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A METHOD OF EVALUATING THE RANGE FOR THE COTTONTAIL RABBIT

by

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Introduction

Wildlife management in the past has been hindered by a lack of definite objectives. Too often an area of land has been put under management without first drawing up an adequate plan. Practices have been instituted which in some cases have not applied at all to the real needs of the animals desired on the area, and the effect has been the familiar one of vainly increasing one or two staves of the barrel while leaving the shortest one unchanged.

Before any species can be managed intelligently on any area, two things must be known. First of all, of course, the requirements of that species must be studied. Life history studies have provided us with this data for many of the important animals at the present time. But the second essential is a knowledge of the land area itself; in what particulars it meets the requirements of the animal or animals to be produced, and in what particulars it is lacking. With this knowledge at hand, it then becomes possible to

locate and remedy those short staves. And it is at this point that the wildlife manager is most likely to make his mistakes.

Prior to 1935 there was no practical method in existence for rapidly and accurately evaluating an area of land for production of any particular species of wildlife. The methods in use were either far too expensive to be available for extensive operations, or were woefully inadequate as a basis for management plans. The results obtained from most of them consisted simply of a rating of poor, fair, or excellent, with no means of determining the reasons for the rating, nor the possibilities of improvement of the area.

In 1935 Wight (32) published a method for evaluating the pheasant range, based on his studies on the life history and management of that bird. The result of an evaluation by this method is a rating of a section of land showing its strong points, its deficiencies, and the most logical means of improving it as habitat for the pheasant. Its value to those desiring to manage land for pheasant production is both obvious and

proven by wide use in the past six years. In concluding the presentation of this method Wight (32) says, "It provides a basic plan that can be applied to numerous other animals and groups of animals." The object of the study presented in the following report has been to draw up a rating sheet for cottontail rabbit range, based on the method used by Wight, and giving the same type of information for this other important game species. It is to be hoped that similar plans will follow for other species which are of importance in wildlife management.

In obtaining the life history data upon which this evaluation method is based, free use has been made of the available literature on studies concerned with cottontail rabbits in this general region (Lake States and adjoining). This material has been supplemented by the author's field observations in Northern Illinois and Southern Michigan, and by the reports of other investigators at the University of Michigan whose work has not been published. Valuable assistance and

advice were received from the Wildlife faculty of the University of Michigan School of Forestry and Conservation, including Prof. Howard M. Wight, Dr. Earl C. O'Roke, and Dr. Samuel A. Graham; and from several of the graduate students in wildlife management.

Habitat Requirements of Rabbits

Before explaining the rating sheet for evaluation of the cottontail rabbit range, a brief review will be given of the habitat requirements of the rabbit in this region. In drawing up these requirements, it has been the policy of the author to determine first in each case, the needs of the animal, and second, the factors in the environment which will satisfy those needs. To this end, as full a study as possible has been made of the natural history investigations on this species. However, for the purposes of this report, only such data as influence the habitat requirements will be cited.

Food Requirements

The rabbit's food requirements may be divided roughly into two classes, summer food, and winter food. During the spring and summer months rabbits feed mainly on green grasses and other herbaceous plants. At this season, the amount of food is almost unlimited in the agricultural areas, since the cottontail will eat a wide variety of plants. Seton (24) says, "To make a complete list

of the plants that serve the Cottontails as food, would mean a catalogue of 99 per cent of the flora of the United States." For this reason, it is felt that the summer food supply is never operative in limiting the numbers of rabbits in this region, and it has not been included in the list of points on which the range is to be evaluated.

With the coming of cold weather, however, most of the leafy plants are killed back, and only a few go through the winter in condition suitable for rabbit food. At this season the cottontail turns to bark, fruits, leaves of conifers, and small twigs of various trees and shrubs for a diet. The species which seem to be most widely preferred [Trippensee (28), Todd (26), Allen (2)] are dwarf and staghorn sumac, apple and hawthorn, various raspberries and blackberries, several varieties of dogwood, introduced conifers, shrubby bittersweet, bush honeysuckle, basswood, black birch, slippery elm, and pin oak. Allen (2) also reports that grain in fields and bird feeding stations was eaten throughout the winter even when

good browse was available.

Cover Requirements

On most of the land in this region, cover is likely to be the limiting factor in rabbit populations. Gerstell (8) says, "Because of the rabbit's wide preferences, there is in almost all sections, except the unbroken forest areas, an abundant supply of suitable rabbit food. Hence, in attempting to improve the rabbit habitat the chief factor to be dealt with is the development of cover conditions immediately adjacent to the various sources of food supply offered both naturally and by agricultural practices." In the evaluation method explained later, cover has been given major consideration in ranking land areas.

Classified according to the various needs of the rabbit, cover falls under several heads. Gerstell (8) lists the types of cover needed by cottontails in Pennsylvania under three groupings: "(1) resting cover, where the animals may bring forth their young; (2) resting cover, where the individuals may idly spend their time

protected from the summer's blazing sun and the winter's chilling wind; and (3) escape cover, where they will find safety from the hunters, predators, and snow." He notes that grassy areas adjacent to brush cover provide favorite nesting sites. Resting cover consists of various shrubs and vines, including wild honeysuckle, raspberry, blackberry, and also of such plants as sunflower and growing corn, which provide good shade. Escape cover is furnished by such plants as evergreens, osage orange, greenbrier, wild rose, etc., as well as by a variety of mechanical forms such as woodchuck, skunk, or badger dens, junk piles, brush piles, hollow logs, rock piles, etc.

Gerstell points out that all cover types should be provided in close proximity to each other and to food supplies. In the rating sheet a fourth type of cover has been added to the three already mentioned, and designated as communication cover. This is intended to provide safe lanes of travel for rabbits between essential cover types which are otherwise separated by

cultivated fields or other ground which cannot be crossed without exposing the animals to predators. As in the case of food, cover, with the exception of nesting sites, is usually deficient only during the winter. Therefore, in scoring land areas on resting, escape, and communication cover, these types will be judged from their winter values.

The knowledge of these requirements has been the basis for establishing the following score card for a section of land (640 acres). The various items contained in the score card are explained in the paragraphs which follow.

Score Card For Evaluation of Rabbit Range

Requirements	Number of Units	Unit Rating	Size and Quality Rating	Final Value (max.)
Nesting Sites	40 (160 ch.)	0-15	3-1	0-15
Resting Cover	100 (100 ch.) (1A:5 ch.)	0-15	3-1	0-15
Escape Cover	100	0-20	3-1	0-20
Winter Food	100 (10 acres)	0-10	3-1	0-10
Interspersion				0-10
Communication				0-10
Distribution				0-10
Adaptation to Management				0-10
Total				0-100

Final Rating:	I	II	III	IV
	76-100	51-75	26-50	0-25

Explanation of Score Card

The values on this score card have been set up to rate areas on their carrying capacity based on a winter population of one hundred rabbits per section as ideal. While this is lower than the populations of rabbits actually found in some habitats in the east-central states, it is felt that this is about the maximum number for which management should aim on land that is primarily agricultural. The table which follows gives the population densities as found by several investigators in this general region.

Reference	Season	Locality	Habitat	Populations
Hendrickson (14)	Winters '36 & '37	Iowa	alfalfa & bluegrass orchard	2 rabbits/ 10 A. 14 rabbits/ 10 A.
Haugen (11)	Winter Summer Fall	Michigan	young hardwood forest & abandoned farm land	ave. 9.2/ 160 A. ave. 15.1/ 160 A. ave. 15/ 160 A.
Hendrickson (13)	Spring Fall	Iowa	Agricultural land	0.3-2 per acre 0.6-4 per acre

Stuber (25) reports that the aim on Ohio's natural propagation areas is to maintain a population of 1 rabbit per 2.5 acres (256 per section).

Research shows that in this region, the cottontail breeding season is from February to September, and that the average female rabbit gives birth to three or four litters per season, with a little over five young per litter. Some of the data obtained on breeding habits is shown below.

Reference	Breeding Season	Number of litters	Young per litter	Young per season
Beule (3)	Apr.-Sept.		5.42	
Hendrickson (13)	Apr.-Sept.		6.4	
Schwartz (23)	Mar.-Sept.	ave. 3.8	4.4	16.7
Allen (1)	Feb.-July		5.1	
Haugen (11)	Mar.-Sept.	4	5.4	21.6
Trippensee (27)	Jan.-Aug.		5.04	

From these data, it seems that a conservative average production of ten young per female per season may be expected here. Using this figure, and assuming that winter mortality would reduce the spring breeding population to 80 rabbits, then the population in the fall would normally be 480 rabbits per

section. Again reducing the number by 50% to allow for summer mortality leaves 240 rabbits per section at the opening of the hunting season. This means that 140 could be removed each year and still leave the desired breeding population.

It becomes evident, then, that a section of land with ideal habitat must provide winter food and cover for 100 rabbits, and nesting sites for 40 females in the spring. The number of units in the classification is thus automatically fixed, and it remains only to decide the size of each type of unit necessary to satisfy the needs of a rabbit.

In the remainder of this discussion the evaluation procedure has been carried through on the basis of 100 rabbits per section in the winter. However, it should be pointed out that this is only a suggested figure which it is felt will apply to average conditions on agricultural land. Under varying conditions of farming practice, the optimum population of rabbits will also vary. In areas where fruit and berries are the main crops, it will doubtless be necessary to control rabbits rather than encourage them. On the other hand, in country which is not heavily farmed, with large areas of open brushy land, the desirable population of rabbits will run considerably higher than 100 per section.

The actual number of rabbits for which management should aim on any section, then, must be determined from an examination of the farming types. The technic for this determination presents a separate problem, and will not be discussed here. It may be based on the percentage

of the farm income derived from crops susceptible to rabbit damage; possibly the location of such crops in respect to favorable rabbit cover must also be considered. This is yet to be determined and presents a good field problem for future work.

Once the optimum population for a section is determined, however, the score card may then be set up to score the land on that basis by simply revising the numbers of units in each requirement class. The other columns will remain the same, since they are expressed in percentage figures.

For example, if 150 rabbits are desired during the winter, with a spring breeding population of 60 females, the requirements for nesting sites would be changed to 60 units, or 240 chains; the resting cover to 150 units, or 150 chains; etc. The score card can then be applied in the same manner described in the following paragraphs.

Nesting Sites

The cottontail prefers open herbaceous cover in which to make its nests. It does not build nests in the brush which it occupies the rest of the year, but in grassland, clover fields, abandoned meadows, etc., adjacent to brushy cover. To provide a suitable nesting site, there should be a strip of land at least ten feet wide, with fairly thick herbaceous growth, and woody cover of some sort adjacent to it. Since the majority

of nests are located twenty to thirty feet from woody cover, and only in extreme cases are they more than one hundred feet away, probably a nesting site fifty feet wide should be considered adequate.

Haugen (11) and Trippensee (27) found evidence that female rabbits establish territories during the breeding season and will not allow other breeding females to remain on the same area. Haugen found the average size of home range of females during the breeding season to be 22.5 acres. Other investigators, however, working in more favorable habitats, have found much smaller home ranges. Some of these are shown in the table which follows:

Reference	Locality	Average Size of Home Range
Dalke and Sime (5)	Connecticut	3 acres
Schwartz (23)	Missouri	1.2 acres
Haugen (11)	Michigan	22.5 acres

In the score card, 160 chains of nesting cover per section have been set up as ideal. If this nesting cover, with its adjacent woody cover

averages a chain wide, each female would be provided with a minimum of .4 acre of nesting territory, which is probably adequate under management conditions.

Resting Cover

Resting cover must provide shelter from wind and sun, yet be open enough so that a rabbit cannot easily be surprised by a predator during the day. Examples of good resting cover are thickets of raspberry and blackberry, vines such as wild grape, or patches of brush such as Crataegus, prickly ash, etc. These do not need to be very wide, and fence rows often provide excellent resting cover. However, a large brier patch will obviously conceal more rabbits than a narrow strip, so allowance has been made for this extra value in the score card. 100 chains has been considered adequate to shelter 100 rabbits, and a thicket one acre in size has been considered equal to five chains of fence row or other narrow cover.

Escape Cover

As has been emphasized before, cover of

all kinds is usually plentiful during the summer, so the value of escape cover depends on its condition in the winter. In the ideal section, escape cover must be provided for 100 rabbits. Since this sort of cover is so varied in nature, it is difficult to set up any definite size measurements for it. However, the average field worker will be able to judge approximately the number of rabbits which will be able to find shelter in a brush pile or junk heap or stand of young evergreens. Gerstell (10) has shown the importance of underground cover for cottontails, and all woodchuck holes and skunk holes should be counted as providing escape for five rabbits. Although this is probably more than would ever be found in a den at one time, the use of this figure will allow for the additional holes which will inevitably escape notice when the evaluation is made.

Winter Food

Winter food for rabbits is provided by the young, succulent growth of a large variety of

woody plants. The cottontail is able to shift food preferences so that almost any species of shrub, tree, or bush will at times serve as a source of winter food. However, the reports of several workers, including Trippensee (27), Todd (26), Allen (2), Hendrickson (14), and Haugen (11) have shown the various raspberries and blackberries, dwarf and staghorn sumac, apple and hawthorn, and several varieties of dogwood to be preferred foods where available, and these should be given a higher quality rating than other species of similar abundance. Food must be provided for 100 individuals, which will require about ten acres of shrubby growth of average density. A hedge or shrubby fence row seven feet wide contains an acre to every 100 chains.

Interspersion

Leopold (17) and others have stressed the importance of interspersion of types so that it has become axiomatic in wildlife management discussions and need not be elaborated on here. Suffice it to

say that proper interspersion is probably the chief factor determining the size of home range and territory of the rabbit, and therefore affects directly the carrying capacity of any area.

Communication

If perfect interspersion of types existed on a section, there would be no need for lines of communication. However, on agricultural areas, the essential types are almost inevitably separated to some extent, and it is to remedy this situation that this additional cover type is introduced. Communication lanes do not need to provide anything but concealment as the rabbits move through them, and Trippensee (27) notes that even shallow dead-furrows are utilized by rabbits in moving from food to cover, etc. However, it is more often true than not, that communication lanes will also provide winter food and escape or resting cover, due to the plants growing thereon.

Distribution

This factor has been added to take into account the relative stability of range of the

cottontail. Allen (2), calls attention to the fact that rabbits do not shift their home range after it is once established, and Stuber (25) gives the cruising range of a rabbit in good habitat as usually about one-fourth mile, seldom more than one-half mile. Due to this immobility of range, ideal conditions on one quarter section cannot be expected to furnish rabbits for an adjoining quarter section. Therefore, the rating sheet presented in this report has been divided into four parts and each quarter section is rated separately. The equity of distribution of types among the four quarter sections can then be rated at a glance.

Adaptation to Management

Two sections of land may receive the same rating as to food and cover conditions at present existing in the areas, yet one may be so intensively farmed or so deficient in some particular item that it is economically impossible to bring it up to ideal conditions. At the same time the other section may have its deficiencies so distributed that they can be remedied with a

minimum of effort and expense. This item can be accurately scored only by a man with a good knowledge of management practices and costs, but is one of the most important factors if the area being evaluated is to be placed under management.

It is important to remember that on agricultural land especially, the rabbit's environment is subject to frequent changes. Not only is there a yearly cycle of food and cover changes as the crops are harvested, land is plowed, etc., but other activities of the farmer directly affect the rabbit range.

Crop rotations affect to a large extent the amount of food and cover in any one year. A field of corn harvested by a mechanical picker may, if adjacent to a woodlot, furnish an excellent source of winter food. But the next year, the field may be in oats, and be plowed early in the fall. For this reason, the shelter and food offered by agricultural crops has been omitted from consideration on the score card and rating sheets. However, the importance of these factors becomes evident

when an area is to be placed under management, and the possibilities of improving the habitat by such methods as controlled crop rotations, underplanting of woodlots, regulation of grazing, soil conservation practices, etc. should form a major part of the basis for rating this last factor.

Rating Sheet for Field Use

Following is a sample rating sheet for evaluation of the rabbit range, in the form which is suggested for use in the actual field work. Accompanying this sheet is given a set of condensed instruction for its use, which can be taken into the field for quick reference.

Sample Rating Sheet

State | County | Township | Section

Requirements	Tally of Number of Units By Quarter Sections	Total	Unit Rating	Size & Quality Rating (3-1)	Final Value
Nesting Sites		40	15		15
Resting Cover		100	15		15
Escape Cover		100	20		20
Winter Food		100	10		10

Interspersion (0-10) - - - - - - - - - - -

Communication (0-10) - - - - - - - - - - -

Distribution (0-10) - - - - - - - - - - -

Adaptation to Management (0-10) - - - - - - - - - - -

Total -

Basis for Final Rating

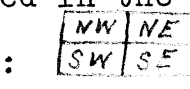
I	II	III	IV
76-100	51-75	26-50	0-25

Final Rating - - - - - - -

Rated by

Date

Instructions for Use of Rating Sheet

Each requirement is tallied by units as defined below. Each unit is tallied in the quarter section in which it is found, thus: 

The foresters' system of tallying trees is recommended, i.e., 1 = ·, 3 = ∴, 5 = ⁘, 8 = ⊡, 10 = ⊠ The tallies for the four quarter sections are added and the total placed in the next column. The unit rating is based on the comparison of actual total units with ideal. The maximum rating in each case is given in the upper left-hand corner of the column. The unit rating is divided by the size and quality rating to give the final value.

Definitions of Requirements

Nesting sites -- strips of herbaceous cover at least ten feet wide, adjacent to brushy growth. Each four chains equals one unit. Size and quality: Fifty feet wide should be given maximum size rating; quality judged on amount of concealment offered by the herbaceous growth, and its freedom from flooding, burning, cutting, or grazing.

Resting cover -- fairly open cover, providing shade in summer, wind-break in winter, but still allowing visibility by the rabbits. Examples: berry or grape vines, sunflowers, sumac, brushy fence rows. 1 chain = 1 unit, or 1 acre = 5 units. Size and quality: judged on width of strips and location in relation to escape cover and food.

Escape cover -- dense woody cover, or other material affording sanctuary from hunters and predators and protection from severe winter weather. Each unit should provide cover for one rabbit; woodchuck and skunk dens are counted as five units each. Size and quality: underground cover provides best all-round protection; nearness to winter food is important.

Winter food -- young growth of many types of woody plants. 1 acre = 10 units; strips about 7 feet wide = 1 unit per 10 chains. Size and quality: young, succulent growth is best; favorite species are sumac, raspberry, blackberry, apple, hawthorn, dogwood, conifers.

Interspersion -- a general measure of

the relative positions of various types of food and cover.

Communication -- lines of travel between essential types which are widely separated.

Distribution -- a measure of the equality in food and cover conditions among the four quarter sections. Judged from tally by quarter sections.

Adaptation to Management -- an estimate of the comparative ease and economy of bringing the area up to ideal conditions by management practices.

On the pages which follow are shown rating sheets for two sections of land in Southern Michigan. These two sections are adjoining, but one has been given a rating of I, while the other has been placed in class IV. The maps following each rating sheet show the location of the four types of requirements and help to explain the basis for the scores given on the other four points.

The average section of land requires about three hours for a complete evaluation by this method, including the location of each type, if suitable base maps are available for field use.

In concluding the presentation of this method, I wish to point out again that it has been more or less arbitrarily set up on the basis of a winter population of one hundred rabbits per section on agricultural land. If it is desired to maintain a higher or lower population than this on some areas, the requirements in the score card must be modified accordingly. The determination of the optimum population on any area must be based on local conditions and field observations of the population figure at which damage to crops begins under various types of agriculture.

RATING SHEET FOR EVALUATING THE RABBIT RANGE

State *Michigan* County *Washtenaw* Township *Ann Arbor* Section *5*

Requirements	Tally of Number of Units By Quarter Sections	Total	Unit Rating	Size & Quality Rating (3-1)	Final Value
Nesting Sites		40 / *21*	15 / *8*	*2*	15 / *4*
Resting Cover		100 / *39*	15 / *6*	*2*	15 / *3*
Escape Cover		100 / *11*	20 / *2*	*2*	20 / *1*
Winter Food		100 / *31*	10 / *3*	*1*	10 / *3*

Interspersion	(0-10)	*2*
Communication	(0-10)	*1*
Distribution	(0-10)	*5*
Adaptation to Management	(0-10)	*2*
Total		*21*

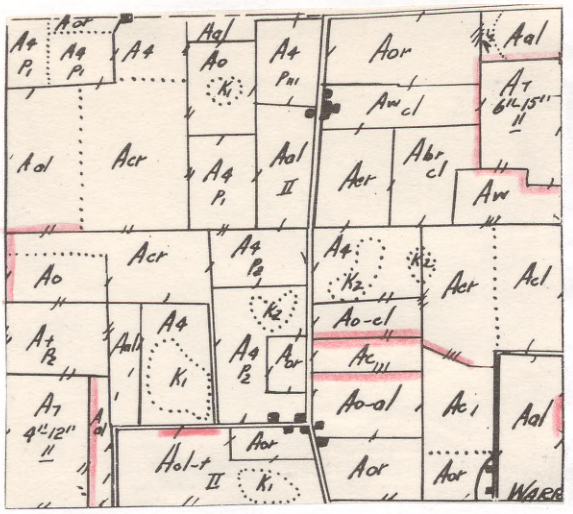
Basis for Final Rating

I	II	III	IV
76-100	51-75	26-50	0-25

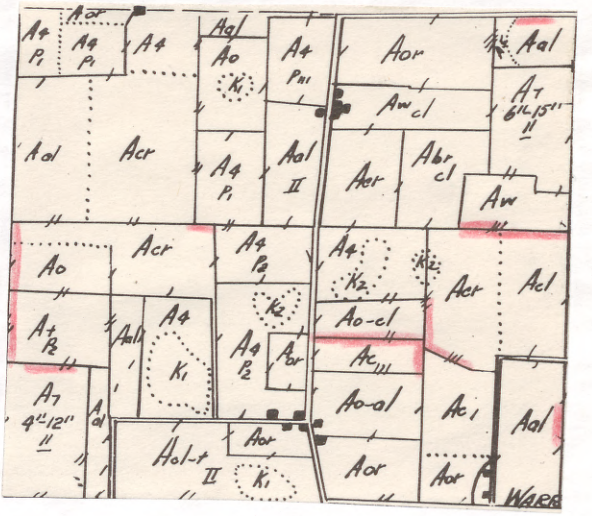
Final Rating - - - - - - - *IV*

Rated by *R. Franklin Dugan* Date *June 11, 1941*

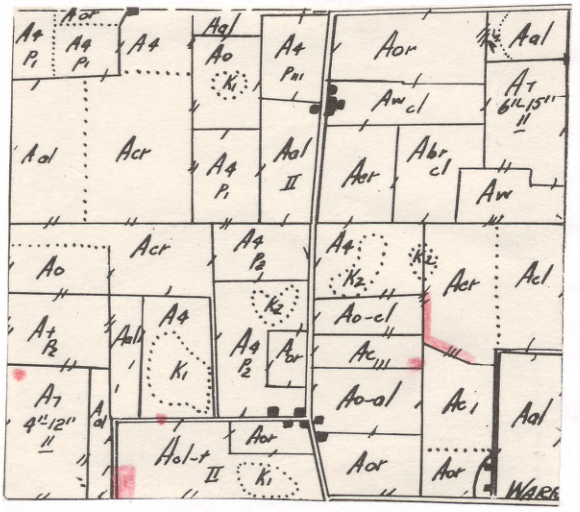
Location of Requirements in Section 5



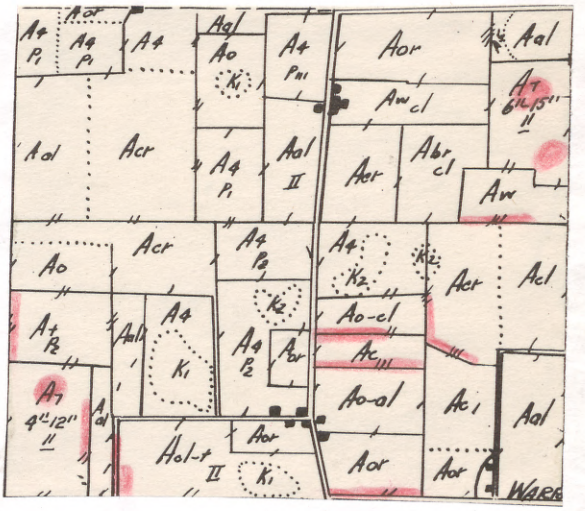
Nesting Sites



Resting Cover



Escape Cover



Winter Food

RATING SHEET FOR EVALUATING THE RABBIT RANGE

State *Michigan* County *Washtenaw* Township *Ann Arbor* Section *6*

Requirements	Tally of Number of Units By Quarter Sections		Total	Unit Rating	Size & Quality Rating (3-1)	Final Value
Nesting Sites	☒ ·	☒ · :	40	15		15
	☒ : :	☒ ·	49	15	2	8
Resting Cover	☒ : :	☒ · ·	100	15		15
	☒ ☒ ☒ ☒ ☒	☒ ☒ □	104	15	1	15
Escape Cover	☒ ☒ .7	☒ ☒ ☒ ☒	100	20		20
	☒ .7	: :	86	17	2	9
Winter Food	☒ ☒ ☒ : :	☒ ☒ ☒ ⊐	100	10		10
	☒ □	☒ ⊐	107	10	1	10

Interspersion	(0-10) - - - - - - - - - - -	10
Communication	(0-10) - - - - - - - - - -	9
Distribution	(0-10) - - - - - - - - - -	7
Adaptation to Management	(0-10) - - - - - - - - - -	9
Total	- - - - - - - - - - - - - - - - - - -	77

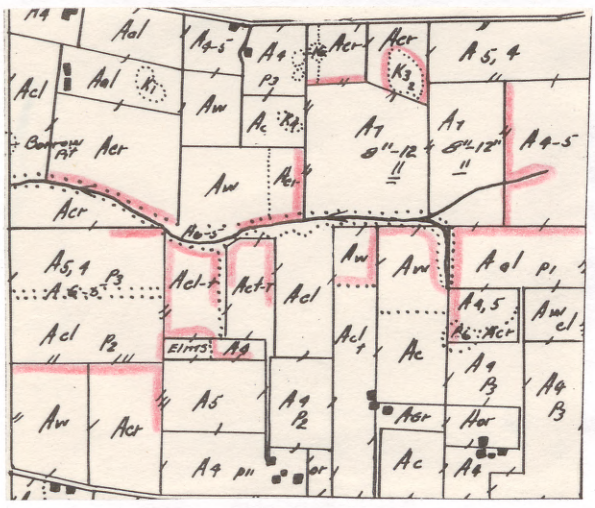
Basis for Final Rating

I	II	III	IV
76-100	51-75	26-50	0-25

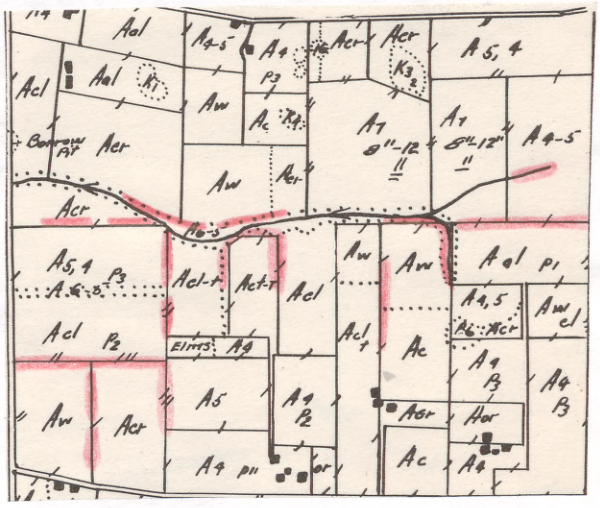
Final Rating - - - - - - - I

Rated by *R. Franklin Dugan* Date *June 11, 1941*

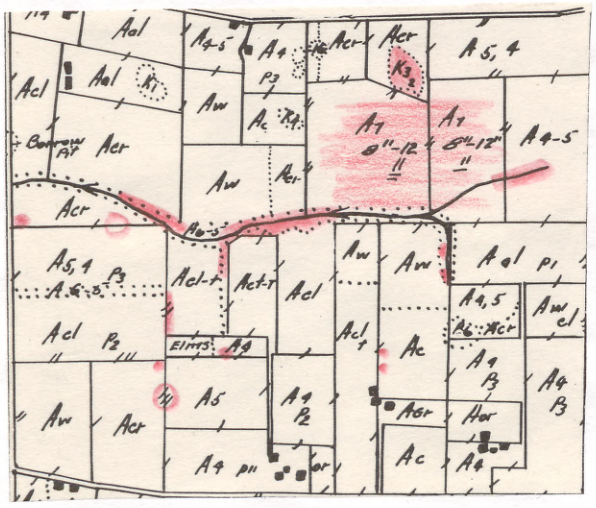
Location of Requirements in Section 6



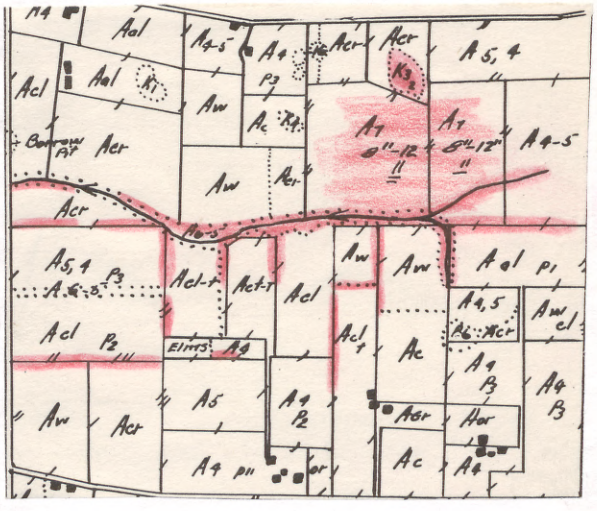
Nesting Sites



Resting Cover



Escape Cover



Winter Food

○ woodchuck den

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