, plant community ecology. The biological method is a goal that seeks to reduce the frequency and intensity of BMP applications through establishment and maintenance of compatible communities. Although listed as one of IVM's five methods, the biological method lacks BMPs appropriate to ROW vegetation maintenance. Realistically, the biological method is better described as IVM's chief objective under which cultural, chemical, manual and mechanical methods operate.

Achieving the Greatest Benefits in Cost-savings and Ecological Value

Evaluating a utility network for IVM cost-savings and ecological benefit varies by utility, but in general we can make a few assumptions. Often, these two management objectives are complimentary. Under competitive growth conditions – full sun, suitable topography and soils –SVM is more likely to produce a high-frequency high-intensity cycle depicted in Figure 4. Cyclic exposure of bare ground will invite the types of weedy pioneer and woody species that are incompatible in ROW environments. Conversely, establishing and maintaining continuous compatible plant cover discourages encroachment by incompatible species and reduces treatment frequency and intensity.

Figure 4 Plant Growth Triangle & Expected Outcomes Under Two Management Approaches: SVM & IVM



Maintenance of compatible plant communities not only provides cost-savings through time, but managing vegetation as an asset provides additional benefits like wildlife habitat conservation. Intentionally managed vegetation provides opportunities for utilities to participate in voluntary conservation initiatives that contribute to social and legal licenses to operate. Should the monarch butterfly be listed as a threatened or endangered species under the Endangered Species Act in June of 2019, signatory utilities to the *Nationwide Candidate Conservation Agreement for Monarch Butterfly on Energy and Transportation Lands* (CCAA) will provide net benefit to the species and continue to operate without development of costly Habitat Conservation Plans or Incidental Take Permits.

North American populations of the mighty monarch once numbered in the billions, but no longer. Declining monarch butterfly populations is only one example that highlights the magnitude of recent biodiversity loss. It is by no means an outlier. Biodiversity loss threatens sustainable business and human health. Biodiversity Loss threatens every human life on Earth, but rather than crumble beneath the weight of apocalyptic tales, an incredible opportunity presents itself to utility vegetation managers. Energy utilities maintain linear ROW spanning 21 million acres across the continental United States. Maintenance of early-successional forb-rich habitats for energy transmission and distribution, if managed intentionally for conservation benefit through IVM, can positively affect numerous endangered, threatened and rare species of plants, insect pollinators, birds and other wildlife. Utility vegetation managers have the choice to shape the lands they maintain into unremarkable landscapes through regular application of structurally-oriented BMPs or into vibrant wildlife habitat through intentional vegetation management (also IVM).

Final Thoughts

Energy utilities are facing many changes over the coming decades. In response to changing social, regulatory and environmental climates, UVM, a system founded on risk-management, would be wise to return to IVM, a system rooted in asset-management, to plan for and cope with a rapidly changing world. While energy utilities transition to cleaner and more cost-effective technologies over the coming decades, IVM will contribute to resilient business practices and largescale conservation efforts.

For Columbia Gas, ArborMetrics Solutions, Grow With Trees and many others, there's no better way forward than to manage for the greater benefit, promoting biodiversity on the landscape while discouraging incompatible vegetation at reduced costs. We reaffirm our commitment to biodiversity management because we see the values, intangible and otherwise.