

A STUDY OF THE COLUMBIAN BLACK-TAILED DEER
Odocoileus hemionus columbianus (Richardson),
AND ITS HABITAT IN OREGON

by

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The maps upon which the Habitat Study material was based, will be found in the Map Room of the Library.

Maps include:

U.S. Forest Service type maps of Northwest and Southwest quarters of Oregon and an overlay tracing for each map.

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INTRODUCTION

The purpose of this paper is to present the results of a habitat study of the Columbian black-tailed deer in western Oregon. A report summarizing the available data on the life history and habits of the species is included, supplemented by observations made while resident in Tillamook County, Oregon, during the spring and summer of 1942. This study was undertaken in April, 1942, as an integral part of an extensive bionomic investigation of the "Coast deer" being conducted under the direction of Arthur S. Einarsen, Associate Biologist, United States Department of the Interior, Fish and Wildlife Service.

The range study material was derived from sight records of the species throughout the western part of Oregon. These records were obtained by personnel of the United States Forest Service, the Oregon State Police, and the United States Fish and Wildlife Service, and recorded on standard forms issued by the Oregon Cooperative Wildlife Research Unit, * Arthur S. Einarsen, Leader.

* United States Fish and Wildlife Service, Oregon Agricultural Experiment Station, Oregon State Game Commission, American Wildlife Institute and Agricultural Research Foundation Cooperating.

All records were tabulated and unreliable or poorly located material was discarded. Master maps of the forest types in Oregon were obtained from the United States Forest Service, and overlay sheets of tracing linen were used to define the average annual rainfall and soil zones on the face of these maps. Each individual record was then plotted also on the tracing linen. This tracing method was used to prevent confusion, since the many records, 2,581, would have obliterated much other map data. By placing the map tracing showing the position of the sight records, the rainfall zones and the soil regions over the forest type map, the number of sight records in each type or zone was observed and recorded. It is assumed that these records show roughly the regions favorable to the species and the areas of low deer populations. Thus it will provide a basis for future studies by indicating preferred types and zones for the Columbian black-tailed deer in western Oregon.

Additional material in this report includes notes on the life history, habits, disease and general characteristics of the Columbian black-tailed deer, obtained from various publications. General notes and observa-

vations were added to the information already available for the species, following field work from April, 1942 through August, 1942 in Tillamook County, Oregon.

The information gained from this deer habitat study when used in conjunction with Kuhn's findings on mortality factors, Kuhn, 1942 (9), and Chatelain's work on census techniques, Chatelain, *1942, furnishes data which will form a nucleus for understanding and management of the species.

Kuhn and Chatelain, former graduate students of the Oregon Cooperative Wildlife Research Unit, made extensive studies of the Columbian black-tailed deer in western Oregon with special emphasis on the problems mentioned.

Though the original material in this report is general in nature, it is hoped that this study will aid in the management of the species by adding information pertinent to range utilization.

THE PROBLEM

The ultimate aim of the study is to produce part of the information necessary for the formulation of a comprehensive management plan for the Columbian black-tailed

*Chatelain, a graduate student with the Oregon Cooperative Wildlife Research Unit.

deer. Any study of this species is important and interesting, because of the lack of information regarding its life history and habits. The lack of any definite management plan is thus easily understood.

In the course of formulating any management plan it is necessary to have reliable information concerning the numbers to be dealt with and their life history and habitat requirements. Emphasis will be placed on the latter. The precise problem is to present analyses of the optimum and minimum habitat requirements for the Columbian black-tailed deer after locating sight records on master maps of the study area, and checking these points to determine the type of forest and soil and the rainfall zones in which they occur.

Observations made in the field while resident in Tillamook County, Oregon, supplement the other material in the report.

THE AREA

The range studied included that portion of Oregon designated as "Western Oregon". The area is bounded roughly by the crest of the Cascade mountains on the East, the Oregon-California line on the south, the Pacific ocean on the west and the Columbia River on the north. Certain areas in the Cascade mountain range in which both the mule

deer and Columbian black-tailed deer ranges overlap were omitted to eliminate mistakes in field identification involving hybrids of the two deer.

The thesis material deals only with the "problem area" and must not be confused with the complete range of the Columbian black-tailed deer in Oregon.

The "area" included rainfall zones of over 120 inches a year in parts of the Tillamook region, to less than 20 inches a year in the Southern section. The forest types, as might be expected, vary as greatly as the rainfall, but the predominant tree throughout is the Douglas fir. The soils of this area are also varied. The region designated as rough and mountainous, or composed of intrazonal and azonal soil classes, underlies the favored deer habitat.

The coastal forests are typical temperate rain forests having a very dense growth of large trees, with a virtually unbroken canopy where undisturbed by fires or lumbering. These forests cover the rugged coastal hills. The dominant trees in this range are Douglas fir, spruce, hemlock, cedars and a few redwoods in the extreme southwestern section. East from the coast range in areas of less rainfall the forests are typified by oak or oak-madrone. This type on the whole may be considered poor blacktail range. The more moist sections here as on the



Fig. 1

General view of the Trask Civilian Conservation Corps Camp located in good deer habitat in the Coast Mountains near Tillamook, Oregon. Notice evidence of the "Tillamook Fire".

coast are typified by Douglas fir, and maple. Farther east on the western slopes of the Cascade mountains dense stands of Douglas fir are again predominant, although there are scattered stands of coniferous and deciduous trees.

The regions of lesser rainfall in the Cascades and the dryer rolling south western section of the state, are typified by ponderosa pine stands.

In this entire region varying from about 90 to 120 miles in width which extends from the northern to the southern boundaries of the state, there is only one large area which cannot be considered potential deer range. The area, the Willamette Valley, is largely cities, rural communities and farmlands.

THE FIELD STATION

The field headquarters was located at the abandoned Trask Civilian Conservation Corps camp about ten miles from the ocean in the Coast Range of Tillamook County, Oregon.

The station was ideally located in that the surrounding rugged and relatively undisturbed hills were ex-



Fig. 2

A tame three weeks old
Columbian blacktail
fawn. Notice the dark
facial markings and char-
acteristic spotting pat-
tern.

cellent deer habitat. The whole region was burned over in 1939 in the fierce "Tillamook Fire" leaving none or very little of the dominant canopy of Douglas fir. The present fire type cover is composed of plants that on the whole furnish excellent deer food.

The dominant hill cover now is blackberry, vine maple, and fireweed, with salmonberry, thimbleberry and elderberry growing on the lower more moist slopes. Red alder and several varieties of willows are abundant along the creeks. Salmonberry, thimbleberry and elderberry also have invaded the creek bottoms and flats. In the open meadow areas bracken fern is common while an occasional red huckleberry may be found.

COMMENT

The following material on characteristics and life history was compiled from the work of several reliable authors and a few other records for the deer. Some facts may not apply, but on the whole the information is fairly characteristic for the Oregon deer. Attempt has been made wherever possible to substantiate and supplement existing data, but the brevity of the field study combined with the stress on range problems leaves much unverified and unstudied.

LIFE HISTORY AND HABITS OF THE COLUMBIAN BLACK-TAILED
DEER

Classification of the Deer

Class-----Mammalia

Order-----Artiodactyla

Family-----Cervidae

Sub-family-----Cervinae

Genus-----Odocoileus

Species-----hemionus

Sub-Species-----columbianus (Richardson).

The Columbian Black-tailed Deer, Coast

Deer, Fallow Deer, Blacktail, Cascade Deer,

Sound Deer, Columbia Deer and others.

Type-----"Not preserved".

Entire Range-----"The coast and most of the coastal islands of western North America, from British Columbia south to central California; eastward roughly to the summit of the Cascade Sierra Nevada chain". Cowan, 1936 (5).

According to Cowan, (5), the type locality should be Cape Disappointment, Pacific County, Washington. The northern limits of the race are believed to be between Bela Bela and Fort Simpson, British Columbia. The southern limits at least Monterey, California.

Fawns - Time of Birth and Numbers

The fawning time of the black-tailed deer in Oregon usually occurs during May, June, or July, following a gestation period of about seven months (210 days), Bailey, 1936 (2) and McLean, 1940 (10). Some fawns are recorded as being born as early as April, or March by Vernon Bailey, 1936 (2). A female blacktail was observed in Tillamook County as being very heavy with fawn on May 22. A young fawn obtained for study purposes May 28 was estimated to be a little under two weeks old. These records verify the fawning dates mentioned by other authors. The first breeding of the does usually results in only one fawn according to Coffman, 1920 (4). Later the does bear from one to three fawns, Seton, 1936 (13), twins being quite common in some places. Robert Orr, 1937 (11), states that twins occur in about 20 per cent of the cases noted in the California Redwood State Park.

Pelage - Young and Adult

When young, the fawns are covered with brown guard hairs and fine woolly black hairs which disappear later. White or creamy spots of long coarse hairs protrude from this coat of brown. Two rows of spots extend from the shoulder to either side of the tail, while

the flanks are less definitely patterned, Figure 2. These light colored hairs which form the spots are white only at the tip grading into a light brown at the proximal end. During the summer, as the coat wears, the spots slowly disappear until by fall they are barely discernible. The autumnal molt takes place at about four months and a drab coat similar to that of the adults is acquired, though the markings are not as accentuated, Cowan, 1936 (5).

This winter or "blue" coat, is replaced the following spring by the summer or "red" coat. Cowan, 1936 (5), says the fall molt in the California blacktail occurs usually in August and September. From records and general observations this would also seem to be the case for Oregon. One male deer observed on August 16 had just started to develop his winter coat though the summer coat was not yet being noticeably shed. Another male had its full winter coat on September third. Cowan, 1936 (5) also says that evidence points to the fact that adult males molt first, followed by the young males and does. No females were observed in winter pelage before September tenth in Oregon, but observations were limited. Authors agree that the time of molt varies greatly from place to place and even in the same locality on different

years. Cowan, 1936 (5), says diseased or heavily parasitized individuals molt later than normal deer.

The molt to the summer coat usually begins in May and ends sometime during June. One buck was observed in Oregon to have started developing his summer coat during April. This same animal had obtained his full "red" coat by the latter part of June.

Hair in the winter coat tends to be longer and a little more shaggy than the sleek brown summer coat. The winter coat is grayish brown in color, the hairs from the distal to proximal end being black, brownish and either plumbeous or brownish in three bands of varying length. The summer coat hairs are light to white basally and rusty red toward the tip.

The underside of the body is definitely lighter than the flanks, sides and back. It is white in the more protected regions and varies to brownish-cream on the belly margins. Darker areas are present along the dorsal line of the body, on the bridge of the nose and across the forehead. The dark face markings are evident even on the fawns. The middle line of the chest is also darker than the surrounding hair.

Albinism in whole or part is apparently quite common with this species as several reliable sources have

reported cases in the Tillamook area and there are many cases reported for the Nehalem country in northwestern Oregon. Seton, 1937 (13), cites examples of albinism in the Whidby Island, Washington deer. This fact was also commented upon by local residents of the section. J.D. Coffman, 1927 (4), mentions localities where albinos and melanistic color phases are common.

The little fawns are hidden by their mothers in tall grass, weeds, or brush, until they are able to follow her about. When very young the fawns are believed to have no scent that a dog can detect and their protective coloration makes them almost impossible to see in their natural habitat. The mother returns to nurse her hidden fawn or fawns, several times a day, Cahalane, 1939 (3).

The fawns lie practically motionless when in danger even though hidden, and because of their natural color camouflage it is possible for one to step on them before seeing them. Even in a fawn tamed for experimental purposes, this hiding habit was well developed. A hunting dog was frequently used to help find it, but proved of no assistance at all, inasmuch as the observer had to locate the animal visually in every case.

In spite of their excellent concealment, J.D. Coffman, 1920 (4), estimates that due to natural enemies and

other natural losses, over 50% of the fawn crop is decimated in the Trinity National Forest, California, before reaching maturity. Seton, 1937 (13), also makes this statement without limiting it to any portion of the range. It has been definitely noted that many females seen in Oregon in the late summer, when the fawns should be following, have no young with them. Of course there may be a variety of reasons for this, but lack of data makes satisfactory discussion impossible. Einarsen states his belief that the high fawn mortality in Oregon, is largely a result of human interference, severe weather at fawning time and the depredations of predators.

Antler Development

The male fawns begin to develop velvet covered knobs on their frontal bones when they are about three to three and one-half months old. These knobs usually develop into three to five inch spikes the next year without the velvet or the antler being shed the first winter of their life, Cowan, 1936 (5). The first pair of forked antlers is usually produced in the third autumn while true dichotomously branching, or antlers bearing four points, are usually produced the fourth or fifth year, Cowan, 1936 (5). According to Cowan, 1936 (5) the antler structure itself is composed of two types of bone, one

compact bone (*substantia compacta*) forming the outer sheath and the other, spongy bone (*substantia spongiosa*) forming the core. The pedicel is formed entirely of compact bone. Antlers are shed from January to March, according to Cowan, 1936 (5), with the greatest number of bucks shedding during February, Seton, 1937 (13). The shedding is accomplished by a dying and sloughing off process at the point immediately above the pedicel. The new antlers are in most cases apparent in April, Seton 1937 (13). They are usually fully developed and the velvet removed by about the first of September, Bailey, 1936 (2). It takes approximately 150 days or less for the antlers to complete their growth, McLean, 1940 (10).

Younger animals usually retain their antlers later in the season than do older individuals. Diseased individuals usually drop their antlers earlier than normal deer, Cowan, 1936 (5).

The antler type of the Columbian black-tailed deer is normally a dichotomously-branching antler. The perfect dichotomous type however, is rare, Cowan, 1936 (5). Many deer regardless of age never carry more than three points to the antler, but with each year the base of the antler becomes more rugose. In old bucks the bases of the antlers are very rough and covered with warty protuberances, Cowan, 1936 (5). This has been noted in the older deer

killed in Oregon.

The over-mature and very old deer frequently have forked antlers though these are often large and roughened at the base. These old individuals have often been called "Pacific Bucks", Cowan, 1936 (5).

The many types of freak antlers or of cases where bucks have no antlers will not be discussed except to state that young male fawns when castrated within their first few weeks of life, never develop antlers. Seton, 1937 (13), pages 374 and 375, describes some freak antlers of which he has record.

Age of Self Sufficiency of Fawns-
Mating Time of Females

Fawns of six weeks are usually able to follow their mothers readily, though the younger they are, the more rest periods they require, Seton, 1936 (13). Weaning probably occurs by fall at two to three months of age as with the mule deer, Dixon, 1934 (6), since at this time the does must prepare themselves for the fall mating and regain their strength. Actual self-sufficiency in the fawns is established by two months when necessary.

Bailey, 1936 (2), states that in Oregon mating usually occurs in October or November. Since the seven

month gestation period is well substantiated, it may be assumed that mating in the case of the two weeks old fawn obtained May 28, occurred about October 15 of the previous year. The female noted as heavy with fawn May 22, was probably also bred during early October.

The fawns apparently return to run with their mothers some time after she mates, because these young frequently referred to as yearlings, are again with her after the mating season. Observations made in Oregon indicate that, at least where no new fawns are born, they run together even through the following summer. Seton, 1937 (13), also mentions this.

Fawns as Individuals

Unfortunately the fawns are very tame or probably uneducated in ways of their kind and many are taken from their mothers by misguided nature lovers. The frail looking creatures have an unsuspecting curiosity that is probably the cause of many an untimely death. When the family is surprised in the woods the little fellows' curiosity, when under two weeks old, often overcomes their desire to flee with their mother, and many a separation results.

Food

One fawn obtained for experimental purposes proved a very interesting pet but was already scouring badly when obtained from her captors. Bismuth in the proportion of about $\frac{1}{2}$ teaspoon full to eight ounces of water and evaporated milk in equal portions, finally brought about normal bowel action. This fawn was fed from a bottle three or four times daily and in increasing quantity as it grew older. By the third week of life, it was eating relatively large quantities of native shrubs and plants within its reach, though it apparently had all the milk it needed. At first no preference was shown for green food, the nibbling being indiscriminate, but later narrow leaf plantain, Plantago and white clover, Trifolium, were favored among the herbs and streambank willow, Salix, salmonberry, Rubus spectabilis, blackberry, Rubus vitifolius and thimbleberry, Rubus parviflorus were favored among the shrubs. This diet would indicate that the fawns apparently take the same foods as the adults though necessarily at lower levels. Their apparent dependency on green food even when very young would indicate one possible contributing cause to mortality in country where low level feed was scarce. An autopsy performed on a one month old fawn showed its stomach to contain about two pounds (wet) of green matter.

Voice

Both fawns and adults are capable of uttering a definite sound when frightened or hungry. The little fawn's voice interpreted into a word would be most nearly described as "eep". This "eep" was used when feeding time approached and was audible for about one quarter of a mile. When in dire fright this "eep" developed into a squeal similar, but more throaty, to that of a wounded rabbit. The voice of the adult is seldom ever heard in the wild though a captured experimental buck deer frequently bleated softly when hungry or excited. This sound was not audible to humans for more than about fifty yards.

Breeding, Age and Life Expectancy

The young does breed for their first time during the second autumn of their life, or at approximately eighteen months of age. The spike bucks are also running with does at this time and are probably sexually mature, Seton, 1937 (13). No information is available on the normal length of productive life for either does or bucks. According to Einarsen, nine years is a long life for a wild blacktail though a life of eighteen years has been recorded for captive specimens.

Habits

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.

Feeding Time

Feeding usually takes place during the cooler periods of the day in early morning or late evening, though night feeding is also common, especially when the deer are harassed during the day.

Blacktails are seldom seen during the heat of a summer day, as they are usually "bedded down" in some cool spot.

In searching for the black-tailed deer in the coast mountains there are a few fairly common places where one may expect to find them. At fawning time the does usually seek shaded, brushy glens near water, though the latter is probably not essential in areas of succulent vegetation. At this time the bucks are in more open

areas, usually at higher altitudes attempting to protect their velvet covered antlers and escape the flies.

Although deer may choose a habitat at any elevation, the bucks will usually be found at the higher altitudes more consistently than the does at all periods of the year, except when inclement weather forces them to lower levels.

The favorite bedding place for does and bucks seems to be near the head of a draw where they have a good vista. They will usually be in such a place during the day and move to their favorite feeding grounds in the evening, often not returning until morning.

Black-tailed deer are frequently "flushed" from their beds when the observer has been perfectly motionless for a while. The deer seem to be able to stand the proximity of a person if they feel that he is merely passing, but to have someone stop nearby seems to make them very nervous.

Often they intently watch a person from concealment and will sneak in the opposite direction at the first opportunity.

Hunting

The fact that the greatest part of good black-tail range is very brushy has a definite retarding influence on hunting pressure. Coupled with the sneaking habits of the deer, this practically impenetrable brush discourages many a prospective deer hunter and sends many another to the open country of the mule deer range. It is probably quite safe to venture the statement that most of the blacktails shot by novices, are the result of accidents. They provide a fine sporting test for a true sportsman-woodsman, but unfortunately most hunters are more interested in a trophy, or pounds of meat at little or no cost or effort. These facts coupled with the presence of paved roads to eastern Oregon, have decreased the hunting pressure in many areas of western Oregon during the last two decades.

Food Value

Blacktail venison is excellent eating, though often the deer are of small size, the average buck usually weighing about 143.8 pounds, according to Chatelain*. They are usually in fine shape when taken during the

* Graduate fellow, Oregon Cooperative Wildlife Research Unit. Field notes on the Columbian black-tailed deer.

fall hunting season as they have just passed through their fattening period. However, many people living away from civilization in the coast mountains find the black-tail fine eating at all seasons of the year. Often Oregonians favor this deer over the mule deer for the table.

Economic Status

There are few big game species in the world that are so well fitted to withstand the advances of civilization as the Columbian black-tailed deer in Oregon. The fact that in the Oregon range it lives almost entirely on otherwise wasted products of the land makes this species valuable, if considered from the land utilization standpoint alone. Its sporting and recreational value are also important.

Most records and recent population studies indicate that the deer will probably never be very abundant, or occur in great concentrations on most of the Oregon range. This fact coupled with their food preferences in this state results in little conflict with agriculture. In California, however, according to Hamilton, 1939 (8), the blacktails are even now in serious conflict with agriculture. The complaints in Oregon occur mainly during more severe winters. At these times damage to

orchard trees has been reported.

According to Einarsen one deer to two sections might cause trouble in Oregon when living in proximity to marginal farms. On suitable ground a population of ten deer per section has been known to cause no damage either to soil or forage. These facts must be recognized and the take of the deer controlled so that the problems never arise or are minimized to a point where the advantages counterbalance them.

The mere fact that the deer is probably the only big game species suited to the range and also compatible with other interests and land usage makes it valuable to the sportsman. Roosevelt's Elk, Cervus canadensis roosevelti, is suited ecologically to some sections of the coast range, but is not suited to even occasional contact with farming regions. Thus, though the habitat of the coast deer is unpopular with hunters, the deer represents the most practical game which will afford recreation, sport and meat, and allow maximum agricultural uses of the land.

The United States Forest Service estimates in 1933, for the national forests in Oregon, showed 35,675 black-tails, Bailey, 1936 (2). This, of course, includes only national forest areas. The 1940 "Report of the Spe-

cial Committee on the Conservation of Wildlife Resources" (14) placed the total number of blacktails at 370,385 and estimated 37,700 on the Oregon national forest lands. McLean, 1940 (10), estimated that California had 186,900 black-tailed deer in 1940. From these rather sketchy figures it may be noted that the range is not densely populated, but by virtue of its peculiar habitat this species, if properly managed will furnish sport, recreation and food for many years to a relatively large hunting populace.

The "Tillamook burn area" of northern Oregon, according to most reliable estimates, supported one black-tail to every 640 acres in 1939 while it had increased to about 10 deer per section by 1942 *.

A review of reliable estimates of deer numbers throughout the state indicates that on the Oregon range two deer to the section generally would be considered average. Ten deer or more per 640 acres would be considered a high concentration.

Einarsen states that observations made at Rocky Pass, Kupreanof Island, Alaska, indicate a population of eight deer per section. This record is, of course, for the Sitka black-tailed deer.

Old records show that even when the Columbian

* Figures furnished through the courtesy of the Oregon Cooperative Wildlife Research Unit.

black-tailed deer was undisturbed in its natural habitat in Oregon, there were probably no great concentrations present. Bailey, 1936 (2), infers from this that in all probability there were no more deer then than there are now in individual localities. This speaks well for the future of the species as a sporting animal in competition with civilization.

In view of the fact that these deer appear by nature to drift away from habitat in which their numbers might be reaching proportions of a concentration even with complete protection, management of hunting should permit only the taking of adult buck deer until such time as deer food scarcity or agricultural competition make drastic herd reduction necessary.

Migration

The Oregon range has both migratory and non-migratory black-tailed deer, dependent upon topography and weather conditions. The more eastern deer migrate up and down the western slopes of the Cascade mountains, while the deer resident in the coast range of Oregon seldom make any movement even resembling this migration. The spring migration in the Cascades might be described as more of an infiltration, since the return to higher elevations is gradual. The fall migration is a definite

movement, probably in direct response to climatic stimuli.

In the coast mountains of Oregon the winters are usually mild enough so that only local movements in search of better feeding grounds are made. Occasionally during hard winters, herds of 20 or more may winter in a protected valley, but this movement cannot be compared to the mule deer migrations which sometimes carry the deer hundreds of miles.

Decimating Factors

Kuhn, formerly a graduate assistant with the Oregon Research Unit presented a paper in 1942 which gives a very fine picture of the decimating factors of the Columbian blacktail in Oregon, (9). His study indicated that illegal hunting was most important in the northern half while internal parasites ranked first as a decimator in the southern half.

Lack of food is seldom a limiting factor in the survival of adult black-tailed deer in Oregon, although the food condition at times may be a contributing factor to the death of deer. Studies made by Arthur S. Einarsen, Associate Biologist, show that following long periods of dull, cloudy weather the nutritive value of native plants used for deer food becomes very low. This food

factor when noted may be enough to turn the tide against a parasitized or otherwise weakened deer. Accompanying these factors we also find heaviest mortality in the spring when the lush vegetation first starts to grow, because of its tendency to cause scours. Scours in a weakened animal whereby the food value is lost to it, is often fatal. The new green food with high water content apparently has a laxative effect when taken following the more fibrous winter food.

As may be expected during periods of great handicap and exertion which occur during heavy snows the low nutritive value of food plants may prove fatal. The greatest death loss usually occurs in early spring when deer attempt to change from the more concentrated winter food to the first watery shoots and lack strength to make the adjustment.

Fire has been considered an enemy of game for many years and few will deny that uncontrolled fire has its immediate effect on game populations. Following the "Tillamook fire" of 1939, counts made by J.E. Meehan, while doing reforestation work, showed that about one deer was killed in the Wilson River section for every 40 acres burned. This was a limited count, but observations by Einarsen indicated that about one dead deer could be found for every mile of stream in the area of

the burn. Such a fierce, uncontrolled fire of the proportions of the "Tillamook burn" thus has a definite decimating effect on the immediate population. The ultimate effect of this fire and others will be discussed under another topic. Smaller, less intense fires seldom trap even a single deer.

There is little data to support any claims that disease is an important decimating factor in Oregon. McLean, 1940 (10), reports that the California blacktails suffer from actinomyces necrophorus or calf diptheria. The Coast deer in California also suffered in the outbreak of hoof and mouth disease in the 1925 epizootic. This latter disease was controlled by killing, burning and deep burial of all deer and livestock in the infected section of California. Probably if all facts were known regarding other deer diseases we would find that Oregon deer are occasionally affected, though they are hardy animals and the net effect is probably not large.

External parasites including dipterous ticks, which are common, and true ticks, together with a host of flies all somewhat impoverish the animals. In the fly group the nose bot fly, Cephenomyia, the larvae of which lives in the sinuses of the deer's head, is considered serious.

The automobile death toll for the blacktails is playing its part in decimating deer herds though how im-



Fig. 3

The right tarsus of a Columbian black-tailed deer, showing the hair outline of the metatarsal gland on the outside of the hind leg.



Fig. 4

Tail of a Columbian black-tailed deer showing the black terminal one-half and small white rump patch. Notice tarsal gland tuft, a, and metatarsal gland tuft, b.

portant this factor is, is not fully known. At Gardiner, Oregon, 17 dead deer were recorded along one mile of highway, during the winter of 1941-42 by the Oregon Cooperative Research Unit. However, there are only a few places as deadly as this section of the coast highway.

Identification of the Columbian Black-Tailed Deer

Deer may be most easily identified by using the metatarsal gland, the tail and the antlers as three superficial characteristics.

The metatarsal gland is situated a little above the mid point of the tarsus and measures between 51 and 63 millimeters in length, Figure 3. The tail is of the bushy type lacking basal constriction and averaging around 180 millimeters in length. The terminal one-third to one-half on the dorsal surface is usually black, the remainder being dark brown. The under side is white, Figure 4. The antlers as previously described are dichotomously branching, though seldom perfect. They are usually smaller than those of the mule deer.

In general body shape the blacktail is similar to the mule deer but usually not quite as heavy or blocky. It bounds like the mule deer, but will flag its tail while the mule deer merely switches his back and forth.



Fig. 5

Thimbleberry, Rubus parviflorus, May 8, 1943. Rapidly reaching climax height for deer food after four years growth, following the "Tillamook Fire" in 1939. Largely a spring deer food.



Fig. 6

Good deer pasture formed by young growth of bracken fern, Pteridium, fireweed, Epilobium, and blackberries, Rubus. "Tillamook Burn" area, May 8, 1943

However, its tail action does not compare with that of the white-tailed deer. The more prominent white rump patch and tail serve to distinguish the mule deer from the coast deer in the field. The large "flag" tail of the whitetail and its running gait easily identify it.

Food Habits

The diversity of habitat included in the Columbian blacktail range, results in great variation of preferred foods in the different areas. Only a few will be mentioned here. As previously noted, the field station from which most of the work was done on this study was in burned-over Douglas fir type, hence the bulk of the original food habits material will be for this particular type.

There are definite seasonal changes in food preferences. For instance, the common bracken fern is taken commonly when it first comes up in the spring, yet later it is almost untouched, Figure 6. Fire-weed, a favored food when it first emerges from the ground, is neglected when it starts to dry and more favorable food becomes available, Figure 6. Thimbleberry and salmon-berry are also examples of foods used most heavily during the early season, Figures 5 and 7.



Fig. 7

Salmonberry, Rubus Spectabilis.
An important deer food in the
spring, though apparently be-
coming less palatable later in
the season. May 8, 1943, "Til-
lamook Burn" area.



Fig. 8

Vine maple, Acer circinatum,
clump. Excellent deer browse.
May 8, 1943. "Tillamook Burn"
area.



Fig. 8 a

Vine maple, Acer circinatum,
showing excellent deer feed-
ing area on low bench. May 8
1943 "Tillamook Burn" area.

An adult captive experimental deer was used for part of the food habit studies. The deer, on a long rope, was allowed to select its own food while the observer made notes. This data, when correlated with actual browse evidence by wild deer, shows at least what the deer will eat and when, though it may not show absolute preference. The following are accounts of some studies made. The foods are listed in order of the amounts taken for that date.

May 4

Thimbleberry, Bracken Fern, Red Alder, Fire Weed, Cascara, Elderberry, Plantain, Clover, Stream-bank Willow.

May 30

Red Alder, Salmonberry, Elderberry, Cascara, Sorrel, Blackberry, Daisy, Huckleberry, Fire Weed, Bracken Fern and Sword Fern.

July 2

Willow (Stream-bank), Herbs, Salmonberry, Red Alder, Plantain, Fire Weed.

July 31

Elderberry, Cascara, Willow, Red Alder, Blackberry, Fire Weed, Bracken Fern, and Plantain.

There was no vine maple and very little elderberry and blackberry where the deer was taken on food observation trips.

Material gained directly from these studies with the deer was so limited that definite statements regarding its value cannot be made. Supported by browse evidence in the field, the following tentative preferred food list for that section might be suggested for summer usage. In order of most usage:

Vine Maple, Figure 8.

Wild Mountain Blackberries or Dewberries, Figure 9.

Elderberry where available, Figure 10.

Fire Weed, Figure 6.

Red Huckleberry and Red Alder, Figures 10 and 11.

Cascara and others.

As might be expected, the more hardy and shrubby varieties are winter foods also. The vine maple, elderberry, huckleberry, red alder, cascara and possibly salal are probably important in the winter. Evidence in the "Tillamook Burn" area indicates that salal is neglected where more palatable foods are available.

The foods listed above don't appear as important in the field studies with the adult deer as is indicated in the preference list. This list, as mentioned before,

is based on field observations plus observations with the captive deer. The vine maple in the region studied showed heavy twig tip and leaf browsing and in general was the most consistently heavily browsed plant noted. The mountain blackberry plants also showed heavy browsing evidence and in places the berry patches were partially stripped of their new growth. The elderberry browse was thoroughly taken where the plants were available. The stream bank willow, mostly small shrubby growth, seemed extremely palatable to the experimental deer and browsed tips with the presence of many tracks nearby indicated the value to the wild deer. The other foods mentioned showed liberal usage, but to a lesser degree in the particular locality for the season studied.

Throughout the blacktail range, a most imposing food list could be prepared. Attempts to name the chief foods only will be made, other than those already mentioned. Other authors mention snowberry, hazel, moss, mistletoe, alfalfa, mountain mahogany, poison oak, sword fern and ceanothus. Numerous herbs and grasses are frequent in appearance on food lists. From some records there are indications that oak and salal play an important role in the diet of the Columbian black-tailed deer in certain sections, Bailey, 1936, (2) and Orr, 1937 (11).



Fig. 9

Elderberry bush, Sambucus glauca. The growth palatable to deer has grown beyond their reach. May 8, 1943. "Tillamook Burn" area.



Fig. 10

Streambank cover along the North Fork of the Trask River. Shrubby willows, Salix sp., red alder, Alnus rubra, and maple, Acer macrophyllum. Frequently used deer cover. "Tillamook Burn" area.

The list of foods indicates clearly that on the Oregon range at least, this deer is primarily a browser.

Comparative Description of the
Columbian Black-tailed Deer

Great variation in characteristics makes it impossible to make positive statements regarding the several species of deer found on the west coast. Variations of hybridized individuals further complicate the problem with regard to the mule deer and the black-tailed deer. With this in mind it may be realized that the following figures are average measurements. In some instances, the figures are for the few available specimens and some individual cases may not be at all characteristic.

TABLE 1

TABLE OF COMPARATIVE CHARACTERISTICS

Columbian black-tailed deer <i>Odocoileus hemionus columbianus</i>	Mule Deer <i>O. hemionus hemionus</i> (Rafinesque)	Western white-tailed deer <i>O. virginianus leucurus</i> (Douglas)
<u>Tail</u>		
<u>Length</u>		
male-178 mm. Cowan 1936 (5)	152 mm.	185 mm.
180 mm. Bailey 1936 (2)	130 mm.	178 mm.
female		
161 mm. Cowan 1936 (5)	175 mm.	no measurement available
<u>Described</u>		
Basal constriction if present, not as evident as in mule deer. Under-surface completely haired with white hairs. Dorsal surface for one half to two thirds of its proximal end, dark brown. Terminal one third or one half black on dorsal surface. Figure 4.	In general shape it is constricted at the base-a terminal lateral flare forming a tassel-like tip. Under surface with proximal one half naked. Dorsal surface has base light to white in color, tip black.	Long and broad in general form, the under-surface completely covered with white hairs, the dorsal surface being brown edged with white to the junction with the body.
<u>Total Length</u>		
male		
1,452mm. Cowan 1936 (5).	1,755mm.	1,610mm.
1,640mm. Bailey 1936 (2).	1,720mm.	1,575mm.

TABLE 1 (Con'td)

TABLE OF COMPARATIVE CHARACTERISTICS

Columbian black-tailed Deer <i>Odocoileus hemionus</i>	Mule Deer <i>O. hemionus hemionus</i> (Rafinesque)	Western white-tailed Deer <i>O. virginianus leucurus</i> (Douglas)
<hr/>		
<u>Total Length (Con.)</u>		
male (Con.)		
1,707mm. Chatelain 1942*	1,435mm.	
female		
1,356mm. Cowan 1936 (5)		
1,511mm. Chatelain 1942.		
<u>Tarsus-Hind Leg</u>		
male		
436mm. Cowan 1936 (5)	555mm.	no measurement available
450mm. Bailey 1936 (2)	510mm.	
476mm. Chatelain 1942*		
female		
439mm. Chatelain 1942		
433mm. Cowan 1936 (5)	475mm.	no measurement available
<u>Metatarsal Gland</u>		
male		
51mm. Cowan 1936	129mm.	16mm.
63mm. Chatelain 1942		

*Chatelain 1942. A graduate fellow with the Oregon Cooperative Wildlife Research Unit

TABLE 1. (Cont'd)

TABLE OF COMPARATIVE CHARACTERISTICS

Columbian black-tailed Deer <i>Odocoileus hemionus columbianus</i>	Mule Deer <i>O. hemionus hemionus</i> (Rafinesque)	Western white-tailed Deer <i>O. virginianus leucurus</i> (Douglas)
<u>Metatarsal Gland</u> (Con.)		
female		
51mm. Cowan 1936 (5)	108mm.	
61mm. Chatelain 1942		
<u>Location on leg.</u>		
Situated above the mid point of the tarsus.	Situated above the mid point of tarsus	Situated below the mid point of the tarsus
<u>Described</u>		
Hair of about the same color as the surrounding leg hair	Hair of about the same color as the surrounding leg hair.	Hair of gland center white.
<u>Weight</u>		
male		
82-238 lbs. Cowan 1936 (5).	174-456 lbs.	160 lbs. Hooker, 1836, pp. 139
143.8 lbs. Chatelain 1942		
200 lbs. Bailey 1936 (2)	200-300 lbs.	
female		
112 lbs. Cowan 1936 (5)	no records	no records
Weight less variable than in the case of the males, Cowan 1936 (5).		

TABLE 1. (Cont'd.)

TABLE OF COMPARATIVE CHARACTERISTICS

Columbian black-tailed Deer <i>Odocoileus hemionus</i>	Mule Deer <i>O. hemionus hemionus</i> (Rafinesque)	Western white-tailed Deer <i>O. virginianus leucurus</i> (Douglas)
---	--	--

Antlers

Dichotomously branching. Rarely perfectly dichotomous, Cowan 1936 (5)	Dichotomously branching	Times subtended from a main beam
Basal snag does not appear before the three point antler, Cowan 1936 (5)	Basal snag does not appear before the three point antler	Basal snag appears on the two point antler

General Coloration

Summer

General color a light red to a tawny red.	More yellowish than blacktail, though varying to a rusty color	Reddish brown general color.
---	--	------------------------------

Winter

General grayish, blue gray, or gray brown. Darker or black areas on nose, forehead, mane, tail and along mid-line of back.	Dark gray general color with black prominent on the breast, nose, forehead, mane and tip of tail. Characterized by large white rump patch	Dark brownish gray, slightly darker along neck. Forehead dark brown, brisket blackish. Bailey 1936 (2).
--	--	--

TABLE 2

Indicating the general superficial differentiating characteristics used in classifying the Columbian black-tailed deer, the Rocky mountain mule deer and the hybrid resulting from the cross of these two species. After Cowan, 1936 (5).

NATURE OF CHARACTER EXHIBITED BY PARENTS AND OFF-
SPRING IN HEMIONUS-COLUMBIANUS CROSS

<u>Character</u>	Typical (Columbian Black-tailed Deer) <u>columbianus</u>	Typical (Rocky Mt. Mule Deer) <u>hemionus</u>	Cross or <u>Hybrid</u>
Ear	small size not woolly without black edges	large size woolly black edges	Intermediate
Tail	terminal one- half black, base brown (Ave. 7" long) broad at base haired below	tip black, rest white (Ave. 6½" long) narrow at base one-half naked be- low	all black intermediate intermediate
Metatarsal gland	short (Ave. 3½" long)	long (Ave. 5" long)	variable
General body color	brownish	grayish	brownish
Underparts	brownish	blackish	blackish
Rump patch	small	large	intermediate to small
First antlers	generally spike	generally forked	generally forked
Face markings of males	dull	bright	bright
Body size	small	large	large to intermediate

KEY TO TYPE NUMBERS USED IN REFERENCE TO THE
ACCOMPANYING MAPS

For complete description see base maps provided by
the United States Forest Service

<u>TYPE NUMBER</u>	<u>TYPE DESCRIPTION</u>
1	Non-Forest Land
2	Agricultural Zones
3	Subalpine and Certain Noncom- mercial Forests
4	Lodgepole Pine
5	Juniper
6	Douglas Fir, Old Growth
7	Douglas Fir, Large Second Growth
8	Douglas Fir, Small Second Growth
9	Douglas Fir, Seedlings and Saplings
10	Spruce-Hemlock, Large
11	Spruce-Hemlock-Cedar, Small
12	Cedar-Redwood, Large
13	Ponderosa Pine, Large
14	Pure Ponderosa Pine, Large
15	Ponderosa Pine, Small
16	Ponderosa Pine, Seedlings, Sap- lings and/or Poles
17	Pine Mixture, Large

<u>TYPE</u> <u>NUMBER</u>	<u>TYPE</u> <u>DESCRIPTION</u>
18	Pine Mixture, small
19	Balsam Firs, Mountain Hemlock and Upper Slope Types, Large
19W	Western White Pine, Large
20	Balsam Firs, Mountain Hemlock and Upper Slope Types, Small
21	Hardwoods-Alder, Ash, Madrone
22	Hardwoods-Oak, Madrone
23	Recent Cut Overs
24	Nonrestocked Cut Overs
25	Deforested Burns

KEY TO THE SOIL REGIONS NUMBERS SHOWN ON THE MAP
TRACINGS A AND B

GRAY BROWN PODZOLIC SOILS

- No. 17 Loams and Silt Loams developed from Sandstones
and Shales (Melbourne).
- No. 26 Red soils of the Pacific Slopes (Aiken, Sierra
and Sites).

SOILS OF THE PACIFIC VALLEYS

- No. 42 Soils too intimately associated to separate on
a schematic map (San Joaquin, Fresno,
Hanford).

INTRAZONAL AND AZONAL SOILS

- No. 43 Rough and Mountainous.

TABLE 3

DATA OBTAINED AND USED IN MAP STUDY

<u>Type Number</u>	<u>Number of Records Per Type</u>	<u>Number of Records with Fawns</u>
1.....	2.....	0
3.....	72.....	19
4.....	19.....	11
6.....	790.....	324
7.....	163.....	79
8.....	399.....	143
9.....	170.....	85
10.....	15.....	2
11.....	9.....	7
12.....	1.....	1
13.....	42.....	18
14.....	6.....	5
15.....	7.....	3
16.....	20.....	2
17.....	7.....	2
19.....	237.....	99
20.....	14.....	0
21.....	38.....	22
22.....	50.....	15
23.....	91.....	34

TABLE 3 (Con'd)

<u>Type Number</u>	<u>Number of Records Per Type</u>	<u>Number of Records with Fawns</u>
24.....	13.....	4
25.....	416.....	149
Total	2,581	Total 1,024
Total number of deer.....10,591		
Total number of fawns..... 2,177		
Total number of males..... 2,416		
Total number of females..... 4,450		
Average number of deer per record.....4.103		

TABLE 4

THE NUMBER OF RECORDS BY SOIL REGIONS

<u>Soil Region Number</u>	<u>Number of Records</u>
17.....	266
42.....	113
26.....	151
43.....	2,051

TABLE 5

THE NUMBER OF RECORDS BY RAINFALL ZONES

<u>Annual Rainfall in Inches</u>	<u>Number of Records</u>
Under 20.....	33
20 - 30.....	75
30 - 40.....	445
40 - 50.....	480
50 - 60.....	425
60 - 70.....	582
70 - 80.....	328
80 - 90.....	64
90 - 100.....	36
100 - 110.....	47
110 - 120.....	38
Over 120	27

HABITAT STUDY

A Summary of Material Obtained from Field Study
in western Oregon Analyzed from Map Plottings
and Correlations.

Procedure and Explanatory Notes

The material upon which the habitat study was based consists of a series of 2,581 sight records furnished largely by the personnel of the Oregon State Police, the United States Fish and Wildlife Service and the United States Forest Service.

A complete list of sight records and all data from the field is on file at the United States Fish and Wildlife Service office, 210 Agricultural Engineering Building, Oregon State College, Corvallis, Oregon. These records were taken only during the months when the adult bucks had antlers, thus for accuracy, December, January, February and March are omitted in most cases. The deer usually drop their antlers starting in December and new growth has started by March.

These records were obtained during the years 1936, 1937, 1938, 1940, 1941 and 1942. Each record includes the deer seen in an individual locality for a day. The date, locality, county, observer, numbers of males, females, fawns and unclassified deer are all given. A

A total of 10,591 deer were observed for the 2,581 records obtained. This included 2,416 males, 4,450 females, 2,177 fawns and 1,548 unclassified deer as to sex. The average number of deer per record was 4.103, summary, table 3.

The work commenced with the elimination of all but the 2,581 records mentioned above from over 6,000 records submitted. The most important reason for eliminating records was the inability to orient them properly due to insufficient data. Other factors such as records occurring out of the problem area or confusing reports, were also reasons for discarding.

The records considered reliable were located as dots on tracing linen held in place over large United States Forest Service type maps of the area studied. A tracing of the northern section, A, and a tracing of the southern section, B, were necessary. As each record was located the forest type in which it fell was recorded, summary, table 3, graph 1 and maps.

Also inscribed on the tracing linen were the soil regions, as prepared by the United States Department of Agriculture and Soil Conservation Service 1937 (16), and the rainfall zones from the 1941 Yearbook of Agriculture "Climate and Man", (15).



Fig. 11

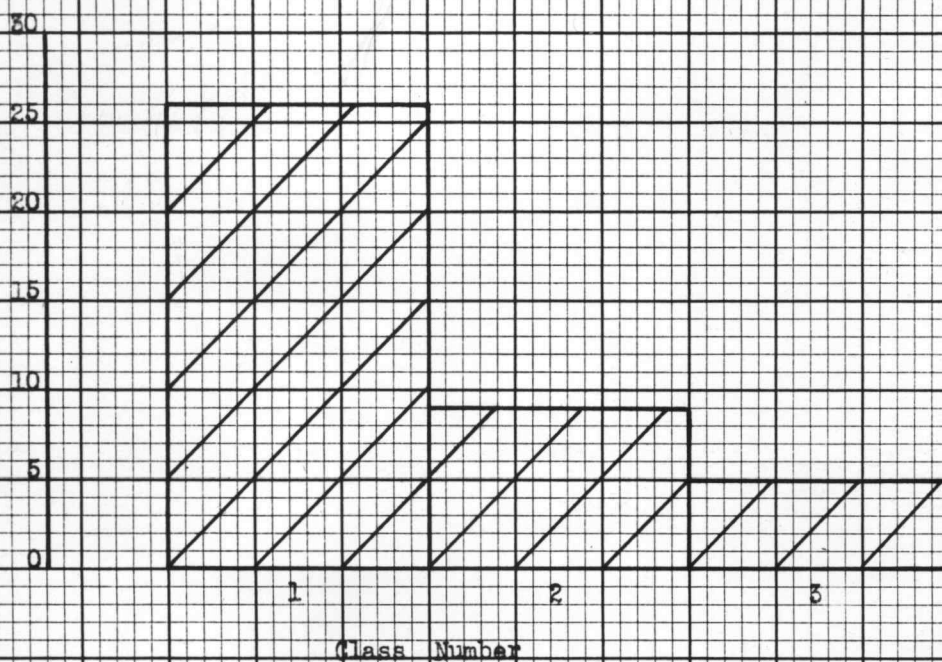
General view of the valley of the South Fork, Trask River, showing all season deer habitat and good cover along watercourses. May 8, 1943. "Tillamook Burn" area.



Fig. 12

Farm meadows near the site of the old Trask House. These meadows are often deer wintering grounds during severe winters. May 8, 1943. "Tillamook Burn" area.

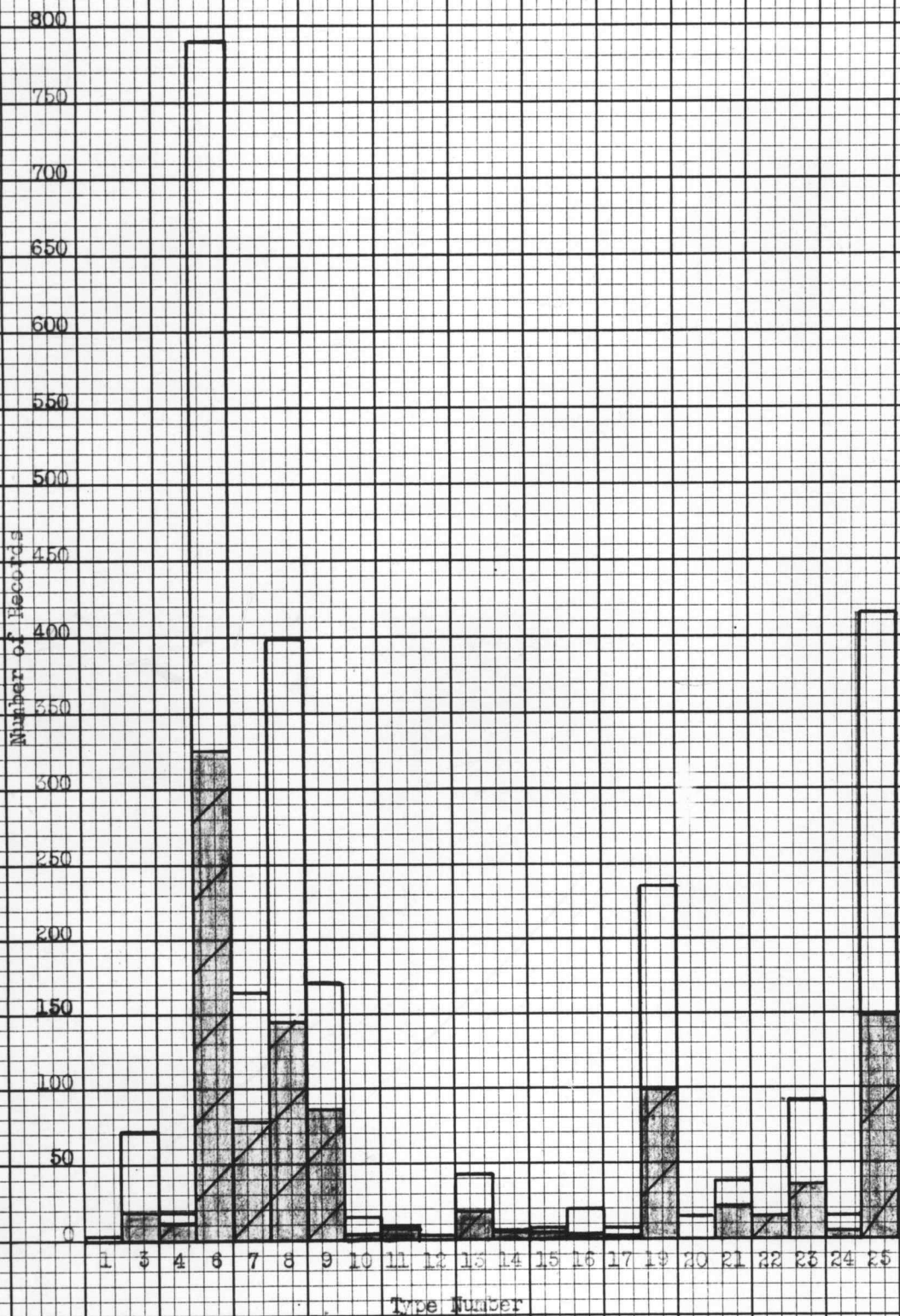
Graph I. The number of concentration areas in relation to forest types.



Key to Class Numbers

- No. 1 — Areas entirely in, partly in, or closely adjacent to burned over areas.
- No. 2 — Areas entirely in, partly in, or closely adjacent to alpine areas, cut-over areas, or natural edges.
- No. 3 — Areas occurring in mature stands where no fire, cutting or other large opening existed.

Graph II. Number of sight records and number of fawns by type.



The number of sight records in each soil region and rainfall zone was recorded, summary, tables 4 and 5, graph 3, curve number 1 and maps A and B. A study of the information obtained from this correlation of sight records with the forest types, rainfall zones and soil regions thus permits a better understanding of the habitat requirements of the Columbian black-tailed deer.

Remarks Regarding the Sight Records

With the method of accumulating field data through the use of volunteer collaborators, only the simplest of records could be obtained. This, of course, makes it difficult to locate observation points in the immediate quarter section. General conclusions which apply to larger areas are thus drawn. Complete field coverage of the entire blacktail deer habitat in Oregon was impossible because of the great cost it would have entailed. Thus, this problem study represents the only possible immediate study; a meeting point between management, research and cost.

It is believed that enough material was available to make this study of value in the management field, however, future studies will add material that will lead to improved or more detailed recommendations and

and make lines of demarcation between good and poor habitat more sharp.

General Habitat of the Columbian
Black-Tailed Deer

In general the species in Oregon exists in the "Western Coniferous Region", which includes the "Oregon Coast", the "Willamette Valley" and the "Cascade" growth regions. The principal life zone occupied is the "Transition Zone", the "Canadian Zone" being next in importance but relatively small in area included. A little of the Arctic Alpine and Hudsonian Zones is also included.

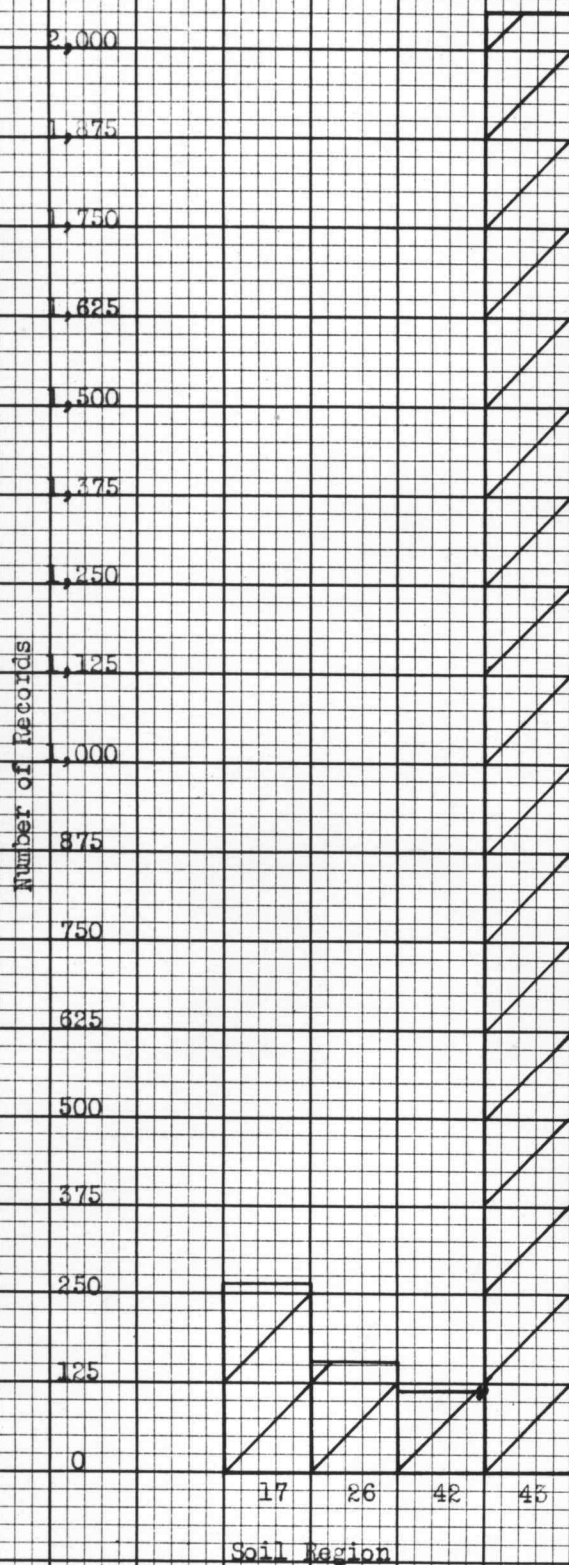
Actual Forest Types Included in Habitat
as Indicated by Plotting Sight Records
on Maps, and summary, Table 3.

Of the 2,581 sight records used, a total of 790 of these occurred directly in the Douglas fir, old growth type number 6, maps and figures 13, 14 and 15. This is to be expected, since this is the basic forest type for most of the deer's range in Oregon. Perhaps a truer picture of the actual preferences of the deer may be obtained by observing that on the maps the 40 concentration areas previously mentioned occur largely in or near

fires, cuttings or other openings. This seems to be generally true of most of the records, graph 1. Second in number of sight records, are those observations occurring in "deforested burns", * type 25. Four hundred and sixteen of the 2,581 records actually occurred in the burns indicating the importance of burned areas to the species as indicated on the base maps and map tracings. The third most common habitat, numbering 399 records, occurs in "Douglas fir, small second growth" type 8. This is a type in which deer food would still be expected to be available in sufficient abundance. Fourth, following the "Douglas fir, small second growth", are balsam firs, mountain hemlock and upper slope types, large, with 237 records, type 19. The number of records in this type might seem surprising, but it must be remembered that timber stands here are scattered in most places and often have many clearings. This type frequently borders sub-alpine clearings and meadows. The "Douglas fir, seedlings and saplings", type 9, is fifth with 170 records. It would probably rank higher if the total area in this type were greater. Sixth, with 163 records and showing roughly the decline in usage with increasing maturity of the stand is "Douglas fir, large second growth", type 7. The other types are listed on the sum-

*Nomenclature of types from United States Forest Service type maps.

Graph III. Relative number of records in four soil regions.

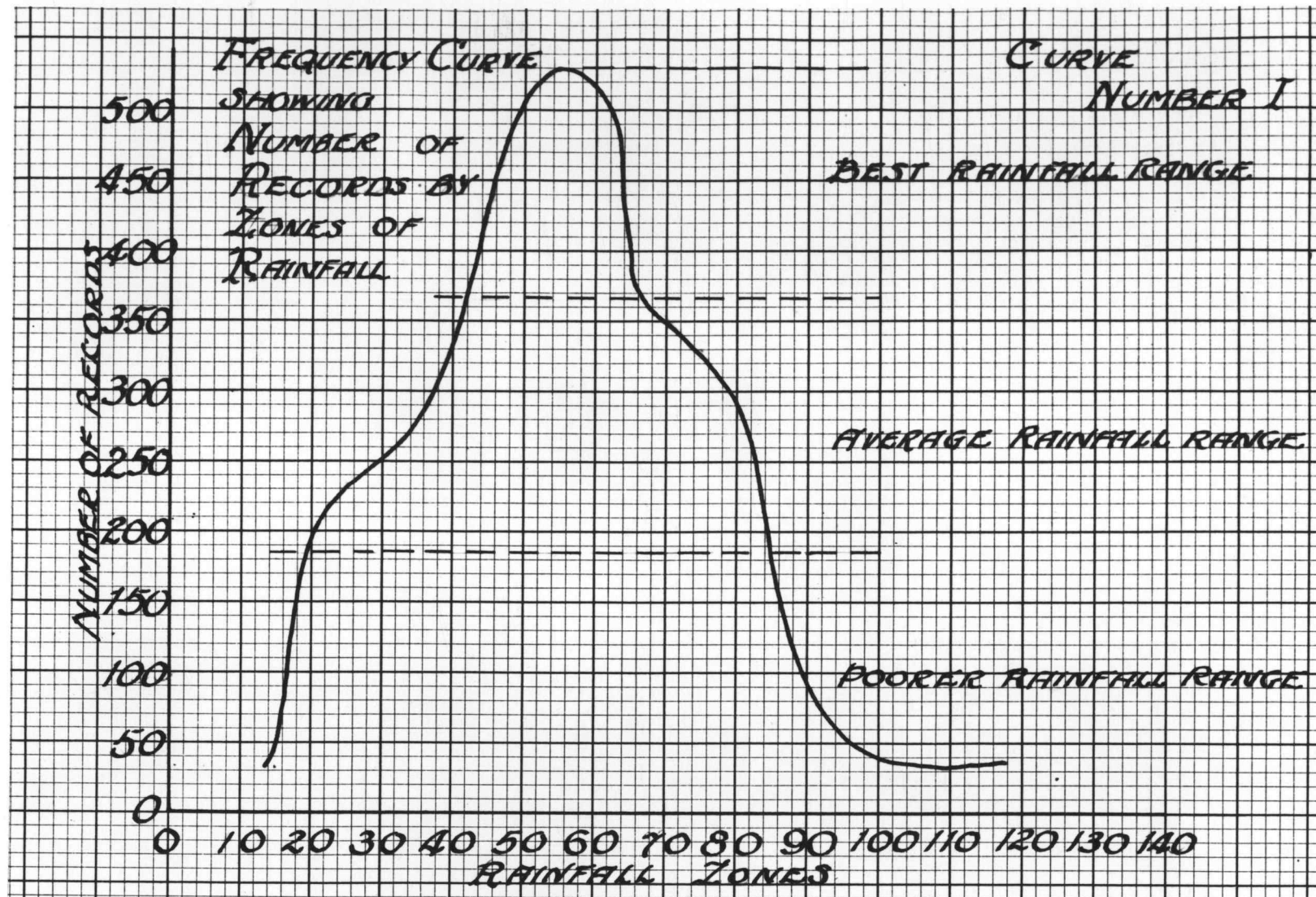


mary sheet, but individually form an unimportant part of the whole group of records, graph 2.

It is difficult to draw definite conclusions from maps alone when the material is subject to so many influences and varying factors. Underlying all the habitat requirements is the basic need for a stand open enough to grow food available to the deer. Field observations completely substantiate this contention. The fact that as a stand matures it becomes of less value to deer, has been clearly shown by the starving of white-tailed deer in Pennsylvania. The deer herd there increased, following a cutting and logging era which not only opened the stands, but produced sprout growth from hardwood stumps. This growth developed into merchantable timber and the canopy closed. The food available there now fails to meet the requirements of the deer herd. The importance of managing these burned and logged areas for the deer in Oregon thus becomes increasingly apparent.

Soil Regions

Small units of soil classification are impractical in the management of big game. Thus in this study more encompassing soil divisions were used, map tracings A and B.



Only one region was found to be of any importance, according to the records. This was the "Rough and Mountainous" region of the "Intrazonal and Azonal Soils" class, number 43 on the map tracings. Since the deer is typical of the mountainous or hilly regions, the result of this section of the study is along obvious lines, graph 3 and table 4.

Rainfall Zones

According to the sight records, the deer shows a remarkable adaptability to varied rainfall zones. The greatest number of records, 582, occurred in the 60-70 inches per year rainfall zone, table 5. On the basis of frequency, rainfall zones falling between 42 and 67 inches a year were the best, curve number 1. Deer were reported quite abundant in rainfall zones of from twenty to forty-two inches, and from 67 to 85 inches, while in zones of annual rainfall of less than 20 or more than 85 inches, deer were scarce, curve number 1. Field work done in the Tillamook area where rainfall was more than 120 inches annually indicated that at least from the food standpoint the area was good deer habitat. Uneven distribution of records in this habitat did not permit a comprehensive analysis of the area.

Fawn Crop in Relation to Deer
Population and to Forest Types

The total number of fawns recorded was 2,177 as opposed to a total of 10,591 deer. This figure indicates a good fawn crop and high survival. Records were taken at all seasons of the year, except when the bucks had dropped their antlers.

Of the total 2,581 records used, 1,024, or nearly one-half included fawns in their observations, table 3. The doe-fawn ratio is about 2 - 1 in actual numbers seen. The buck-doe ratio is about 1 - 2.

Records listing fawns appeared most often in the "Douglas fir, old growth", type 6. There were 324 records for this type. This is in a direct parallel to foregoing statements on deer distribution by type in western Oregon. In nearly every case where there are enough observations to be of importance, the number of records listing fawns averages about one-third to one-half the total number of records for all the deer using that type. The actual percentage occurrence for each type is therefore roughly the same, graph 2.

Thus it would seem that the number of fawns depends directly on the number of deer, rather than on the forest type. The sex ratio is good, even for deer

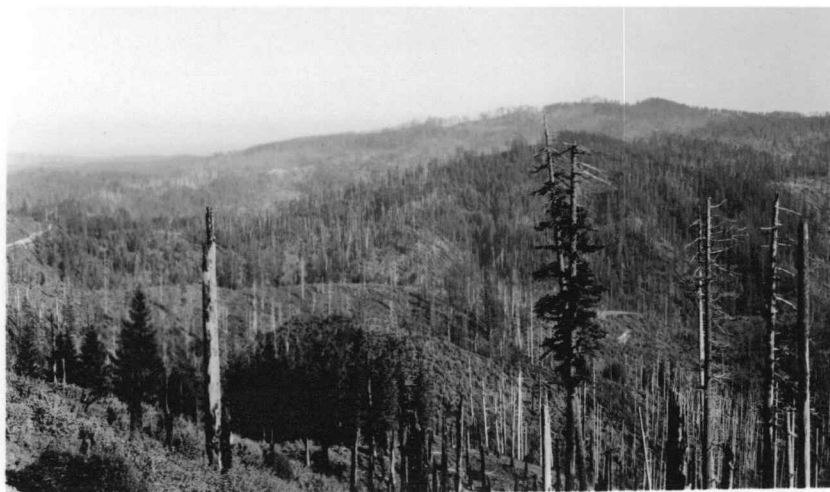


Fig. 13

Logged-over and burned-over land south of Mary's Peak, Benton County. Notice profuse growth of brushy deer food, and islands of timber used for deer cover.

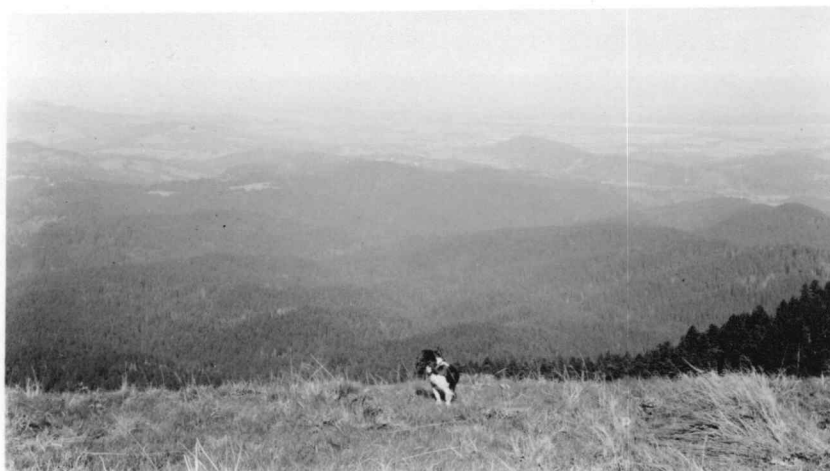


Fig. 14

East from Mary's Peak, looking down on the Willamette Valley and dense stands of Douglas fir. The Cascade Mountains across the valley represent the eastern limit of the Columbian black-tailed deer, problem area.

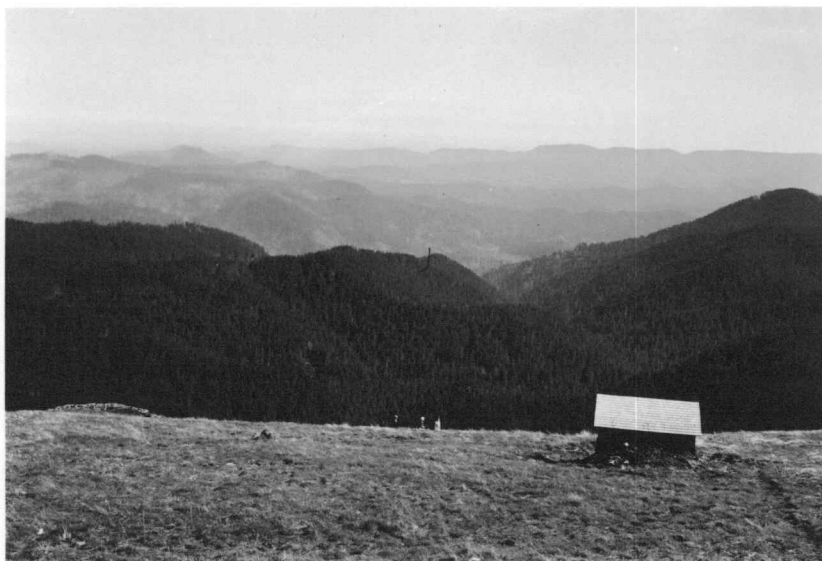


Fig. 15

Looking south from Mary's Peak in the Coast Range. Notice burned and logged-over areas in the background and dense Douglas fir growth in the foreground. Typical Coast Range habitat for the Columbian black-tailed deer.

in a scattered population typical of the Columbian black-tailed deer. Claims of an unbalanced sex ratio in this instance are unfounded. Deer are very polygamous and a sex ratio of one male to four or five females is considered acceptable where the population is evenly distributed.

The Role of Fire and Logging on the
Survival and Increase of the Colum-
bian Black-Tailed Deer

Although this topic alone could provide ample material for several papers, only the facts made obvious by this study and considered of immediate importance to the management of the species will be mentioned. Stress will be placed on management of burned and logged-over areas in favorable black-tailed deer range.

As is indicated by their food preferences this deer must of necessity obtain their food in fairly open areas. Again, as with many wild animals, the law of edges is important. Originally open areas were formed in the forest by the natural dying of trees, by fires caused by lightning, by fires intentionally set by the Indians, or occasionally by trees killed by disease or insect attack. Hence deer, as old records indicate were never excessively plentiful, since even these open areas were ever chang-



Fig. 16

Spring at high elevation in the Coast Range, a frequently used watering place for the deer. "Tillamook Burn" area.



Fig. 17

Vegetative stand, 4 years after the area was burned over, reaching such height and composition that it became less suitable for deer food. May 8, 1943. "Tillamook Burn" area.

ing. Of course there were always edges at timberline and at the margins of swamps and dryer valleys, thus a fairly even over-all population level was probably maintained.

In spite of the fact that the deer is now limited by both white men and predators, its numbers are believed to be about the same as when it existed under primitive conditions, Bailey, 1936 (2). The predator take has been reduced by the killing of mountain lions, bobcats and coyotes, but the human take has probably far exceeded this original toll. Little if any evidence indicates that the Indians caused serious losses to the blacktail deer herd.

Thus the Columbian blacktail has apparently held its own, even under a seemingly heavier load of decimating factors. These factors include continued predator losses, possible weather losses, increased killing by man and a new factor, livestock diseases, about which little is known. Hence, man's activities must favor the survival of the deer in some manner, since there has been little noticeable population change. Man has increased the food supply, thereby making the habitat more favorable for deer, thus the resulting increase allows a heavier take. Logging, slash burning, accidental fires and farm clearings have all increased the areas which

support the best deer food. Actually the blacktail thrives on the fire type, following fire in the Douglas fir stands.

Many proofs of the value of edges, fires and cuttings may be offered. First, consider the logging operation and the deer that concentrate around these openings. Most loggers will testify that there are more deer near the opening than in the dense woods nearby. Second, note that many of the best hunting sites are in burned-over areas not only because the deer there are more accessible, but because of their increased numbers.

After locating the records on the maps, A and B, special attention was given to relatively small areas in which large numbers of deer were seen, usually 10 or more records within a 2 mile radius. Of 40 areas noted, 26 were either entirely or partly in, or closely adjacent to a burned area. Nine areas were either wholly or partly in, or closely adjacent to alpine areas, cut-over areas, or natural edges, though no fire occurred. Five areas were in old stands where no fire, cutting or other large opening existed, graph I, maps A and B.

Factual evidence thus supports the belief that the deer is favored in the long run by fires. In much of the habitat range it is more practical to take advan-

tage of the periodic "burns", and extend management to these grounds, than to actually adopt controlled burning as a management policy. Pastures, logging areas and slash burning, lightning and incendiary fires combined annually, provide more acreage for management than the Columbian black-tailed deer need in western Oregon. Observe the large areas of this type on the maps. Thus by providing deer range management the deer population can be greatly increased.

Next, the question arises, when can the benefit be realized following a fire? The average fire will cause sprouting and deer food growth within a month if weather conditions permit. The following season is actually much more productive, however. Even intensely burned areas sprout quite rapidly and within a year there is usually sufficient deer food for a good population. This must not be mistaken to mean that the dominant stand is being again replaced by sprout growth, since reference is made only to deer food suppressed or held entirely dormant by the major canopy. Later, of course, bird, rodent and wind seed dissemination becomes important in deer food distribution in more barren areas. Note figures showing pictures of "Tillamook Burn".

Many deer food plants present under the major canopy are unavailable to the deer because of their size or coarseness. Fireweed may be merely a dormant rootstock and many of the berries merely exist as tiny sprouts or as seeds stratified in the duff and humus layers. When the fire occurs, it kills old growth, causing sprout growth, and releases the seeds, small sprouts and root stocks to the influence of sun and rain.

The importance of fire as a sterilizing agent cannot be overlooked, especially on range frequently used by livestock. Controlled burning is probably one of the best methods that the game manager has for cleaning the range and its use will undoubtedly become more important in the future. Sterilizing is an immediate and valuable effect. It is interesting to observe that on known parasitized ground, deer losses were heavy, but on the "Tillamook burn" area not one deer loss was recorded except at the hands of man.

Finally the question arises, how long will the deer receive benefit from the fire in the form of increased food availability? This is, of course, dependent on the type of food plants, the climate and whether they are in competition with a timber stand being re-



Fig. 18

A steep-sided draw with small creek at the bottom in favored deer habitat. May 8, 1943. "Tillamook Burn" area.

generated. Usually, however, the maximum available food production for the coastal region, with the resultant increase in deer, occurs during the first three to five years. This will be indicated by observing food conditions after several years and noticing how much has become old hard growth unpalatable to deer and how many of the preferred tips and shoots are over five feet high. After five years the fire-type jungle has developed to a point where the deer follow well worn trails and hence the available food supply has dwindled, though actually there may be more in the region, figures 6 and 9.

Management of Burned Areas

Actually, there is little management necessary for these areas except a hunting closure and complete deer protection for the proper length of time to take advantage of the increased deer population resulting from better deer habitat. No burn has been seen where seeding to deer food would be necessary. The closure may vary, but normally it should not exceed five years, or be less than three, depending on deer responses. Three years is really a minimum from the deer reproduction stand point also, as the fawns require two years to reach breeding age. Young bucks do not become legal two-

point deer until their third season, hence opening the season the fourth year takes advantage of the bucks born the first season.

Einarsen estimates that for a burn the nature of the "Tillamook burn", all factors considered, a three year closure would be enough to insure a good shooting population. However, in actual practice, a partial opening the third year and a full opening the fourth has been recommended to the Oregon State Game Department. In the "Tillamook burn" deer were burned to death, as previously stated, leaving only small remnant of the breeding stock. The reproduction, therefore, had to take care of this negative factor, besides showing the necessary population increase. Actual check on the kill in the "Tillamook burn" area during the 1942 season was impossible due to lack of assistance, but the population was known from field observations, to have been high, probably in excess of ten deer to the section in favored areas at the time of the hunt. This was three years after the burn in 1939.

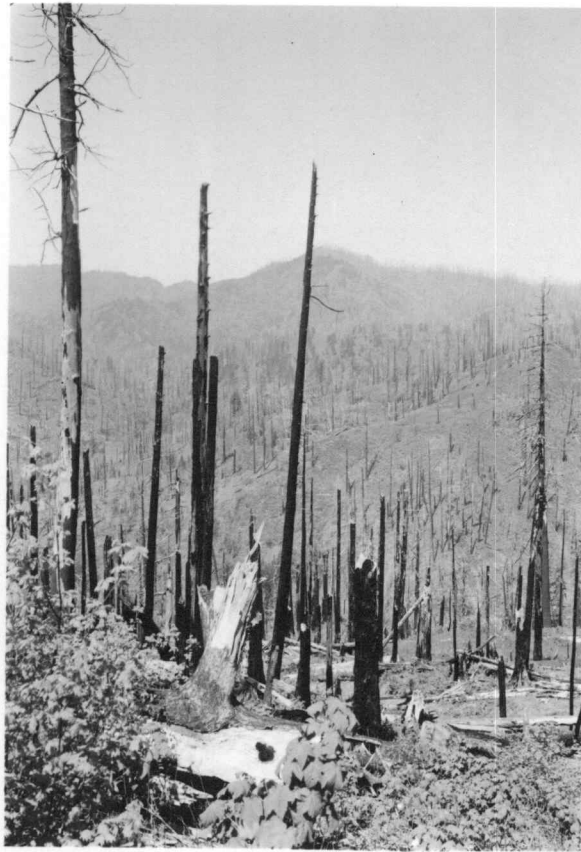


Fig. 19

Spot stands of unburned timber on the background ridge in the "Tillamook Burn", looking south across the valley, North Fork of the Trask River. Note the vine maple, Acer circinatum, and thimbleberry, Rubus parviflorus, growth in the foreground.

CONCLUSIONS AND RECOMMENDATIONS DERIVED FROM HABITAT STUDY

The whole habitat study is based on the location of sight records in certain forest types, rainfall zones and soil regions as indicated on the maps accompanying this paper.

Briefly stated the preferred forest types were "Douglas fir, old growth", type 6, "deforested burns", type 25, and "Douglas fir, small second growth", type 8. This indicates the preference for the Douglas fir type and more particularly for areas opened up enough for food production within the type.

The preferred soil region was the "Rough and Mountainous" region of the "Intrazonal and Azonal Soils" class, region 43. This is the typical basic coast range habitat.

With reference to rainfall zones, remarkable adaptability was noted. The deer were found to occur in zones ranging from less than 20 inches per annum to more than 120 inches, the greatest frequency of occurrence being between 42 and 67 inches a year. Thus even in the preferred rainfall zones rather high flexibility is indicated. Deer habitat studied in an area receiving more

than 120 inches annually was found to be favorable from the food standpoint and supported a good deer population. Thus three of the outstanding factors relative to the survival of the species can be used in defining regions of value for deer habitat on the map of the area studied. It was found that especially in areas where burns had occurred, falling in the 42 to 67 inches a year rainfall zone and in the soil region designated as rough and mountainous, deer concentrations might be expected.

Management of the blacktail would therefore take into consideration the over-lapping of these three factors in setting up preserves, or in designating certain areas as good blacktail range to be intensively managed. As previously mentioned the hunting closure of three to five years in burned-over areas falling in the proper rainfall zone and soil region is one important management feature. Management attention on burned-over areas is a present need. Burns of large size should be quickly established as deer preserves.

A study of the accompanying maps reveals large portions of the total problem area of the Columbian black-tailed deer in Oregon to be in the desirable range

class from all three standpoints.

Referring back to the food preferences of the deer, open areas are necessary within the forest for the production of food plants essential to the blacktail. This must be considered in creating any deer management plan. Important food plants for the northern coast range include: Vine maple, wild blackberry, elderberry, stream bank willow, fireweed and many others.

This paper represents an attempt to add the material pertinent to the management of the Columbian black-tailed deer. This deer has great value to the sportsman and general populace in its sporting, aesthetic and land utilization returns. It lives largely on the waste products of the land and at present, in Oregon conflicts little with agriculture. It is well worth proper management when looked upon as a way of realizing a return from much of the coast range brush growth which inevitably follows fires and logging.

TECHNICAL NUMENCLATURE FOR TREES AND PLANTS MENTIONED*TREES:

Douglas Fir	<u>Pseudotsuga taxifolia</u>
Oregon Red Alder	<u>Alnus rubra</u>
White Oak	<u>Quercus Garryana</u>
Lodgepole Pine	<u>Pinus contorta var. Murrayana</u>
Juniper	<u>Juniperus sibirica</u> and other Species
Sitka Spruce	<u>Picea sitchensis</u>
Hemlock	<u>Tsuga heterophylla</u>
Mountain Hemlock	<u>Tsuga Mertensiana</u>
Red Cedar	<u>Thuja plicata</u>
Port Orford Cedar	<u>Chamaecyparis Lawsoniana</u>
Incense Cedar	<u>Libocedrus decurrens</u>
Redwood	<u>Sequoia sempervirens</u>
Ponderosa Pine	<u>Pinus ponderosa</u>
Grand Fir	<u>Abies grandis</u>
White Fir	<u>Abies concolor</u>
Alpine Fir	<u>Abies lasiocarpa</u>
Western White Pine	<u>Pinus monticola</u>

*

Common and scientific names taken from A Manual of Higher Plants of Oregon, by Morton E. Peck.

TECHNICAL NOMENCLATURE FOR TREES AND PLANTS MENTIONEDTREES: (Continued)

Larch	<u>Larix occidentalis</u>
Ash	<u>Fraxinus oregana</u>
Maple	<u>Acer macrophyllum</u>
Madrono	<u>Arbutus Menziesii</u>
Cascara	<u>Rhamnus Purshiana</u>
Willow	<u>Salix sp.</u>

SHRUBS AND OTHER PLANTS:

Vine Maple	<u>Acer circinatum</u>
Mountain Mahogany	<u>Cercocarpus ledifolius</u>
Brake Fern	<u>Pteridium aquilinum var.</u> <u>pubescens</u>
Fire weed	<u>Epilobium angustifolium</u>
Thimbleberry	<u>Rubus parviflorus</u>
Salmonberry	<u>Rubus spectabilis</u>
Blackberry	<u>Rubus vitifolius</u>
Elderberry	<u>Sambucus glauca</u>
Clover	<u>Trifolium sp.</u>
Alfalfa	<u>Medicago sativa</u>
Plantain	<u>Plantago sp.</u>

TECHNICAL NOMENCLATURE FOR TREES AND PLANTS MENTIONEDSHRUBS AND OTHER PLANTS: (Continued)

Red Sorrel	<u>Rumex Acetocella</u>
Red Huckleberry	<u>Vaccinium parvifolium</u>
Snowberry	<u>Symphoricarpos sp.</u>
Hazel	<u>Corylus californica</u>
Buckbrush and others	<u>Ceanothus sp.</u>
Moss	<u>Bryophyta</u>
Poison Oak	<u>Rhus diversiloba</u>
Sword Fern	<u>Polystichum munitum</u>
Salal	<u>Gaultheria Shallon</u>
Mistletoe	<u>Phoradendron villosum</u>

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