Shrub Communities as Inhibitors of Plant Succession in Southern Quebec

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ABSTRACT / The purpose of our research was to identify shrub species growing in southern Quebec that inhibit ecological succession in power-line corridors. Results are presented in three parts. First, clonal characteristics that allowed the establishment of stable communities were identified. Second, successional vector analysis identified those species that have the potential to inhibit succession. In poorly drained sites those species were Cornus stolonifera, C. obliqua, Salix petiolaris, and Spiraea alba. In well-drained sites, those species were Zanthoxylum americanum, Rubus idaeus, Spiraea alba, Rhus typhina, and Thuja occidentalis. Third, analysis of variance showed that there is a significantly larger number of tree seedlings found in adjacent herbaceous communities than found under the dense cover of Cornus stolonifera, C. obliqua, Salix petiolaris, Spiraea alba, Rhus typhina, Rubus idaeus, Thuja occidentalis, and Zanthoxylum americanum. These results indicate that the planting of selected shrub species could, through biological control, delay reforestation.

Relatively stable shrub communities of eastern North America are far less known or exploited by man than are the desert or semidesert shrub communities of the southwest mentioned by McKell (1989). Where low shrub vegetation exists, it is associated with distinct edaphic characteristics. For example, in the Northeast, herbaceous and shrub communities near streams are maintained by recurrent disturbances (Morin and others 1989). Such shrub communities are dominated by Alnus rugosa (Curtis 1959, Dansereau 1959, Damman 1971, Niering and Goodwin 1974, Jean and Bouchard 1991). With the exception of alder communities, the dominance of eastern American shrub communities seems to have increased as a result of anthropic disturbances on forest ecosystems (White 1965) or abandoned fields. Some relatively stable shrub communities of the Northeast dominated by Gaylussacia baccata and Vaccinium angustifolium were described, with regard to disturbance, by Egler (1950), Pound and Egler (1953), and Bramble and Byrnes (1972). Niering and others (1986) also reported the presence of a shrub community dominated by Viburnum lentago that resisted the invasion of trees for at least 55 years. In Connecticut, Dreyer and Niering (1986) stated that the use of relatively stable shrub communities dominated by Gaylussacia baccata, Smilax rotundifolia, Corylus americana, and Kalmia latifolia is an efficient way of reducing herbicide applications in powerline rights-of-way (ROW). Gates (1942) in Michigan and Jean and Bouchard (1987) in southern Quebec reported the presence of Salix petiolaris and of Cornus stolonifera as dense shrub communities. All these studies indicate a link between shrub communities and an edaphic factor or anthropic disturbance. Major disturbances that affect the composition of the plant communities include the construction of electrical transmission lines or gas pipelines (Lathrop and Archbold 1980, Grigal 1985) as well as treatment of the ROW with herbicides.

The aforementioned studies are descriptive and do not utilize multivariate statistical methods to characterize the species composition of the shrub communities. The purpose of the present paper is to demonstrate, by use of successional vectors and analysis of variance, that some shrub species growing in southern Quebec may inhibit ecological succession. Planting and propagation of these species offer an alternative to existing methods of vegetation control around electrical transmission lines.

Study Site

The power line under study occupies a long, narrow strip of land, referred to as a corridor (Forman and Godron 1981), in the Municipalité Régionale de Comté (MRC) du Haut-Saint-Laurent. The MRC is in the southwest of Quebec, and is bordered by the St. Lawrence River to the north, and the state of New York (USA) to the south (Figure 1). The corridor is...
the right-of-way of a transmission line in service since 1978. Within this corridor, a 60-m-wide strip was cleared for the construction of the transmission line.

The region has a humid continental climate with cool summers. The annual average temperature is 6.1°C in Huntingdon (elevation 75 m) with an average temperature of −10°C in January and 20.8°C in July (Anonymous 1982). The average freeze-free period is 140 days (Huntingdon). The annual number of degree-days of growth is approximately 2093°C (Wilson 1971).

The territory and its vicinity lie on a bed of dolomite, limestone, and shale of the Beekmantown group, represented as the Beauharnois formation (Globensky 1981). Glacial recession occurred between 12,500 and 12,000 years BP (before present) (Prichonnet 1977) and left a glacial relief characterized by: (1) northeast/southwest drumlinoid forms, (2) roughly east–west forms surrounding the transition zone between the St. Lawrence lowlands and the foothills of the Adirondacks, (3) moraine islets buried in marine accumulation plain, and (4) moraine bumps and hollows suggesting ice disintegration (Bariteau 1988). The horizontal or slightly undulating flat marine plain is clearly dominated by gley soils with poor drainage (Mailloux and Godbout 1954). Podzols are found on acid and coarse-textured materials and eluvial brown soils are found on the numerous well-drained moraines. Gley soils often exhibiting peaty or organic surface deposits occupy hollows where drainage is very poor.

The region under study is located within the hickory–maple climax (Grandtner 1966), which is part of the deciduous forest of the Great Lakes and St.