MAN-CREATED STABLE LOW VEGETATION UNDER A ROADSIDE UTILITY LINE NORFOLK, CONNECTICUT

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INTRODUCTION

The purpose of this paper is to describe the results of 37 years of observation and management of the vegetation under a utility line along a 1-1/4 mile length of the rural North Colebrook Road in Norfolk, Connecticut. This paper is also a progress report on this area since the vegetation continues to be observed and managed, and because Vegetation is always dynamic. The road has been under botanical and sociological observation with respect to town government and utility corporation management, since 1946 under Egler's partial influence with respect to the management, since 1968 under scientific management for the root-killing of remaining unwanted trees. With the aid of a much appreciated grant from the Electric Power Research Institute for 1982 and 1983, this root-killing has involved the research use of Picloram with 2,4-D (Dow's Tordon RTU diluted to half-strength), and is now essentially completed. The critical problems of obtaining a stable non-tree vegetation under the wires goes back in history to early mis-management practices - typical of most of New England, and thus those situations are summarized in this paper.

The road lies in an area of the beech-birch-maple-hemlock forest Zone (Egler, 1940) characterized by beech (Fagus grandifolia), yellow birch (Betula lutea), sugar maple (Acer saccharum), and hemlock (Tsuga canadensis), white pine (Pinus strobus) in the old pastures, and with red maple (Acer rubrum) generally common throughout and often a dominant on wet sites. (The so-called "Northern Hardwood Forest" is not considered a suitable scientific concept; it is a physiognomically-determined Cover Type that exists in several distinct Zones.) Hickories and oaks (except red oak, Quercus rubra) are absent, except on some of the higher, drier "southern-like" monadnockoid summits. The results of this study can be extrapolated to other parts of the Zone in the Northeast, especially the lower elevations of the Adirondacks, the Green Mountains and the White Mountains, as well as to analogous parts of the southern Appalachians.

HISTORY

The history of North Colebrook Road begins in the late 1700's and the founding of the Town of Norfolk. At peak population there were seven subsistence farms on the road, together with a one-room schoolhouse, with no mature forests adjacent to the road. In 1925 there were still three working farms, producing milk as

a "cash crop". The last farm was abandoned after the home burned in 1935. The road was black-topped in the early 1950's.

Town management of the roadsides is typical of many towns in Connecticut; it is now done with back-hoe/bucket loaders, mowing machines, a minimum of hand-labor, and little knowledge of the plant-life. (A serious effort was made by Egler to cooperate with the Town in the 1950's, but it was not successful, nor have other efforts since then been successful.) Winter sanding, spring sweeping of the sand to the sides, occasional re-surfacing and patching and heavy sanding, together with earth-moving operations without regard for the sites, have left crushed blacktop edges, small "levees" of brushed-aside sand, the original drainage ditch filled, unsightly piles and gouges, and taller vegetation at the outer margins.

Utility company management in general, until recent years, has resulted in the perpetuation, if not an increase, in the vegetation problems under the wires. Two decades ago, it was standard engineering specifications of the utility companies, for implementation by the brush-control contractors, to remove all vegetation within three feet of the wires. This resulted in two effects: an unsightly under-the-wire "crewcut", or a "tunnel" thru the forest canopy. With this practice, vegetation has to be repruned every three years to maintain the proper minimum distance from the wires. No attempt was ever made to remove the entire population of under-the-wire trees, only those branches that might reach the wires in the next three years. However, the crews of the contractor would generally comply with the personal requests of an adjacent landowner if they did not interfere with their minimum-distance-from-the-wire goal.

Scientific Roadside Vegetation Management was first begun on a phone line coming from the east (the Town of Colebrook) which has since been removed. In the 1940's, since selective basal dormant spraying with a herbicide/oil mixture had been shown effective, Egler treated all the basal tree sprouts, and even those of all shrubs, in the 180 feet between poles. Brush was purposely left surrounding each pole, as a demonstration to the utility company personnel (which they never noticed). By the early 1950's, phone service was switched to that coming from the west; the line was removed, but to this day there is a cluster of trees where each pole had been.

From 1968 on, Egler took over the task of tree removal under the utility lines along North Colebrook Road. Originally this was accomplished by cutting with a brushhook, and girdling the larger trees. For this road, it was usually found that the crews of the contractors were intelligent, or at least cooperative (tho they were not formally or legally obligated to comply). It was requested

(1) that they cut no "ground brush" (trees rooted under the wires); and (2) that they limit their activities to clear-boling the adjacent trees (cutting off the side-limbs close to the trunk, thus eliminating repeated pruning of those branches and improving the esthetic appearance).

Beginning in 1980, the Tordon root-killing project was expanded to include the stable, low, under-the-wire roadside vegetation of North Colebrook Road. At this time, the brush-control crew was scheduled for its three-year-retreatment of this road. They cooperated fully with Egler: they helped to selectively cut, and to spray with Tordon, the larger trees. In 1983, when the same crew foreman came thru for an inspection, he decided that no treatment was needed. This was the first time in his experience that any such rural road did not need the customary three-year-treatment, this despite the company forester's objections that this is the "worst" roadside, in terms of "brush", in the town.

Since the root-killing aspect of this work ("plant-community construction") is essentially completed, emphasis in this paper focuses upon the composition and structure of the remaining plant-communities, with economic concern for the future maintenance activities. There is nothing new or unusual in this scientific approach for roadsides (Egler 1953, 1957, 1961, 1971, 1973, 1975, 1979). The idea is entirely compatible with our scientific knowledge of the long-term stability of many scrublands around the world: chaparral, garrigue, fynbosch, heath balds,etc. (Egler 1977, Niering and Egler 1955, Pound and Egler 1953, Egler and Anderson 1982, 1983 in press).

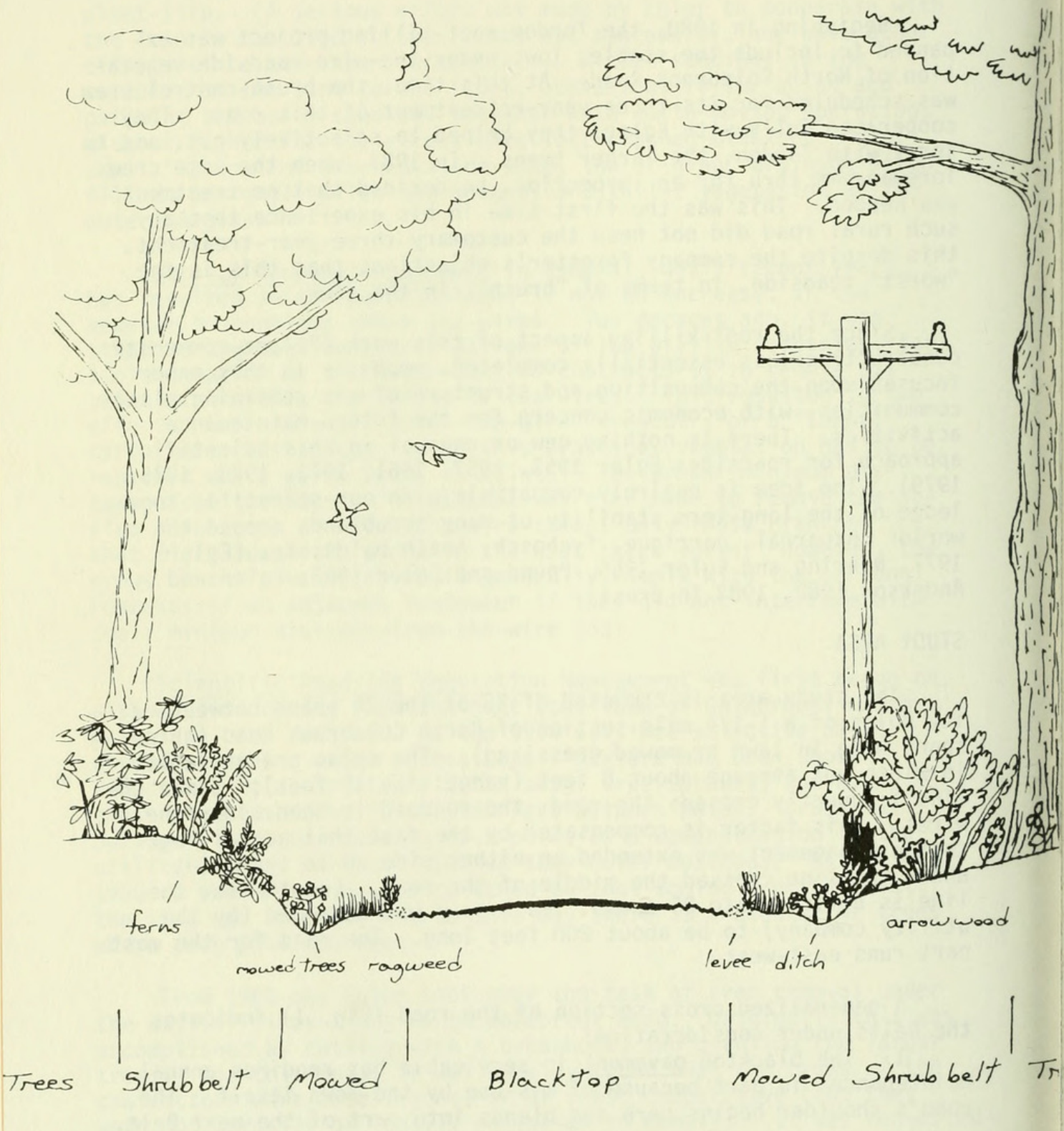
STUDY AREA

The study area is composed of 25 of the 28 spans between utility poles of a 1-1/4 mile section of North Colebrook Road (three spans were in lawn or mowed grassland). The spans are variable in width but average about 8 feet (range: 4 - 12 feet). Since the line frequently crosses the road, the roadbed is then under the wires. This factor is compensated by the fact that actual Vegetation Management was extended on either side up to the point where the line crossed the middle of the road. Lengthwise, the line is divided into 25 spans. Each span was designed (by the utility company) to be about 200 feet long. The road for the most part runs east-west.

A generalized cross-section of the road (Fig. 1) indicates the Belts under consideration:

1. The blacktop pavement is servicable but requires annual maintenance, in part because of mis-use by the Town itself. The road's shoulder begins here and blends into part of the next Belt.

Road Cross-Section



2. The mowed strip is one-cutter-bar wide (but sometimes unnecessarily two wide). It is rough, stony, with a line of ragweed at the pavement edge, and an assortment of herbs and small trees elsewhere.

3. The shrub belt is the site of this special study, composed of what shrubs nature has put there, plus what herbs are under or between the shrubs. No species need to be planted by landscapers.

4. Beyond the shrub belt lies the tree belt --the forest-- on town or private property. The trees on the edge of the shrub belt have been clear-boled, producing tall, straight trunks, with high, large, healthy branches overarching the wires (which is actually protection to the wires in severe weather).

METHODS

Refer to Egler and Anderson (in press) for the root-killing research on trees under the wires. For this plant-community study, the road was walked and notes recorded by both investigators on five days in September and October, 1983, for a total of approximately 34 man/hours. All shrub species and all significant or obvious herbaceous species within the Shrub Belt of each span (with each span considered one study unit) were identified and given an Abundance rating: Abundant (patches or the aggregate of spaced individuals which have a ground coverage or canopy of at least 25% by ocular estimate), Rare (single individuals, few scattered individuals and very small groups which cover less than 5% of a span); Intermediate (all others). Site conditions and special notes were recorded for each unit. Newly invading trees were carefully watched for. Observations of the line as a whole were also recorded.

The field data have been purposely restricted to species identification, ocular estimate of Abundance, plus descriptive comments. It is the opinion of the authors that these are fully adequate, since the entire study area was surveyed (not sampled), because of the authors' long and intimate familiarity with the roadside vegetation and its history, and because this is a paper which expresses the link between basic research and the subsequent application of a method by technicians and professionals managing R.O.W.'s.

RESULTS

Forty species of shrubs and small trees and 62 species of herbaceous plants were involved in the study units. Most were Rare under the utility line (25 of the woody plants and 50 of the herbs). Only 10 woody plants and 7 herbs were recorded as being Abundant at least once. Five to 10% of the line was sparsely vegetated (having some bare soil). Approximately one quarter of all study units combined were covered with Patches. (A Patch being loosely defined as one or more individuals of one plant species

which are predominant in an area, to the general exclusion (90% pure) of all other species, and dense enough so the ground is entirely covered. So called Patches of herbs and low shrubs here cover areas of at least 25 square feet and larger shrubs at least 100 square feet).

Nearly all sites had well drained soils. Only one study unit, and less than half of it, was on poorly drained soil and had two wetland species: the blue swamp aster (Aster puniceus) and a sedge (Carex crinita). No sites were classified as excessively drained, i.e. "arid". Most sites were characterized as light shade. Six sites were considered shady (two extremely so) and five sites were in bright light. These conditions were related to the height and density of the adjacent forests on both sides of the road. Thirteen and one half units were on the north side of the road and the remaining eleven and one half were on the south side.

In the Tree Belt adjacent to the Shrub Belt, the predominant tree species were red maple and white ash (Fraxinus americana). Other common trees were white pine, sugar maple and red oak. Hemlock deserves special note because,though infrequent, the average hemlock on this line creates dense shade, even across the road. All other tree species were incidental in occurrence and numbers, despite local influence.

Sensitive fern (Onoclea sensiblilis) and arrowwood (Viburnum recognitum were the two species which provided 16% and 7% of the total cover respectively, and occurred as Abundant more often than any other species. They also had the greatest overall occurrence (with the exception of choke cherry (Prunus virginiana). Arrowwood composed the largest and most frequent Patches (the longest continuous Patch is 450 feet in length).

Species which were frequently classed as Patches, or scattered but of intermediate abundance, and therefore contributed importantly to the groundcover over the entire line, include: snakeroot (Eupatorium urticaefolium), interrupted fern (Osmunda claytoniana), lady fern (Athyrium filix-femina), choke cherry, and hay-scented fern (Dennstaedtia punctilobula). Other species which were important locally as Patches, though not necessarily rated as Abundant, and also of high Constancy (present in many study units) include: buckthorn (Rhamnus catharticus), meadowsweet (Spiraea latifolia), blackberry (Rubus allegheniensis), nannyberry (Viburnum lentago), maple-leaved viburnum (Viburnum acerifolium), witherod (Viburnum cassinoides), staghorn sumac (Rhus typhina), winterberry (Ilex verticillata), shadbush (Amelanchier arborea and A. laevis), and grape (Vitis labrusca). Other species which formed Patches but were apparently not spreading on the study area and occurring only at one location include: ostrich fern (Matteucia struthiopteris), tapering fern (Thelypteris noveboracensis),

orange day-lily and lemon day-lily (Hemerocallis fulva and H. flava), lilac (Syringa vulgaris), wild plum (Prunus americana), silky dogwood (Cornus amomum), and witch-hazel (Hamamelis virginiana).

DISCUSSION

This roadside is now a highly successful demonstration of ecologically sound Vegetation Management (Egler 1954, 1975, 1977). The vegetative and sexual reproduction of undesirable plant species under the utility wires has been arrested and at most sites is now essentially eliminated. We estimate that under-the-wire retreatment will not be necessary for at least 15 years, and even then the work will be substantially reduced when compared with those roadsides which are butch-cut and hole-cut and indiscriminately herbicided every three years. Some Patches on this line, on the basis of research by Niering and Egler (1955, restudied in 1983), may not need another treatment for 50 years.

For proper scientific Vegetation Management it is necessary not only to understand the characteristics and dynamics of Vegetation Types but also to understand how each species and community functions within its environment (in this case a casually managed roadside). The preferred Vegetation for under roadside utility lines is one of dense, stable shrublands and herblands (but NOT grasslands, which are seedbeds for several tree species, especially when mowed). Trees cannot be tolerated directly under the wires, however, trees alongside can be clear-boled. Low tree types are probably best avoided, but whether certain low trees are left should be decided on a species by species basis (for example, apples and shadbushes can generally be left for aesthetic and wildlife values, though they may need occasional top pruning).

The important species on the North Colebrook roadside are discussed below as to their form, structure, requirements, behavior, merits and disadvantages.

Sensitive fern. Grows to 2 feet. Is clonal, and spreads easily into disturbed areas(though a clone can be destroyed itself by disturbance) and into many plant communities (grasslands, under shrubs, etc.). They need never be mowed even when adjacent to the pavement. Found in full sun or shade, but heavy shade will cause it to die-out. Found in somewhat dry to occasionally wet sites, but does not occur in the extreme conditions of dry or wet. No other plant is yet known to invade and dominate a dense, healthy stand of this fern. Clones are generally long-lived. Benefits: soil stabilization; often considered aesthetically pleasing; fertile fronds and spores have some value as a wildlife food.

Arrowwood. Grows to 7 feet. Forms a dense clump of straight but flexible stems from a single crown (up to 10 feet in diameter). Will layer readily (large plants especially prone to this after

winter snows and ice bend the stems to the ground). Colonizes disturbed areas (mowed, grazed, plowed, and scraped lands) mainly by seeds distributed by birds. Found in sun or light shade (shading causes the plant to lose vigor and it will generally die-out under forests). Found in somewhat dry to occasionally wet sites, but not in the extremes. The canopy and root-system forms a dense groundcover; no woody species are known to invade a large, healthy stand of this shrub. It is long-lived in sunny locations. Benefits: attractive in form, flower and fruit; has a high wildlife value (birds and small mammals eat the fruits; insects feed on the nectar; deer and beaver feed on the stems - and can reduce or destroy a stand; provides cover for wildlife). Large plants are susceptible to winter storm damage, causing stems close to the road to lie in it, and in extreme cases flattening a stand (though generally this will resprout and layer). These large plants, after 20 years next to the pavement, may need cutting (but NOT root-killing).

Snakeroot. Grows to 3 feet. Is clonal; spreads as single stems, or sometimes several stems from one crown. Found in full sun or forest shade. Found on mesic sites. It often forms pure stands in the shade; most stands in full sun are a mixture with other herbs, though the snakeroot can be predominant. It is not generally found in shrub communities. This plant has recently become aggressive. It is not eaten by whitetail deer. Benefits: forms a groundcover and stabilizes soil in shady situations; when the plant is in blossom it can be attractive; the seeds provide some food for birds.

Interrupted fern. Grows to 4 feet. Is clonal but grows in clumps, with many fronds growing from one crown. Found on mesic to mostly wet (but not standing water) sites. Found in sun or shade. Not an aggressive speader, but persistant once established. Benefits: aesthetically attractive. Should not be mowed.

Lady fern. Grows to 2 feet. Is clonal, spreading in clumps. Found in sun or shade. Found on many sites, but not in the extremes of wet or dry. Not an aggressive spreader, but can form a tight, complete groundcover. Benefits: aesthetically attractive. Should not be mowed.

Choke cherry. Grows rarely to 30 feet. Sometimes clonal; a cluster of stems is usually a clone. Found in sun or partial shade; does not tolerate the shading within most forest situations. Found on mesic to dry sites. Can be an aggressive spreader in grasslands and some other herblands, and in bare soil and disturbed areas. Seed is mostly distributed by birds. Benefits: attractive for its spring flowers; cherries provide food for birds and small mammals. In some areas and in some years it is attacked by tent caterpillars which can top kill the plant. This cherry's height has not been a problem under these utility lines, and dense clones do

not generally grow as rapidly or as tall as single individuals.

Hay-scented fern. Grows to 2 feet. Is clonal; fronds arise individually, not as a clump. Found in full sun or forest shade. Found on mesic to dry sites. A very aggressive spreader into most plant communities, except very dense shrublands and very dense conifer stands. This plant is not eaten by whitetail deer, and,therefore, may become much more abundant where high deer populations persist. A clone is extremely long-lived. Benefits: aesthetically attractive; a soil stabilizer. Not considered of any benefit to wildlife (perhaps provides some cover); no wildlife species is known to feed on this plant (though some invertebrates must, but there never seems to be any damage). The cover formed, though low, is very dense, making summer foot travel often difficult. It should not be mowed.

All other species mentioned in the Results section are important plants for creating non-forest, stable plant-communities in the Northeast. However, they have much less occurrence, abundance or importance on this local roadside than the above species. Many of their attributes are similar though, and abundances may shift over time.

Special mention should be made of certain alien plant species on this roadside because they are extremely stable and unusually colorful and appealing in bloom. The orange and lemon day-lilies are clonal, but, though persistant, they do not spread rapidly or aggressively often (except when the town scrapes clean the ditches or plows snow too close to the road edge and moves the plant's tubers into newly bared soil). Growth in the spring is early, providing a spot of green when it is most desired. The flowers bloom most of the summer, and the lemon day-lily is pleasantly scented. They can both form pure Patches, resisting all invasions, but they cannot survive long in too shady a site. They both bloom best in full sun. The orange day-lily does not produce seed or hybridize, but the lemon day-lily can produce hybrid seedlings if a different fertile clone is nearby. The day-lilies should not be mowed, but if they are within reach of the tractor's mowing bar, they usually are.

The Patches of lilac and plum occur near one another on this roadside and produce an impressive display and aroma in spring. Both are clonal, but are increasing only slowly in size. The older plums were severely affected by a bark disease in 1982. The plum rarely has produced seedlings; the lilac has never produced seeds. These two are found near an old homesite, as is usually the case with non-native ornamentals along roads.

Even relatively pure roadside Patches have a mix of various species within them. Sensitive fern often occurred with, and does well under, arrowwood as long as the stems remain somewhat up-

right. However, where the stems bend to the ground the fern thins or is non-existent. It is expected that as these shrubs become larger this loss of fern (and other species as well) will increase, thereby purifying this Viburnum community even more.

Under most other shrubs (with more upright growth) sensitive fern and the other common herbs occurred, generally thin and scattered, but frequently thriving. Meadowsweet and blackberry were two exceptions, never having a significant herbaceous layer under them when they occurred as Patches.

Other common local shrubs that would be very highly desirable, were they to have occurred under the wires, because of their ability to form stable communities include: high-bush blueberry (Vaccinium corymbosum), low blueberry (V. angustifolium), mountain laurel (Kalmia latifolia), sheep-laurel (K. angustifolia), gray and red-osier dogwood (Cornus racemosa and C. stolonifera), chokeberry (Aronia melanocarpa), flowering raspberry (Rubus odoratus), Japanese barberry (Berberis vulgaris), spicebush (Lindera benzoin), (Phragmites communis), the goldenrods (Solidago, several species), maleberry (Lyonia ligustrina), juniper (Juniperus communis), sweet-fern (Myrica asplenifolia), and beaked hazel (Corylus cornuta).

As mentioned in the Introduction to this paper, the results of this study can be extrapolated within the beech-birch-maple-hemlock Zone as described by Egler (1940, 1977). This Zone roughly parallels the southern boundary of the biome known as Taiga (and can be considered a part of it). At least in the eastern United States, all the important species of this study occur and will generally behave as described here. Specific extrapolation to other zones is not recommended since many of the species do not occur, may behave differently (such as not forming Patches or occurring only rarely and scattered), or other species not mentioned may hold greater promise for forming attractive, stable plant communities. However, the general principles shown by this study can be applied anywhere in the world, provided an understanding of the Vegetation of the study/management area is available. When it is known which plant-communities and species form stable communities, when it is known which species can prevent or disturb community stability, and when it is known how the various species and communities react to possible managment practices, then choices can be made as to what is appropriate in many different situations needing management. Additionally, the results of this study can be extended beyond road-side utility line ROW's to provide some solutions to problems on any ROW, vistas, wildlife management areas, eroding sites, or any area where low, stable vegetation is desired (such as employed in naturalistic landscaping).

CONCLUSION

Now that techniques for root-killing undesirable plants have been proven, and these plants have been essentially eliminated from this study area, the desirability and long-term stability of various plant-communities can be reported (and be observed through the future). The species on this roadside today have obviously benefited from the removal of trees under the wires. Though shrubs (especially: arrowwood, choke cherry, buckthorn, nannyberry, blackberry, lilac, silky dogwood and meadowsweet) appear to offer the best resistance to tree invasion (and human disturbance), while at the same time being highly attractive, various herb communities can also be very stable (especially those containing: sensitive fern, snakeroot, interrupted fern, lady fern, hay-scented fern, ostrich fern, and orange day-lily). What this study shows us is that we can achieve management objectives under utility lines (and other situations requiring low vegetation) while the solution can be long-term, low-maintenance, attractive to humans and wildlife, and preserve diversity, a necessity for both people and the Earth as a whole.

Abundance ratings of all species on 25 study units of North Colebrook Road, Aton Forest, Norfolk, Connecticut.

+ forms Patches on study area.
* alien species.

Species	Auth.[1]	Abundance Rating Rare	Int.	Abun.[2]
Equisetum arvense (common horsetail)	GI:13	3	1	0
Osmunda regalis (royal fern)	GI:25	1	0	0
O. cinnamomea (cinnamon fern)	GI:25	5	0	0
O. claytoniana (interrupted fern) +	GI:25	10	1	4
Dennstaedtia punctilobula (hay-scented fern)+*	GI:28	2	2	3
Pteridium aquilinum (bracken)	GI:28	5	0	0
Matteucia struthiopteris (ostrich fern)+	GI:37	1	0	1
Onoclea sensibilis (sensitive fern)+	GI:37	10	5	8
Athyrium filix-femina (lady fern)+	GI:43	14	5	1
Thelypteris phegopteris (beech fern)	GI:48	4	0	0
T. noveboracensis (tapering fern)+	GI:48	1	0	0
Dryopteris austriaca (spinulose shield fern)	GI:52	1	0	0
D. marginalis (marginal shield fern)	GI:54	1	0	0
Bromus catharticus (brome grass)	GI:106	1	0	0
Agropyron repens (quack grass)	GI:139	1	0	0
Brachyelytrum erectum (woodland grass)	GI:180	1	0	0
Carex crinita (sedge)	GI:356	1	0	0
Arisaema triphyllum (Jack-in-the-pulpit)	GI:367	3	0	0
Hemerocallis fulva (orange day-lily)*+	GI:411	0	1	1
H. flava (lemon day-lily) *	GI:411	1	0	0
Lilium canadense (Canada lily)	GI:417	1	0	0
Smilacina racemosa (false Solomon's seal)	GI:426	2	0	0
Convallaria majalis (lily-of-the-valley)*	GI:431	1	0	0
Trillium erectum (red trillium)	GI:433	1	0	0
Smilax herbacea (carrion flower)	GI:435	3	0	0
Salix discolor (pussy willow)	GII:20	3	0	0
Carpinus caroliniana (bluebeech)	GII:32	4	0	0
Alnus rugosa (speckled alder)	GII:36	3	0	0
Castanea dentata (American chestnut)	GII:39	1	0	0
C. crenata (Japanese chestnut)*	B333,H231	1	0	0
Urtica dioica (stinging nettle) *	GII:54	1	0	0
Asarum canadense (wild ginger)	GII:61	1	0	0
Polygonum cilinode (fringed bindweed)	GII:84	1	0	0
Actaea alba (doll's eye baneberry)	GII:158	2	0	0
A. rubra (red baneberry)	GII:158	2	0	0

Table continued

Species	Auth.	Abundance Rating Rare	Int.	Abun.
Thalictrum polygamum (meadow rue)	GII:161	14	0	0
Anemone virginiana (windflower)	GII:180	1	0	0
Clematis virginiana (virgin's bower)	GII:184	7	0	0
Berberis thunbergii (Japanese barberry)*	GII:190	6	0	0
Lindera benzoin (spicebush)	GII:193	1	0	0
Sedum telephium (live-forever) *	GII:257	1	0	0
Tiarella cordifolia (foamflower)	GII:265	2	0	0
Ribes sp. (gooseberry)	GII:274	1	0	0
R. sativum (garden currant) *	GII:279	1	0	0
Hamamelis virginiana (witchhazel)	GII:280	3	0	0
Spiraea latifolia (meadowsweet) +	GII:286	11	3	1
Rubus allegheniensis (blackberry) +	GII:310	9	1	2
R. strigosus (red raspberry)	GII:316	11	2	0
Rosa sp. (green-stemmed rose) * +	B534,H975	1	0	0
R. multiflora (multiflora rose) *	GII:323	6	0	0
Prunus virginiana (choke cherry) +	GII:329	15	6	3
P. pensylvanica (pin cherry)	GII:331	3	0	0
P. americana (wild plum) +	GII:332	0	0	1
Pyrus malus (apple) *	GII:335	9	0	0
Amelanchier laevis, A. arborea (shadbush) +	GII:377	9	1	0
Amphicarpa bracteata (hog peanut)	GII:450	0	1	0
Rhus radicans (poison-ivy)	GII:495	2	0	0
R. typhina (staghorn sumac) +	GII:496	3	1	2
Ilex verticillata (winterberry)+	GII:500	7	1	0
Celastrus scandens (bittersweet)	GII:502	1	0	0
Acer spicatum (mountain maple)	GII:507	5	0	0
A. pensylvanicum (striped maple)	GII:507	3	0	0
Impatiens biflora (touch-me-not)	GII:512	2	0	0
Rhamnus catharticus (buckthorn) * +	GII:514	3	0	2
Vitis labrusca (fox grape) +	GII:519	3	0	1
Parthenocissus quinquefolia (Vir.creeper)	GII:520	2	1	0
Aralia racemosa (spikenard)	GII:605	2	0	0
Umbelliferae (an Umbellifer)	GII:606	1	0	0
Aegopodium podagraria (goutweed)	GII:622	1	0	0
Cornus alternifolia (alt.-leaved dogwood)	GII:642	6	0	0
C. amomum (silky dogwood) +	GII:643	2	0	0
C. stolonifera (red-osier)	GII:644	1	0	0

Table, continued

Species	Auth.	Abundance Rating Rare	Int.	Abun.
Kalmia latifolia (mountain-laurel)	GIII:14	2	0	0
Vaccinium corymbosum (highbush blueberry)	GIII:31	1	0	0
Steironema ciliatum (steironema)	GIII:40	1	0	0
Syringa vulgaris (common lilac) *+	GIII:52	0	0	1
Gentiana andrewsii (bottle gentian)	GIII:63	1	0	0
Asclepias exaltata (milkweed)	GIII:75	1	1	0
A. syriaca (common milkweed)	GIII:76	6	0	0
Prunella vulgaris (self-heal)	GIII:154	1	0	0
Viburnum acerifolium (maple-leaved vib.)	GIII:292	1	1	0
V. cassinoides (witherod)	GIII:292	3	0	0
V. lentago (nannyberry) +	GIII:293	5	0	1
V. dentatum, recognitum (arrowwood)+	GIII:295	11	5	7
Sambucus canadensis (elderberry)	GIII:296	7	0	0
Valeriana officinalis (garden heliotrope)*	GIII:306	1	0	0
Helianthus tuberosus (Jerusalem artichoke)	GIII:337	1	0	0
Solidago juncea (summer goldenrod)	GIII:426	1	0	0
S. rugosa (rough-stemmed goldenrod)	GIII:430	19	1	0
S. gigantea (goldenrod)	GIII:432	2	0	0
S. canadensis (goldenrod)	GIII:432	2	0	0
S. graminifolia (grass-leaved goldenrod)	GIII:438	3	1	0
Aster macrophyllus (larged-leaved aster)	GIII:444	2	0	0
A. divaricatus (woodland white aster)	GIII:446	5	0	0
A. puniceus (marsh blue aster)	GIII:454	2	0	0
A. umbellatus (early tall white aster)	GIII:458	9	0	0
A. lateriflorus (small white field aster)	GIII:464	1	0	0
A. simplex (tall white field aster)	GIII:464	11	0	0
Erigeron annuus (annual erigeron)	GIII:472	2	0	0
Eupatorium perfoliatum (boneset)	GIII:491	2	0	0
E. rugosum, urticaefolium (white snakeroot)+	GIII:492	8	0	2
Lactuca canadensis (wild lettuce)	GIII:535	4	0	0

1. Authority on nomenclature; for further botanical information:
   G - Britton and Brown Illustrated Flora, H. A. Gleanson, 1948,or
   B - Manual of Cultivated Plants, L.H. Bailey, 1949, or
   H - Hortorium's Hortus Third, L.H. Bailey, 1976.
2. See Text, Page 4.

Bibliography

Egler, Frank E. 1940. Berkshire Plateau Vegetation, Mass. Ecol. Monogr. 10 (2): 145-192.

Egler, Frank E. 1953. Roadside brush control. An application of plant-community management. 28th National Shade Tree Conf. Prof. 1952: 59-70.

Pound, Charles E., and Frank E. Egler, 1953. Brush control in southeastern New York: fifteen years of stable treeless communities. Ecology 34 (1): 63-73.

Egler, Frank E. 1954. Vegetation Management for Rights-of-Way and Roadsides. From the Smithsonian report for 1953, pages 299-322. Smithsonian Institution, Washington, D.C.

Egler, Frank E. 1957. Roadside spraying - boon or bane? Garden Club of America Bull. 45 (5): 57-60.

Egler, Frank E. 1961. Roadside ragweed control knowledge and its "communication" between science, industry and society. Pp. 1430-1435 in Recent Advances in Botany. Univ. of Toronto Press: Toronto, Canada.

Egler, Frank E. 1971. The Romance of Roadside Ragweed. N.Y. State Conservationist 26 (1):27.

Egler, Frank E. 1973. Bibliography of (79) papers by F.E.E. concerning Rightofway Vegetation Management, Herbicides and Society. 8 p. Connecticut Conservation Association.

Egler, Frank E. 1975. Plight of the Rightofway Domain. Victim of Vandalism. 2 vols. 294 p., 160 p. Futura Pulbishing Co., Mt. Kisco, N. Y. 10549.

Egler, Frank E. 1977. The nature of vegetation. Its' management and mismanagement. 527 p. Egler: Norfolk, Ct. 06058.

Egler, Frank E. 1981. R/W Management and Herbicides: an iatrogenic disease of the technologic age, 1949-1979. Keynote Address of Environmental Concerns in Rights-of-Way Management, Second Symposium, 1979: 18 p.

Egler, Frank E. and John P. Anderson, Jr. 1982. Botanical studies in the stability of non-diversity: Cornus racemosa, Gray Dogwood. Conn. Botanical Soc. Newsletter 10 (3):1.

Bibliography, continued:

Egler, Frank E. and John P. Anderson, Jr. In press. Botanical studies in the stability of non-diversity: Taxus canadensis, Yew. Third Symposium on Environmental Concerns in Rights-of-Way Management, San Diego, Calif. 1982.

Egler, Frank E. and John P. Anderson, Jr. In press. Phytologia. Harold N. Moldenke & Alma L. Moldenke, Plainfield, N.J. 07060. Use of picloram to obtain ROOTkill of unwanted woody plants in practicable Rightofway Vegetation Management, 1982.

Egler, Frank E. and John P. Anderson, Jr. In press. Phytologia. Plainfield, N.J. 07060. Use of picloram to obtain ROOTkill of unwanted woody plants in practicable Rightofway Vegetation Management, 1983.