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WILDLIFE USE AND MANAGEMENT OF POWER LINE RIGHTS-OF-WAY IN NEW HAMPSHIRE[1/]

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Abstract.--The purpose of this study was to compare wildlife usage on power line rights-of-way that have been managed with traditional clearcut methods, and on experimental selectively cut rights-of-way. The selectively cut right-of-way had the greatest number of wildlife observations and number of wildlife species. Direct observations of wildlife showed the right-of-way to be an edge habitat used by wildlife species not commonly found in the adjacent unbroken forest. Right-of-way management to benefit wildlife should maintain a high degree of interspersion of vegetation, habitat edge, and clumping of vegetation.

INTRODUCTION

Most of the literature on power line management deals with the effect of chemical brush control on vegetation. Such studies often suggest to the wildlife biologist the effects of power lines on wildlife, but few studies actually count wildlife use, have adequate controls, and have been carried on long enough to accurately assess the effect of right-of-way management techniques on birds and mammals.

Foster (1956) found that wildlife utilized rights-of-way strips under study in Michigan more than the surrounding tracts of woodland. Mayer (1974) evaluated actual and potential wildlife use for major game animals in New Hampshire, West Virginia, and Georgia. His evaluation of potential food supply and desirability of habitat in New Hampshire indicates that for the three game species studied (white-tailed deer, ruffed grouse, and woodcock), plant communities on power line rights-of-way are comparable or in some cases, superior to communities found on adjacent old fields. A survey of potential browse availability showed in all cases that more woody browse was available on rights-of-way than in understory of adjacent woods.

General recommendations to selectively cut only the interfering trees have been made to utility companies, without quantitative research to determine whether this would benefit wildlife. The purpose of this investigation was to measure actual wildlife usage on power line rights-of-way. These were managed by traditional clearcut methods and experimental selective cut techniques. Comparisons and recommendations are made for future power line management to benefit wildlife.

METHODS

Description of Study Area

The area chosen for this study is an overhead power transmission line right-of-way managed by the Public Service Company of New Hampshire. The power line runs from the

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Madbury Substation to the Deerfield Substation, located in Strafford and Rockingham Counties in southeastern New Hampshire (fig. 1). The right-of-way is 235 feet wide and services three separate power lines. The two outside power lines were utilized during this study and the study strips were 100 feet wide.

The "old clearcut right-of-way" first was cleared in 1926. It has since been maintained with five chemical foliage sprays of 2,4-D and 2,4,5-T. The right-of-way has now developed into a grass, fern and shrub community interspersed with conifer and deciduous seedlings and saplings.

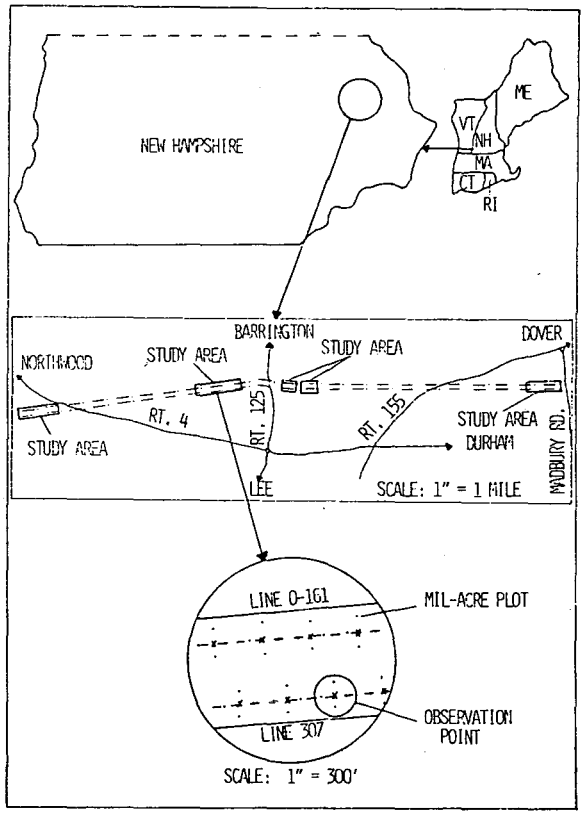

Figure 1.--Location of the study area in New Hampshire and the pattern of mil-acre vegetation plots and wildlife observation points.

A new transmission line was constructed during the summer of 1973 adjacent to the old clearcut right-of-way. Certain sections were selectively cut, favoring shrub species with the removal or topping of trees which interfered. It is not uncommon to find trees 20 feet in height within the "selective cut right-of-way". The other sections of the right-of-way were clearcut with the removal of all trees. After cutting, the "new clearcut right-of-way" and the selective cut right-of-way both received one chemical stump spray with Tordon to reduce sprouting.

An attempt was made to select an area of typical forested habitat for comparison purposes. The "forested area", located in Durham, represents a forest community with little recent disturbance during the past 50 years and with species composition similar to that adjacent to the power line study area. The forest composition adjacent to the right-of-way is a white pine-hemlock-hardwood forest typical of southern New Hampshire. Most common species are white pine, hemlock, red oak, white oak, black oak, red maple, gray birch, black birch, and shagbark hickory.

Smaller plots were established for intensive analysis of vegetation and to relate wildlife observations and activity with vegetative type. An observation point, representing approximately 0.34 acre, was set every 150 feet in the center of right-of-way study strips (fig. 1). The linear distances and number of observation points for each area were:

Area	Length	Observation Points
Selective Cut	0.87 miles	31
New Clearcut	0.48 miles	17
Old Clearcut	0.57 miles	22
Forested Area	0.57 miles	20
Total	2.50 miles	90

These study strip areas were largely dependent on the location of the right-of-way sections that were selectively cut by the utility company. Several low-level flights were made in a helicopter to inspect terrain and vegetation in order to assure that these selected study areas were as nearly comparable as possible. In some cases, all three right-of-way treatment areas are located within the same general locale.

Wildlife Observation Procedures

Direct observations of wildlife utilizing the study area were made during the period from 1 December 1973 to 31 May 1975. All species of game and non-game mammals and birds were recorded. Indirect signs of utilization such as browsing, tracks, and scats also were noted. Information recorded for

each observation included: wildlife species, activity, the three most important plant species, vegetation height, and vegetation density.

All observations were made within the first four hours after sunrise. It was necessary to census all 90 observation points during one time period. During the winter, observations were limited to the days after a fresh snow fall, so that animal tracks could be identified. Track data was recorded the morning after one night of animal activity succeeding the fresh snow.

Vegetative Measurement

Conditions of food and cover were evaluated during the summer after construction of the new power line. Five mil-acre plots (radius = 3.7 feet) were systematically established at each of the 90 observation points (fig. 1). One plot was located at the observation point center, and the other four plots were 25 feet and 90, 180, 270, and 360 degrees from the center plot. For each plot, the following variables were measured: plant species composition, number of stems for each species, height of each stem, number of stems browsed by deer and snowshoe hare, and the percent of observer's vision obstructed by vegetation.

Cover maps for the study area were made by using standard cover-mapping techniques to designate changes in vegetative types. In addition to cover mapping, a subjective rating of habitat patterns was made for each observation point. The amount of interspersion and edge effect, the number of vegetation height zones, and the variability in vegetation patchiness were rated on a scale from 1 to 5. Vegetation patchiness was rated as to the variability in spacing and clumping of the vegetation within the habitat.

The concept of edge effect also was measured, using an index of "habitat shape irregularity" as developed by Fried (1975). Habitat shape irregularity for the study area was measured by tracing the outline of cover types on the cover maps with a polar planimeter. Indices were calculated for individual observation points by measuring the cover type borders for the area within which each observation point was located.

RESULTS

Wildlife Observations

Direct observations of wildlife utilizing the power line right-of-way study area in southeastern New Hampshire were made on 106 mornings. A total of 1275 direct observations and indirect signs, representing 71 different species of wildlife, were recorded for the length of the study (Table 1). The majority of wildlife observations (63 percent) were accounted for by 59 avian species. The remaining observations (37 percent) were provided by 12 mammalian species.

Selectively Cut Right-of-Way

Wildlife usage was significantly greater in the selectively cut right-of-way. Sixty-one of the 71 species of wildlife observed during the study were seen using this area. The number of wildlife observations was significantly greater in this treatment area, as indicated by a mean of 18.36 observations per observation point (fig. 2). The number of different wildlife species was also significantly greater in the selective cut area, with a mean of 8.00 different species observed per observation point.

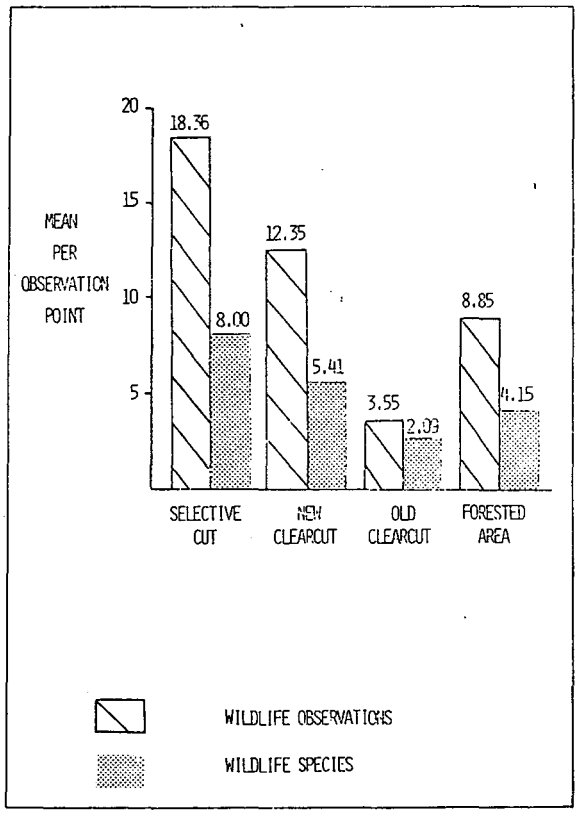

Figure 2.--Wildlife use on power line right-of-way study areas in southeastern New Hampshire. *Level of significance calculated between areas by Students t test ($P < 0.05$).

Table 1.--Wildlife species observed on selected power line right-of-way study areas in southeastern New Hampshire from December 1973 through May 1975.

Species	Total Observations	Percent of Total Observations			
		Selective Cut Right-of-Way	New Clearcut Right-of-Way	Old Clearcut Right-of-Way	Forested Area
Pine Warbler	8	100	---	---	---
Tree Sparrow	5	100	---	---	---
Short-tailed Weasel	3	c	---	---	---
Eastern Cottontail	3	c	---	---	---
Ruby-throated Hummingbird	3	c	---	---	---
Downy Woodpecker	2	c	---	---	---
Red-eyed Vireo	2	c	---	---	---
Evening Grosbeak	2	c	---	---	---
Red-tailed Hawk	1	c	---	---	---
Warbling Vireo	1	c	---	---	---
Northern Parula	1	c	---	---	---
Yellow Warbler	1	c	---	---	---
Magnolia Warbler	1	c	---	---	---
Chestnut-sided Warbler	1	c	---	---	---
Canada Warbler	1	c	---	---	---
Bobolink	1	c	---	---	---
Red-winged Blackbird	1	c	---	---	---
Savannah Sparrow	1	c	---	---	---
Northern House Wren	6	83	c	---	---
American Goldfinch	20	65	35	---	---
Eastern Phoebe	7	57	43	---	---
Dark-eyed Junco	43	21	79	---	---
Eastern Kingbird	5	c	c	---	---
Broad-winged Hawk	3	c	c	---	---
American Kestrel	3	c	c	---	---
Cedar Waxwing	4	c	c	---	---
Northern Oriole	4	c	c	---	---
Alder Flycatcher	2	c	c	---	---
Brown Thrasher	3	c	c	---	---
Veery	2	c	c	---	---
American Redstart	2	c	c	---	---
Gray Catbird	24	75	21	c	---
White-throated Sparrow	76	67	22	11	---
Song Sparrow	45	56	24	20	---
Rufous-sided Towhee	95	56	27	17	---
Least Flycatcher	9	44	44	c	---
American Woodcock	11	c	36	45	---
Palm Warbler	7	c	57	c	---
Chipping Sparrow	16	c	63	31	---
Common Yellowthroat	96	74	16	9	c
White-tailed Deer	65	66	25	c	c
American Robin	34	65	21	c	c
Eastern Chipmunk	42	55	12	c	29
Mouse, Vole	160	53	32	10	5
Blue Jay	34	50	29	12	c
Red Fox	79	46	13	22	20
Ruffed Grouse	12	42	c	c	42
Snowshoe Hare	57	40	9	9	42
Black-capped Chickadee	119	24	c	7	67
Golden-crowned Kinglet	9	56	c	---	c
Common Flicker	8	50	38	---	c
Hairy Woodpecker	9	33	33	---	33
Red Squirrel	15	c	c	---	87
Gray Squirrel	44	18	---	c	80
Mourning Dove	16	94	---	---	c

Table 1.--continued

Species	Total Observations	Percent of Total Observations			
		Selective Cut Right-of-Way	New Clearcut Right-of-Way	Old Clearcut Right-of-Way	Forested Areas
Long-tailed Weasel	6	83	---	---	c
American Crow	3	c	---	---	c
Red-breasted Nuthatch	4	c	---	---	c
Black and White Warbler	3	c	---	---	c
Rose-breasted Grosbeak	2	c	---	---	c
Prairie Warbler	4	c	---	c	---
White-breasted Nuthatch	7	---	---	---	100
Wood Thrush	6	---	---	---	100
Blackburnian Warbler	4	---	---	---	100
Raccoon	1	---	---	---	c
Tennessee Warbler	1	---	---	---	c
Black-throated Green Warbler	1	---	---	---	c
Scarlet Tanager	1	---	---	---	c
Purple Finch	1	---	---	---	c
Eastern Bluebird	4	---	100	---	---
Woodchuck	3	---	c	---	---
TOTAL OBSERVATIONS	1275	50	22	9	19
TOTAL NUMBER OF SPECIES	71	61	37	20	29

c = Only occasionally observed in area (less than 4 observations)

The species commonly observed in the selective cut right-of-way include: white-tailed deer (Odocoileus virginianus)red fox(Vulpes fulva), chipmunk (Tamias striatus), mice and voles (Peromyscus spp. and Microtus spp.), mourning dove (Zenaida macroura), blue jay (Cyanocitta cristata), gray catbird (Dumetella carolinensis), American robin (Turdus migratorius),common yellowthroat (Geothlypis trichas), American goldfinch (Spinus tristis), rufous-sided towhee (Pipilo erythropthalmus), white-throated sparrow (Zonotrichia albicollis),and song sparrow (Melospiza melodia) (Table 1). Pine warbler (Dendroica pinus), tree sparrow (Spizella arborea), and 16 other occasionally-observed species were recorded only in the selective cut area during this study.

The most dominant game animal, the white-tailed deer, was observed throughout the year in this area, but was more frequently observed during late spring and early summer, feeding on young hardwood stump sprouts and annual and perennial herbs. Ruffed grouse utilized the selective cut area for late fall feeding in areas where wintergreen berries were common. Several ruffed grouse broods also were flushed from this area in late spring. Snowshoe hare were recorded only from tracks during winter, but is suspected that this species utilizes the right-of-way throughout the year. Red fox were recorded as present only during the winter when tracking was possible but they are thought to hunt for small mammals and birds, and to feed on berries during all seasons. Mourning doves occasionally were observed feeding on seeds on bare ground areas.

Most songbirds did not enter this area until the trees began leafing out in the spring, and then sporadically left during the early fall. Gray catbird, common yellowthroat, rufous-sided towhee, and white-throated sparrow were regular summer resident birds that probably nested in this area. Many species migrated through the area in spring and fall, while other species were seen occasionally in the selective cut right-of-way but probably nested in adjacent habitats.

New Clearcut Right-of-Way

The abundance of wildlife observations (mean of 12.35 observations per observation point), and the number of different wildlife

species (mean of 5.41 species per observation point) in the newly clearcut area was significantly lower than the selective cut treatment area but significantly greater than the old clearcut treatment area (fig. 2).

Thirty-seven species of wildlife were recorded as utilizing the new clearcut right-of-way. The most common wildlife species observed in the new clearcut treatment area include: American goldfinch, dark-eyed junco (Junco hyemalis), gray catbird, white-throated sparrow, song sparrow, rufous-sided towhee, and chipping sparrow (Spizella passerina), (Table 1). The eastern bluebird (Sialis sialis) and an occasional woodchuck (Marmota monax) were species found exclusively in this area. White-tailed deer occasionally browsed on hardwood sprouts but did not frequent the open areas void of adequate cover.

Many species of songbirds frequented the area from adjacent habitats but did not limit their activities to within this right-of-way area. Gray catbird, white-throated sparrow, song sparrow, and rufous-sided towhee were regular summer residents and apparently these birds all found successful nesting sites on the new clearcut right-of-way. Much of the songbird and some of the mammal activity in this area seemed to be closely associated with the cover created by the brush piles made during construction of the new power line.

Old Clearcut Right-of-Way

The old clearcut right-of-way had the lowest wildlife utilization, with a mean of 3.55 wildlife observations per observation point (fig. 2). The number of different wildlife species was also lowest in this area, with a mean of 2.09 different species per observation point. The old clearcut right-of-way accounted for only 9 percent of the total observations. There were no species observed in the old clearcut right-of-way that were not observed in the other treatment areas.

The most common resident bird species observed in this area include: white-throated sparrow, song sparrow, rufous-sided towhee, and chipping sparrow. Very few migrant birds or birds from adjacent habitats were found in this area. Red fox, commonly associated with grassy, shrubby fields, frequently hunted for prey in this area.

Forested Area

Twenty-nine species of wildlife were observed using the forested area. The close-canopy forest provided habitat for resident species such as red squirrel (Tamiasciurus hudsonicus), gray squirrel (Sciurus carolinensis), snowshoe hare (Lepus americanus), black-capped chickadee (Parus atricapillus), nuthatches (Sitta spp.), wood thrush (Hylocichla mustelina), black and white warbler (Mniotilta varia), and blackburnian warbler (Dendroica fusca). The high tree canopies were used by occasional migrating wood warblers in the spring and fall. The thick hemlock, white pine understories were utilized as winter cover for snowshoe hare and roosting areas for ruffed grouse. The number of wildlife observations (mean of 8.85 observations per observation point) and the number of different wildlife species (mean of 4.15 species per observation point) observed in the forested area, was significantly greater than the old clearcut right-of-way but less than the selective cut right-of-way.

Browse Evaluation

For all sample areas, a total of 204 stems showed evidence of having been browsed by white-tailed deer or snowshoe hare on the 450 mil-acre plots used for vegetative analysis (Table 2). The plant species of the highest utilization by deer and hare for this study area include: common bracken fern (Pteridium aquilinum), red maple (Acer rubrum), water hemlock (Circuta maculata), jewelweed (Impatiens pallida), and white ash (Fraxinus americana).

The selective cut right-of-way revealed the highest browse utilization, with a mean of 1.15 stems browsed per plot. The number of stems browsed on the new clearcut plots (mean of 0.19 stems per plot) and old clearcut plots (mean of 0.09 stems per plot), were significantly less than the selectively cut area. No stems were found browsed on forested area sample plots.

Certain species of vegetation found only on the selective cut treatment area (i.e., water hemlock, jewelweed, white ash, basswood (Tilia americana), northern arrow-wood (Viburnum recognitum), sour-gum (Nyssa sylvatica), and trillium (Trillium spp.) were preferred as browse. Young bracken fern was conspicuously browsed on the selective cut area. Although bracken fern was much more abundant on the old clearcut right-of-way, it was not utilized.

Wildlife Use in Relation to Habitat

Certain parameters of the vegetation were recorded at each observation point. These parameters included: total number of stems, number of tree stems, number of shrub stems, percent obstruction of view, total number of plant species, number of tree species, number of shrub species, number of herbaceous species, number of different plant heights, and maximum height.

Table 2.--Number of stems for each plant species showing evidence of deer and snowshoe hare browsing on 450 mil-acre plots used in vegetative analysis.

Species	Number of Stems Browsed			
	Selective Cut Right-of-Way	New Clearcut Right-of-Way	Old Clearcut Right-of-Way	Forested Area
Number of Plots =	155	85	110	100
Common Bracken Fern	65	7	P	N
Red Maple	28	P	5	P
Water Hemlock	15	N	N	N
Jewelweed	12	N	N	N
White Ash	11	N	N	N
Quaking Aspen	7	N	P	N
Basswood	7	N	N	N
Northern Arrow-wood	6	N	N	N
Sour-gum	6	N	N	N
Trillium	5	N	N	N
Winterberry Holly	5	P	P	N
Highbush Blueberry	5	P	P	N
Meadow Sweet	3	P	P	N
Maple-leaved Viburnum	3	N	2	N
Black Oak	3	P	P	N
Black Cherry	2	P	P	N
Witch-hazel	P	9	P	N
Red Oak	P	P	2	P
Staghorn Sumac	N	N	1	N
TOTAL STEMS BROWSED	178	16	10	0
MEAN STEMS BROWSED/PLOT	1.15	0.19	0.09	0

P = Species present in area but not browsed on vegetative plots
N = Species not present in area

Table 3.--Results of Students "t" test on mean values over all mil-acre plots for 10 vegetative parameters.

	Comparison Between Study Areas					
	Selective Cut/New Clearcut	Selective Cut/Old Clearcut	Selective Cut/Forested Area	New Clearcut/Old Clearcut	New Clearcut/Forested Area	Old Clearcut/Forested Area
Total No. of Stems	*	(NS)	*	*	*	*
No. of Tree Stems	*	*	*	(NS)	(NS)	*
No. of Shrub Stems	(NS)	*	*	*	*	*
Percent Obstruction of View	*	*	*	*	*	*
Total No. Plant Species	*	*	*	*	*	*
No. of Tree Species	*	*	*	*	*	*
No. of Shrub Species	*	*	*	*	*	*
No. Herbaceous Species	*	*	*	*	*	*
No. of Different Hgts.	*	*	*	*	(NS)	*
Maximum Height	*	*	*	*	*	*

* = Significant Mean Difference ($P < 0.05$)

(NS) = No Significant Mean Difference ($P > 0.10$)

There were obvious differences between treatment areas for each of the parameters measured (Table 3).

An attempt was made to estimate correlation coefficients with the number of different wildlife species and vegetation parameters. For the range of the conditions sampled on this study area, they were found to be non-significant from zero. These vegetative parameters do not adequately reflect the structure of the vegetation. It may be that wildlife respond to the patterns of spatial distribution or form of the vegetation in the habitat rather than individual parameters of the vegetation.

The calculation of habitat shape irregularity for each observation point of right-of-way areas allowed a linear regression analysis of habitat edge with wildlife species diversity. Fifty percent of the variation in number of wildlife species over plots can be accounted for by variation in edge effect in the habitat ($r = .71$, $P < 0.01$), (fig. 3).

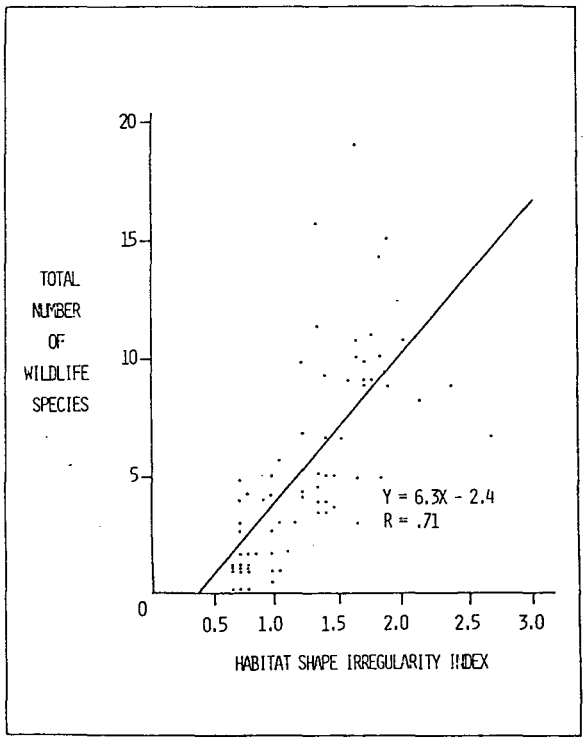

Figure 3.--Linear regression of number of wildlife species on habitat shape irregularity for the 70 right-of-way observation points.

A rank order regression analysis was possible with the subjective ratings of interspersion, edge effect, and vegetation patchiness or clumping with the level of wildlife use. It would appear from this analysis that a habitat with a high degree of interspersion, edge, and patchiness (i.e., selective cut right-of-way) is a potentially good habitat, though other factors may be involved to increase the amount of wildlife use. A homogeneous habitat, low in interspersion, edge, and patchiness (i.e., old clearcut right-of-way) can be considered poor habitat resulting in low wildlife utilization.

DISCUSSION

The Right-of-Way as "Edge"

The data presented in this study strongly supports the presumption that power line rights-of-way provide edge habitat for a diversity of wildlife. The right-of-way, providing in effect a forest edge, supports the requirements of edge species like gray catbird, common yellowthroat, rufous-sided towhee, white-throated sparrow, and other commonly observed species with low mobility. In addition, the rights-of-way are utilized by many species of the forest proper, such as white-tailed deer, snowshoe hare, ruffed grouse, wood thrush, and numerous wood warblers.

Right-of-way areas evaluated in this study have considerable diversity in habitat components. The ground cover varies from bare soil to a dense grass, sedge, and fern cover intertwined with dewberry. Shrub and tree growth ranges in height from seedlings to twenty feet, and density ranges from scattered individuals to a dense, impenetratable thicket. This complexity of vegetation seems to be most important in supporting a diversity of wildlife.

In this study, maximum wildlife diversity was found on the selective cut right-of-way which is in a late-mixed shrub and small tree stage of succession. The disturbance of habitat resulting from right-of-way construction, created a patchwork of vegetation. Clumps of shrubs and small trees were broken up by small areas of bare ground, sparse vegetation, and brush piles. This disturbance factor was very important in developing a right-of-way interspersed with a variety of habitat conditions.

The transition presented by the selective cut right-of-way, which lay between forest and a clearcut right-of-way, probably is responsible for the diversity of wildlife represented by woodland species, edge species, and grassland species. This study has indicated that the clumping of vegetation in patches, increasing habitat shape irregularity and edge effect, is

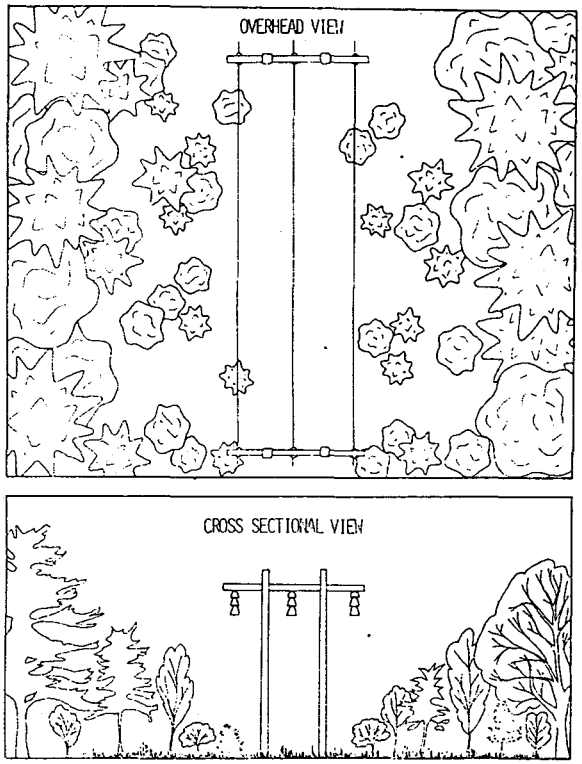

Figure 4.--Schematic concept of ideal vegetative patterns for wildlife habitat on powerline rights-of-way. The patchiness or clumping of vegetation which is shown on the overhead view is the single most important component of the vegetation.

the most important component of the vegetation to benefit wildlife (fig. 4). This can be combined with the concept of an ideal right-of-way as originally proposed by Niering and Egler (1955). A graded U-shaped right-of-way that maintains a low plant growth beneath the powerline, and also allows a gradual increase in vegetation height to the edges of the right-of-way, should provide habitat for a maximum diversity of wildlife.

Food and Cover on Rights-of-Way

This study clearly reveals differences in food utilization on different powerline habitats. The food has to be located in the proper pattern of vegetation for it to be utilized. For example, bracken fern was not utilized in the old clearcut right-of-way, but it was heavily utilized in the selective cut area that provided the necessary cover and mobility requirements.

It was noted during this study that areas with an abundance of food plants were not utilized unless suitable cover allowed concealment, security, and an easy escape route to adjacent cover. Snowshoe hare and white-tailed deer did not utilize preferred browse species located in open, clearcut areas. Some of these differences in utilization may be due to different nutrient levels, but the presence of suitable cover seemed to be a very important determinant of wildlife use on rights-of-way.

The amount of cover on the rights-of-way of this study varied seasonally. The most important winter cover consisted of low, bushy white pine, hemlock, and brush piles. Winter track data indicates that snowshoe hare, white-tailed deer, and red fox activity were very closely related with cover. Movement was limited to areas where patches of cover were located close to feeding areas. Very rarely were track observations made in areas void of adequate cover for escape.

Direct observations of white-tailed deer crossing rights-of-way showed the importance of travel lanes between adjacent habitats. Lowland areas with a coniferous cover allowed deer to cross the right-of-way to reach adjacent areas.

Plant communities on the old clearcut right-of-way are largely composed of species somewhat resistant to herbicides. Over a long history of spraying, an "herbicide climax" can develop and dominate (Carvell 1972). The low ground cover in the old clearcut right-of-way in this study is largely an extensive, dense understory of mosses, ground pines (Lycopodium spp.), bracken fern, mixed grasses, and sedges entangled with dewberry (Rubus spp.) and low blueberry (Vaccinium angustifolium). The mat has become so dense that much of the food for seedeaters and low mobility species with small feet probably is inaccessible and not utilized.

Management Implications

The results of this study indicate that maximum wildlife diversity after construction of a new right-of-way can be realized by selectively removing only the trees that interfere with the function of the powerline. Where possible, the right-of-way clearing procedure should produce clumps of shrubs and small trees interspersed with sparser vegetation and areas of open, grassy cover or bare ground.

Maintenance of rights-of-way to support a diversity of vegetation may be accomplished with a selective herbicide spraying program. Monotypic habitats must be avoided. The habitat

should be broken up as much as possible, thereby creating a clumping effect. Efforts should be made to avoid a dense, entangled ground cover which may restrict mobility and availability of food.

Costs of Rights-of-Way Management

The cost of selective clearing and maintenance of a selective cut right-of-way are estimated to be very high in comparison to traditional clearcut and selective spraying management. Cost imformation provided by the cooperating Public Service Company of New Hampshire indicates that selective clearing on these study areas cost approximately $1,200 per acre, as opposed to an average of $425 per acre to clearcut a right-of-way. The cost of maintaining a selectively cut right-of-way by selective spraying could be as high as $100 per acre per year, whereas the cost of maintaining a clearcut right-of-way is presently about $8 per acre per year.

It is possible that the cost of selective cut management would be lower as crews become more experienced with techniques. The management of existing powerlines may allow development of vegetation patchiness, edge, and interspersion by selective use of herbicides.

If environmentalists, sportsmen, or other groups insist on selective cut management, it must be recognized that the utility companies will pass the cost on to the consumer. State game management funds might also be used to assist in powerline habitat management.

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