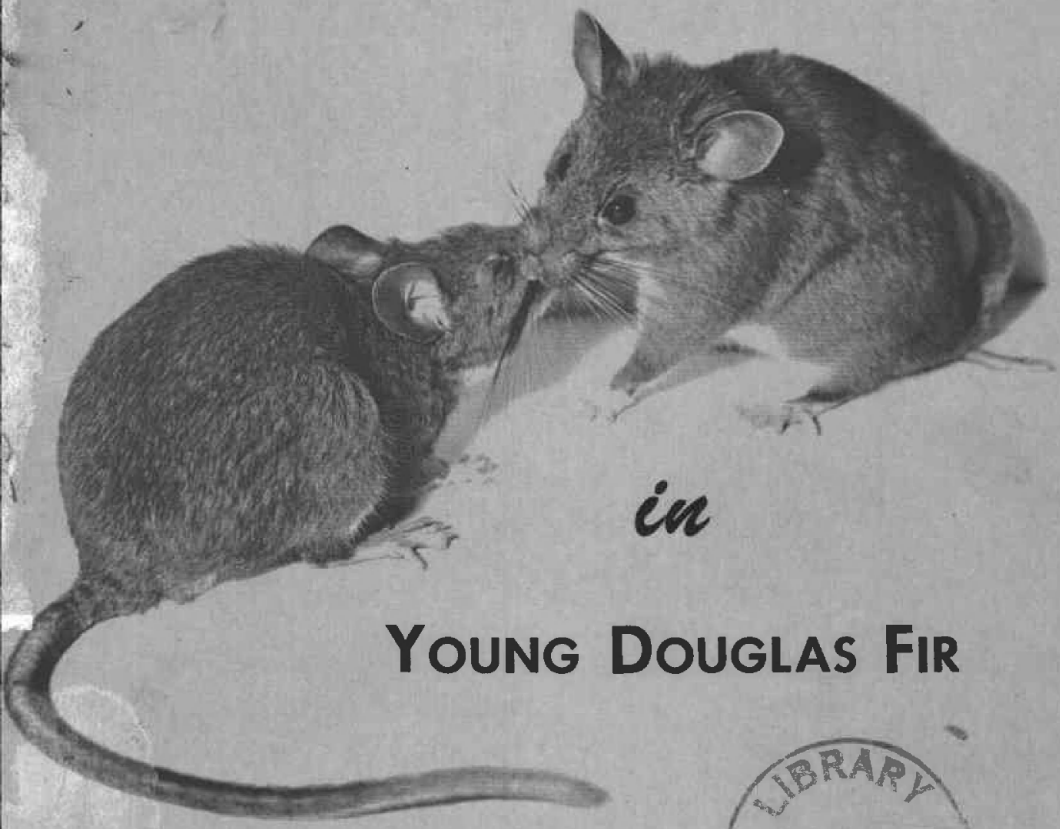
DUSKY-FOOTED WOODRAT



in

YOUNG DOUGLAS FIR

By **Edward F. Hooven**

Research Note 41, November 1959

orest Lands Research

OREGON FOREST RESEARCH CENTER

Corvallis

Dusky-Footed Woodrat in Young Douglas Fir

By

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OREGON FOREST RESEARCH CENTER

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CONTENTS

SUMMARY

Woodrats were studied in a mixed stand of young Douglas fir and Oregon white oak about 7 miles north of Corvallis.

Some effects of previous baiting were noted, diet of caged woodrats was determined, population changes on 2 study plots were determined, and obvious damage to Douglas firs around woodrat houses was listed.

Principal damage noted was severe barking of young Douglas firs to secure material for nests; some leaders were cut, also. Numerous laterals were cut, but apparently for house building , not for food.

Control by bait containing thallous sulphate, or by intensive management to remove cover, appears practicable.

DUSKY-FOOTED WOODRAT IN YOUNG DOUGLAS FIR

by

Edward F. Hooven

INTRODUCTION

Improved management of the timber resources of Oregon focuses attention on mammals that might be detrimental to growing stock. The most obvious damage is caused by animals such as rabbits, deer, porcupines, and range cattle. Less well known is damage caused by the woodrat. Study of this animal was begun to acquire knowledge to suggest possible measures for control where necessary.

Review of the literature revealed that, although the diet of the woodrat appears confined to hardwood trees, underbrush, berries, acorns, and fruits, the animal does considerable damage to some conifers. Damage to Jeffrey pine (Pinus Jeffreyi) has been reported as early as 1917 (9)*. In Douglas fir (Pseudotsuga menziesii, (Mirb.) Franco), saplings 15-25 feet tall seem the most susceptible to attack.

The rats chew bark from upper trunks and limbs, damage being comparable to that done to pine by porcupines. Because of sporadic distribution of woodrat populations, the amount of damage is difficult to estimate. The animal works in an insidious manner. One or two trees to an acre may be girdled partially or wholly. Sometimes only the main stem of the tree is attacked, sometimes the lateral branches, or both. Red needles are easily seen on the affected part of the tree soon after attack. Later, evidences of damage become hard to detect and may be overlooked entirely.

Distribution

The woodrat (Neotoma Say and Ord) is a medium-sized rodent native to North America (Figure 1). The range of the genus extends from 60 degrees north latitude to Central America, and from the Atlantic to the Pacific Coasts (11, 12, 14).

The dusky-footed woodrat (Neotoma fuscipes Baird) is restricted to the Pacific Coast, ranging south from the Columbia River to Lower

* Numbers in parentheses refer to similarly numbered references in the Bibliography.

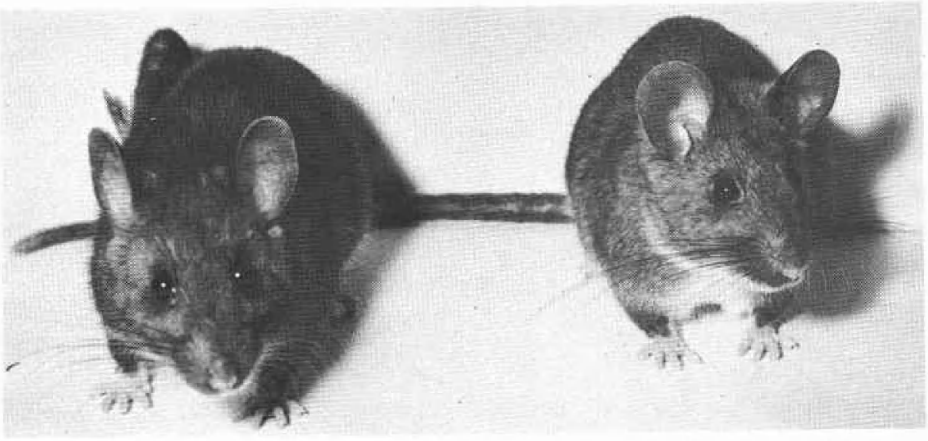

Figure 1. Woodrats; male (left) and female, 14 weeks old.

Figure 2. Favored location for woodrat nest; Douglas fir regeneration at base of old Oregon white oak.

California (15). It is found from the lower Sonoran to the Canadian zone, but the greatest populations occur in the Chaparral of the upper Sonoran. In Oregon, it occurs chiefly in dry parts of the transitional zone, distributed mainly on low slopes or rolling foot hills of the drainages of the Rogue, Umpqua, and Willamette Rivers. Its distribution becomes sparse in northern limits of its range as it nears the Columbia River. Dominant vegetation of area occupied is Douglas fir, pines, oaks, and many other broadleaved trees.

Habitat

The habitat of the woodrat depends to a large extent upon amount and type of vegetative cover offered. Cover usually affords protection in varying degrees from predators and inclement weather, and provides food, travel routes, and seclusion (2). As cover is vital, the woodrat is absent from open grassland or open woodland where there is little or no underbrush. In the southern part of its range, it is abundant in dense, young-growth California live oak (Quercus agrifolia Nee) (7). Association with oaks is continued into the northern part of the range, where woodrats almost invariably are found with Oregon white oak (Quercus Garryana Dougl.) (Figure 2).

Adequate protection appears to consist of dense underbrush composed of thickets of hawthorne (Crataegus sp), blackberry (Rubus macropetalus Dougl.), snowberry (Symphoricarpus albus (L) Blake), and abundant poison oak (Rhus diversiloba T and G) (3). The overstory is usually Douglas fir in various densities, oak, Oregon maple (Acer macrophylum Pursh.), Pacific madrone (Arbutus menziesii Pursh.), and Oregon ash (Fraxinus latifolia Benth.). When available, the woodrat prefers to build its large houses in thickets of Douglas fir saplings about 20 feet tall (Figure 3).

General Habits

The houses, either on ground (Figure 4), or in trees (Figure 5), are conspicuous indicators of abundance of woodrats in an area. In either location, the house is of startling size in relation to size of the builder. The ground house varies from several feet to about eight feet high with a base diameter from five to six feet. The conical roof sheds water and affords protection from inclement weather. Buildings are made of sticks and vegetation built up and around old logs, stumps, or many-stemmed clusters of rugged shrubs. The number of nests or chambers in a house varies with size, some having as many as eight. Each nest is composed of bark and other material, all finely shredded.

Figure 3. Preferred location for woodrat nest; advanced regeneration of Douglas fir around grove of old Oregon white oaks.

Figure 4. Woodrat nest on ground among small Douglas firs. Identification tag is being fixed to ear of woodrat after capture in trap in right foreground.

Figure 5. Woodrat tree house in Douglas fir thicket.

Many woodrats build an auxiliary nest in a tree adjacent to the ground house. This is generally smaller than the ground house, but an occasional one is built very large, especially if it is not far above the ground. Belief was that males occupied tree nests until after the young were weaned (1), but findings in the present study did not support that belief.

Life History and Description

The dusky-footed woodrat has a round, tapering, short-haired tail almost as long as the head and body. The ears are large and thinly haired. Upper parts are dark cinnamon-brown darkened by blackish outer hairs; underparts are whitish, with a buff, or pale-cinnamon, belly.

Average measurements taken from 13 adults were:

weight	215 grams
total length	415 mm
tail	216 "
hind foot	40 "
ear	33 "

Breeding starts in early spring and continues, perhaps, until July. Three embryos to a female seem general, with occasionally one having four. Gestation period is 33 days. Eyes are opened at 12-14 days (4, 16), and young are weaned at 25-36 days. Some individuals in the present study appeared to have more than one litter a season (Figures 6-9).

Predators

Although increase of woodrat population does not seem to be rapid, identity of the chief predator is uncertain. Some writers have stated that bobcats, coyotes, and house cats will refuse it as a bait (7), others that it is preyed upon by predatory mammals as well as birds (13). The woodrat is known to constitute 3.7 per cent by weight of the diet of the barn owl (Tyto alba Scopoli) and 18 per cent of that of the horned owl (Bubo virginianus Gmelin) in some parts of California (5, 6). It also is prey of the red-tailed hawk (Buteo jamaicensis Gmelin).

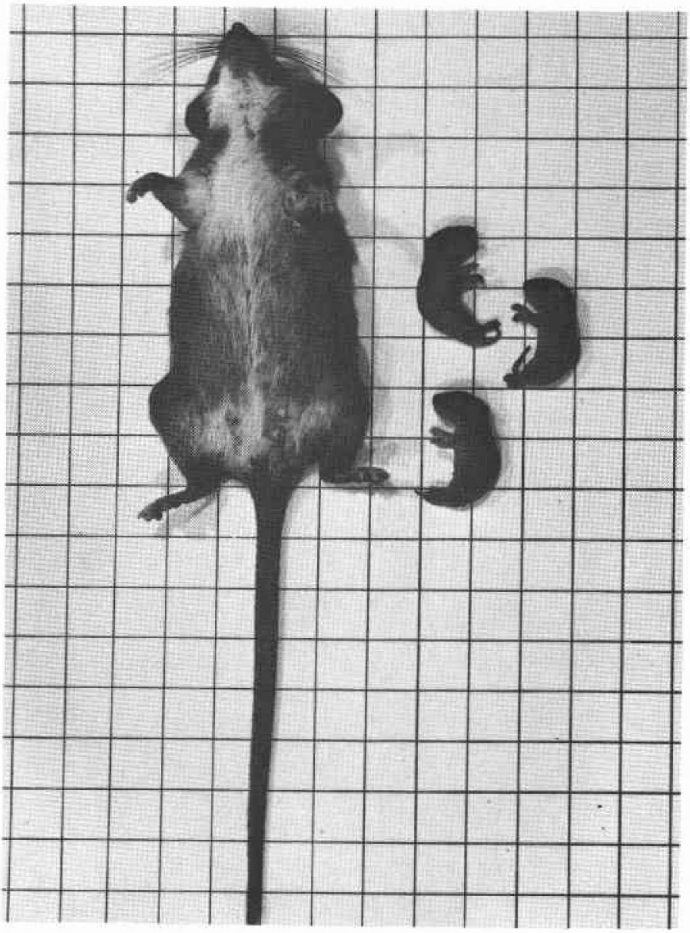

Figure 6. Anesthetized woodrat with newborn young.

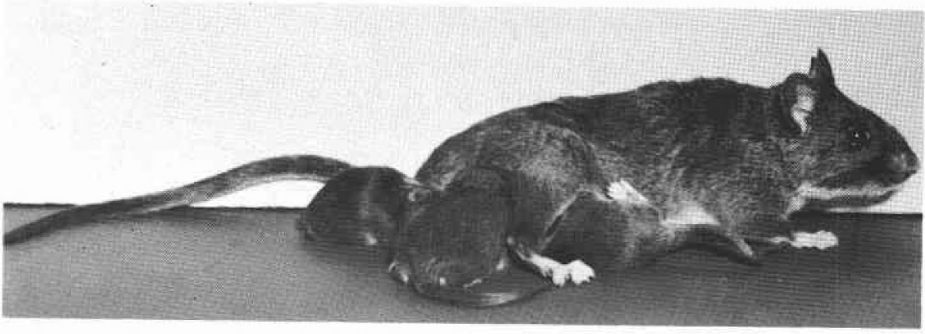

Figure 7. Woodrat with young at age of 2 weeks.

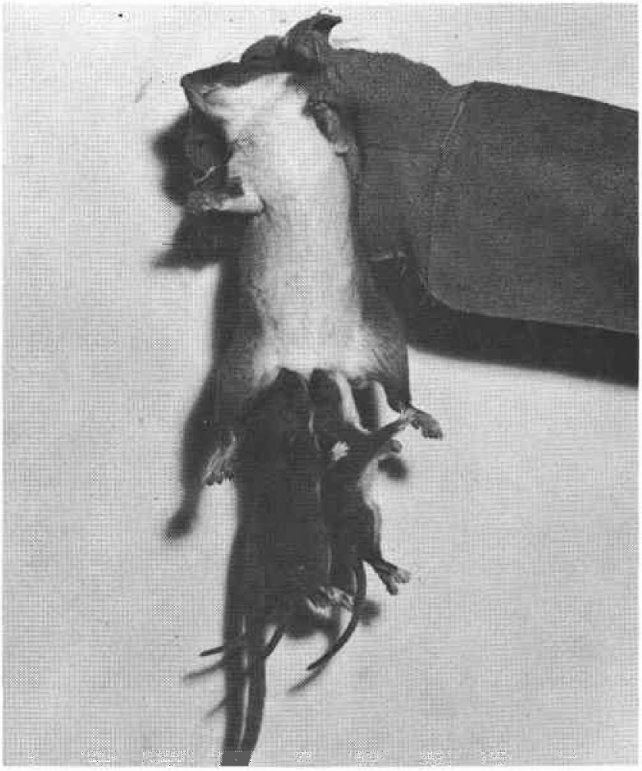

Figure 8. Young woodrats remain attached to nipples for about 20 days.

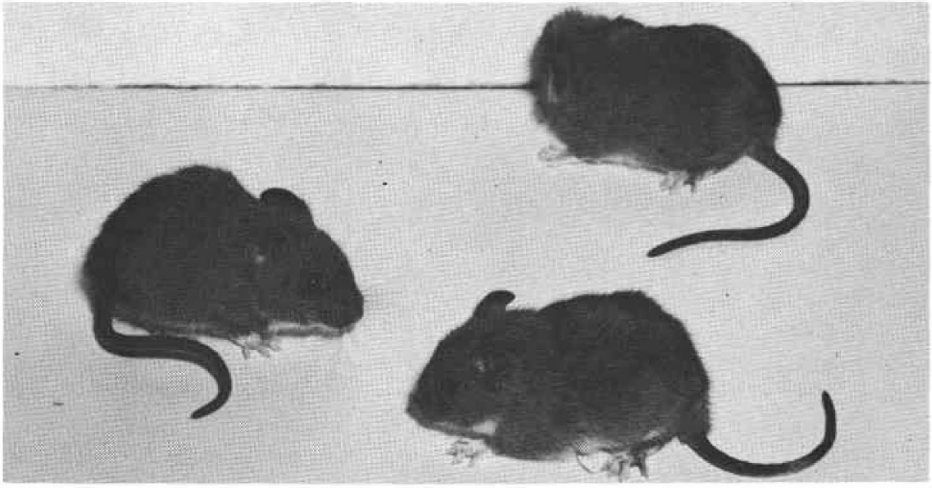

Figure 9. Young woodrats at age of about 3 weeks.

PROCEDURE

Area chosen for study was reviewed as to physical characteristics, and the woodrat population was studied for a year. Damage by woodrats was tabulated.

Study Plots

Two plots were established in the "Adair tract", which is northwest of Corvallis and owned by Oregon State College. Part of the tract had been baited the previous fall (1957) to control woodrats. Plot A was established where no control had been attempted, and plot B was established where bait had been distributed. An interval of one-half mile separated the two plots.

Unbaited plot A comprised about seven acres, with northeastern exposure and slope of 11 per cent (Figure 10). This area contained small thickets of Douglas fir saplings. Surrounding the thickets were scattered Douglas fir reproduction and hardwood brush (Figure 11). This area had 14 houses, of which 12 were trapped. Five were at the bases of Douglas firs, two were ten feet up in the branches of Douglas firs, two were at the bases of hazelnut clumps, two were built at the bases of willows, one at the base of a madrone, one in a patch of poison oak and snowberries, and one at the base of a fallen snag under a medium-sized maple. There were no old-growth oaks on the area. The two houses nearest each other were 46 feet apart; the two most distant were 277 feet apart. Average distance between traps was 112 feet.

Baited plot B was level, and about eight acres in area (Figures 12,13). It included 2.5 acres of Douglas fir about 20 inches in diameter, breast high, interspersed with old-growth oak without ground vegetation. A thicket of Douglas fir saplings ringed the trees. The area in trees was surrounded by a natural meadow, except for the southwest portion, which consisted of oak brush and scattered conifers. Originally, 15 woodrat houses had been on the area, but five had been opened during baiting. No attempt had been made by the woodrats to rebuild the damaged houses. Of the remaining ten houses, six had been built in, or at the bases of, oak trees, one had been built at the junction of a large oak branch with a Douglas fir sapling, two had been built at the bases of Douglas fir saplings, and one had been built in a clump of snowberry near a large Douglas fir. The shortest distance between houses was 33 feet, the longest was 325 feet, and the average was 145 feet.

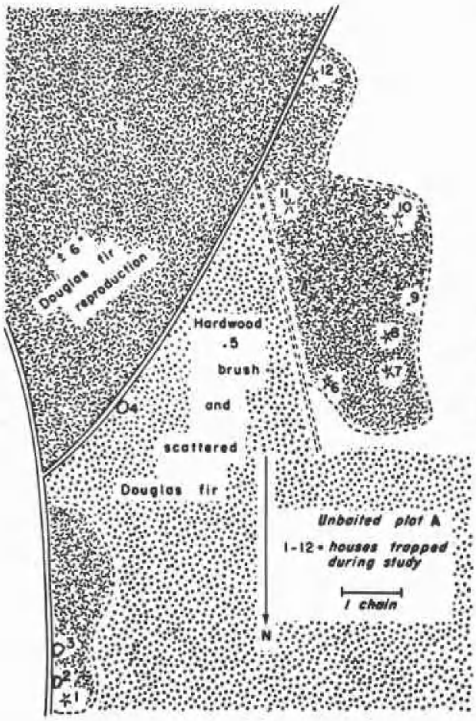

Figure 10. Plot A, of about 7 acres, contained 14 woodrat houses, none of which had been baited.

Soil

Soil was a reddish-brown Latosol developed from basalt and probably of the Melbourne series. The topsoil (A_1-A_3, 0 to 8 inches) was a dark-brown silty-clay loam with pH 5.7. The subsoil (B_1-B_2, 8 to 36 inches) was reddish-brown clay loam to clay, with the lower portion having weathered basalt fragments. At about 36 inches, the weathered basalt became prominent. The area was well drained. Root penetration occurred to a depth of three feet, but was centered largely from 0 to 2 feet.

Trapping Methods

The study was initiated by catching woodrats in a modification of the Sherman live-trap. Traps were 6 by 6 by 14 inches in size, with hardware mesh in the rear. New traps were used, and few animals were caught during the first two weeks. Once a rat was caught in a trap, however, the same, or another, rat readily entered the trap.

Various combinations of bait were tested at the start of trapping, including walnuts, honey, peanuts, rolled oats, and whole oats. Peanuts were accepted most readily, so a standard mixture of peanut butter and raisins was chosen for duration of the trapping. Each trap was placed at the base of a house near an entryway. Each animal was noted for sex, age, tag number, trap number, and breeding data, then was released at the point of capture. Trapping periods were at monthly intervals, except when extremely wet weather caused deferment for a day or two. A period lasted about a week, during which time the traps were inspected each morning.

To forestall disturbance to study plots, specimens to study food habits and reproduction rate were caught about one-half mile distant.

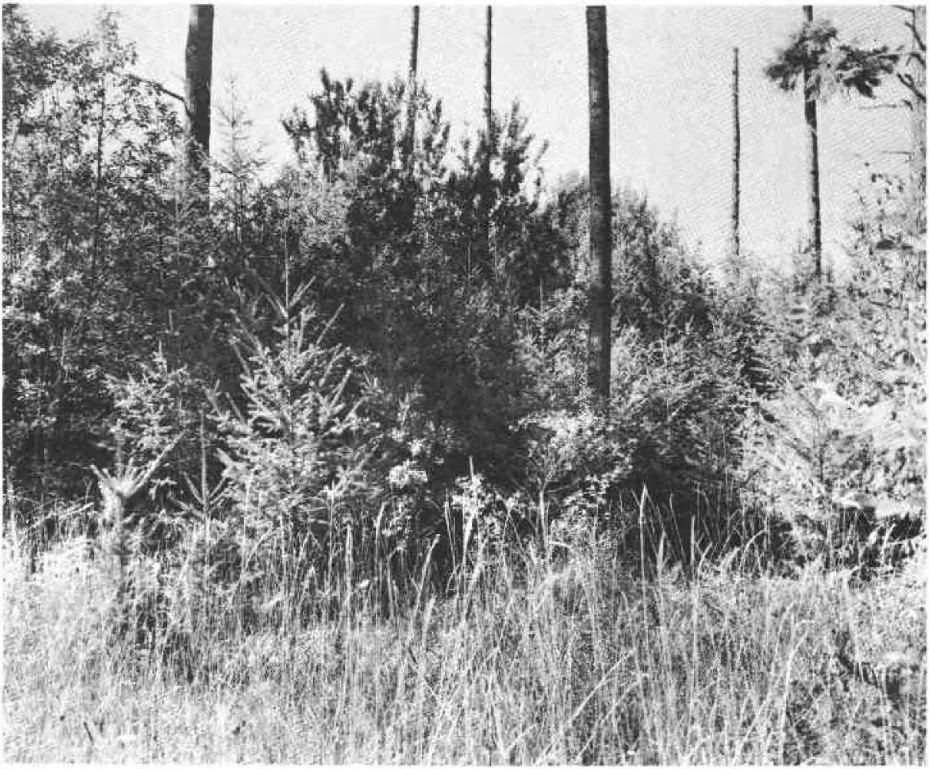

Figure 11. Unbaited plot A contained thickets that are preferred habitat for woodrats.

Assessing Damage to Trees

Damage by woodrats is difficult to judge, because it is done over periods of time that allow new growth to obscure cut leaders and branches, and areas where bark has been removed.

Nevertheless, inspection of trees immediately adjacent to nests in the two plots studied brought to attention considerable evidence of damage caused by activity of woodrats. Trees within 10 feet of each woodrat house where a trap had been set were examined. Each damaged tree was measured, and extent of damage was determined. Date of damage was impossible to judge in most instances, so damage was classified merely as new or old.

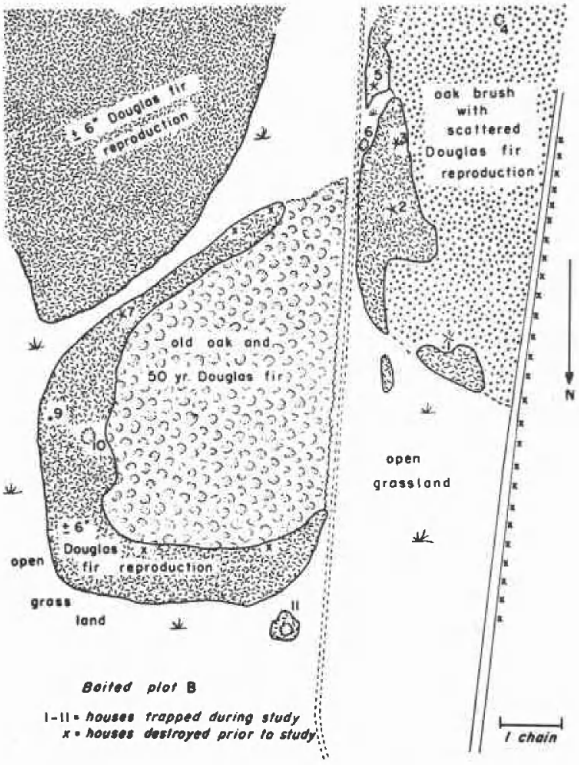

Figure 12. Plot B, of about 8 acres, contained 15 woodrat houses, 5 of which had not been rebuilt after opening when baited.

Figure 13. Baited plot B contained thickets of Douglas firs with large oaks. Houses were near oaks when present in an area occupied.

RESULTS

Population changes during the year were determined fairly well by live-trapping, and food habits of caged animals were noted. Damage to trees was recorded only where severe, because of difficulty in noting signs of minor damage.

Population

Of the 23 woodrats caught in unbaited plot A, 14 were adults when first caught (Table 1). The catch on baited plot B totaled 39, of which 27 were adults (Table 2). Production of young was limited to late spring and early summer. The earliest uterine examination to produce embryos occurred in April, and the last at the end of July. The average number of embryos to a female was three. Of 19 woodrats captured on the two plots in April, when trapping started, only two females remained the following March, one on each plot. Of 20 young born on the areas, four remained in March, a reduction of 80 per cent in less than a year. Considering nocturnal habits of the woodrat and complexity of its house construction, its life is short (Tables 3, 4).

The population in plot A varied from 0.6 woodrats an acre in December to 1.6 an acre in August. Plot B had a population of 1.1 an acre in December, but the peak came in June with 2.1 an acre.

Home Range

Home ranges of woodrats studied appeared confined to small areas. Of the 23 animals from plot A, 11 were caught during one trapping period only. Of the remainder, four were caught at different trapping periods, but always at the same house; four were caught at two different houses averaging 130 feet between traps; the remaining four were caught at three different places, averaging 154 feet between traps.

Of the 39 animals from plot B, 14 were caught during one trapping period only. Seven were caught during more than one trapping period, but always at the same house. Eight were caught at two different houses, averaging 130 feet between traps. The remainder were caught at three different houses, averaging 66 feet between traps.

Table 1. Catch of Neotoma Fuscipes in Trapping Periods in Unbaited Plot A.

Month	New-tagged				Total new	Recaptured				Total new	Total caught
	Adults		Juveniles			Adults		Juveniles			
	♀	♂	♀	♂		♀	♂	♀	♂		
1958											
April	4	4	-	1	9	-	-	-	-	-	9
May	1	1	-	1	3	3	2	-	-	5	8
June	1	1	-	2	4	3	2	-	-	5	9
August	1	-	3	1	5	3	1	-	1	5	10
Sept.				-	-	3	2	2	-	7	7
Oct.				1	1	3	2	1	-	6	7
Dec.						1	3	-	-	4	4
1959											
March						2	2	-	-	4	4

Table 2. Catch of Neotoma Fuscipes in Trapping Periods in Baited Plot B.

Month	New-tagged				Total new	Recaptured				Total new	Total caught
	Adults		Juveniles			Adults		Juveniles			
	♀	♂	♀	♂		♀	♂	♀	♂		
1958											
April	6	4	-	-	10	-	-	-	-	-	10
May	1	1	-	-	2	5	2	-	-	7	9
June	3	4	4	4	15	2	-	-	-	2	17
August	1	3	3	-	7	2	1	1	3	7	14
Sept.	-	1	1	-	2	3	3	3	-	9	11
Oct.	-	-	-	-	-	3	3	5	1	12	12
Nov.	1	-	-	-	1	3	3	4	2	12	13
Dec.	-	1	-	-	1	1	2	3	2	8	9
1959											
March	-	1	-	-	1	2	4	2	2	10	11

Table 3. Mortality as Indicated by Decline in Recaptures From First Trapping Period in Unbaited Plot A.

Month first captured	Recaptures							
	April	May	June	Aug.	Sept.	Oct.	Dec.	March
1958								
April	(9)*	5	5	4	3	3	2	1
May		(3)						
June			(4)	1				1
August				(5)	3	2	1	1
Sept.					(1)	1	1	1
Oct.						(1)		
Dec.								
1959								
March								
Total	9	8	9	10	7	7	4	4

* Parentheses indicate first time caught.

Table 4. Mortality as Indicated by Decline in Recaptures From First Trapping Period in Baited Plot B.

Month first captured	Recaptures								
	April	May	June	Aug.	Sept.	Oct.	Nov.	Dec.	March
1958									
April	(10)*	7	2	1	1	1	1	1	1
May		(2)							
June			(15)	6	3	5	5	3	3
August				(7)	5	5	5	3	4
Sept.					(2)	1	1	1	1
Oct.						(0)			
Nov.							(1)		
Dec.								(1)	1
1959									
March									(1)
Total	10	9	17	14	11	12	13	9	11

* Parentheses indicate first time caught.

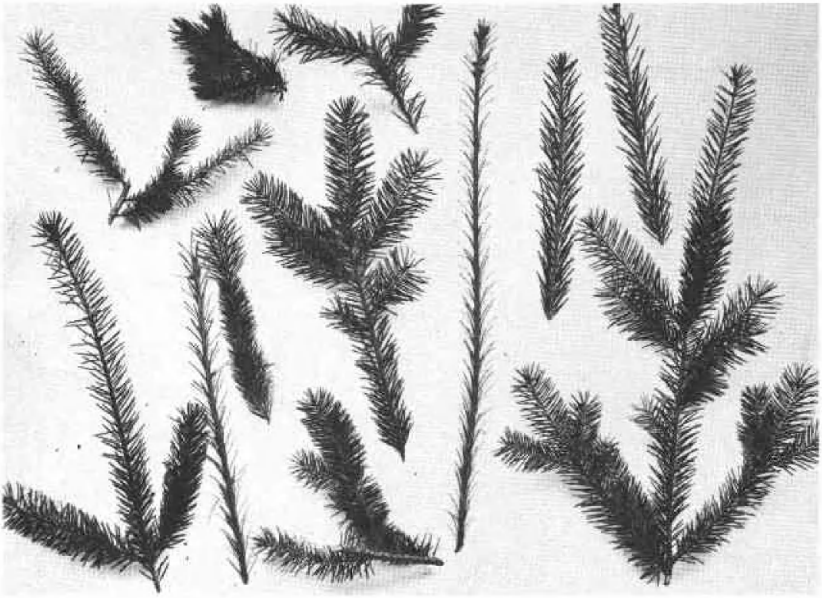

Figure 14. Freshly cut branches of Douglas fir taken from woodrat ground house February 26, 1958.

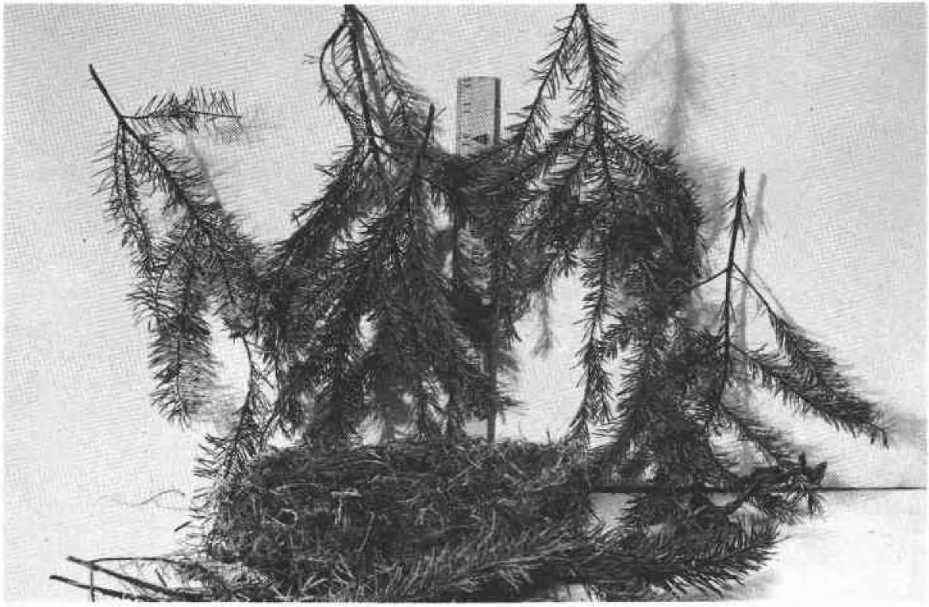

Figure 15. Douglas fir branches, and nest of chewed bark taken from ground house February 26, 1958.

Food

When damage to conifers by woodrats first was considered, material taken was assumed to be part of the general diet. Findings did not verify this assumption, however.

The diet generally accepted as food while caged was cuttings from Oregon white oak, snowberry, cascara (Rhamnus purshiana DeCandolle), Oregon maple, and poison oak. Acorns, berries, and fruits of the foregoing species, plus hazel (Corylus rostrata Ait.) and Oregon ash were eaten. Cuttings from Oregon maple and cascara were accepted readily throughout the year. While acorns were accepted readily at all times, oak cuttings appeared to be preferred only during spring when buds were largest.

Among cuttings packed into the houses were madrone, blackberry, and sword fern (Polystichum munitum (Raulf) Presl.). When these were introduced into cages, they were not eaten. These species are used for house construction. Caged woodrats stripped bark from Douglas fir branches and shredded it into nesting material, but did not eat it. Leaders and lateral limbs up to two feet long are cut from Douglas firs and used for building materials (Figures 14, 15). Damage to Douglas fir seems to be initiated with advent of fall rains when houses are being renovated and repaired for winter.

Damage to Douglas Fir

Slightly more than half of the houses where traps had been set in both the unbaited and the baited plot were close to trees where damage was found.

Damage listed in Table 5 consisted largely of dead tops where bark removal was severe. Also noted were trees where leaders had been cut, and trees where bark had been removed seriously, but tops had not been killed outright. Minor barking and cutting of laterals were not recorded, largely because extent of such damage was difficult to assess.

Naturally, damage brought to attention by inspection of an area in a single season is only indicative of possible damage during the entire period when the stand is susceptible to attack.

Table 5. Damage by Woodrats to Douglas Firs Within Ten Feet of Houses Where Traps Were Set in Both Plots Studied. Inspection was Made in October 1959.

Trap no.	Trees damaged				Damage				
	Number	Percentage	Dbh, range	Height, range	New, no. trees	Old, no. trees	Dead top	Some barking	Leader cut
		Per cent*	Inches	Feet					
Unbaited area									
1	0								
2	0								
3	0								
4	1	25	3	20		1	1		
5	0								
6	0								
7	4	15	2-4	14-20	2	2	4		
8	9	15	1-3	10-25		9	9		
9	3	2	1-4	10-20		3	3		
10	2	1	3-4	12-15		2	1		1
11	3	5	1-4	10-20		3	3		
12	1	10	4	25		1	1		
Baited area									
1	3	5	1-3	12-19	1	1	3		
2	0								
3	3	5	1-3	12-15		2	1	1	
4	0								
5	0								
6	3	5	1-4	12-20		2	2		
7	0								
8	0								
9	2	1	5	28		2			2
10	5	5	2-3	18-22		5	5		
11	3	10	3	14		3	3		

* Based on trees within 10 feet of house.

DISCUSSION

Although Neotoma fuscipes commonly is considered to be restricted to the Chaparral, presence or absence of oaks is, perhaps, the most important factor in determining its occurrence in the northern Transition Zone. Relative humidity or rainfall may limit the distribution ranges of the animal, but temperature is considered to be of minimal importance. The houses are substantial structures and aid the rat in avoiding extremes of dryness, moisture, heat and cold.

The woodrat becomes prevalent in foot-hill areas that previously were logged selectively for the better grades of Douglas fir. This type of logging will cause an area to revert to Douglas fir reproduction and hardwood brush of various densities. Areas at low elevations with limited seed from Douglas fir and a tendency for rapid growth of hardwood brush are conducive to woodrat populations. Such areas supply material necessary for houses and dense cover in which to erect them. Where conifers appear scattered and mixed with oak and shrubby plants a variety of species appear. Madrone, Oregon maple, vine-maple (Acer circinatum Pursh), wild cherry (Prunus emarginata (Dougl.) Walpers), poison oak, snowberry, and ocean spray (Holodiscus discolor Pursh.) form a dense bushy cover.

On areas where Douglas fir regeneration does not occur in extensive pure stands, but in sporadic thickets in hardwood brush, the woodrat has a tendency to concentrate in such thickets, especially where oak occurs. This is the type of regeneration that is likely to suffer the most damage, especially when in the sapling stage. Upon reaching pole size the amount of damage declines. Trees 25-30 feet high appear unattractive to woodrats.

The damage is not readily apparent on a seasonal basis and appears slight to the casual observer. Such damage, totaled over a period of years, however, may affect severely from 10 to 40 per cent of the young trees.

Where Douglas fir regenerates in extensive stands, it prohibits brush formation and is unattractive to woodrats. Such areas have little, if any, woodrat populations.

Two methods of control are indicated. Because of the short life span and restricted home-range area, baiting appears reasonable. Peanut butter and raisins or walnut meats are accepted readily by woodrats.

Such materials treated with thallous sulphate and placed in entrances of the houses are lethal to them. As there is indication that houses of the deceased will be reoccupied by other individuals, especially during the rainy season, more than one baiting is advisable. The alternate control is extensive forest management. Removal of as much logging debris as possible, appearance of extensive Douglas fir reproduction, and pruning and thinning of young stands would tend to inhibit building houses. Without shelter, the woodrat would be susceptible to "natural" control by exposure, disease, and predators.

BIBLIOGRAPHY

1. Donat, Fae. 1933. "Notes on the Life History and Behavior of Neotoma fuscipes." Jr. Mamm. 14:19-26.
2. Elton, Charles. 1939. "On the Nature of Cover." Jr. Wildlife Mgt. 3:322-338.
3. English, Pennoyer F. 1923. "The Dusky-footed Woodrat (Neotoma fuscipes)." Jr. Mamm. 4:1-9.
4. Feldman, Horace W. 1935. "Notes on Two Species of Woodrats in Captivity." Jr. Mamm. 16:300-303.
5. Fitch, Henry S. 1947. "Predation by Owls in the Sierran Foothills of California." Condor 49:137-151.
6. _____. Freeman Swenson and Daniel Fillotson. 1946. "Behavior and Food Habits of the Red-tailed Hawk." Condor 48:205.
7. Gander, Frank F. 1929. "Experiences with Woodrats, Neotoma fuscipes and macrotis." Jr. Mamm. 10:52-58.
8. Horton, J. S. and John T. Wright. 1944. "The Woodrat as an Ecological Factor in the Southern California Watersheds." Ecology 25:341-351.
9. Munns, Edward N. 1917. "The Packrat as an Enemy of Natural Reproduction of the Angeles National Forest." Jr. Forestry 15:417-423.
10. Parks, Harold E. 1922. "The Genus Neotoma in the Santa Cruz Mountains." Jr. Mamm. 3:241.
11. Poole, Earl L. 1940. "A Life History Sketch of the Allegheney Woodrat." Jr. Mamm. 21:249-270.
12. Richardson, Wm. B. 1943. "Woodrats (Neotoma albigula): Their Growth and Development." Jr. Mamm. 24:130-143.
13. Vestal, Eldon H. 1938. "Biotic Relations of the Woodrat (Neotoma fuscipes) in the Berkeley Hills." Jr. Mamm. 19:1-36.
14. Vorhies, Charles F. and Walter P. Taylor. 1940. Life History and Ecology of the White-throated Woodrat, Neotoma albigula albigula Hartley, in Relation to Grazing in Arizona. Tech. Bull. 86, College of Arizona, University of Arizona, Tucson.
15. Walters, Roland D. 1949. Habitat Occurrence and Notes on the History of the Dusky-footed Woodrat Neotoma fuscipes, Baird. Thesis. Oregon State College, Corvallis.
16. Wood, Fae Donat. 1935. "Notes on the Breeding Behavior and Fertility of Neotoma fuscipes macrotis in Captivity." Jr. Mamm. 16:105-109.

The Forest Lands Research Advisory Committee is composed of representatives of public and private landowners who are interested in the best use of Oregon's forest land resources. Present members are:

GENE KNUDSON, Principal, Chairman WILLIAM D. HAGENSTEIN, Alternate	Industrial Forestry Association
GEORGE H. BARNES	School of Forestry
R. W. COWLIN	Pacific Northwest Forest and Range Experiment Station
_____	Bureau of Land Management
NAT GIUSTINA, Principal DAVE BURWELL, Alternate	Willamette Valley Lumbermen's Association
JOSEPH W. McCRACKEN, Principal SAM R. KONNIE, Alternate	Western Forest Industries Association
T. J. ORR, Principal A. W. MOLTKE, Alternate	Western Pine Association
D. L. PHIPPS	State Forester
B. SAM TAYLOR, Principal ROBERT KLINE, Alternate	Southern Oregon Conservation and Tree Farm Association

DALE N. BEVER, Secretary

The Forest Protection and Conservation Committee administers activities of the Oregon Forest Research Center. Present members are:

FREEMAN SCHULTZ, Chairman	Western Pine Association
GEORGE BURR	Member at Large
CHARLES W. FOX	Willamette Valley Lumbermen's Association
LEE J. NELSON	West Coast Lumbermen's Association
WALTER F. McCULLOCH	School of Forestry

R. M. KALLANDER, Administrator

OREGON FOREST RESEARCH CENTER

Two State programs of research are combined in the Oregon Forest Research Center to improve and expand values from timberlands of the State.

A team of forest scientists is investigating problems in forestry research of growing and protecting the crop, while wood scientists engaged in forest products research endeavor to make the most of the timber produced.

The current report stems from studies of forest lands.

Purpose . . .

Develop the full potential of Oregon's timber resource by:

- increasing productiveness of forest lands with improved forest practices.
- improving timber quality through intensified management and superior tree selection.
- reducing losses from fire, insects, and diseases--thus saving timber for products and jobs.

Keep development of the forest resource in harmony with development of other Oregon resources.

Current Program . . .

Seed production, collection, extraction, cleaning, storage, and germination.

Seedling production, establishment, and survival for new forests.

Growth and development of trees, quality of growth, and methods of thinning and harvesting to grow improved trees.

Study of forest fire behavior and fire weather to prevent fires.

Insect pests and their control, to save trees.

Disease control and prevention in Oregon forests.

Mammal damage and the controls to help regrowth.

Soils and their relationship to growth.

Development of improved forests through selection and breeding.