BLACK-TAILED DEER INVESTIGATIONS ON A CLOSED AREA IN WESTERN OREGON

by

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BLACK-TAILED DEER INVESTIGATIONS ON A CLOSED AREA IN WESTERN OREGON

Columbian black-tailed deer, Odocoileus hemionus columbianus Richardson, investigations on a closed area in the Coast Range Mountains west of Dallas, Oregon, Polk County, were begun in September, 1950, to determine population densities on diversified types of habitat. Investigations were also made to add life-history data to a long-term blacktail study currently being conducted by the Oregon Cooperative Wildlife Research Unit[1]. About one-fourth of the study area, as observed through a preliminary survey by Unit and Oregon State Game Commission personnel in midsummer of 1950, indicated low deer abundance even though the vegetation seemed ideal for the support of a high population. Therefore, an effort was made to ascertain if artificial or natural causes were influencing survival rates.

Since 1940, several related problems have been studied and analyzed under the leadership of Arthur S. Einarsen. They include: mortality studies by Kuhn, 1942 (6); habitat studies by Lindzey, 1943 (8); and

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1. Agricultural Research Foundation, United States Fish and Wildlife Service, Wildlife Management Institute, Oregon State Game Commission, and Oregon State College cooperating.

food preference studies by Chatelain, 1947 (1). The work was designed to provide a management plan for blacktails in the coastal regions of the Pacific Northwest. The present study lasted during the fall and winter months from September, 1950, to March, 1951. Supplementary information was gained from August 18 to September 18, 1951, when residence was again taken on the area. Between these times, and until December 29, 1951, periodic trips were made into the area to keep informed of deer conditions and changing circumstances.

A description of the area and weather conditions will be reviewed. Next, black-tailed deer life-history observations will be presented. The main findings, including the deer population, the deer hunt, and food habits will then be treated, followed by certain conclusions and recommendations.

METHODS

Intensive field observations were facilitated by living in proximity of deer ranges, and living quarters were frequently changed to meet the requirements of the work program and deer movements. To obtain information about the closed area and its past history, various sources were used. Persons who worked for the logging industry were well informed because of their intimate

acquaintance with the isolated regions. Local residents were consulted about the occurrence of forest fires and the ownership of land. Forest Service employees and government trappers offered information about past and present deer conditions. The local newspaper office at Dallas gave the names of old-time residents of the area, and these people were consulted about the early settlement of the region, early hunting techniques, and logging history.

Observations on the habits of deer were best accomplished by stalking. If the deer were disturbed they would cease their ordinary activities and leave the locality. When making deer counts, the most practical method was to "flush" the deer by whistling and shouting. The deer could then be counted as they ran for cover. Frequently a dog was used to drive deer out of draws and brushy patches. Illegal hunting, as a limiting factor, was checked at night from some high observation point. Roads were occasionally patrolled.

Browse plants for nutritional analysis were collected in burlap sacks about the twentieth of each month. When about a pound of the edible portions was assembled, they were tied into compact bundles with twine. These were stored in labeled paper sacks and then allowed to dry. Later, the plants were analyzed to learn their

protein content. The time required to collect 36 samples on three different deer ranges was about two days. Further accounts on procedure are included in the text under the appropriate topic.

THE AREA

The study area included about 40,000 acres of land on the summit and east slope of the Coast Range which were closed to hunting through formal action of the Oregon State Game Commission under resolutions of August records in 1950. The purpose of the closure was to test the possibility of an increase of deer numbers by protection on burned areas where browse was plentiful. Since boundaries such as section lines usually prove unsatisfactory, an attempt was made to select obvious boundaries such as roads so that the hunter would know definitely the areas closed.

The vegetation in the Coast Range is associated with a large amount of rainfall which occurs during the winter and spring months with a consequent jungle-like growth of trees, shrubs, and herbs. The typical forest type in the closed area is Douglas fir, Western hemlock, and Western red cedar. The understory typically consists of bigleaf maple, Pacific dogwood, California hazel, vine

maple, and madrone. The terrain is rough and rocky, and the land affords many large draws and ravines which make suitable hiding places for deer.

The closed area is approximately 15 miles long by 5 miles wide. The west boundary lies on the summit, and the east boundary is state highway number 22 in the foothills adjacent to the Willamette Valley. The north boundary is a road paralleling Mill Creek, and the south boundary is similarily the road which follows Rickreall Creek, figure 1, p. 14. Because of natural physiographic differences, the closed area can be conveniently divided into three districts. The eastern district is a lowland agricultural area, the central district contains predominately out- or burned-over areas with interspersed blocks of standing timber, and the western district is on a high, flat, logged- and burned-over plateau.

Agricultural District

The agricultural, low-elevation area is at about 500 feet, and it borders the mountainous terrain on the west at an imaginary straight line from Buell to Falls City. Much of the land has been cleared for orchards and field crops, but small stands of Oregon white oak and Douglas fir are present. The land is also typified by pastures and private gardens. The main fruits raised in

the orchards are prunes, apples, and cherries. Berries which are grown include strawberries, red raspberries, and blackcaps. Some field crops are oats, vetch, barley, and peas. The soil is a silty clay-loam which appears to be leached and somewhat unproductive unless heavily fertilized.

Central District

The central district is of medium elevation at about 1000 to 1500 feet. The terrain is exceedingly rough, and deep, picturesque ravines and canyons are present. A high ridge which forms the backbone of the closed area occurs between Mill and Rickreall Creeks, and it slopes in a west-to-east direction toward the Willamette Valley, figure 2, p. 15. Shorter ridge-spurs lead down from the divide, and these spurs recede abruptly into the large drainages. The district is composed of interspersed open areas, and logging continually occurs at various places, hence the vegetation throughout is at different stages of reproduction. It is in this district that some of the deer customarily winter. These areas are referred to as the marginal winter area, figure 3, p. 15.

During slash disposal operations of a logging company in 1949, a forest fire swept over 850 acres of

land. This new burn has very little shrub or herb cover because the fire was quite severe, and the ground duff was destroyed, figure 4, p. 16. Plants such as California hazel, vine maple, cinnamon bush, salal, Oregon grape, and Western swordfern are beginning to appear. Their height varies from a few inches to three feet. Particular attention was given to the new burn during field work to observe the reappearance of deer. Although the deer also winter here, the burn was studied as an independent unit because its location is separated from the marginal winter area by ridges and strips of green timber.

Western District

The western district is at high elevation, reaching to 3700 feet on Laurel Mountain. It exists on a high, flat plateau with rather smooth, rolling hills. The full size of the elevated table land, which includes territory outside of the closed area, is about eight miles long and four miles wide. The expanse overlaps an imaginary circle drawn on the map between Laurel Mountain, Condenser Peak Lookout, Sugarloaf Mountain, and Fanno Mountain. The plateau apparently has no similar land formation in the immediate vicinity as observed from topographic and relief maps. On the western margin of

the plateau, there is a perceptible drop in altitude oceanward, and the terrain is again of a lower mountainous type, figure 5, p. 16.

Almost all of the western district was burned in 1945, and the land now appears starkly desolate with numerous dead and charred snags, figure 6, p. 17. The total amount of burned-over land was 11,488 acres. The fire started on July 16, 1945, from discarded burning material, and it was not completely extinguished until November 27, 1945. It is in this large, singular, open area that an abundance of deer foods occur; the deer density, however, appears below potential carrying. Within the 1945 burned area, hereafter to be synomonously called the old burn, are five, small, green timber areas which were not consumed by the fire. They range from 10 to 50 acres in size, and they are utilized by deer for cover and protection.

The western district extends into the Canadian life zone, and such trees as noble fir and Western white pine are present. The reproduction mainly consists of Douglas fir seedlings which attain a height of eight feet. Shrubs and other plants as vine maple, salal, Oregon grape, Western swordfern, red alder and elderberry form dense thickets. Almost all of the plants occurring here have value as deer food at some season of the year.

Associated Districts

As work on the project commenced during the winter, it was evident that observations would have to be extended beyond the actual closure boundary to obtain a more complete picture of deer movements. Two associated districts were logically included. The first is the Mill Creek basin, which is located in lands north of the closed area at an altitude lower than the plateau, figure 7, p.17. The 1945 fire also burned most of this basin, and the stage of vegetative growth is similar to that of the western district. The vegetation by species is also similar except for the plants associated with the Canadian life zone. Cinnamon bush and madrone occur commonly, but these shrubs are generally absent in the western district. The inclusion of Mill Creek basin to the study project was deemed necessary because some deer drift between the plateau and the basin at the onset of winter.

The second district is Boulder Canyon, figure 8, p. 18. It is a relatively smooth-surfaced gorge which divides the plateau into approximately equal areas, and it proceeds from south to north paralleling the west boundary for a distance of four miles. The canyon then swings sharply westward for two miles where it adjoins a solid fringe of standing timber. Boulder Canyon appears

to have the status of a winter yard for a few deer which summer on the surrounding plateau, and it may also serve as a refuge from strong winter winds.

Area History

A review of the past history, according to old-time residents, indicates that the land in 1885 was heavily timbered. As such, it probably supported very few deer. Homesteads were taken on Laurel Mountain in 1905. Soon after this time, logging operations began near Black Rock. Also around the turn of the century, limited logging was taking place on Mill and Rickreall Creeks. At first, only the timber near the water was cut so that the logs could be conveniently floated down the river to mills in the Willamette Valley. Later, when the expansion of the lumber industry necessitated exploitation of larger tracts, railroads were built, and logging trains hauled out the timber. It was during this period when vast areas of land were denuded. Because of the high cost of building railroads, all of the trees present were cut to make the enterprise profitable. Such a method of logging was harmful in that it sometimes affected whole watersheds. This method is no longer in general use. Lumber companies now almost exclusively build roads by which they can easily reenter areas and

cut on a rotation plan.

Logging operations progressed gradually and by 1935 large quantities of timber had been removed from the western district. From 1936 to 1939, construction began on logging roads in the western district; and in 1943, roads so completely checkerboarded the area that the use of railroads was abandoned. About 1939, a logging road was started near Mill Creek; and by 1942, roads were extensive in the central part of the closed area.

Black-tailed deer probably benefited when openings were created in the forest, and their numbers undoubtedly increased. A fresh crop of shrubs and herbs appeared when the dominants were removed as competitors, and these plants included an abundance of palatable deer foods.

The deer population within the last 15 years may have been good in the western district as judged from the experiences of persons who have knowledge of past conditions. The area is isolated and was not easily accessible to the hunting public. Railroads made entry into the area, but these were privately owned. So the hunting pressure was probably moderate, and the only persons who hunted in the vicinity of the plateau were the loggers or a few hunters who entered on foot or by horseback. Some observers are of the opinion that a

reduction of deer numbers began after 1942. This date coincides with the advent of road building and the consequent admittance of numerous deer hunters.

The deer population in the central district is presumed to have been lower than in the western district. These areas were closer to the settlements and more accessible to hunting. Numerous reports of illegal activity indicate that poaching was rampant both by loggers and townspeople. A.F. Toner, a long-time resident of the area, relates how hounds were used to hunt deer on Mill Creek. Men would be stationed on deer runways at the head of the drainage, while parties on horseback would drive out the deer with the aid of hounds. This practice was widespread in the coastal area, and was of great concern to the game wardens. In 1923, the Game Commission reported the following (10, p.5):

> "The old and well established habit of running deer with dogs is one which is found extremely difficult to cope with in the brushy coast sections of the state, and is so serious in some localities that deer have become greatly depleted in numbers in such sections of the state."

Early fires occurred at intervals through natural causes; the occupation of the area by pioneers and the advancement of the logging industry may have been responsible for some fire damage. W.M. Curtis, Dallas District Warden, Oregon State Board of Forestry, says in a letter

dated June 29, 1951, that a 2000-acre fire occurred in the western district in 1936. Also, it is stated that in 1936 nearly 1000 acres were burned in the marginal winter area, and in 1934 that 600 acres were burned in the Mill Creek basin. Undoubtedly these fires benefited deer by forming openings for the growth of new food plants.

Logging operations occur within the closed area at present by three major lumber companies and several smaller independent "gypo" outfits. As a result of recently adopted methods of logging, which is on a sustained-yield basis by rotational cutting, new areas will continually be opened and will provide favorable deer habitat.

Field Stations

Two cabins, owned by the Willamette Valley Lumber Company, were maintained in the closed area. At the beginning of the study, a house at the Willamette Valley Camp was used as headquarters to facilitate observations during the preliminary inventory, the 1950 deer hunt, and the rutting season. Later, a cabin on Mill Creek was utilized during winter studies, figure 9, p. 18.

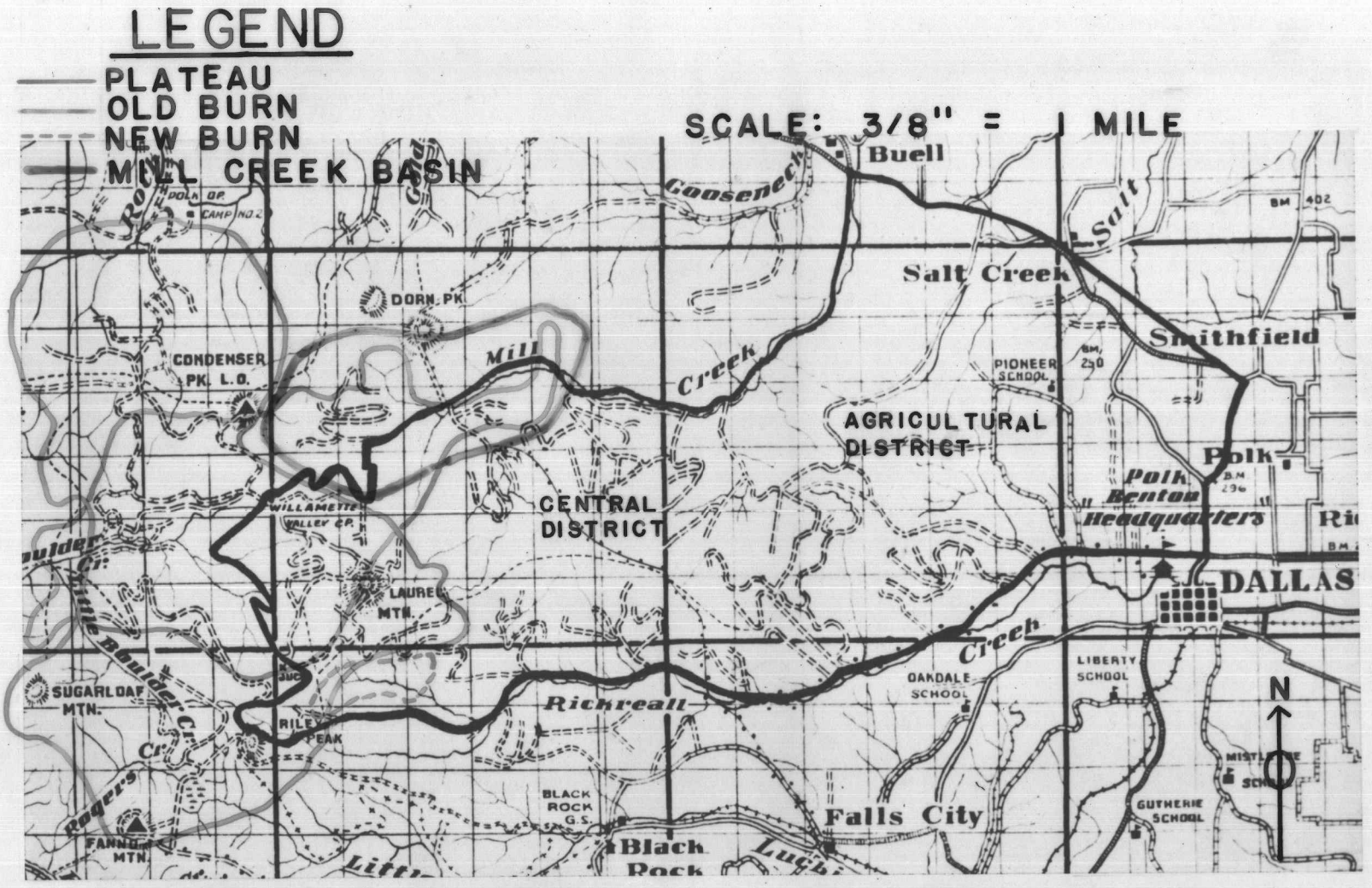

Figure 1. Map of the closed area and transparent over-lay.

Figure 2. The high ridge which forms the backbone of the closed area.

Figure 3. The marginal winter area.

Figure 4. The new burn.

Figure 5. A view of the low mountain regions which extend west of the plateau to the coast.

Figure 6. The western district.

Figure 7. Mill Creek basin. The plateau exists beyond the ridge line at horizon level. Note location of "persistent" snow line.

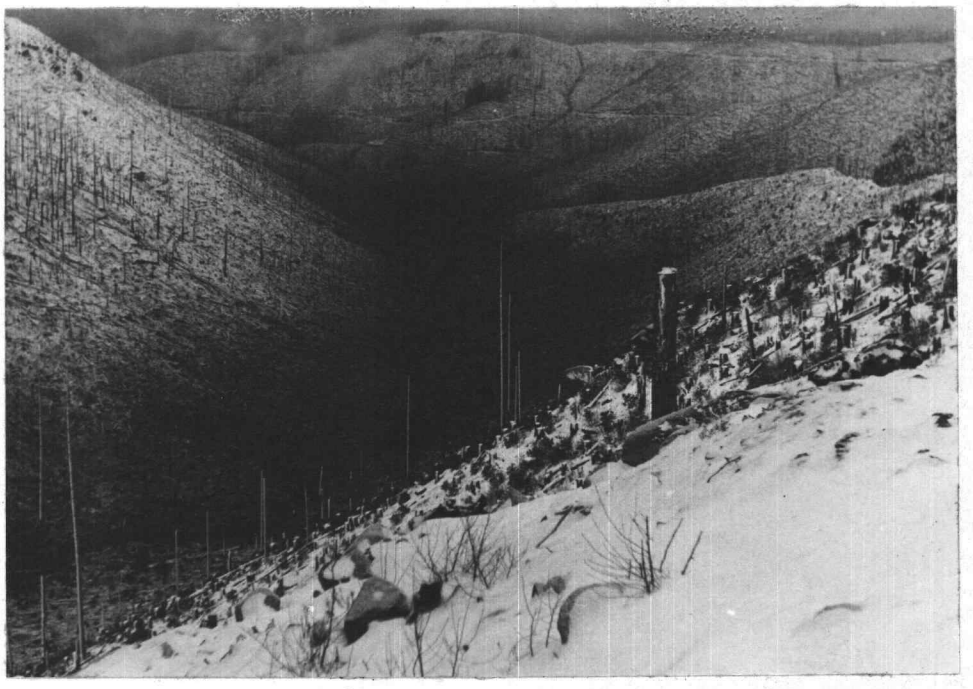

Figure 8. Boulder Canyon. Deer probably winter below the snow line in the river bottom.

Figure 9. The cabin at Mill Creek.

WEATHER CONDITIONS

A discussion of weather in the coastal regions of Oregon is contained in the United States Department of Agriculture Yearbook, 1941 (13, pp.1085-86). This information may well be applied to the closed area, and a few general statements are as follows:

> "Westerly winds predominate, carrying the modifying effect of the ocean over the western part of the state...
>
> "The heaviest rains occur on the slopes toward the ocean. There are some localities on the west slope of the Coast Range that have heavier precipitation than has been recorded in any other State except in some corresponding areas in Washington... In general, precipitation increases from the coast to a belt near the summit of the Coast Range, thence decreases in the valleys of the Willamette... The annual average precipitation ranges...to more than 130 (inches) on some Pacific slopes.
>
> "In the coastal areas snow seldom falls, and when it does it melts almost at once.
>
> "Strong southerly winds are an occasional feature of winter weather on the coast, and sometimes they are very destructive."

The closed area, as was previously mentioned, is on the east slope of the Coast Range and therefore in the rainfall shadow. The prevailing winds are from the ocean, and most of the moisture is lost on the west slope of the mountains. To illustrate that fact, it can be shown that

in 1949, Valsetz[2] (on the condensation slope) had an annual precipitation of 118.67 inches (14, p.275). Dallas, on the other hand, (in the rainfall shadow) had an annual precipitation of 46.04 inches (14, p.273). The two communities are about 15 miles apart. Both figures are near normal.

In the summer months, precipitation is low, and the area is warm and dry. In the winter, since about 44 per cent of the moisture is dropped at that time, the west slopes are subjected to much rainfall. The western district on the plateau, however, is covered at intervals with large amounts of snow. An explanation of this condition is offered by the Weather Bureau at Portland in a letter dated June 29, 1951. An excerpt of the letter reads as follows:

> "The very moist and relative warm marine air moving in from the Pacific and up across the Coastal Range is cooled both by contact with the colder ground and by being forced to higher elevations. The elevations at Valsetz are low enough that the precipitation temperature is slightly above freezing most of the time. However, temperatures decrease from 3 to 5 degrees for each 1,000 feet of ascent; therefore, a few hundred feet higher difference might well serve to produce snow rather than the rain experienced at these lower stations. Precipitation such as falls in the Coastal Range coming in the form of snow would produce considerable depth."

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2. Valsetz is located two miles south of Fanno Mountain.

The terrain of the Coast Range is commonly divided by a series of canyons which permits the westerly winds to circulate the valleys. The plateau, however, presents a large barrier at high altitudes. This causes the moisture-laden air to suddenly rise and cool, then thin, and drop precipitation in the form of snow. It is apparent that this climatic situation would have an effect on deer distribution, even if snow appeared for only a few weeks at a time. Customarily then, the deer are forced to vacate the western district in a drift to the new burn, the marginal winter area, and the Mill Creek basin which are all below the persistent snow line. The picture seems to be that the deer become less in numbers in the central district and infiltrate to the fringe of the plateau during the snow-free season. This movement of the deer is not a true migration, but perhaps should be more properly called a local or seasonal drift brought on by deep snow.

Temperatures are usually moderate throughout the year with no sharp seasonal variations. Winter temperatures are mild. An example is Falls City, which had a February average temperature of 39.0 degrees in 1949 (14, p.271).

No past records of the snow depth or its yearly occurrence have been kept, nor are weather stations

located in the area of interest. Reports were received verbally from men who hunted or trapped in the area, and from loggers who once lived in the now deserted Willamette Valley Camp[3]. These people seem to be of the opinion that the snow was sometimes very deep, but that it came at several-week intervals. It is credited with being in a continual state of thaw except during severe winter conditions. The only place nearby where records have been kept on snow depth which may be comparable to the situation on the plateau, is at Mary's Peak. This is an isolated mountain at an elevation of 4097 feet located 27 miles south of the closed area. Readings of depth are taken once in January and once in March at an elevation of 3620 feet by the Federal State Cooperative Snow Survey. An example of the records which were received verbally at the office in the City Hall, Corvallis, Oregon, are as follows, and each year represents the average of the two samples: 1946- 53.0 inches, 1947- 15.8 inches, 1948- 33.7 inches, 1949- 67.2 inches, 1950- 81.9 inches, and 1951- 16.3 inches.

With regard to observations of snow conditions in the western district of the closed area during the

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3. Willamette Valley Camp was vacated about 1945 because of a shift in logging operations, and because of the expense involved in keeping the roads plowed of snow during winter.

winter of 1950 to 1951, the first snowfall came during a blizzard on November 14 to 17. At this time, the snow depth was 36 inches; however, on November 27, the snow had melted and it was possible to drive again by automobile on the logging roads. Around December 1, it snowed again, and then the depth was 14 inches. This snow gradually thawed and almost disappeared. From then on the snow came periodically, but it would thaw fast and the ground would sometimes be bare before the next snowfall. The last snow of the year fell from March 4 to 8. However, this was unusually late. Entry could not be made into the western district at this time, but snow depth in the marginal winter area was measured at 27 inches, figure 10, p. 25. This cold period was accentuated by an east wind which delivers the continental influence in seasonal variations of hot and cold. The March snows persisted through April because of the unusual depth.

The western district, because of its smooth terrain, high altitude, and burned-over condition, is harshly weather-beaten. An accumulation of moisture in the form of fog is commonly prevalent, figure 11, p. 25. On a typical fall day, when fog is present, a walk into the central district may reveal conditions there to be sunny. Occasional high winds which occur on the coast

are exaggerated on the plateau because there are few windbreaks. It seems likely then, that the western district, which is on the plateau, would not offer protection to the deer from the frequent winds because of its smooth, rolling topography. Their refuge would be in Boulder Canyon or in the central district. Weather conditions in the remainder of the closed area are modified. The central and agricultural districts are protected from the extremities of snow, wind, and to a lesser degree, fog, because they are at a lower elevation on the protected east slope. The Mill Creek basin is also in a sheltered location, and plus the fact that vegetation there is at a stage of growth favorable for food plants, this may partially explain why it contains a good deer population at all seasons of the year.

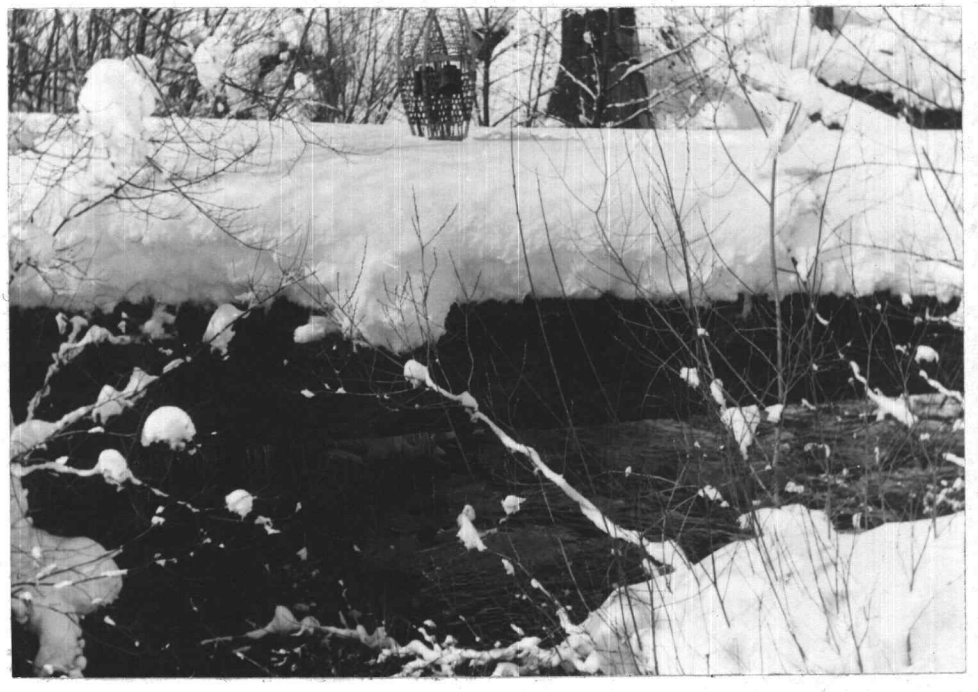

Figure 10. A log bridge showing snow depth in the marginal winter area.

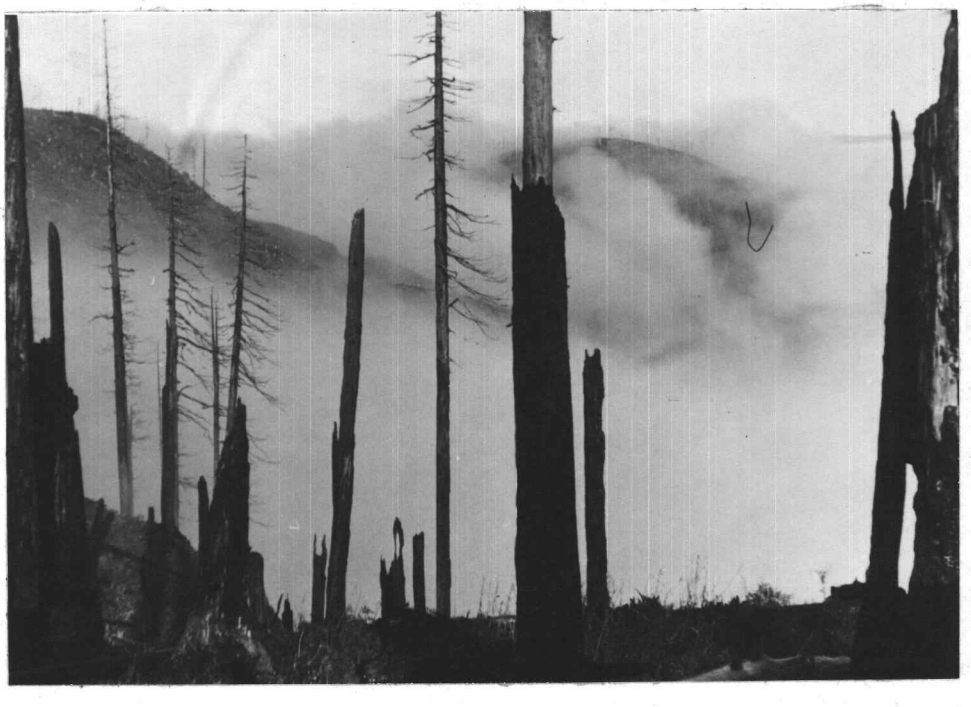

Figure 11. A view showing fog which is prevalent in the fall months.

THE ANIMAL

Some work has been done by various investigators on the life history of the Columbian black-tailed deer, but management information is scarce. There is very little published material on the animal. Seton, an early investigator, accomplished one of the first notable life-history accounts in 1929 (12).

Mannerisms of the blacktail are legendary. Because of the habitat of dense coast forests which it occupies, protective adaptations for survival have developed. Lindzey describes the elusiveness of the animal as follows (8, p.19):

> "Columbian black-tailed deer are noted for their stealth and skulking habit when suspicious of approaching danger. They will often lie in their beds, or hide in the brush even when approached within a few feet. The tendency is generally to depend more on concealment than flight. In this way they take advantage of their own camouflaged coat and the typical heavy brushy cover of the major part of their range."

Variation

The deer population in the closed area did not appear to be entirely homogeneous, with individuals being observed which were different either in coloration or conformity. Some deer were seemingly different in color of coat, notwithstanding the seasonal variation from blue

to red as a result of molt.

Hunters of the area sometimes claim that oddly conformed bucks inhabit certain high ridges and watersheds. These are referred to locally as "benchleg deer", and they are described as being square and blocky with short legs. It seems entirely possible that a genetic strain may have been isolated in a large drainage. Mention of this circumstance in Washington is also made by Lauckhart (7, p.153). Perhaps some of these deer which are described by hunters may be the counterpart of the old decadent "Pacific bucks" which Dixon referred to in California (3, p.238).

Albinism in whole or part is apparently quite common with this species (8, pp.11-12), but no striking examples of it were seen in the closed area. Two deer were seen that had white spots on the brisket below the usual throat patch; the size was about eight inches in diameter. Residents on Mill Creek report that a partially albino buck was once killed in the vicinity. Both flanks and one side of the body were white.

Habits

Blacktails are wary and therefore difficult to observe and study. When they sense danger, their actions vary. Often they will remain quiet in their beds and

not leave until approached to with several feet. Or perhaps they may be frightened away while the observer is still a long distance away. Escape procedure seems to depend in some instances on the weather. During rainy weather, the deer probably do not like to move about; but in fair weather, unless they are at rest, they may flush very readily. Wind direction, and the ability to smell the enemy, also determines behavior. During the hunting season, bucks are extremely wary, and often only a fleeting glimpse of them can be observed. Does and fawns, on the other hand, are not as wild unless shot at. This perhaps explains why many hunters see all does and fawns during the hunting season, although plenty of bucks may be seen before and after that time. Blacktails have a definite escape procedure established within their well-known orbit, and therefore the hunter may have time for only one shot. It was observed that blacktails readily follow logging roads for long distances as an escape route.

When deer are cornered, they do not hesitate to cross a barrier that happens to be between them and safety. On one occasion, a three-point buck was trapped near a river, and he did not hesitate to go through fast, deep water to escape to an opposite ridge. They appear

to be excellent climbers, and readily go up or down steep bluffs and cliffs when necessary. The reaction of deer to rain during the winter months is interesting. For the first few days after the outbreak of adverse weather, the blacktails seek shelter under windfalls or timber. Sooner or later, however, they are forced to come out and feed. Then they can be seen standing on open hillsides in small groups of from three to five individuals where they stiffly walk around to browse. Continually they shake the water from their body like a dog, and often they flick their tails from side to side denoting discomfort.

At rare times, such as when accompanied by an east wind, snow of considerable depth would fall and isolate the deer in their usual winter area. The first response of the blacktails was to make their way from the ridgetops into canyons, then into the protection of brush or timber stands, figure 14, p. 38. For ease of travel, some of the deer walked in the small creeks to avoid floundering in the snow. It was possible to trace where deer tracks entered the creek, and where the trail reappeared several hundred yards downstream. When the deer had to break trail through deep snow to reach food or cover, they adopted a way of propelling themselves by

a series of leaps. The successive depressions were approximately 76 inches apart from center to center, figure 15, p.38. This method permitted a faster way of travel. Tracks of deer showed that movement was from one place of cover to the next and that approximately 50 to 150 feet would be covered at a time. Walking through the snow was so strenuous that they stopped in the protection of a tree or overhanging bush to rest. In only one or two feet of snow, the deer did not build definite paths, and the lanes of travel were crisscross in all directions.

Observations on habits suggest that during the dismal winter months of rain and fog the deer of this area are active at irregular hours. They can be seen feeding as commonly at midday as in the early morning or late evening. In these months when the sun rarely shines, the deer utilize all short periods of sunshine, and deer activity will increase. When clouds again form, the deer will retreat to their beds in the surrounding vegetation.

It is believed that black-tailed deer in this region prefer to inhabit ridge tops during the winter months. At that time deer could best be observed on the prominent ridges of the vicinity. Here the most-favored food plants would be heavily browsed, while the same species in the valley bottoms were hardly touched. This

occupancy of ridge tops may be due to the never-ending search for sunlight. A ridge may shade its neighbor because of type of terrain, and some locations in the bottoms will have sunlight for a few hours only when the sun is at zenith. This is illustrated by observations that deer will repeatedly step over a shadow line to be in the sun while feeding. As the sun travels its orbit, the deer change from an east slope in the morning to a west slope in the afternoon. Thus an occupation of ridge tops permits access to all exposures during one day. Another reason for their inhabiting the ridge tops may be that by natural inclination, deer have a tendency to seek high vantage points to apprehend danger. Changing slopes by deer was also influenced by snow conditions; the warmer south and west exposures would thaw first and permit rehabitation, figure 16, p.39.

Voice

Columbian black-tailed deer have no sound which is comparable to the loud snort of the Virginia white-tailed deer. The blacktails do have a danger call which can be described as a very audible nasal or throaty bleat. It is probably used mainly by the dominant doe of a family group to warn the fawns of danger. Ravens, which are present in the area, are capable of imitating this sound

and they often do so while careening in the sky overhead. Bucks seldom give voice. They are usually solitary or in pairs, and do not take part in functions of the family group.

Antler Rot

In October of 1950 near Black Rock, a buck was killed which appeared to have a fungus growth on two antler tines, figure 17, p.39. A cavity three fourths of an inch deep was in the end of each tine, and the antler material was porous and brittle. It is possible that the ends may have been broken or shot off thus permitting an attack by fungus. The same animal appeared to have a ringworm infection on the forehead below the brow tines. Cattle in the vicinity of Dallas are known to be subject to the ringworm disease, but the condition was not otherwise observed in the deer herd.

Family Groups

Columbian black-tailed deer form family groups consisting of does, fawns, and yearling does. The size of the family may be three or four. Spike bucks and small forked-horn bucks (two points) may often be found in these families, especially during winter. A herd may then consist of two or three families banding together. A

herd is usually not much larger than nine to twelve animals.

Bucks have solitary habits, but occasionally they may be in companionship with one or more other males. No more than three bucks in a group were observed during the study. Usually bucks of the same size and age class are seen together. For example, two four-point bucks may be associated, but not a small forked-horn and a four-point. The dividing line seems to be between large and small-sized forked-horns. Large bucks were noted to have judiciously guarded their private territory from intrusion by smaller bucks. The small forked-horn bucks group with spike bucks or the families of does and fawns.

A difference in the appearance of deer classes can best be judged in the light of experience. According to Darling who studied red deer in Scotland (2, p.24):

> "This power to distinguish is necessary if the social system and the dynamics of population are to be understood and interpreted. It takes time for the eye to become accustomed to recognize differences, and once that has occurred the nature of the differences has to be defined in the mind by careful self-interrogation if the matter is to be set down on paper. There are some things which escape the scientific approach...The size of the beast and possibly the shape of the neck are the likely clues. The difference is one of a few inches and the distance of the animal from the eye considerable."

Casual observations seem to indicate the following diversity in bucks and does: The buck has a square

appearance, and he is thicker through the neck and shoulders. The face of the mature buck is grizzled, and the facial colors are more contrasting than in the doe. The head of the buck is square in conformation, being blunt on the nose, while the head of the doe is long and slender. The buck is prone to be more smooth and blue in winter pelage. A morphological difference in carriage causes the buck to walk stiff-legged and crouched lower to the ground, and he seems to walk in a more stealthy manner with head and neck held high and rigid. To an experienced field worker, a recognition of the above factors are an aid when recording sex and age classes in the field; and observations can be based on the appearance of the animal, the family group, and habits and characters of individual deer. It is of special aid at times when herd composition counts are conducted.

Rutting Season

Attention was given to the rutting period since there is little information on this particular phase of the life history. All information was gained by field sight records. No controlled experiments were carried on. According to an analysis of the material assembled, the following points are worthy of mention: Inclusive dates

of rutting activity were from October 1 to January 6 (about three months). The peak of the rut was from October 31 to December 5 (about one month).

Harem-collecting tendencies were exhibited by the bucks, and communal areas were formed with four or five does. The communal grounds were typically located on one-half acre plots in naturally protected areas. Harem-collecting activity dropped off after December 5. Large forked-horn bucks were noted to have strong ability to herd a number of does, but their role in breeding activities is not known.

Fawns are often present in the breeding circles, probably because they continue to stay with the mother doe throughout the winter. The bucks, however, are not tolerant of fawns, and will not permit them to approach at close range.

Enemies

Coyotes are the most numerous predator on the study area. This animal is not believed to have inhabited the dense coast forest in substantial numbers before large tracts were opened by the logging industry. At the present time, their scat can be seen on runways across roads or at waterplaces. Six coyotes were observed while the study was in progress. Their effect upon deer is

negligible; no depredations were noted in the closed area.

Bobcats occupy the area, and their tracks can be seen in the western district. No evidence of depredations on deer was observed, and their effect upon the deer population is probably negligible. Only one was seen. Cougars occasionally visit the area. No tracks were noted. Black bear inhabit the area. There was an unverified report of a female bear with cubs having killed and eaten a doe in September of 1950. Two bears were counted in the field. The most common predaceous bird present is the raven. Golden and bald eagles are present, but they are rather uncommon. Predaceous birds are important mainly as scavengers. Depredations upon deer do not appear to be a serious decimating factor.

Limited trapping for large predators is done by a professional trapper in the locality. In 1950, trapping was carried on in August and September. The total take was 20 coyotes, 16 bobcats, and 1 cougar. Two or three parties periodically come into the area during winter to hunt "cats" with dogs. They take a few bobcats and an occasional cougar, but the take is not definitely known.

Figure 12. A blacktail fawn.

Figure 13. A blacktail buck.

Figure 14. A small timber stand where deer sought protection from deep snow.

Figure 15. Depressions in the snow caused by a series of leaps to reach food or shelter.

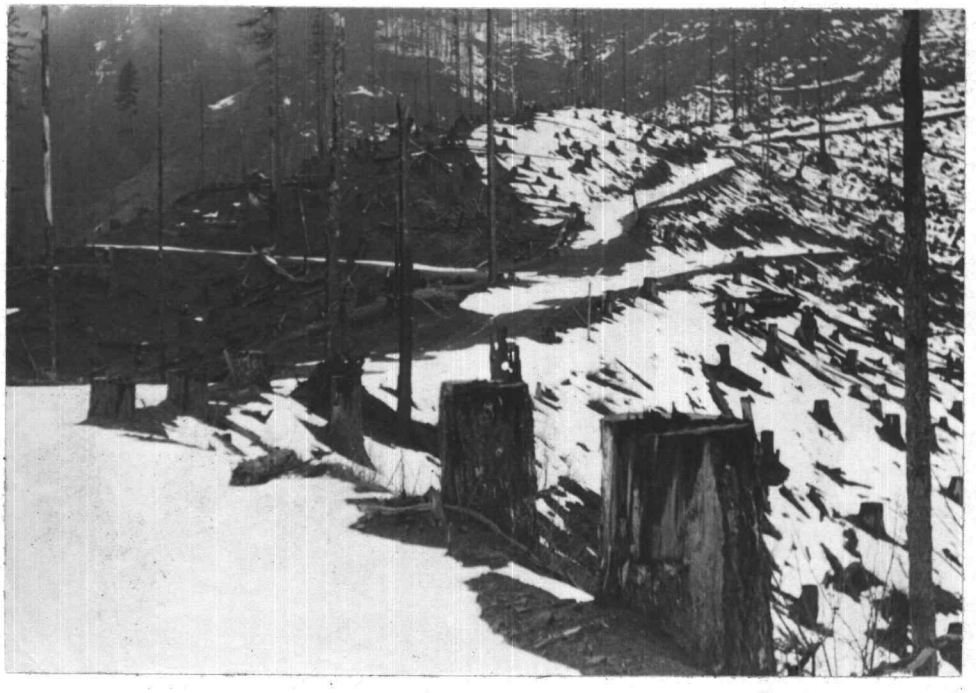

Figure 16. A snow-covered east slope which shifts the deer to the bare west slope.

Figure 17. Antlers which appeared to have a fungus growth on two tines. Note ringworm infection on forehead below brow tines.

THE DEER POPULATION

Census and herd composition statistics will be presented to show population densities and distribution. The condition of the deer and total deer counts will be given.

Fall Inventory

A pre-hunting season inventory was conducted on the 40,000 acre unit to determine relative deer densities. The census was taken during the period from September 18 to 28, 1950. The total area was divided into plots; and each day, two to three sections were covered which would give a count for a particular vegetative or habitat type. The system was designed so that by the time hunting season opened, the total area would have been surveyed to provide information on density, sex and age classes. By using a habitat evaluation method adopted by Kuhn, good black-tailed deer habitat produced seven deer per square mile, fair carried five deer per square mile, and poor carried one deer per square mile (6, p.19). Each plot was given an arbitrary count in relation to other areas depending on the number of deer actually seen, the number of beds and tracks, and the number of pellet groups counted. Information was tallied on a section basis.

The results of the census provided an indication of deer density by locality. Areas of good and fair deer abundance were located on the northeast and east margin of the plateau where it bordered the marginal winter area. Good and fair areas were also in the Mill Creek basin, and in some logged-over places on lower Mill and Rickreall Creeks. The areas of poor abundance were located on the expanse of the plateau, and in second-growth timber stands along Mill and Rickreall Creeks. The new burn proper was poor, but its timbered edges were considerably better. It appeared that the young browse in the new burn provided a feeding ground for deer which sought cover along the edges. The farming lands were checked, but deer sign was scarce. Although no permanent census plots were established, it was assumed that these areas were poor in deer abundance since farming lands generally do not contain the varieties of natural food plants to support a good black-tailed deer population.

The total number of deer recorded was 114. This number included 11 bucks, 43 does, 46 fawns, and 14 unclassified deer. The sex ratio was computed to be 1 buck to 4 does, and 1 doe to 1.07 fawns. Of 65 sections in the closed area, only 12 were considered to be of good or fair deer abundance; and the remaining 53 sections were considered to be of poor abundance.

Winter Data

A herd composition count to determine sex and age classes was conducted in the central district when most of the deer were in the winter areas. Since the deer were inhabiting a smaller area between the western district and agricultural district, it enhanced the opportunity for arriving at an accurate composition ratio. This count was conducted from November 14, 1950, the time of the first snowfall, to January 6, 1951, the time when bucks commenced to drop their antlers. A total of 225 deer were counted. The buck-doe ratio was 1 to 1.64. The doe-fawn ratio was 1.25 to 1.

Distribution of the deer during the winter months from November 27 to March 9 is summarized in Table 1. Records were obtained on a total of 252 deer. The central district and the Mill Creek basin contained the majority of the deer.

TABLE 1.

WINTER DISTRIBUTION OF THE DEER POPULATION BY PERCENTAGE BASED ON RECORDS OF 252 DEER

Locality	Percentage
Marginal Winter Area	48.0
Mill Creek Basin	23.4
New Burn	21.4
Western District (Plateau)	4.3
Riley Peak	2.3

Along with sight records, information was recorded when possible on the condition of the individual deer. This was rated by good, fair, or poor depending on appearance and estimated weight. No deaths were recorded. Only one deer, a doe, was observed which was in serious poor health. The information is summarized in Table 2.

TABLE 2.

CONDITION OF THE DEER HERD IN THE CLOSED AREA BY PERCENTAGE

Number Counted	Class	Condition			Condition Not Determined
		Good	Fair	Poor	
47	Bucks	91.4	4.2	0	4.2
79	Does	81.0	11.3	6.3	1.2
71	Fawns	70.4	23.8	5.6	0

Supplementary Counts

A second fall inventory was taken on the closed area a year later from August 16 to September 18, 1951. The areas of low deer density were again noted to be in the western district. The greatest number of deer occurred on the eastward slope of the plateau where it leads into Mill and Rickreall Creek drainages. The Mill Creek basin supported a high density as it did the previous winter. A comparison for the years 1950 and 1951 is given in Table 3.

TABLE 3.

COMPARISON OF THE INVENTORY IN 1950 AND 1951

Year	Number of deer counted	Number of census areas	Buck-doe ratio	Doe-Fawn ratio
1950	114	12	1:4	1:1.07
1951	309	23	1:2.81	1:0.58

Twelve permanent census areas showed a very slight increase from 114 deer in 1950, to 119 in 1951. The 1951 fawn crop count included 66 per cent does with single fawns, 32 per cent with twins, and 0.02 per cent with triplets. Results of the census work showed no substantial increase of deer numbers; the mediocre fawn crop may be a clue that there is a stalemate in

reproduction, and that the highest densities on favorable areas have been reached. Perhaps the surge of a growing herd is no longer an impetus to herd fecundity, or there is a more specific cause which has escaped attention.

Total Deer Counts

The total number of deer counted during the study period was 810. However, some of these animals may have been repeat counts. Of the total amount, 120 were bucks, 297 were does, 225 were fawns, and 168 were unclassified. The buck-doe ratio was 1 to 2.48, and the doe-fawn ratio 1 to 0.76.

A breakdown of the age classes of bucks according to the number of points is as follows: 24 spikes, 49 two-points, 16 three-points, 9 three to five-points (positive number of tines not determined), 5 four-points, and 17 unknown.

THE DEER HUNT

The 1950 and 1951 hunting seasons will be reviewed to learn the importance of hunting pressure and related information to the overall study.

The 1950 Season

The 1950 season was held on lands adjacent to the closed area from September 30 to October 22. A patrol was maintained on both the open and closed areas to check what losses occurred. Observations were made to see if persistent hunting pressure was influencing population trends. No law enforcement work was carried on except by the regular law enforcement officers, so that the hunters' suspicions would not be aroused. It was desirable that the activities of hunters not deviate from normal.

The hunt was controlled to the extent that the majority of hunters entered the hunting area through a private gate at Black Rock. Although there were other roads into the area, these were too rough for passenger cars, or they were locked off by the lumber company controlling the land. This step was taken to minimize fire danger and to protect logging equipment. As an added precaution, the lumber company requested that each hunting party register at the gate, and that there be no overnight camping. Furthermore, hunting was only allowed on weekends. Consequently, with these controls, and with only one main point of entry, it was possible to determine rather accurately the character of the hunt. The most

bucks were killed on the first weekend. On Saturday, 26 were taken; and on Sunday, 10 were taken. On the second weekend, 7 were taken on Saturday and 2 on Sunday. The next two weekends, 1 was taken on each day. A total of 49 deer were taken in four weekends or eight days of hunting. Other animals killed during the hunting season included five black bear and one coyote. Approximately 27 sections of land were hunted adjacent to the closed area. This resulted in 1.8 deer bagged per section. Regarding the age class of the bagged deer, 24 bucks had two-points, 14 had three-points, and 11 had four-points. This sample indicated that the young bucks supported the heaviest kill, and that the proportion reflects a well balanced ratio. In studies from 1938 to 1941 by Hunter on Rocky Mountain mule deer in Colorado, it is stated that as long as the youngest age classes support the principle kill, breeding stock for maximum production is not jeopardized (5, p.38).

Six hundred and forty cars carrying 1920 hunters made entry into the area through Black Rock. The hunter success ratio was 1 buck for every 39.2 hunters. According to past Oregon State Game Commission file records on deer kill in and around the study area, the average success in 1948 was 1 buck per 8.8 hunters.

In 1949, it was 1 buck per 11.5 hunters[4]. This decline of hunter success in 1950 was probably caused by a reduction of available hunting ground as a result of the closure.

An attempt was made to correlate hunter success with prevailing weather, since fog and rain limit both visibility and mobility and decidedly affect hunting attitudes. Records which were kept show that weather conditions became progressively worse during the hunting season, and that the number of bucks killed decreased. So although some correlation seems to exist here because of adverse weather, the most important factor concerning the decrease is probably that the deer became more wary as the season progressed.

The common method of hunting was to slowly drive along logging roads which were built along canyon walls. The hunter would stop about every 100 yards, and then get out of the car to kick large rocks and boulders into draws where the bucks would be hiding. Oftentimes the drop-off was so steep that the rock would go crashing through the brush into the valley below. With rifle ready, the hunter would shoot when the disturbed deer

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4. Information on past deer kill furnished by Robert U. Mace, Chief Big Game, Oregon State Game Commission.

began to escape. This method was very successful because there are many miles of road that can be covered. Very few people, with the exception of the expert woodsmen who preferred to stalk their game, attempted to walk into the thick, brushy areas with its surface of steep bluffs and down timber. The favorite type of weapon used for deer hunting was a light rifle such as the caliber 30/30 Winchester. In the open places where long shots would be obtained, more powerful rifles such as the calibers 30/06, .270, and .300 Savage were used.

A few petty violations occurred. The misdemeanors observed were: hunting in the closed area, shooting at illegal deer, and hunting without a proper deer tag. No spotlighting or night hunting was detected. It may generally be stated that the hunters acknowledged the boundary of the closed area except on fringes of the more accessible localities. During the hunt, a spike buck and a doe were found which had been killed and left by hunters. The spike buck was located by watching for ravens which habitually swarm over dead animals. After the hunt, the grounds were combed to detect crippling losses. None were found. This work terminated after a two-week period because of the likelihood that the carcasses had been consumed by scavengers. One month after the season had closed, a two-point buck was found

in the Mill Creek basin. The flesh was completely eaten by ravens and scavengers, and only the skeleton remained, figure 18, p.52.

Crippling losses and mortality losses for previous years are not known. Loggers report that losses occur in Boulder Canyon during severe winters. Deer that become trapped there probably die of starvation, since the only exit from the canyon to snow-free areas is interrupted by a dense tract of timber in the west.

The 1951 Season

The 1951 hunting season was held from September 29 to October 21. That year there were fewer hunters. The poor success of the previous year discouraged deer hunters and many went elsewhere. The details of the 1951 season were similar to those of the preceding year, except that a private gate on the Mill Creek road was opened and automobiles entered there. About 25 deer were killed in that vicinity. At Black Rock, 418 cars carrying 1087 men went through the gate into the hunting area. They bagged 28 deer. The success ratio was 1 buck per 38.8 hunters. This figure is very near the 1:39.2 ratio of 1950.

Information was obtained on deer weights at meat locker plants in Dallas and Falls City. Most of the deer were killed in the vicinity of the closed area. Average dressed weights of 28 deer were as follows: 15 two-points, 99.8 pounds; 8 three-points, 126.5 pounds; and 5 four-points, 162.4 pounds. The average weight of all the deer was 125.7 pounds. This low weight may be indicative of unfavorable range conditions, for in a study of a burned-over range in northwestern Oregon, 22 bucks had an average dressed weight of 213 pounds (4, p.310).

Figure 18. A crippling loss with flesh completely eaten by ravens and scavengers.

FOOD HABITS

Information on winter deer food preferences and the results of nutritional analysis on some important winter foods will be presented. Data collected concerning salt utilization and deer damage will be enumerated herein.

Preferences

To establish winter food preferences in the closed area, investigations were made by direct observation. Binoculars were used to observe the feeding deer with a subsequent scrutiny of the plants eaten. Mention was also made when plants were observed to have been browsed. The investigations were carried out while engaged in other routine duties. At intervals, when snow fell in the marginal winter area, preferences were determined by following the trails of deer.

The occurrence of food plant groups varied by locality, depending, presumably, on soil conditions, moisture, slope, and seed dissemination. For example, vine maple was important in one area because of its localized abundance; and in another area, Oregon grape was the most important as deer food. In Table 4, a list is offered of the plants which were preferred as food by deer. Records were kept from December 5, 1950,

to March 14, 1951. The plants are listed in the order of probable importance. The selection depends both on the degree of utilization by deer and the availability of the food plant groups. Plants usually not eaten

TABLE 4.

WINTER FOODS OF BLACK-TAILED DEER IN THE CLOSED AREA

1.	Cinnamon Bush	11.	Hairy Manzanita
2.	Salal	12.	Red Alder
3.	Wild Blackberry	13.	Redflowering Currant
4.	Oregon Grape	14.	Grass
5.	Madrone	15.	California Hazel
6.	Vine Maple	16.	Moss
7.	Willow	17.	Lichen
8.	Western Swordfern	18.	Oregon White Oak, dry leaves
9.	Red Huckleberry	19.	Pacific Dogwood
10.	Elderberry	20.	Western Blackcap

but which deer were forced to eat when snow covered the ground were Western red cedar, Western yew, and Western hemlock.

When the deer drifted into the marginal winter area, the increased concentration had an adverse effect on food plants. Though no overbrowsed conditions existed on the range, browsing was at least heavy. In preferred

habitat areas, as on ridge tops, some of the madrone trees showed a browse line, figure 19, p.61. Cinnamon bush was often so heavily browsed that no leaves remained on the stem, figure 20, p.61. The same conditions were true in localized areas with other important food items such as salal and Western swordfern.

Some plants of the same species appeared to have a difference in palatability. Cinnamon bush exhibited this characteristic in the marginal winter area. The unbrowsed individuals had more red color in the stem, and the waxy leaves smelled more pungent. The deer did not browse these plants even though others in the same locality were heavily utilized. The difference is presumably in physiological makeup, but the reasons are not yet fully understood. A comparable example is the garden cucumber where now and then one is found which is bitter and unpalatable. It is common knowledge among game workers in Oregon that this condition also exists in Western juniper trees in eastern Oregon, where the plant serves as a main food item for mule deer.

Nutritional Analysis

Preferred winter deer foods were collected monthly on occupied habitat and later analyzed for crude protein content. The analysis was accomplished by

J.R. Haag, Nutritional Chemist, and Staff, Oregon State College. The purpose of this investigation was to learn the comparative value of the deer ranges, and to see if nutritive requirements were being supplied. In previous studies by Einarsen in western Oregon, it was found that good black-tailed deer range was on those areas where high protein browse grows and persists well into winter (4, p.312). During the dismal winter months when sunlight was lacking, protein value dropped critically low. It was learned that losses of deer corresponded to the time when protein was reduced to below five per cent (4, p.311). During studies of the Tillamook Burn area on the north fork of the Trask River, there was an obvious trend toward low values in the preferred deer foods when grown on the same ground over an eight year period. For example, in a comparison of records for 1941 and 1949, crude protein content of vine maple dropped from 6.17 to 3.84 per cent (9). Records of other plants showed this declining trend to be consistent. It was thought that perhaps a parallel situation existed in the closed area, and that a low nutritive value on the range was affecting deer density. Samples were thereby collected from the old burn, new burn, and marginal winter area. A representative part of the results are presented in Table 5.

TABLE 5.

WINTER DEER FOOD PROTEIN VALUE BY PERCENTAGE OF PLANTS COLLECTED IN THE CLOSED AREA*

	1950			1951		
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Oregon Grape:						
Old Burn	8.10	8.40	6.70	6.95	6.95	6.66
New Burn	8.03	8.90	7.38	7.06	8.25	8.23
Mar. Area*			7.97	6.40	6.99	6.31
Wild Blackberry:						
Old Burn	7.53	8.15	7.25	7.00	6.02	11.59
New Burn	9.75	9.90	8.45	7.85	8.36	12.86
Mar. Area			8.00	8.55	6.25	11.78
Cinnamon Bush:						
Old Burn	9.00	7.95	9.45	8.25	8.95	9.81
New Burn	8.30	8.00	9.28	9.25	8.99	9.63
Mar. Area			9.75	10.25	10.34	10.65
Vine Maple:						
Old Burn	4.05	4.05	4.05	4.70	4.38	4.63
New Burn	3.75	5.25	3.85	4.25	4.62	7.71
Mar. Area			4.47	5.05	4.08	7.00
Salal:						
Old Burn	4.75	4.05	5.75	4.50	4.47	5.96
New Burn	5.15	5.80	4.97	5.85	5.05	4.27
Mar. Area			4.95	4.90	4.67	5.60
Western Swordfern:						
Old Burn	11.90	9.20	9.15	10.50	8.80	7.32
New Burn	12.95	11.15	4.90	9.05	11.05	9.18
Mar. Area			9.45	8.35	7.85	9.70

* Analysis by J.R. Haag, Nutritional Chemist, and Staff, Oregon State College

* Mar. Area - The marginal winter area.

There appears to be no great difference in protein value of the ranges concerned to affect deer distribution. The food plants on the new burn average only 0.51 per cent higher than the old burn. Since deer were prone to drift in from the west and forage on farms, it was probably an effort to vacate ranges where there was a food deficiency. If later observations show this to be a persistent condition, management plans must be adjusted to meet the situation. Attempts to increase deer herds under such handicaps would not be sound.

Deer density may be influenced by the general low nutritional quality exhibited. Salal and vine maple, which are the two lowest, get down to four per cent. A deer crisis may be precipitated in future winters as the vegetation matures and loses its food value.

The Salt Lick

A salt lick was set out in October, 1950, in the Mill Creek basin near the boundary of the closed area. The salt was placed to see if it brought about an avenue of travel between open and closed areas, to facilitate observations on deer if it caused them to group, and to indicate whether or not additional salt was needed in their diet. Attempts were made to funnel the deer into the lick by dragging a ten-pound sack of coarse salt on

three different approaches. This established a line of scent about two miles long which transected the north boundary. The work was done early in the morning when dew was on the ground, and the moisture caused the salt to become wet in a short time. Thus a heavy brine solution remained on the vegetation, and the deer no doubt easily smelled it on the grass and leaves. Next, the remainder of the salt was placed on the open ground in a position where the deer could not detect an observer.

The lick was checked periodically, and the salt was not observed to have been utilized. Gradually the salt disintegrated because of exposure to rain, and in January it was completely leached into the ground. It is assumed that the deer in this vicinity have little desire for salt, and these findings coincide with similar studies by Chatelain who found that black-tailed deer in the Tillamook Burn area utilize very little salt (1, p.60). Reports were received of two mineral licks which had recently been used by deer. The existence of these two licks could not be determined by an intensive search. It is believed that the informants may have mistaken old cattle salt stations for natural deer licks.

Deer Damage

Since a buildup of the deer population might be a potential threat to crops in the agricultural district, and because some complaints were registered by people living and farming within the closed area, a survey was made in February of 1951 to determine the status of the matter. The complaints appeared to be based on damage by deer and the desire to hunt on private farming lands in the low-lying areas. Twenty-six land owners in the affected area were interviewed. Of this group 14 were against the closure, 4 favored it, and 8 had no opinion. The belief that a closure would increase the deer density and therefore harm crops caused great concern to the farmers. Actual damage was done by deer to several kinds of orchard trees, various berries, oats, vetch, and peas. Damage was done to electric fences, and some wire fences were torn down. It became obvious that the farming lands should be eliminated from the closed area. To that effect, a new east boundary in the form of an old logging road was found; and in July of 1951, the Oregon State Game Commission officially changed the location of the boundary to exclude the agricultural district.

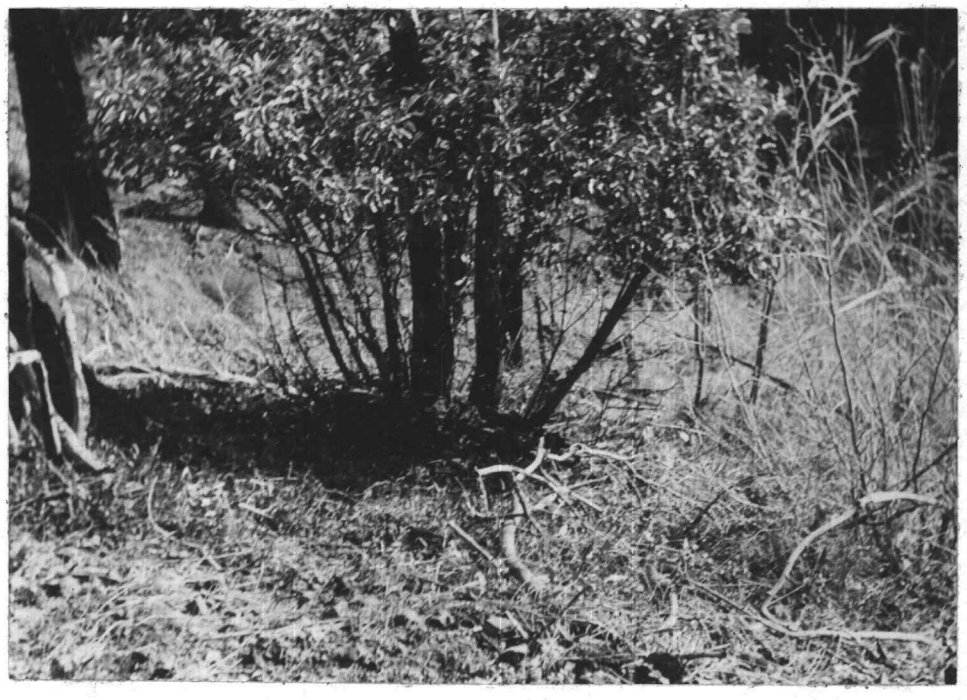
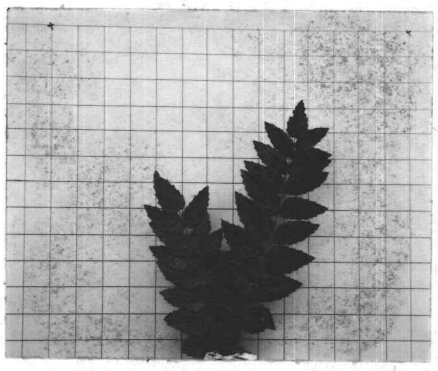


Figure 19. Browse line on a small madrone tree.



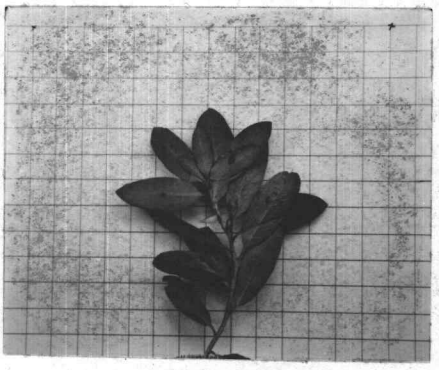
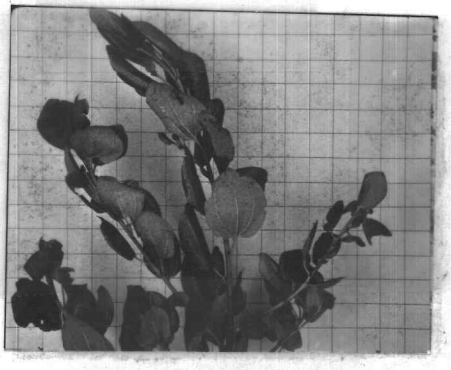
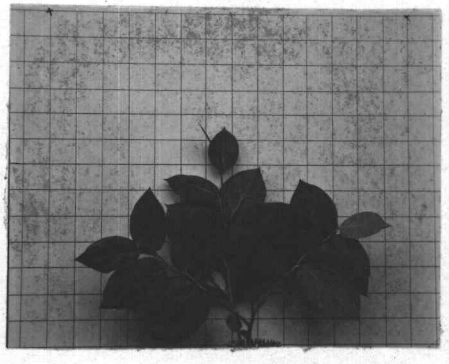
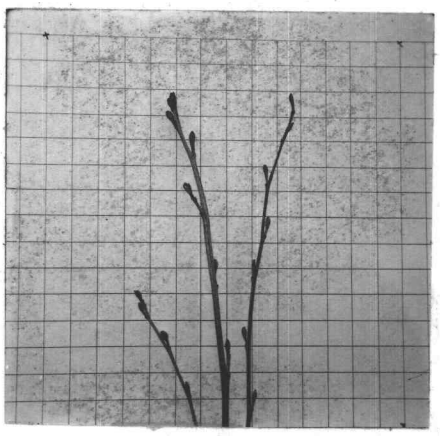


Figure 21. Some winter foods of blacktail deer. The background is ruled off in one-inch squares. Upper left, Oregon grape. Upper right, madrone. Lower left, cinnamon bush. Lower right, salal.







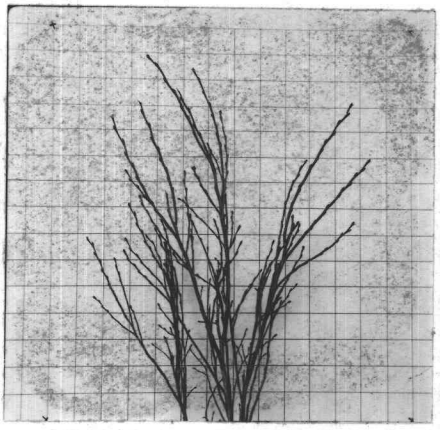
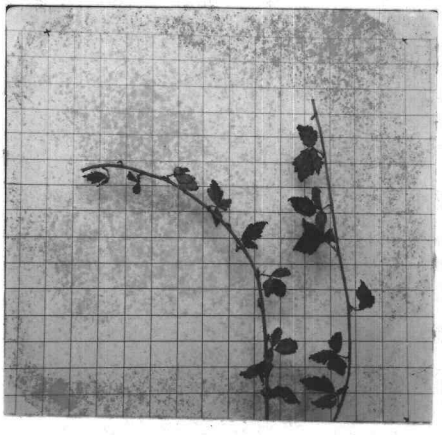
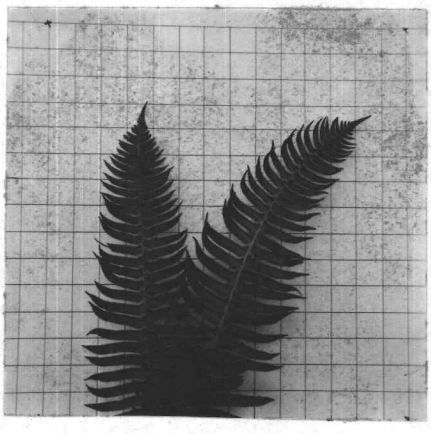


Figure 22. Some winter foods of blacktail deer (continued). Upper left, red alder. Upper right, red huckleberry. Lower left, wild blackberry. Lower right, Western swordfern.





CONCLUSIONS

It can be seen that several diverse factors are responsible for the low level of deer density and the extent of distribution. In this case, weather appears to have a major role. Snow in the western district causes a drift to the marginal winter area in the east where heavy browsing in localized areas is noted. Boulder Canyon seems to serve as a refuge for a few deer which remain on the plateau during winter. These deer may be winter killed during hard years because the only exit from the canyon is interrupted by a solid stand of timber which contains insufficient deer food. All other exits are interrupted by deep snow banks. Loggers report finding groups of dead deer in the spring.

Nutritional analysis of winter deer foods indicates that the ranges have a low protein value. Two important plants, salal and vine maple, get down to four per cent. The tendency of deer to forage on farm lands may be an effort to meet nutritional requirements, or it may be an effort to escape from deep snow in the west. The condition of the deer was fair, and no deaths were recorded. Since the ranges appear to have a low carrying value, a deer crisis may be precipitated in future winters.

Illegal hunting was checked at night from

observation posts and by patrolling roads. Such hunting was not observed, but one case was reported by an informant. It does not appear to be a serious limiting factor at present because most of the closed area is privately owned and not accessible to the public except during the hunting season. At any rate, a poacher would not find it necessary to go that far for a deer, since almost all foothill villages have deer at their city limits. In years past, illegal hunting was more of a problem.

Hunting pressure may be a contributory factor. The open burn areas are close to the highly populated Willamette Valley, and are heavily hunted. Road building and the admittance of numerous hunters after 1942 was probably partly responsible for a decline in deer populations.

Predation by enemies does not appear to be a serious decimating factor.

The buck-doe ratio appears to be near normal for western Oregon. There is no buck shortage. The mediocre fawn crop indicates that the herd is not increasing for reasons not fully known, and that because of influential natural factors including snow conditions and low protein value of the ranges, maximum populations are being supported.

Circumstances in the closed area are not conducive to a population increase, and it is recommended that the closure be lifted for these reasons: (1) The western district, where deer foods are plentiful in the summer, is uninhabitable during hard winters; (2) the remaining ranges are probably not capable of supporting high densities because of low protein value; (3) the tendency of deer to drift in from the west during winter may endanger farm crops in the agricultural district; and (4) a comparison of the inventories for 1950 and 1951 shows no substantial increase in population.

SUMMARY

This paper concerns investigations of Columbian black-tailed deer on a closed area in western Oregon from September, 1950, to December, 1951.

1. The specific problem was to determine population densities and distribution on diversified types of habitat, and to add life-history data to a long-term blacktail study currently being conducted by the Oregon Cooperative Wildlife Research Unit.

2. Many persons helped with the study, and information was gained from various sources.

3. The closed area consists of three regions.

An agricultural district, a central district which contains a marginal winter area, and a western district which is on a high, flat, logged- and burned-over plateau. Associated districts include the Mill Creek basin which supports a good deer population the year around, and Boulder Canyon which serves as a refuge for a few deer which remain on the plateau during the winter.

4. Past history indicates that the area was originally covered with timber. When the logging industry moved in, many openings which provided a fresh crop of browse were made in the forest, and the deer population undoubtedly increased.

5. Weather conditions are such that the western district is covered at intervals with large amounts of snow. This may cause a deer kill, and it is responsible for a seasonal drift to the marginal winter areas. Localized places in the marginal winter area were noted to have been heavily browsed.

6. Weather conditions influenced the habits of deer. Life-history information such as variation, voice, antler rot, family groups, and rutting is mentioned. Enemies of the deer are enumerated.

7. The relative deer density was determined by census in 1950 and 1951. In winter, the majority of the deer were contained in the central district and the Mill

Creek basin. A comparison of the inventories shows no substantial increase in deer numbers.

8. Two hunting seasons were observed to learn the character of the hunt, and to see if hunting pressure was influencing population density.

9. General food preferences were established. Nutritional analysis indicated that the ranges were deficient in food value, and that a drift to farms was probably a combination of snow conditions and an effort to meet nutriment requirements. A salt lick was set out, but deer in this vicinity have very little desire for salt in their diet. Some deer damage occurred, and for that reason the Oregon State Game Commission in July of 1951 changed the boundary to exclude the agricultural district.

10. Several diverse factors were responsible for the level of deer density and the extent of distribution. Weather, low food value of deer ranges, illegal hunting, hunting pressure, and enemies were the factors explored.

11. It is recommended that the closure be lifted and hunting be allowed because the value of the closed area as a study plot is not important for a longer trial, and the opportunity will be present in the future to measure the harvestable deer crop and determine density trends.

BIBLIOGRAPHY

√1. Chatelain, Edward Frank. Food preferences of the Columbian black-tailed deer Odocoileus hemionus columbianus (Richardson), on the Tillamook burn, Oregon. M.S. thesis, Oregon State College, 1947. 64p.

2. Darling, F. Fraser. A herd of red deer; a study in animal behaviour. London, Oxford university press, 1937. 215p.

3. Dixon, Joseph S. A study of the life history and food habits of mule deer in California. California fish and game 20:181-282. 1934.

4. Einarsen, Arthur S. Crude protein determination of deer food as an applied management technique. In Transactions of the (eleventh) North American wildlife conference. Washington, D.C., American wildlife institute, 1946, pp. 309-312.

5. Hunter, Gilbert N. Physical characteristics of Colorado mule deer in relation to their age class. Denver, Colorado game and fish dept., no date. 38p.

6. Kuhn, Lee Wallace. Mortality studies of Columbian black-tailed deer in the coastal regions of Oregon. M.S. thesis, Oregon State College, 1942. 78p.

7. Lauckhart, Burton. Black-tailed deer in western Washington. In (twenty-eighth) annual conference of western association of state game and fish commissioners. Salt Lake City, Utah, mimeographed by the association, 1948, pp. 153-161.

√8. Lindzey, James Shotwell. A study of the Columbian black-tailed deer Odocoileus hemionus columbianus (Richardson), and its habitat in Oregon. M.S. thesis, Oregon State College, 1943. 67p.

9. Narrative report of the Oregon coop. wildlife research unit for the quarter, July-September 1949. (Unpublished; available through the Unit at Oregon State College.)

10. Oregon. State game commission. Biennial report 1923. Portland, Ore., Kubli-Howell, 1923. 31p.

√11. Peck, Morton E. A manual of the higher plants of Oregon. Portland, Ore., Binfords and Mort, 1941. 866p.

12. Seton, Ernest Thompson. Lives of game animals, 4 vols. Garden City, N.Y., Doubleday, 1929. (Cited is v.3, pt.1; 412p.)

13. U.S. Dept. of agriculture. Yearbook of agriculture: climate and man. Washington, Govt. printing office, 1941. 1248p.

14. U.S. Dept. of commerce. Weather Bureau, climatological data, Oregon, annual summary 1949 55:270-280. 1949.

APPENDIX

NAMES OF TREES AND PLANTS MENTIONED IN THE TEXT*

TREES:

Douglas Fir	*Pseudotsuga taxifolia*
Western Hemlock	*Tsuga heterophylla*
Western Red Cedar	*Thuja plicata*
Bigleaf Maple	*Acer macrophyllum*
Pacific Dogwood	*Cornus Nuttallii*
Madrone	*Arbutus Menziesii*
Oregon White Oak	*Quercus Garryana*
Noble Fir	*Abies nobilis*
Western White Pine	*Pinus monticola*
Red Alder	*Alnus rubra*
Western Yew	*Taxus brevifolia*
Western Juniper	*Juniperus occidentalis*

SHRUBS AND OTHER PLANTS:

California Hazel	*Corylus californica*
Vine Maple	*Acer circinatum*
Cinnamon Bush or Sticky Laurel	*Ceanothus velutinus*
Salal	*Gaultheria shallon*
Oregon Grape	*Berberis nervosa*
Western Swordfern	*Polystichum munitum*
Elderberry	*Sambucus* sp.

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* Technical nomenclature taken from *A Manual of Higher Plants of Oregon*, by Morton E. Peck.

NAMES OF TREES AND PLANTS MENTIONED IN THE TEXT

SHRUBS AND OTHER PLANTS: (Continued)

Wild Blackberry	*Rubus vitifolius*
Willow	*Salix* sp.
Red Huckleberry	*Vaccinium parvifolium*
Hairy Manzanita	*Arctostaphylos columbiana*
Redflowering Currant	*Ribes sanguineum*
Grass	*Gramineae*
Moss	*Bryophyta*
Lichen	*Thallophyta*
Western Blackcap	*Rubus leucodermis*