EVALUATION OF THE WILDLIFE HABITAT VALUES OF RIGHTS-OF-WAY

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Abstract: Wildlife habitat on segments of a sprayed electric transmission right-of-way (ROW) was evaluated by a new technique that provided useful quantitative habitat values based upon field rating of essential needs of a selected species. Similar evaluation was made of the adjacent forest unmodified by a ROW. Use of the technique in central Pennsylvania with white-tailed deer (*Odocoileus virginianus*) gave an average value of 8.2 for segments of a sprayed ROW with a forest edge as compared with 5.5 for adjacent oak forests without a ROW. A realistic evaluation of the differences between the 2 habitat types appeared to be obtained. A food plot and a wildlife clearing were also evaluated and the practical use of the technique was tested using professional utility personnel.

With the current increase in interest in wildlife management on transmission rights-of-way (ROW) and in the effect of a ROW on a forest habitat (Lancia and McConnell 1976), it has become evident that a simple but accurate technique for evaluating wildlife habitat conditions could be a useful management tool (U.S. Fish and Wildlife Service 1976). Such a technique could produce documentation of the specific effects of management on food and cover as well as on general enhancement of a forest habitat area through ROW management.

For the purposes of this technique, a wildlife habitat area will refer to 1 specific component of a wildlife home range. A wildlife range usually encompasses both the daily and annual crusing radii of a species and may include a number of different and widely separated habitats. Therefore, a ROW and its resultant edges, which are an integral part of the ROW, will be considered a specific habitat area that is only 1 component of the total dwelling place of a wildlife species. This is similar to use of "environmental type" by Leopold (1937). The "adjacent forest" refers to the forest without the presence of a ROW.

Food and cover factors of the habitat have been used for evaluation as these are the ones usually manipulated in ROW management. However, it is recognized that a habitat is influenced by many factors: climatic, edaphic, physiographic, and other biotic factors that are not usually managed on ROW.

The purpose of this paper is to describe a simple field technique that will be useful in evaluating wildlife habitat conditions on a transmission ROW and to report values obtained for a ROW and the adjacent forest. More specifically, it describes use of the technique in comparing habitat values of a ROW under several different types of vegetation management with values of the adjacent forest without a ROW. Examples also are given of evaluation of 2 other habitats, a game food plot and a clearing.

DESCRIPTION OF THE TECHNIQUE

The habitat evaluation technique involves use of a field form (Tables 1–3) to obtain quantitative data similar to that re-

Table 1. Initial page of the field form for habitat evaluation; completed for a sprayed right-of-way (ROW).

WILDLIFE HABITAT EVALUATION, GENERAL		
Wildlife species	*White-tailed deer*	Date *14 Jul 78* Recorder *WCB*

Habitat type to be evaluated: *ROW in a shrub-herb-grass cover, maintained by a broadcast spray in 1953 followed by a selective spray in 1966.*

Habitat location: *Central Pennsylvania*

Habitat needs of the wildlife species:
    Successional stages: *Early shrub and herb stages and mature forest*
    Interspersion of cover types: *Interspersion of forest and openings*
    Food: *Acorns, other fruit, herbs, grasses, woody browse*
    Cover: *Low dense cover for bedding and hiding*
            Open areas for feeding and loafing
    Water: *Available within 1.6 km, more or less*
    Reproduction: *Low dense cover for bedding and fawn concealment*
    Important food plants: √ = found on ROW

Woody Plants				Herbs	
Fruit		**Leaves & Twigs**			
Oak	√	Teaberry	√	Clover	
Crab apple		Mountain laurel	√	Cinquefoil	
Apple		Cherry	√	Plantain	
Cherry	√	Hemlock		Strawberry	
Blueberry	√	Red Maple	√	Trefoil	
Blackberry	√	Blueberry	√	Speedwell	
Pear		Pine		Goldenrod	√
Rose		Grape		Loosestrife	√
Hawthorn	√	Blackberry	√	Bracken	√
Grape		Oak	√	Sedge	√
Sumac		Sweetfern	√	Panic grass	√
Deerberry	√	Witchhazel	√	Sheepsorrel	√
		Bear oak	√		

ported by Flood et al. (1977) for use in solving wildlife mitigation problems on federal water development projects. The quantitative habitat value obtained is then correlated with the qualitative needs of a wildlife species and helps to relate numbers generated to actual field conditions (Table 4). (Scientific names are omitted from the tables because the plants are listed only as examples.)

Although qualitative descriptions and personal evaluations have commonly been used and provide useful information in wildlife habitat evaluation, use of a field form with specific characteristics to be evaluated, one by one, appears to serve the admirable purpose of concentrating attention of the estimator on important characteristics that, in turn, may be summed to a total habitat value.

The technique employs the approach prescribed in the Flood et al. handbook (1977) whereby only 1 wildlife species, or a related group of species, is evaluated at a time. In the present case, evaluation is restricted to white-tailed deer in central Pennsylvania. Other species of upland wildlife could readily be fitted into the technique with little or no alteration of the field form used for deer by inserting the habitat needs of other species on page 1 (Table 1) of the field form.

Table 2. Second page of the field form of habitat evaluation: completed for a sprayed right-of-way.

HABITAT EVALUATION			
CHARACTERISTICS WEIGHTED 2–10	SCORE (X-mark the actual score)		
	Mast	Other Fruit	Browse
I. Important Food Plant Abundance			
A. Very sparse	2	2	2
B. Sparse	4	4	4
C. Moderate abundance	6	6	6X
D. Numerous	8	8X	8
E. Very numerous	10X	10	10
Average (sum divided by 3)		8.0	
II. Important Food Plant Diversity			
A. Very few species (1–2)		2	
B. Few species (3–4)		4	
C. Moderate number of species (5–7)		6	
D. Numerous species (8–10)		8	
E. Very numerous species (>10)		10X	
III. Low Vegetation <0.91 m height			
A. Very scant <5%)		2	
B. 5–25% of ground surface		4	
C. 25–50% of ground surface		6	
D. 50–75% of ground surface		8	
E. 75–100% of ground surface		10X	
IV. Shrub and Low Tree Cover >0.91 m height			
A. Very scant (<5%)		2	
B. 5–25% of ground surface		4	
C. 25–50% of ground surface		6X	
D. 50–75% of ground surface		8	
E. 75–100% of ground surface		10	
1. Total of I–IV		34	
2. No. of characteristics		4	
3. Average (1 ÷ 2)		8.5	

Use of the Field Data Form

For describing use of the field data form and to illustrate the form itself, a sample completed for white-tailed deer is shown in Tables 1 to 4. This sample was for a ROW that had been given a broadcast spray of 2,4-D (2,4-dichlorophenoxy acetic acid) + 2,4,5-T (2,4,5-trichlorophenoxy acetic acid) in 1953 followed by a selective basal spray of 2,4-D + 2,4,5-T in 1966 (Bramble and Byrnes 1974).

Characteristics used in Tables 2 and 3 of the field form are based upon the habitat needs of a selected wildlife species, which in Table 1 are given for white-tailed deer. They can be defined as follows:

I. Important food plant abundance: an ocular estimate of the combined abundance of important food plants present on the habitat area, which for a ROW includes both the ROW proper and its forest edges. Mast-producing plants, other

Table 3. Third page of the field form for habitat evaluation; completed for a sprayed right-of-way.

HABITAT EVALUATION		
CHARACTERISTICS WEIGHTED 1–5	SCORE (X-mark the actual score)	
	Border 1	Border 2
V. External Shrub Borders		
A. Very scant (less than 5%)	1	1
B. 5–25% of the border	2	2
C. 25–50% of the border	3X	3
D. 50–75% of the border	4	4
E. 75–100% of the border	5	5X
Average of 2 borders	4	
VI. Interspersion of Cover Types		
A. Uniform plant community	1	
B. Two adjacent plant communities	3X	
C. More than 2 plant communities	5	
VII. Stage in Plant Succession		
A. Late stage forest	1	
B. Middle stage shrub or brushland	3	
C. Early stage shrub-herb-grass	5X	
1. Total of V–VII	12	
2. No. of characteristics	3	
3. Average (1 ÷ 2)	4.0	
HABITAT UNIT VALUE		
Total score (average I–IV + average V–VII)		12.5
Habitat value (Total score × ⅔)		8.3

fruit-producing plants, and browse plants are each estimated separately and their total divided by 3.

II. Important food plant diversity: a count of important food plant species present on the habitat area. These plants are check-marked in Table 1.

III. Low vegetation <0.91 m height: an ocular estimate of the percent of ground surface covered by low vegetation.

IV. Shrub and low tree cover >0.91 m height: an ocular estimate of the percent of ground surface covered by shrubs and low-growing trees.

V. External shrub borders: an ocular estimate of the percent of linear ROW edge occupied by shrubs and low-growing trees. In the forest, edges of major openings are estimated.

VI. Interspersion of cover types: a count of the number of plant communities occurring on a habitat area. In the case of the ROW, these include both the ROW proper and its forest edges. In the adjacent forest, it includes the forest and major openings that have a different plant community from that occupying the general shrub and herb layers of the forest.

VII. Stage in plant succession: a notation of the dominant stage present on the habitat area.

Steps in the evaluation process are:

Step 1.—The important 1st step is to record on page 1 of the field form the important habitat needs of the wildlife species being evaluated (Table 1). These needs were obtained from publications

Table 3. Third page of the field form for habitat evaluation; completed for a sprayed right-of-way.

HABITAT EVALUATION		
CHARACTERISTICS WEIGHTED 1–5	SCORE (X-mark the actual score)	
	Border 1	Border 2
V. External Shrub Borders		
A. Very scant (less than 5%)	1	1
B. 5–25% of the border	2	2
C. 25–50% of the border	3X	3
D. 50–75% of the border	4	4
E. 75–100% of the border	5	5X
Average of 2 borders	4	
VI. Interspersion of Cover Types		
A. Uniform plant community	1	
B. Two adjacent plant communities	3X	
C. More than 2 plant communities	5	
VII. Stage in Plant Succession		
A. Late stage forest	1	
B. Middle stage shrub or brushland	3	
C. Early stage shrub-herb-grass	5X	
1. Total of V–VII	12	
2. No. of characteristics	3	
3. Average (1 ÷ 2)	4.0	
HABITAT UNIT VALUE		
Total score (average I–IV + average V–VII)		12.5
Habitat value (Total score × ⅔)		8.3

fruit-producing plants, and browse plants are each estimated separately and their total divided by 3.

II. Important food plant diversity: a count of important food plant species present on the habitat area. These plants are check-marked in Table 1.

III. Low vegetation <0.91 m height: an ocular estimate of the percent of ground surface covered by low vegetation.

IV. Shrub and low tree cover >0.91 m height: an ocular estimate of the percent of ground surface covered by shrubs and low-growing trees.

V. External shrub borders: an ocular estimate of the percent of linear ROW edge occupied by shrubs and low-growing trees. In the forest, edges of major openings are estimated.

VI. Interspersion of cover types: a count of the number of plant communities occurring on a habitat area. In the case of the ROW, these include both the ROW proper and its forest edges. In the adjacent forest, it includes the forest and major openings that have a different plant community from that occupying the general shrub and herb layers of the forest.

VII. Stage in plant succession: a notation of the dominant stage present on the habitat area.

Steps in the evaluation process are:

Step 1.—The important 1st step is to record on page 1 of the field form the important habitat needs of the wildlife species being evaluated (Table 1). These needs were obtained from publications

Table 4.   Fourth page of the field form for habitat evaluation; completed for a sprayed right-of-way.

HABITAT EVALUATION SUMMARY

Habitat type: *Early shrub-herb-grass stage with an oak forest edge*

Habitat value 8.3 = *high value habitat*

HABITAT NEEDS THAT ARE
SATISFACTORILY MET:

Abundant mast and fruit producing plants and moderate browse.

High food plant diversity.

Dense low vegetation covers 75–100% of ground surface.

Shrubs cover 25–50% of ground surface.

Shrub border occupies 50–75% of the edge on east side and 75–100% on west side of ROW.

Two adjacent plant communities present: a shrub-herb-grass community on ROW and adjacent oak forest.

An early stage of shrub-herb-grass present on ROW.

Water is available within 1.6 km.

HABITAT NEEDS THAT ARE NOT
SATISFACTORILY MET:

None of the 7 listed on page 1.

DEER USE OBSERVED ON THE RIGHT-OF-WAY

Light deer browsing on witchhazel and loosestrife.

Heavy deer browsing on blackberry stems and leaves.

One deer bed in a fescue patch.

Table 5.   Habitat value classes for use with quantitative habitat values.

Habitat value	Value class	Habitat needs met by value class
7 to 10	High	6 or 7
5.1 to 6.9	Medium	4 or 5
1 to 5	Low	1 to 3

excluded after testing as it was not altered or manipulated in management, and it produced the same value on all habitat areas because streams occurred within 1.6 km of all habitats. Water was given recognition, however, in the Habitat Evaluation Summary (Table 4).

Step 2.—Characteristics that are considered habitat needs of top importance are shown in Table 2 and are rated on a scale of 2 to 10.

As the field form was being tested, it became evident that there was a need to evaluate food plants in 3 categories to achieve a realistic picture of the situation in both ROW and forest habitats. Acorn-producing trees were put in a separate category, mast, because acorn crops vary considerably from year to year and cannot be depended upon entirely for food. The remaining 2 categories of other fruit and browse that are highly important in poor acorn years were therefore evaluated separately to get a true picture of important food plants.

Calculations at the bottom of Table 2 give the average value of the 2- to 10-rated characteristics. This was 8.5 for the right-of-way example shown on the form.

Step 3.—Characteristics considered to be habitat needs of lesser importance are shown in Table 3 and are rated on a scale of 1 to 5.

In rating the 2 external borders of a ROW it was found that there was often a considerable difference between them. Sometimes 1 border is almost completely absent in contrast to a well-established

on deer in the region (Liscinsky et al. 1973), from consultation with a local wildlife biologist doing research on deer, and personal experience. This information forms the basis for evaluation.

The habitat needs of white-tailed deer that were selected are important to deer management and ones that would be altered in ROW management. The needs were also selected for their applicability to evaluation of ROW habitat areas as compared with the adjacent forest. Habitat factors that are not affected by ROW management were dropped in order to increase the sensitivity of the evaluation. For example, availability of water was

Table 6. Fourth page of the field form for habitat evaluation: completed for the adjacent forest habitat without the right-of-way.

HABITAT EVALUATION SUMMARY

Habitat type: *Mixed oak-red maple upland forest*
Habitat value 4.5 = *low value habitat*

HABITAT NEEDS THAT ARE
    SATISFACTORILY MET:

Abundant mast-producing trees.
Low vegetation covers 75–100% of ground surface
Medium food plant diversity.
Water is available within 1.6 km.

HABITAT NEEDS THAT ARE NOT
    SATISFACTORILY MET:

Very sparse fruit-producing plants and sparse
    browse.
Very scant shrub cover.
Only very small openings without borders or
    change in species.
Lack of type interspersion—uniform forest
    community.
Late stage in plant succession present—forest.

DEER USE OBSERVED ON THE HABITAT
    AREA:

Moderate deer browsing on sassafras, red maple,
    bracken, and loosestrife.

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shrub border on the other side. Therefore, the 2 borders were estimated separately to indicate this situation when it occurred and an average of the 2 ratings was used in habitat calculations (Table 3).

Calculations near the bottom of Table 3 give the average value of the 1- to 5-rated habitat needs.

Step 4.—The final habitat value is obtained by adding the averages of the 2- to 10-rated and the 1- to 5-rated characteristics. The result is then multiplied by ⅔ to reduce the value to a 1 to 10 range for ease in handling and for standardizing the results. A habitat value of 8.3 was obtained for the ROW example given (Table 3). The habitat value is then summarized (Table 4) when it is placed in a habitat value class of high, medium, or low (Table 5).

To relate the numerical habitat value to the real world, a description of the habitat needs met and not met are then listed (Table 4). High value habitats range from values 7 to 10, with 6 to 7 habitat needs met. Low value habitats range from 1 to 5 with only 1 to 3 habitat needs met. Medium value habitats lie in the range 5.1 to 6.9, with 4 to 5 habitat needs being met. Some borderline exceptions may occur that are typical of such a pigeonhole-type of classification.

In the example given, the value of 8.3 for the right-of-way falls in a high habitat value class (Table 4). In an additional example (Table 6), an adjacent forest habitat summary indicates that its habitat value of 4.5 falls in a low value class, with 3 or less habitat needs of deer being met.

TESTS OF THE TECHNIQUE

Sprayed Rights-of-Way vs. Adjacent Forests

In order to test application of the technique for habitat evaluation on a right-of-way (ROW) under field conditions, habitat evaluation was made on 4 ROW areas that had been maintained by selective basal sprays and on 4 areas maintained by a broadcast spray that had been followed by a selective basal spray. These areas were located in 4 randomized blocks (Bramble and Byrnes 1974). At each location, the adjacent forest habitat was evaluated without the ROW to indicate the enhancement effect of a ROW.

The 4 ROW maintained by selective basal sprays gave an average value of 8.0 with a range from 7.1 to 8.5 (Table 7). Four ROW maintained by the broadcast spray followed by a basal spray gave a similar average value of 8.4 with a range from 7.7 to 9.3. The 0.4 difference between the 2 average habitat values for

Table 7. White-tailed deer habitat values for segments of a sprayed right-of-way (ROW) compared with adjacent forests without the ROW, a handcut ROW, a wildlife food plot, and clearing.

Habitat area	Habitat value	
	ROW	Adjacent forest
Broadcast plus selective spray ROW		
IB	8.3	4.5
IIB	8.2	4.6
IIIB	7.7	6.0
IVB	9.3	6.5
Average	8.4	5.4
Range	7.7–9.3	4.5–6.5
Selective basal spray ROW		
ID	8.1	6.8
IID	8.2	5.0
IIID	7.1	5.1
IVD	8.5	5.2
Average	8.0	5.5
Range	7.1–8.5	5.0–6.8
Handcut ROW, 3 years after cutting	9.0	4.1
Wildlife food plot, cultivated and mowed	7.7	
Wildlife clearing, not cultivated	7.2	

Table 8. Comparison of consistency in habitat values assigned by 5 different estimators.

Estimator	Habitat value		
	Broadcast sprayed ROW	Adjacent forest without ROW	Wildlife food plot
Forest ecologist	7.9	5.3	6.9
Forest ecologist	7.5	5.0	7.0
Utility personnel			
Forestry manager	6.4	4.7	7.8
Forestry manager	7.5	5.7	
Forestry manager	6.3	5.4	
Average	7.1	5.2	7.2
Range	6.3–7.9	4.7–5.7	6.9–7.8

Comparison with Other Habitats

The wildlife habitat evaluation technique was tested on 2 nearby habitats, a wildlife clearing and a food plot, which relate to ROW in that they represent intensive management on small areas (Table 7).

The cultivated food plot had been planted with a grass-legume mixture, had been mowed during the current year, and had a well-developed shrubby edge. The wildlife clearing had not been planted or cultivated and was in an early shrub-herb-grass stage of development. The cultivated food plot had a habitat value of 7.7 that was close to the 8.2 value of the sprayed ROW. The clearing without cultivation had a value of 7.2.

Evaluation of a handcut section of the ROW gave a high value of 9.0 as compared to the 8.2 average for all sprayed ROW (Table 7). The ROW, which had been maintained only by handcutting had been cut just 3 years before the rating, was in an open shrub stage that would soon close and suppress the ground layer. Habitat value of the forest adjacent to the handcut ROW was 4.1.

DISCUSSION

The important information from these tests is that the habitat ratings were re-

these ROW areas was not significant ($P > 0.05$, t-test for unpaired replicates).

For comparison of ROW with the adjacent forest without a ROW, the 8 forest habitats adjacent to the ROW gave an average habitat value of 5.5 with a range from 4.5 to 6.8. All of the 8 forest habitat values fell below the lowest of the 8 ROW values. The difference between the 8.2 average of all habitat values for the ROW and the 5.5 average habitat value of adjacent forests was significant ($P < 0.05$).

It is evident that the rating technique did consistently separate the 2 habitats into high and medium values. A rating between 7 and 10 is considered a high habitat value while 5.1 to 6.9 is a medium habitat that lacks some of the important habitat needs (Table 5).

alistic and indicated that the technique would be useful in habitat comparisons. Habitats that lacked essential needs of deer were consistently rated lower than those that furnished those needs. The needs that were typically lacking in the forest habitat included a shrub layer, borders of shrubs, type interspersion, and early stages of plant succession.

In order to test the practical use of the technique in evaluating rights-of-way (ROW), the same habitats were evaluated by 5 persons, independently, after a short orientation (Table 8). Habitat values of the sprayed ROW from these evaluations ranged from 6.3 to 7.9 which separated them from the adjacent forest that had a range of habitat values of 4.7–5.7.

A familiarity with the local vegetation and experience with ROW and forest conditions appeared to be necessary to obtain such comparable results. All of the estimators were trained in forestry and had experience in ROW management.

LITERATURE CITED

BRAMBLE, W. C., AND W. R. BYRNES. 1974. Impact of herbicides upon game food and cover on a utility right-of-way. Purdue Agric. Exp. Stn. Bull. 918. 16pp.

FLOOD, B. S., M. E. SANGSTER, R. D. SPARROWE, AND T. S. BASKETT. 1977. A handbook for habitat evaluation procedures. U.S. Fish Wildl. Serv. Resour. Bull. 132. 77pp.

LANCIA, R. A., AND C. A. MCCONNELL. 1976. Wildlife management on utility company rights-of-way: results of a national survey. Pages 308–314 *in* Proc. First Natl. Symposium on Environmental Concerns in Rights-of-Way Management. Mississippi State Univ.

LEOPOLD, A. 1937. Game Management. Scribner's, New York. 481pp.

LISCINSKY, S. A., C. T. CUSHWA, M. J. PUGLISI, AND M. A. ONDIK. 1973. What do deer eat? Pa. Game News. May:13–18.

U.S. FISH AND WILDLIFE SERVICE. 1976. Habitat evaluation procedures. U.S. Dep. Comm., Natl. Tech. Info. Serv. PB-258 254. 30pp.