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Habitat Preference and Dispersion of Nuttall's Cottontails²

Abstract

Dispersion in a population of Nuttall's cottontails (*Sylvilagus nuttallii*) was ascertained by live-trapping and by direct observation of individuals flushed along 32 transect lines across an 84.9-ha study area in central Oregon. Dispersion of 457 captures in three habitat types based on vegetative, edaphic, and topographic substrates was significantly different from a uniform distribution; however, dispersion of 86 cottontails flushed in the same habitats was not significantly different from a uniform distribution, but was significantly different from the distribution of captures. Observed differences in dispersion were believed to be related to diel activity patterns of cottontails, and to the physiographic and vegetative differences in habitats. Based on these conclusions, observed habitat preferences of cottontails on the study area were believed to be artifacts of the methods of quantification of dispersion of the population.

Introduction

This is a report of our attempts to determine habitat preferences of Nuttall's cottontails (*Sylvilagus nuttallii*) by quantification of the dispersion of a population inhabiting a sagebrush-juniper scabland community in central Oregon.

Within its range, Nuttall's cottontail is reported to occupy ridges and slopes vegetated with sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), rabbitbrush (*Chrysothamnus* sp.), western juniper (*Juniperus occidentalis*), mountain mahogany (*Cercocarpus ledifolius*) at low elevations, upward into pinon pine (*Pinus edulis*), Douglas fir (*Pseudotsuga menziesii*), and aspen (*Populus tremuloides*) zones (Orr, 1940; Janson, 1946; Ingles, 1965). Apparently, plains areas without rocky outcrops or thick brush are not occupied (Orr, 1940). However, to our knowledge, dispersion of a population of Nuttall's cottontails in an area encompassing different vegetative, edaphic, and topographic substrates has not been quantitatively evaluated.

Study Area and Methods

An 84.9-ha study area was established 4.9 km west of Terrebonne, Deschutes County, Oregon, in July 1972, but was shifted about 90 m north (one row of traps) and increased in size to 87.0 ha in April 1973. The area was situated in a sagebrush-juniper scabland community of the Columbia Basin Physiographic Province (Franklin and Dyrness, 1969). From an aerial photograph of the area (Fig. 1) three distinct habitat types were discernible. Habitat Type 1 comprised about 18.2 ha of the study area, and was about 835.4 m in elevation with a flat topography and very fine pumice soils. Habitat Type 2 incorporated about 46.1 ha, ranged in elevation between 835.4 m and 841.5 m,

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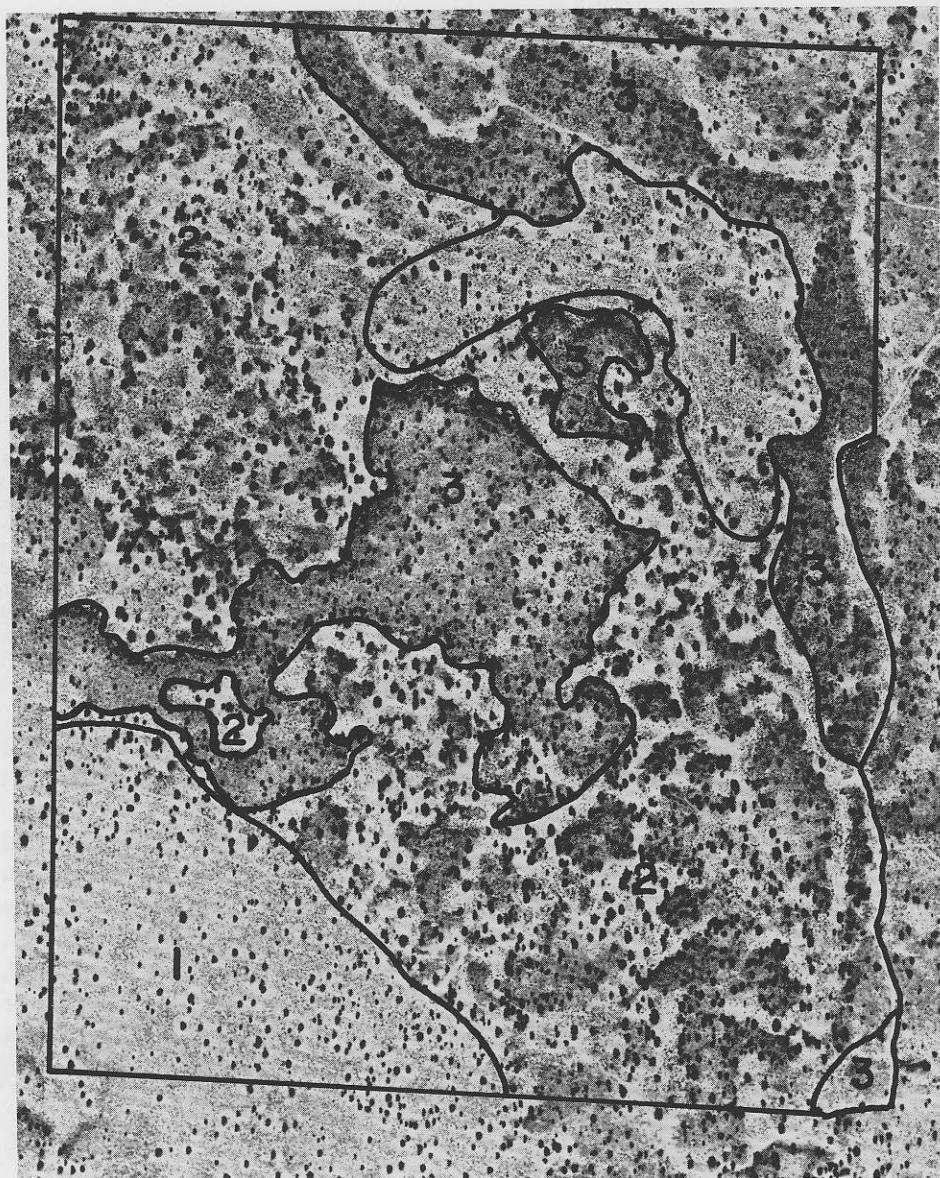


Figure 1. Aerial photograph of the study area with portions in different habitat types delineated and numbered, Deschutes County, Oregon, 1970.

and consisted of a mosaic of small lava hummocks between narrow valleys with deep pumice soils. Habitat Type 3 included about 22.6 ha of broad flat lava hummocks at the 841.5 m elevation with shallow soils that contained numerous pebbles and stones.

During July 1973, the vegetation was sampled by establishing 10 rectangular quadrats (0.3 X 0.6 m) at 10-m intervals along 10 randomly established transects in each habitat type. Species of plants occurring in each quadrat were recorded; percentage fre-

quency of occurrence of species in quadrats was used to evaluate vegetative differences among the habitat types.

Populations of Nuttall's cottontails on the study area were sampled by livetrapping with 15- x 18.7- x 58-cm unbaited cedar box-traps distributed in a 9- x 13-trap grid with approximately 90 m between traps. Livetrapping was conducted for 30 consecutive days during August 1972 and 1973, for three days on alternate weekends during April and May 1973, and for three days each week during June and July 1972 and 1973. Locations of sites of capture within the grid were recorded for each cottontail. During trapping periods in 1973, sites at which cottontails were flushed were recorded; numbered markers were erected at 30.5-m intervals along 32 parallel transect lines 30.5 m apart to facilitate locating the sites at which cottontails were flushed.

Results

Vegetative Survey

Growth of herbaceous species ceased prior to the survey; consequently, plant species recorded on the study area were primarily perennial shrubs, and the dried remains of a few forbs and grasses (Table 1). Cheatgrass, *Bromus tectorum*, the most commonly

TABLE 1. Percent frequency of occurrence of plant species in 100 quadrats established in each habitat type on the study area, Deschutes County, Oregon, July 1973.

Species	Percent Frequency of Occurrence		
	Habitat Type 1	Habitat Type 2	Habitat Type 3
<i>Bromus tectorum</i> ¹	43	75	84
<i>Chrysothamnus viscidiflorus</i> ¹	29	30	5
<i>Sitanion hystrix</i> ¹	23	12	4
<i>Stipa thurberiana</i> ¹	18	32	7
<i>Artemisia tridentata</i> ¹	16	5	13
<i>Erigeron vimineum</i> ¹	10	1	3
<i>Chrysothamnus nauseosus</i>	2	1	3
<i>Juniperus occidentalis</i>	1	1	2
<i>Sisymbrium altissimum</i>	1	—	—
<i>Mentzelia albicaulis</i>	—	18	—
<i>Agropyron dasystachum</i>	—	6	1
<i>Festuca idahoensis</i>	—	4	4
<i>Purshia tridentata</i>	—	1	2
<i>Agropyron spicatum</i>	—	—	9
<i>Poa sandbergii</i>	—	—	8
<i>Poa cusickii</i>	—	—	4
<i>Leptodaetylon pungens</i>	—	—	1

¹Frequency of occurrence significantly different ($P < 0.01$) from that expected based on uniform occurrence in all habitat types.

encountered plant in all habitat types, occurred almost twice as frequently in quadrats in Habitat Types 2 and 3 as in Habitat Type 1. Three species, green rabbitbrush (*Chrysothamnus viscidiflorus*), squirreltail (*Sitanion hystrix*), and Thurber's needlegrass (*Stipa thurberiana*) appeared to be of major importance in Habitat Types 1 and 2, but of little consequence in Habitat Type 3 (Table 1). Other major differences in vegetation between habitat types were the relatively low species diversity but relatively high percentage frequency of occurrence of most species in Habitat Type 1, and the relatively high species diversity but relatively low percentage frequency of occurrence of many

species in Habitat Type 3 (Table 1). Species diversity and percentage frequency of occurrence of species present were intermediate in Habitat Type 2.

Cottontail Dispersion

During 1972 and 1973, sites for 457 captures of Nuttall's cottontails were recorded. In both years, dispersion of capture sites in relation to habitat type was significantly different ($P < 0.05$) from the expected dispersion based on the proportion of each habitat type occurring on the study area (Table 2). Cottontails were captured considerably

TABLE 2. Dispersions of Nuttall's cottontails in relation to habitat based on numbers caught in live traps or flushed in each habitat type on the study area, Deschutes County, Oregon, 1972-1973. Expected numbers based on proportion of study area in each habitat type in parentheses.

Year	Method of Observation	Type 1	Habitat Type 2	Type 3
1972	Livetrapped	84 (65) ¹	168 (153) ¹	38 (72) ¹
1973	Livetrapped	46 (35) ¹	92 (89) ¹	29 (22) ¹
1973	Flushed	11 (18)	46 (46)	29 (22)

¹Numbers observed significantly different from numbers expected ($P < 0.05$).

more frequently than expected in Habitat Type 1 and considerably less frequently than expected in Habitat Type 3. Numbers of captures in Habitat Type 2 did not deviate greatly from expected numbers (Table 2). Because there were no significant differences ($P > 0.3$; $X^2 = 1.529$, d.f. = 1) in numbers of captures in the habitat types between years, these data were combined for subsequent analyses.

During 1973, Nuttall's cottontails were flushed at 86 locations. The dispersion of sites at which cottontails were flushed was not significantly different from the expected dispersion based on the proportion of each habitat type occurring on the study area ($0.10 > P > 0.05$; $X^2 = 4.759$, d.f. = 2). However, 32 percent more cottontails than expected were flushed in Habitat Type 3 and only 61 percent as many as expected were flushed in Habitat Type 1 (Table 2). Dispersion based on records of cottontails flushed was significantly different from that based on livetrapping records ($P < 0.05$).

Discussion and Conclusion

We believe that explanation of our observed differences in dispersion lies in a combination of the diel activity patterns of Nuttall's cottontails, and in the physiographic and vegetative differences in habitat types. Because records of cottontails flushed were obtained during periods that livetraps were examined (about 0700 to 1500 PST), we believe that these records were influenced by the diurnal activity of cottontails. Likewise, we believe that dispersion of captures in live traps tended to reflect the nocturnal activities of the species.

Nuttall's cottontails appeared to use crevices and fissures in lava outcrops as daytime retreats, and were commonly observed in or near such formations. They were flushed much less frequently from forms of the type used by eastern cottontails (*S. floridanus*) and some other lagomorphs; apparently, the sparse, mostly shrubby vegetation in the sagebrush-juniper scablands is not conducive to construction and use of forms. Although we did not measure activity systematically, Nuttall's cottontails appeared to begin foraging early in the evening and retired to their daytime retreats early

in the morning. Similar periods of activity were reported for other lagomorphs (Lord, 1961, 1964; Mech *et al.*, 1966).

Habitat Type 1 was essentially devoid of lava outcrops; the paucity of suitable daytime retreats may account for the relatively few cottontails flushed there. The relatively low numbers of Nuttall's cottontails flushed and the larger than expected numbers caught in live traps in Habitat Type 1 tended to indicate that most extensive use of that habitat type occurred during the hours of darkness. We suspect that Nuttall's cottontails foraged in Habitat Type 1, but returned to areas with suitable refuges during the daylight hours. Cottontails may have entered our traps set in Habitat Type 1 to obtain shelter similar to that provided by crevices and fissures in lava outcrops in other habitat types; such behavior could explain, in part, the larger than expected numbers caught in live traps in Habitat Type 1.

We believe that fewer Nuttall's cottontails were present in Habitat Type 3 than indicated by the number flushed in that habitat type. Crevices that appeared to be suitable daytime retreats for Nuttall's cottontails were present in Habitat Type 3, although considerably less abundant than in Habitat Type 2. Consequently, this feature alone doubtfully explains the larger than expected numbers of Nuttall's cottontails flushed in Habitat Type 3. We suspect that the relatively flat topography and the sparse vegetation on the thin stony soil permitted easy visibility of cottontails that were flushed; in turn, these factors caused counts of cottontails flushed in Habitat Type 3 to be elevated. If densities of cottontails were actually lower in Habitat Type 3 as postulated, fewer captures than expected would be a logical assumption. In addition, the low frequency of occurrence of some plant species in Habitat Type 3 that were common in Habitat Types 1 and 2 (Table 1) suggests that those cottontails residing in Habitat Type 3 may have foraged considerably elsewhere, and were not subject to capture in live traps set within this habitat type during much of their period of activity. Habitat Type 2, with an abundance of preferred daytime retreats supplied by innumerable crevices and fissures in low lava hummocks in close proximity to vegetation of a type sought by foraging cottontails, seemingly should be preferred by Nuttall's cottontails and support more dense populations of them.

We strongly suspect that Habitat Type 2 supported more Nuttall's cottontails and that the observed habitat preferences of the species on our study area were artifacts of the methods of quantification of dispersion of the cottontail population.

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