Assessment of Changes in Vegetation Management on Powerline Corridors in Connecticut

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Recently there has been growing alarm among conservationists and professional ecologists about rapid changes in management of vegetation along Eversource powerline corridors in Connecticut. These changes appear to have proceeded without an understanding of the highly effective, scientifically-based program of vegetation management (Integrated Vegetation Management or IVM) that was previously used on these corridors. This approach was developed in the 1950s as an alternative to blanket spraying of herbicide to control vegetation, and it has been tested and fine-tuned over the past six decades. Numerous scientific experiments and long-term studies have assessed the effectiveness of this approach in controlling vegetation to protect powerlines and providing habitat for threatened species of plants and animals and a diversity of other early successional wildlife. Although this approach has been primarily restricted to the northeastern U.S. for the past 60 years, many utility companies in other parts of the country are now considering adopting IVM as a replacement for mowing or foliar herbicide spraying in order to reduce costs and protect pollinating insects and other organisms (Russell et al., 2018).

Integrated Vegetation Management, which originally focused on creating stable shrub communities, was developed by plant ecologists such as Frank Egler, William Niering, Richard Goodwin and W.C. Bramble based on their deep understanding of the ecology of different species of plants in the northeastern U.S. The first demonstration plot was established in 1953 along a powerline that runs through the Connecticut College Arboretum (Niering and Goodwin, 1974). During the 1950s the Connecticut Botanical Society established a Right-of-Way Vegetation Committee to advise utilities on how to implement ecologically based vegetation management, and this approach was adopted on most electric transmission lines in the state (Niering, 1958). The overriding goal of IVM was to establish low, relatively stable vegetation that is resistant to invasion by trees. This prevents the growth of trees that would touch or fall on powerlines without requiring the application of large amounts of herbicides. The new IVM approach was based on two well-established generalizations from plant ecology: (1) areas dominated by a dense cover of low shrubs are resistant to the establishment and growth of trees and, (2) most of the hardwood trees that grow in New England resprout and quickly grow back if the above-ground foliage and stems are destroyed but the roots survive. Consequently, the best way to manage vegetation on a powerline corridor is to kill trees (including their roots) and leave shrubs. Shrubs typically spread after the trees are removed, forming a stable shrub community that is resistant to invasion by tree seedlings. The best way to kill tree roots and prevent resprouting is to precisely spray herbicide at the base of each tree trunk without damaging nearby shrubs (Dreyer and Niering, 1986). Treatment crews must be trained to identify different species of woody plants so that they consistently remove trees and leave shrubs. The initial process is labor intensive but the tradeoff is that vegetation management is required much less frequently as the shrub community below the powerline becomes increasingly resistant to tree invasion. On the Delmarva Peninsula (Delaware and the Eastern Shore of Maryland and Virginia), where mowing is exceptionally easy because the land is flat and rock-free, the vegetation maintenance cost on powerline corridors over ten years was lower with Integrated Vegetation Management than with mowing (Johnstone, 1990).

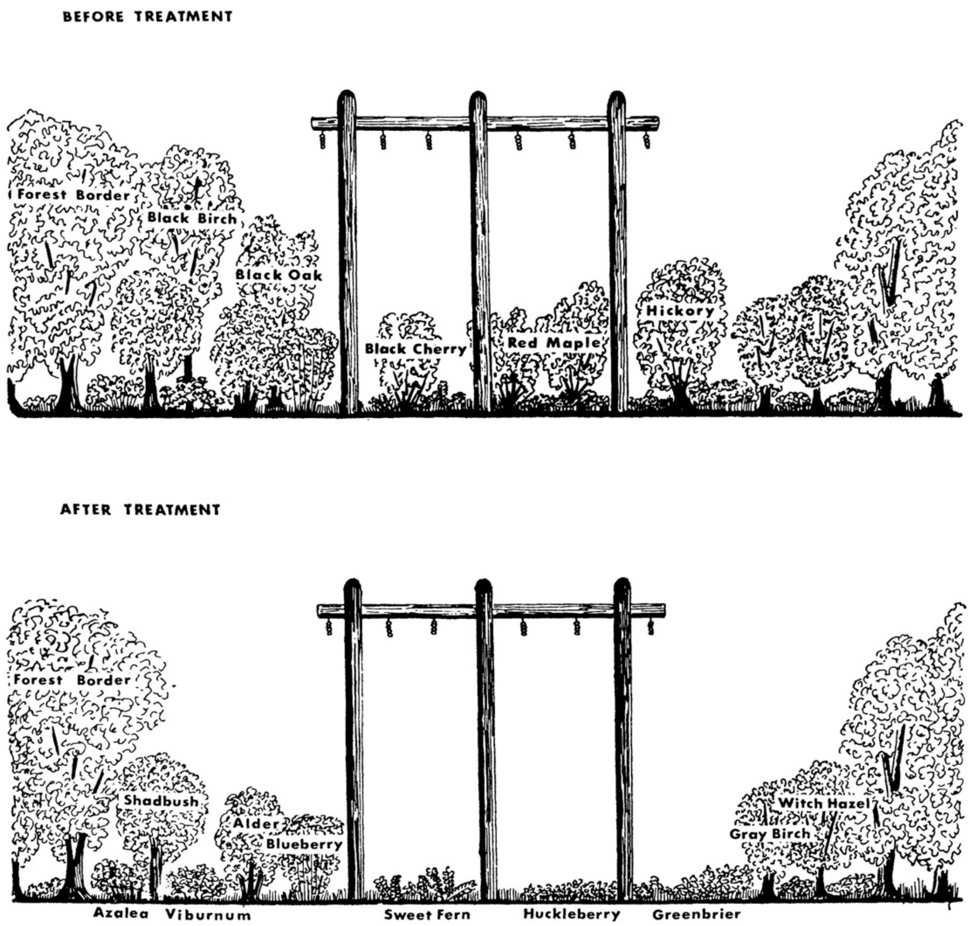

Figure 1. Diagram of an electric transmission right-of-way showing tree and shrub vegetation prior to and after selective herbicide treatment. Shrubs and low-growing trees have been preserved where they do not interfere with the utility operations (from Niering and Goodwin, 1974).

After six decades of this type of management many powerline corridors in Connecticut are covered with a dense carpet of shrubs that are relatively stable and resistant to tree invasion. This is particularly true where plants such as huckleberry and greenbrier produce stems or rhizomes that spread horizontally to create a dense, expanding clump of low vegetation. The current shift to mowing down all woody vegetation on powerline corridors runs the risk of disrupting these stable shrub communities, opening the way to invasion by tree seedlings (see Bramble et al., 1990 for experimental evidence for this effect). The result could be a much more dynamic system that requires frequent mowing to prevent the rapid growth of trees under powerlines. It is also likely to result in the invasion of powerlines by pernicious invasive species such as autumn olive, Oriental bittersweet and mugwort.

Although the main goal of the stable shrub community approach was to provide an affordable and less environmentally risky alternative to blanket spraying of herbicides, ecologists recognized that the resulting shrubland vegetation would also be valuable for protecting a wide variety of plant species and providing favorable habitat for wildlife. These strips of low vegetation turned out to be even more important for preserving biological diversity than anyone anticipated in the 1950s. Since the 1950s most species that depend on treeless grassland or shrubland habitat have declined steadily and many are now at risk of entirely disappearing from the region (Askins, 2001; Dettmers, 2003, Wagner et al., 2003). The immediate cause of these declines is the loss of the fallow fields and pastures as farmland was abandoned. Much of the former farmland is now covered with woodland or residential housing. The longer-term cause of these declines is the loss of open habitats created by natural disturbances such as wildfires, beaver activity, and seasonal flooding along major rivers (Askins, 2002). These natural disturbances were suppressed after people controlled fires, trapped out beavers, and built dams. Large patches of grassland and shrubland created by natural disturbances are currently too infrequent to support populations of many of the species that require open habitats, and it is likely that the extent of shrubland habitats in the Northeast is now at an historic low (King and Schlossberg, 2014). Consequently, powerline corridors maintained by selective removal of trees are now among the most important habitats in the Northeast for numerous species (Bramble et al., 1994; King and Byers, 2002; Confer and Pascoe, 2003; Wagner, 2003; Yahner et al, 2004;

Figure 2. Photograph of a powerline corridor in Montville, CT with a stable shrub community that supports a high diversity of native plant species.

King et al., 2009; Askins et al., 2012; Wagner et al., 2014a, Wagner 2014b; Schlossberg and King, 2015; Russell et al., 2018). These corridors support exceptionally high densities of eastern box turtles, white-eyed vireos, blue-winged warblers, prairie warblers, and New England cottontails as well as numerous species of plants and pollinating insects. Many of these species have become increasing scarce and have a high priority for conservation (King et al. 2011, King and Schlossberg 2014). Large-scale shifts in vegetation management should be carefully considered so that these already diminished and declining populations are not imperiled by management practices that reduce the habitat value of powerline corridors.

The consistent goal of vegetation management along powerline corridors in Connecticut has been to create stable shrub communities that inhibit the establishment of trees that would interfere with powerlines. This method has been extraordinarily successful at developing low vegetation with a rich diversity of native shrubs, vines and herbs along with numerous species of animals that depend on this habitat. However, it's important to remember the following limitations of this approach:

1. Stable shrub management is generally not compatible with protecting trees. Trees can cause major power outages on powerlines, of course, and they also threaten the shrub communities that make this system work. An exception can be made for trees that never grow very tall such as flowering dogwood, gray birch and scrub oak (bear oak), which can be safely left on the borders of the corridor if not under the wires. Scrub oak does not exceed a height of 20 feet, and is especially important because 16 species of butterflies and moths depend on this small tree as a food plant, including several species that are rare in Connecticut. Eastern red-cedars often grow to be 20 to 50 ft. tall, however, so they are not appropriate for powerline corridors unless they are topped to inhibit them from growing tall enough to threaten powerlines.
2. If vegetation management works well to establish a dense shrub community, then grasses and wildflowers tend to be replaced by shrubs. Despite this, herbaceous plants often survive on powerlines in rocky areas or areas with poor soil. They also become

established in disturbed areas along powerline roads, but recently this habitat has been greatly reduced because many of these roads have been covered with gravel to improve access to utility poles. It would help if dirt roads could be retained in areas with dry and/or sandy soils that are relatively stable. However, conservation of a diversity of grasses, wildflowers and pollinating insects could be accomplished most effectively by managing some sections of powerline corridors to favor herbaceous plants instead of shrubs. This approach has already been used in sites with dry soils. Perhaps this could be done at additional sites that are easily mowed or where there is already a rich diversity of herbaceous plants or a population of threatened wildflowers.

References

Askins R.A. 2001. Sustaining biological diversity in early successional communities: the challenge of managing unpopular habitats. Wildlife Society Bulletin 29: 407–412.

Askins, R. A. 2002. *Restoring North America's Birds. Lessons from Landscape Ecology* Second Edition. Yale University Press, New Haven, CT.

Askins, R. A., C. Folsom-O'Keefe, and M. Hardy. 2012. Effects of vegetation, corridor width and regional land use on early successional birds on powerline corridors. PLoS One 7(2): e31520.

Bramble, W.C., W.R Byrnes, and R.J. Hutnik. 1990. Resistance of plant cover types to tree seedling invasion on an electric transmission right-of-way. Journal of Arboriculture 16: 130-135.

Bramble W.C., R.H. Yahner, and W.R. Byrnes. 1994. Nesting of breeding birds on an electric utility right-of-way. Journal of Arboriculture 20: 124–129.

Confer J.L. and S.M. Pascoe. 2003. Avian communities on utility rights-of-ways and other managed shrublands in the northeastern United States. Forest Ecology and Management 185: 193–205.

Dettmers R. 2003. Status and conservation of shrubland birds in the northeastern U.S. Forest Ecology and Management 185: 81–93.

Dreyer, G.D. and W.A. Niering. 1986. Evaluation of two herbicide techniques on electric transmission rights-of-way: Development of relatively stable shrublands. Environmental Management 10: 113-118.

Johnstone, R.A. 1990. Vegetation management: mowing to spraying. Journal of Arboriculture 16: 186-189.

King, D.I. and B.E. Byers. 2002. An evaluation of powerline rights-of-way as habitat for early-successional shrubland birds. Wildlife Society Bulletin 30: 868-874.

King, D.I., R.B. Chandler, J.M. Collins, W.R. Petersen, and T.E. Lautzenheiser. 2009. Effects of width, edge and habitat on the abundance and nesting success of scrub–shrub birds in powerline corridors. Biological Conservation 142:2672-2680.

King, D.I., K.H Nislow, R.T Brooks, R.M DeGraaf and M. Yamasaki. 2011. Early-successional forest ecosystems: far from “forgotten”. Frontiers in Ecology and the Environment 9:319-320.

King, D.I. and S. Schlossberg. 2014. Synthesis of the conservation value of the early-successional stage of succession in eastern U.S. forests. Forest Ecology and Management 324: 186–195.

Niering, W.A. 1958. Principles of sound right-of-way vegetation management. Economic Botany 12: 140-144.

Niering, W.A. and R.H. Goodwin. 1974. Creation of relatively stable shrublands with herbicides: Arresting "succession" on rights-of-way and pastureland. Ecology 55: 784-795.

Russell, K.N., G.J. Russell, K.L. Kaplan, S. Mian, and S. Kornbluth. 2018. Increasing the conservation value of powerline corridors for wild bees through vegetation management: an experimental approach. Biodiversity Conservation doi.org/10.1007/s10531-018-1552-8.

Schlossberg, S. and D.I. King. 2015. Measuring the effectiveness of conservation programs for shrubland birds. Global Ecology and Conservation 4: 658–665.

Yahner R.H., R.D. Ross, and R.T. Yahner. 2004. Long-term effects of rights-of-way maintenance via the wire-border method on bird nesting ecology. Journal of Arboriculture 30: 288–294.

Wagner, D.L., M.W. Nelson, and D.F. Schweitzer 2003. Shrubland Lepidoptera of southern New England and southeastern New York: ecology, conservation, and management. Journal of Forest Ecology and Management 185: 95-112.

Wagner, D.L., J.S. Ascher, and N.K. Bricker. 2014a. A transmission right-of-way as habitat for wild bees (Hymenoptera:Apoidea: Anthophila) in Connecticut. Annals of the Entomological Society of America 107: 1110-1120.

Wagner, D.L., K.J. Metzler, S.A. Leicht-Young, and G. Motzkin. 2014b. Vegetation composition along a New England transmission line corridor and its implications for other trophic levels. Journal of Forest Ecology and Management 327: 231–239, DOI: 10.1016/j.foreco.2014.04.026