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AN EVALUATION OF CHEMICALLY-SPRAYED ELECTRIC TRANSMISSION LINE
RIGHTS-OF-WAY FOR ACTUAL AND POTENTIAL WILDLIFE USE

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AN EVALUATION OF CHEMICALLY-SPRAYED ELECTRIC TRANSMISSION
LINE RIGHTS-OF-WAY FOR ACTUAL AND POTENTIAL WILDLIFE USE^{1/}

Thomas Douglas Mayer^{2/}

Abstract.--A wildlife inventory, emphasizing three major game species in each state, was conducted on chemically-maintained rights-of-way in New Hampshire, Georgia and West Virginia. Plant cover types were evaluated and mapped on 27 plots in the three states. Results indicate that rights-of-way are comparable or superior in wildlife foods to adjacent unsprayed plots. Chemically-treated rights-of-way did show greater wildlife use than adjacent old-field habitats.

INTRODUCTION

The total land area beneath electric transmission lines increases each year. Periodic herbicidal treatment, used on most of these rights-of-way, serve a dual purpose: (1) to control undesirable vegetation, thus preventing the brush from growing into the conductors; and (2) to provide ready access for line inspection and repairs.

Many electric power company officials are becoming increasingly concerned about the environmental impact of such regular herbicidal applications, however, and this concern is a direct reflection of the increasing environmental awareness on the part of the general public. Of major concern at the present time is how herbicides change the normal successional trends on rights-of-way, and what the eventual plant make-up of the major communities will be as a result of the chemicals. Additionally, another prime concern is whether these plant communities will continue to be aesthetically desirable and valuable areas for song birds and other wildlife.

During the spring and summer of 1972, three chemically-controlled rights-of-way in the Eastern United States were studied to determine which plant communities were now dominating

these sites. Vegetation maps were prepared depicting the major species and areas of each community within 27 permanent study plots to show changes in these communities during the growing season.

METHODS

Vegetation study plots located on the rights-of-way were rectangular in shape and 1/5 acre in size. Vegetation was mapped by using a 100-foot tape with chaining pins dropped at 10-foot intervals on each end of the plot. All vegetation was mapped on graph paper, with each block representing one square foot.

All major plant communities then were identified and mapped. Communities which appear on the map usually form fifty percent or more of the composition. Predominance may be judged on the basis of abundance in the dominant and co-dominant plant communities. Society of American Foresters cover types (1973) were used to name woody plant communities. All woody vegetation was recorded, and each woody species was given a number and keyed.

These 27 plots were divided equally in three states: Nine plots were located in the heart of the Southern Pine Region beneath a transmission line in the Piedmont area of Georgia, near Athens; nine plots were located in typical northern hardwood stands (yellow birch-beech-sugar maple type) beneath a transmission line in New Hampshire, near Whittier; and nine were located in West Virginia, near Morgantown, an area of typical Appalachian hardwood types. Each of these areas contain

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an equal number of wet, average, and dry sites and each provides a cross-section of the plant community. Plots then were compared with adjacent old fields which at present are undergoing natural succession without the use of herbicide treatment. In selecting off right-of-way sites, consideration was given to areas which had not been recently utilized for active agriculture. Fields which previously had been used for improved pasture, or where grasses and legumes had been seeded, also were avoided.

Maps similar to those used for the permanent line plots were drawn. Plot corners of these areas were not marked, however, though detailed notes on their location were made.

The present studies were conducted at the request of the Edison Electric Institute, an organization of 185 investor-owned electric companies encompassing all 50 states. Travel and other expenses are being funded by the Institute through a grant to West Virginia University.

The edge effect as noted by Leopold (1936) has long been recognized as important for wildlife habitation. Transmission rights-of-way, due to their edge effect, have been shown to provide abundant food and cover value for many species of wildlife (Bramble and Byrnes 1972).

The purpose of this study was to determine the actual and potential wildlife food supply, plus the desirability of the habitat for major game animals in each of the three study regions.

PROCEDURES AND RESULTS

The three major game species in each area, as determined by the State Game and Wildlife Commission for each area, are:

West Virginia

White-tail deer	<u>Odocoileus virginianus</u>
Ruffed grouse	<u>Bonasa umbellus</u>
Eastern gray squirrel	<u>Sciurus carolinensis</u>

New Hampshire

White-tail deer	<u>Odocoileus virginianus</u>
Ruffed grouse	<u>Bonasa umbellus</u>
Woodcock	<u>Philohela minor</u>

Georgia

White-tail deer	<u>Odocoileus virginianus</u>
Cotton-tail rabbit	<u>Sylvilagus floridanus</u>
Bob-white quail	<u>Colinus virginianus</u>

In estimating wildlife values of the above-listed areas both present use and potential habitat were studied, since desirable habitat does not necessarily imply current use.

The most abundant plant communities on these line areas were rated for wildlife value, using the existing ratings from Martin, Zim and Nelson (1951), in order to determine the value of the major plants as wildlife food for each of the three prime game species listed. In this rating, asterisks have been used instead of percentage figures to indicate the extent of use for food. There are two reasons for this usage: (1) There is a danger of attributing unwarranted finality or accuracy to data on food habits as expressed in percentages. An approximate, tentative picture of an animal's food habits, or the extent of its use of a plant for food, is all that could be attempted or implied; and (2) Rating by the use of asterisks provides a simple, see-at-a-glance method in which findings readily receive attention (Martin et al. 1951).

These rankings are primarily based directly on percentages from food-habits tabulations. The system as used here has the following approximate percentage equivalents:

+ = 0.5 to 2% of diet
 * = 2 to 5% of diet
 ** = 5 to 10% of diet
 *** = 10 to 25% of diet
 **** = 25 to 50% of diet
 ***** = 50% or more of diet

All items preceded by one or more asterisks are likely to have some importance for the wildlife species concerned. As can be seen, there are few 5 star items, since these are so exceptional that they imply a unique relationship between a wildlife species and a particular plant group. In these cases, therefore, the actual percentage base also is given, as a matter of interest (Martin et al. 1951).

Color-coding of existing vegetation maps showing plant communities may be used to illustrate the importance of each recognized community for the major game species in each area.

Overlays, prepared for the 27 vegetation maps used in the power line research areas, show potential use of these plant communities by the three major game species in each state.

In comparing the desirability of vegetation on power line areas with that on adjacent old fields, the area and desirability ratings for each community on both line areas and on old fields were contrasted, using group t-tests (Table 1).

Table 1.--Results of group t-tests comparing potential use of power line areas and old fields for the three major game species in each state.

State	White-tail deer	Ruffed grouse	Game Species		Cotton-tail rabbit	Gray Squirrel
			Wood-cock	Bob-white quail		
New Hampshire	N.S.	*	*	---	---	---
West Virginia	N.S.	N.S.	---	---	---	N.S.
Georgia	*	---	---	N.S.	N.S.	---

* Power line potential use significantly better than old fields at the 0.05 level.
N.S. Indicates non-significant difference.

Table 2.--Results of browse study on West Virginia line area showing total number of stems and percent of actual use.

	Power Line Area	Power Line Edge	Interior of Adjacent Woods	Total
Number of Browsed Stems	142	204	143	489
Number of Unbrowsed Stems	361	392	125	878
Total	503	596	268	1367
Percent Actual Use	28.2	38.0	53.0	

Results indicate that power line habitats are comparable or even occasionally superior in preferred wildlife food plants to the habitats measured in adjacent old-field areas.

Actual use by White-tail deer was recorded by browse surveys, pellet group counts, and miscellaneous observations.

Woody browse transects were established at all permanent vegetation plot locations (a total of 54 transects) in order to determine both the amount and location of the woody browse present on the right-of-way. Transects were 100 feet long and 2 feet wide. All woody material less than 6 feet in height was tallied. The 50-foot mark on the tape was placed at the edge of the right-of-way, so that equal areas were studied on the right-of-way, the edge, and the interior of the adjacent stand. The ratio of the number of stems per species--browsed and unbrowsed-- was used to obtain the actual use percentage for each species present on each transect. This method allows comparison of available browse and use between the three areas.

These transects showed that more browse usually was available on right-of-way and at right-of-way edge than in interior woods (Tables 2-7).

Browse utilization for West Virginia was highest in the woods (53%), lowest in the open areas, (28%), and medium at the edge (38%).

However, interpretation of the results should be tempered by the fact that more browse was available on open and edge areas of the power line than in adjacent forest. Also, considerably more stems were browsed on the edge of the power line than in the interior of the woods (204 versus 143 stems).

Greenbrier (*Smilax* spp.) (Table 3) far surpassed all other species insofar as total abundance and amount used for browse. Of the total of 1,367 stems, greenbrier comprised 867, and of these 331 were browsed. This confirms previous findings that greenbrier is one of the important foods in this area for White-tail deer. Sassafras (*Sassafras albidum*) was the only other important species in the immediate area that was used by deer to any noticeable extent: out of 131 stems, 67 were browsed. For both greenbrier and sassafras, more stems were available on the power line and edge than in the interior of the woods. However, as far as actual use was concerned, more stems were consumed from within the wooded areas.

Table 3.--Results of browse study on West Virginia line areas showing most abundant species present and their location on the transect with percent actual use.

Area	Greenbrier	Species	Sassafras
		Percent Actual Use	
Open	116/352* = 32%		9/16 = 56%
Edge	132/346 = 38%		29/62 = 47%
Interior	83/159 = 52%		29/53 = 55%
Total	331/867 = 38%		67/131 = 51%

*This ratio is browsed stems/total stems.

Table 4.--Results of browse study on New Hampshire line areas showing total number of stems and percent actual use.

	Power Line Area	Power Line Edge	Interior of Adjacent Woods	Total
Number of Browsed Stems	30	8	1	39
Number of Unbrowsed Stems	468	346	326	1,140
Total	498	354	327	1,179
Percent Actual Use	6.4	2.3	0.3	3.3

Table 5.--Results of browse study on New Hampshire line areas showing most abundant species present and their location on the transect with percent actual use.

Area	Blackberry	Species	Chokecherry
		Spiraea	
Open	27/379* = 7%	Percent Actual Use 0/23 = 0%	0/56 = 0%
Edge	3/145 = 1%	0/92 = 0%	0/32 = 0%
Interior	2/62 = 3%	0/69 = 0%	0/77 = 0%
Total	32/586 = 6%	0/184 = 0%	0/114 = 0%

*This ratio is browsed stem/total stems.

The most available and utilized browse in New Hampshire was blackberry (*Rubus* sp.), (Table 5). The total number of stems of all species was 1,179 and the number of blackberry stems was 586, over 50%. Of the 586 blackberry stems, 32 were browsed, giving a value of 5.5% actual use. Blackberry that were browsed were generally single stems rather than those in thickets, showing that deer do not readily penetrate dense blackberry areas for browse.

Spiraea (*Spiraea* sp.) and chokecherry (*Prunus virginiana*) were the next most abundant species, but these were not browsed.

Eighteen browse transects were established on the Georgia study plots with the following results (Table 6).

Table 6.--Results of browse study on Georgia line areas showing total number of stems and percent actual use.

	Power Line Area	Power Line Edge	Interior of Adjacent Woods	Total
Number of Browsed Stems	4	1	21	26
Number of Unbrowsed Stems	334	338	283	955
Total	<u>338</u>	<u>339</u>	<u>304</u>	<u>971</u>
Percent Actual Use	1.2	0.3	6.9	2.8

Table 7.--Results of browse study on Georgia line areas showing most abundant species and their location on the transect with percent actual use.

Area	Species		
	Greenbrier	Blackberry	Privet
		Percent Actual Use	
Open	1/42* = 2%	1/165 = 1%	2/51 = 4%
Edge	0/49 = 0%	1/68 = 2%	0/22 = 0%
Interior	17/26 = 65%	2/129 = 2%	2/24 = 8%
Total	<u>18/117 = 15%</u>	<u>4/362 = 1%</u>	<u>4/99 = 4%</u>

*This ratio is browsed stem/total stems.

Browse utilization was highest in the woods (6.9 percent), lowest on the edge (0.3 percent), and medium in the open areas (1.2 percent). As was evident in West Virginia, more browse was utilized in the woods.

Greenbrier was the most widely-consumed browse (Table 7), followed by blackberry, and privet (*Ligustrum*). Most browsed greenbrier stems were found in the interior on the wet sites. This may be due to either palatability of plant material or availability of cover. There was more lush vegetation on the wet areas during the spring and summer, and cover was more available there than on average or dry plots.

For each study area, nine 1/50 acre study plots were installed. These plots were located on well-established vegetation plots - three in wet areas, three in average areas, and three in dry areas. Data obtained from deer pellet counts was sparse and inconclusive. due to unusual weather conditions occurring in the study areas, namely flooding. Also, for more accurate findings, it would be advisable to enlarge the scope of the study.

In West Virginia and in Georgia, deer pellet counts indicated that deer were using wet areas during the spring and summer rather than the average or dry sites. More pellets were found on wet areas than on either average or dry sites. In New Hampshire, all wet plots were flooded. One pile of pellets was found on a dry site, and none were found on average sites.

In West Virginia, more pellets were found on dry sites during the winter than on either wet or average plots. This observation might be attributed to the fact that many different herbs are present on the wet areas during the summer months in contrast to the dry plots. Also, the possible palatability of these herbs could account for increased deer use during this period. No pellets were found in Georgia or New Hampshire in the winter due to flooding at the time of each visit.

It was observed that deer grazed on many different kinds of herbs during the spring, summer and fall. It also was noted that certain species were taken as they became available to deer for a source of food. This is probably associated with available food and

palatability of preferred foods. These herbs include bracken fern (Pteridium aquilinum), blackberry (Rubus spp.), false Solomon's seal (Smilacina racemosa), pokeweed (Phytolacca americana), Joe-Pye-weed (Eupatorium spp.), lion's foot (Prenanthes trifoliolata), boneset (Eupatorium fistulosum), and goldenrod (Solidago spp.).

Gray squirrel nest index counts (Uhlig 1956), revealed an approximate population of 6.5 squirrels along the 1.5 mile study area in West Virginia.

Spring grouse drumming counts showed only one bird present on the West Virginia line and four birds along the 0.8 mile New Hampshire line. The birds were not actually drumming on the line area, but in the woods immediately adjacent to the line.

Woodcock-singing ground surveys revealed no woodcocks using the power line study area in New Hampshire. It may be that observations were made too late in the spring, in spite of accumulated records indicating this to be well within the singing period.

Bob-white quail singing and flushing counts were made on July 15-16, 1973 at the Georgia site. Six small quail were seen and eight were heard on and around the power line area.

Quail dusting areas were found where open soil was present on power line rights-of-way. It should be pointed out that several species of lice (Mallophaga) occur regularly on bob-white quail, but rarely in large numbers on any one individual. Constant dusting serves to keep lice in check; bob-white deprived of such dusting facilities for two or three weeks frequently become infested (Stoddard 1936).

A total of four rabbits were flushed along the powerline areas in Georgia on September 15-16, 1973. All rabbits were flushed from under a heavy cover Japanese honeysuckle (Lonicera japonica), and blackberry. Numerous places where rabbits had "set" were found on line areas.

MISCELLANEOUS OBSERVATIONS

Box turtles (Terrapene carolina) use power line areas in all three states to lay their eggs. The majority of these eggs are found and preyed upon by skunks (Mephitis sp.) raccoons (Procyon lotor), red fox (Vulpes fulva), and other predators such as the black rat snake (Elaphe obsoleta) (Storer and

Usinger 1965).

It was noted that during spring, summer and early fall, many insects important to a number of wildlife game species occupied line areas. Trippensee (1948) states that the food of juvenile grouse, for example, consists largely of animal matter, primarily insects. The proportion is greatest during early summer, this gradually decreases until by autumn the juvenile diet conforms closely to that of adult birds. Studies on the food habits of grouse in New York reveal that this change of diet and the importance of animal matter in the diet declines with the advance of summer. For example, this element of the young chick's food comprised approximately 58 percent of the total stomach contents. This sharply dropped to 12 percent in July, and only 4 percent during August (Darrow 1939). Favored vegetable materials during this period of high animal consumption are fruits of the genus Rubus and seeds of the genus Carex.

It was found that inaccessible rocky areas on power line rights-of-way in West Virginia provide good areas for the timber rattlesnake (Crotalus horridus). During the two-year study period, these snakes often were found in these rocky areas, but were not observed in adjacent woods. Three such denning areas were found on the line study locales. The total number of snakes for each area is not known.

SUMMARY

Chemically-maintained rights-of-way do show greater wildlife uses than adjacent old field habitats or adjacent woodlots. The three major game species in the three states included in the study project appear to benefit from the "edge" effect of utility line rights-of-way. Evidence of wildlife use was extensive on all three study regions.

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