

**THESIS**  
**ON**  
**A STUDY OF THE ECONOMIC STATUS OF THE**  
**COMMON WOODPECKERS IN RELATION TO OREGON HORTICULTURE**

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A STUDY OF THE ECONOMIC STATUS OF THE  
COMMON WOODPECKERS IN RELATION TO OREGON HORTICULTURE

Johnson Andrew Neff

INTRODUCTION

The family of birds called by the scientist 'Picidae', and by the layman 'woodpeckers', is a part of an almost cosmopolitan group. Members of this group are found in all of the wooded portions of the world except Madagascar and the Australian region. The group is nearly equally represented in the two hemispheres (1), the Western claiming 22 genera and 225 species and subspecies, the Eastern 27 genera with a little more than 200 species and subspecies. Three genera are of circumpolar range, with 63 American ( mostly Nearctic ), and 29 Palaearctic forms.

As implied by the common name, woodpeckers are characterized by their habit of pecking the bark and decayed wood of trees, in their search for insects, and by excavating deep cavities in the trunks of trees in which to rear their young. These habits are more highly developed in this than in any other group. Although they are to a great extent insectivorous, the woodpeckers also feed to some extent upon fruits and grains. One genus, *Sphyrapicus*, subsists largely upon the soft inner bark or cambium and upon the sap of trees or shrubs, and does considerable damage to ornamentals and

orchard plantings. The other genera are for the most part beneficial, although there are occasional exceptions.

The physical structure of the woodpecker has enabled it to combat with ease insects that no other bird can reach. The bill is long, very strong, and so attached that the bird, by constant pecking, drills with ease through the hardest wood. The tongues of the true woodpeckers are very prehensile, capable of extraordinary voluntary extension far beyond the tip of the bill (  $2\frac{1}{2}$  inches ); the tongue is barbed at its tip in varying manners; thus it is capable of extension far into a larval burrow, the barbed tip extricating the larvae from their position far beyond the bird's range of vision. The clinging and climbing ability of the woodpecker, dependant upon his four toes and stiff-quilled tail, is more highly developed than in other groups.

Few other groups of birds have been subjected to so constant adverse criticism as the woodpeckers. Usually very little attempt is made to discriminate between the numerous species, and the beneficial species share the disgrace of the few injurious types. However, during the last several decades large sums of money have been spent in searching for methods of controlling noxious insect pests. With increasing interest in the control of insect enemies of farm, orchard, and ornamental plantings, there has arisen an overwhelming demand for the protection of our timber land and national forests from the attacks of destructive insects.



It is said that some insect feeds upon every sort of terrestrial plant. Upon some of the forest and ornamental trees the number runs into the hundreds. Five hundred species (10) feed upon the apple. Other fruit plants are infested proportionately. It is unquestionably worth one's while to study the means by which these losses may be lessened. Most of the entomologists and agriculturists of today believe that birds are by far the greatest natural check to insect multiplication. If the farmers and foresters of the West are to continue the fight against insect losses, it is especially worth while that the woodpecker family be considered with care.

Oregon was favored by Nature in the distribution of bird species, and 21 species and subspecies of woodpeckers range the state; they vary in habitat and in seasonal abundance, as is to be expected in a state of such varied topography and climate. A great deal of confusion still exists, concerning the economic status of these species, in the minds of farmers and fruit growers. A sufficient amount of damage to ornamentals and fruit trees is incurred to lead the farmer to suspect any bird bearing the title of 'woodpecker' or 'sapsucker'. Whereas, in reality, there are within this group both highly beneficial and highly injurious species. In an aesthetic sense, too, this group is outstanding in color, and interest, a real field for the student.

When the Biological Survey was established as a bureau of the U. S. Department of Agriculture in 1885, the staff of this division began an extensive study of the economic status of American birds and mammals. Three publications from this division have related to woodpeckers in general; one other briefly discussed them as relating to the fruit industry in California. The latest of these was published in 1912; none of them covered the Oregon area except sketchily or by indirect discussion of widely distributed species. Many scientists have at various times worked out studies along similar lines, none of which related to the horticultural industry in Oregon or to specific races of woodpeckers found within the state.

In consideration of the lack of definite data for this region, this study was undertaken after fruit growers and farmers had, by correspondence, approved its timeliness and economic merit. The primary object was to make a systematic study of the economic status of the commoner woodpecker groups of Oregon, especially in their relation to horticulture; to enable the horticulturist to differentiate more clearly between those species proven to be his friends, and those of doubtful or truly injurious character, giving recommendations for the treatment, protective or antagonistic, to be accorded each. In some cases this has meant an adapting of former data to geographical variations, and of localizing and adapting the data to the horticultural areas

and practises of the state. In other cases previous investigations have been much enlarged and amplified, as well as adapted to local conditions.

### GENERAL PROCEDURE

The general procedure recommended by the Biological Survey (8) for the investigation of economic relations studies has been used as a basis for this study. There are two closely connected methods of approach : (a) observation of the birds in the field, including such notes on the available food materials as may be of service in identifying later items of food, and (b), examination of the content of the bird stomach. These methods are most accurate when used in combination.

Classification of food : Bird food is conveniently divided into three classes (8) : (a) beneficial, (b) neutral, and (c) injurious. The first class includes those insects which cause commercially important injury to horticultural or other products. The second class includes wild fruits of no commercial value, unimportant insects, etc. The third class includes predaceous and parasitic insects, parts of commercial crops, etc. The season and the place play a part in these classifications. There is no arbitrary rule, for circumstances alter conclusions. The abundance of the birds must also be considered in fixing the status; an abundant bird may cause a great deal of damage, although the

individual activity of each may be small. The neutral food items can not be overlooked, although they prove nothing on either side of the question. Unusual habits such as flocking, disseminating weed seeds, etc, must be considered.

Field Work : Field observations form the preliminary step for further study. Only by field observation can the total damage to fruits, trees, or crops, be determined, or the benefits of insect destruction be approximated. As a further preliminary step, six hundred questionnaires were sent out to fruit growers in all parts of the state. From the answers received, valuable statistics have been compiled.

Field work in the problem was carried on throughout the period from November, 1924 to March, 1926. With the aid of volunteer observers, the birds under investigation have been observed in the field at all seasons, and under varied conditions. Their life histories and habits have been noted and compared with the writings of other observers.

Numerous complaints concerning damages sustained by bird activity have been investigated. During the period covered by this study fairly systematic collections have been made, preparatory to the second phase of the work, covering each month of the year, and two of the leading horticultural sections, the Rogue River Valley and the Willamette Valley.

Stomach Analysis : Stomach analysis is carried on to find out just what food the bird has taken, and the proportion each bears to the total. The method of procedure in

this study, in general, has been as follows : the stomach was split open with a scalpel, and its contents washed or seraped into a filter. Insect remains, as a rule, float to the surface. The insect and vegetable items were separated onto filters or blotters. These remains, often comminuted by the action of the stomach, were examined under a binocular microscope.

Recently taken food retained much of its normal shape. That taken some time before the death of the bird was often reduced to fragmentary remains; the harder parts, such as mandibles, tarsi, wing covers, etc, and the seeds or epidermis of fruits, were all that remained. Each item which could be singled out was recorded; in some cases an actual count of numbers was made; in all cases the approximate percentages of each different element were estimated by volume.

After all analyses were completed, monthly averages were figured for each species of bird, based upon the number of stomachs collected in that month, and from these averages a yearly average was taken. Due to seasonal movements of the birds, and to rain and high water in the Willamette Valley, it was impossible to collect a fixed quota each month, and the desirable high degree of accuracy is not possible, although collections in this study were as systematic as in any of the previous Federal investigations.

From the monthly and yearly averages tabulated, the results of the stomach analyses were compared with those of the earlier Federal work, the object being to reduce to the minimum any possible personal error. Using the present accepted status of each food item, conclusions were formulated concerning the economic place of each species studied.

### REVIEW OF LITERATURE

Exploration and Discovery. The history of early ornithological study in the Northwest is a composite of the wanderings of many professions, as in that day many men had hobbies in which they were supreme. Before 1800, little was known of the birds of the Oregon country. There were many voyageurs, but they were interested in wild life only as it afforded them food or trade. Captain Cook, on one of his famous journeys, touched, among other places, Nootka Sound, Vancouver Island, and Prince William Sound, now in the territory of Alaska, in April and May, 1778. Sir Joseph Banks, who accompanied him, obtained the first West Coast bird specimens of which there is now a record (2).

In 1786 a party of French explorers under Comte de La Perouse collected along the coast, and during this same year the English surgeon, Archibald Menzies, is said to have passed some time in the Northwest (3); he returned in 1792 with Captain Vancouver. Menzies was a botanist and naturalist, and made a close study of all wild life in the Oregon

country. Gmelin described new species of birds in 1788.

The first expedition of note in the 19th century was the great Lewis and Clarke Expedition. This party of 29 men left Woods River, Illinois on May 14, 1804, and arrived at Fort Vancouver in December, 1805. They left Fort Clatsop on March 23, 1806, and arrived at St. Louis on September 23, 1806. There was no naturalist with the party, but the men kept detailed journals of those things they found new and interesting to them.

Between 1810 and 1830 few expeditions entered the territory. Swainson (2) during that period described some new birds collected in Mexico by an English taxidermist, Mr. Bullock. Wagler is said to have worked during that period. The surgeon of a French sailing vessel, Dr. Botta, collected on the Coast, sending the specimens to the Duke of Rivola. Lesson (2) obtained the collection and brought it to America at a later date. Vigors (1) described birds collected during this period in California.

On April 7, 1825 David Douglas, botanist, and John Scouler, naturalist, came to Fort Vancouver. Douglas spent three years exploring the Oregon country, and left his mark fixed on the flora and fauna of the area. In 1833 Dr. Tolmie and Dr. Gairdner arrived at Fort Vancouver (3). Tolmie remained for many years, and became identified with the progress of the Northwest; apparently Gairdner left in 1834 because of ill health.

The next important expedition was that of Captain Wyeth, from Missouri to the Columbia River. On his second journey in 1834 he was accompanied by J. K. Townsend of Philadelphia, and Thomas Nuttall of Harvard. They arrived at Fort Vancouver on September 16, 1834. Nuttall remained on the Coast until 1836, and Townsend, after collecting widely over the territories, left the next year.

Two foreign expeditions appeared in the South; a German, Dieppe, journeyed through Mexico and California in 1828. During the same year, under command of Captain Chas. Wilkes, a naval party spent the season along the Northwest Coast. With this party were several naturalists : Peale, Rich, Drayton, Dye, and others. In a very general manner they surveyed the resources of the territory. After the loss of a boat, Peale and Drayton accompanied others of the party overland to Sacramento. In 1839 (2) Vigers discovered a collection of birds said to have been taken by an English captain, Buckley, in or about 1825.

In 1841, William Gamble made his first trip to the Coast with a party of trappers, travelling and collecting in California for four years. In 1843 it is said that Capt. J. C. Fremont led a party including a naturalist by the Northern route to Vancouver, returning by way of Fort Dalles and Klamath Lake. During the same year John G. Bell, New York taxidermist came to California via Central America, and



spent seven years collecting in the area; he is known to have visited the Klamath region (3) collecting birds there. In 1849 Wm. Gamble and Isaac Wister journeyed to the Coast, the former dying from exposure after reaching Feather River. During 1849, A. L. Heerman came to the Coast, and remained for several years collecting birds. After 1850 numerous ornithologists visited the area, and only a few of them can be mentioned.

From 1853 to 1856 the Government sent out many surveying expeditions to seek logical routes for transcontinental railways. One of these (4) under Gov. Stephens, worked from St. Paul to the Cascades; with it was Dr. Geo. Suckley, physician and naturalist. Another party worked from Vancouver to the Cascades, headed by B. C. McClellan, and accompanied by Dr. J. H. Cooper, an eminent bird man. Both men were afterward located at various forts in the Northwest, and Dr. Cooper remained in the West until his death. During this period Lieut. Williamson surveyed the Cascade - Sierra region along the Oregon California boundary, coming as far north as Fort Umpqua; Heerman (2), and Newberry (4) were at times connected with this survey. Stanberry's party in New Mexico, 1852, is also connected with some of the birds of the Oregon country.

Mr. J. K. Lord, naturalist of the British Boundary Commission, covered the Deschutes River drainage area in or

about 1860. Cabanis and Heine, Germans, studied Western bird life in 1863, collecting in the vicinity of Monterey. Another, Malherbe, studied birds from the area in 1861. Dr. Elliot Coues was naturalist and surgeon for the Northern Boundary Commission from 1873 to 1876, and was secretary-naturalist for the U. S. Geographical Survey of the Territories until 1880. Lyman Belding came to California in 1856, and lived for 61 years in that state. Major Charles Bendire was for over a decade stationed at various army posts in the Northwest, and was at Camp Harney during the late '70's, and at Fort Klamath during the early part of the next decade (5). James C. Merrill followed him at Fort Klamath, in 1886 and 1887 (6). Since that time ornithology as a study has progressed so fast that it is manifestly not feasible to follow it further.

Economic Literature : Ornithological literature is most comprehensive, occupying volumes of pages from Biblical times on to the present. The first records of the birds of the Coast were contained in the journals of the explorers, and as the area was settled these records gradually began to include more specific studies on each of the species of bird life native to the area. With the coming of modern specialization, ornithology has been divided into its numerous phases, each of which is followed by numerous investigators. Its writings cover many volumes of technical and popular reading.

The phase of ornithology dealing with food habits originated in the same manner, as chance observations of the early students. One of the earliest papers dealing with bird foods alone was one by Treadwell (7) in 1858, and one by Jenks, during the same year, and both concerning the food of the Robin. One of the greatest of the early students was Anghtey, who, in the early 1870's studied the bird enemies of the hordes of migratory Rocky Mountain Locusts in the plains of Nebraska. At this time entomologists came to see the connection with their work, and to include economic bird study among the projects of the colleges and experiment stations. This has made available a great deal of literature upon the general subject. One of the foremost studies was that carried on by Forbes in Illinois in 1881 and 1882. Weed (N. H.), Wilcox (N. Y.), King (Wisc.), Warren (Penn.), and Forbush (Mass.), paved the way for the modern studies.

With a realization of the value of this work, the staff of the Biological Survey began, at its establishment in 1885, the work which has made known to all the importance of economic ornithology. In the reports of Barrow, Beal, Bailey, Fisher, Judd, Henshaw, McAtee, and others, data may be obtained concerning nearly every native bird. Professor Beal began, in 1894 a study of the food habits of the woodpeckers, which he amplified during succeeding seasons, printing two reports, one in 1895, the other in

1912. He spent parts of three years in California, and a part of one season in Oregon and Washington, studying food habits of birds in relation to fruit growing; his report on this work discusses the woodpeckers briefly, but in some cases he was unable to close serious gaps in the collecting, and the report was therefore lacking in information about these species. McAtee made an exhaustive study of the true Sapsuckers in relation to trees and wood products, published in 1912. A large portion of the western data given is suitable to Oregon conditions.

Order and Nomenclature : For the order in which the birds are discussed, and for nomenclature, Bailey's "Handbook of Birds of the Western United States" (9) has been used as the standard. This volume is based upon the American Ornithologists Union 'Check List of North American Birds', 3rd Edition, 1910. The American Ornithologists Union has for many years controlled the technical classification of bird species. The available records for each species have been compiled; the old records have been carefully studied and checked against present day knowledge ; and priority of discovery and of published description has been established as a basis for the naming of the species. Today this body passes upon the question of further subdivisions.

In the earlier days there were almost no subspecies of birds. If birds of the same general group were found in widely varied regions they were called by the same

name. As the study of ornithology progressed the minor differences were noted, and at regular intervals new geographical races have appeared in the lists. In many cases there are distinct differences ; in other cases the sub-specific identification is almost impossible, the bugbear of the common bird lover; it makes one refer to arbitrary geographical areas in making field identifications.

It was at first the intention of the investigator to confine this study to the supposed injurious species. However, after a survey of the 21 types of this family that are found in the state, and following recommendations from the Biological Survey, the six groups most representative of the horticultural areas of Oregon were selected. By thus including in the study some of the beneficial types, the comparison between these and the injurious types is made clearer. These groups are discussed at length in the following chapters.

THE HAIRY WOODPECKER GROUP

(Dryobates villosus , subsp)

Three subspecies of this group are found within the state of Oregon. One of them is easily distinguished; the other two are so similar that it is almost necessary to depend upon geographical location rather than upon appearance. Some authorities allow another subspecies. The Eastern Hairy Woodpecker is illustrated in Plate I.

The Harris Woodpecker

A.O.U. No. 393 c. Dryobates v. harrisi (Aud.).

The Harris Woodpecker was first collected (3) by Townsend near Fort Vancouver in 1834. He sent skins to Audubon (11), who named the bird for his patron, Edw. Harris. It was the first distinctively Western Hairy Woodpecker, and is still the most distinct of the many subspecies.

Description : Male : Upper parts black, with scarlet nape, white stripe down back, wing coverts and tertials plain black or lightly spotted with white; outer primaries with white spots; outer tail feathers plain white; under parts smoky gray or light smoky brown. The female is identical except that she has no scarlet nape. Size, 9 to 10 inches.

Remarks : The Harris differs from the true Hairy such as is illustrated, by the plain black or very lightly spotted wing coverts or tertials, which in the Hairy show much

white. Its dark smoky underparts are the outstanding mark, different from all of its relatives.

Range : The humid Pacific Coastal region from southeastern Alaska to Humboldt Bay, California, and in winter to Monterey (12).

#### The Modoc Woodpecker

A.O.U. No. \_\_\_\_\_. *Dryobates v. orius* (Oberhol.).

The Cabanis Woodpecker was named by Cabanis and Heine after their studies in 1863. The first known skin of this type was one from Monterey, studied by Vigors in 1839. The Modoc Woodpecker was separated from the Cabanis by Oberholser in 1911. It is a geographical variation, said to be slightly larger than the last.

Description : The Modoc and Cabanis Woodpeckers are very similar to the Harris, but are pure white below rather than smoky.

Range : The Cascade-Sierra system from central Washington to central California (12).

#### The Rocky Mountain Hairy Woodpecker

A.O.U. No. 393 e. *Dryobates v. monticola* (Anthony).

The Rocky Mountain Hairy Woodpecker was called the Harris in the early days, having been collected on the Spokane River in 1835 (4), and described by Baird. In 1898 Anthony obtained the present classification.

Description : This type has the unspotted wing coverts and tertials, is as large as the Harris, with a very clear white below, and with lores chiefly or totally black, in a few respects being very similar to the eastern form.

Range : The entire Rocky Mountain area.

Note : Even so late a publication as Bendire's Life Histories (19) in 1895 made use of only two types of the Hairy group, the Cabanis and Harris. The former included what are now called the Cabanis, Rocky Mountain, and Modoc groups.

Distribution in Oregon : Gabrielson states the present distribution of the *Dryobates villosus* group as follows : " The Harris Woodpecker is found throughout western Oregon from the western slope of the Cascades to the Coast, altho in the Rogue River Valley some specimens which are close to 'orinus' have been taken. I have one labeled 'orinus' by Dr. H. C. Oberholser, also have typical Harris from this district, so that this is probably the region of inter-gradation between these two forms.

The Modoc Woodpecker is found on the eastern slope of the Cascades from the Klamath area to The Dalles and east in a diagonal line at least to Lake County. The Rocky Mountain Hairy Woodpecker is the breeding form of the Blue Mountain section of eastern Oregon. This section consists of all of Baker, Union, Wheeler, Wallowa, and Grant counties



and the northern part of Malheur and Harney counties, the eastern part of Crook, and the southern part of Morrow counties, and most of Umatilla county. Probably this form would be found in the greater part of these counties mentioned except western Crook and southern Harney and Malheur. I am in doubt as to what form might be found in extreme southeastern Oregon."

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### HABITS

The Hairy Woodpeckers are not especially companionable; while not especially shy, they seem to prefer the more secluded timber or the wooded mountain sides. They will visit the outlying orchards frequently, especially in the less highly settled areas. They are somewhat solitary in habit, not taking kindly to an over abundance of company in their natural haunts. Most generally they work in pairs, for very rarely do more than two remain in the same immediate vicinity. Only during the winter months do they venture in any numbers into the closely settled areas; however, in severe weather they come into the trees of the city streets in search of food.

The birds of this group are resident; they are, during a large portion of the year, relatively silent, and are very apt to be overlooked. From the time the eggs are laid and incubation begins, until autumn crispness stirs

the atmosphere, relatively little will be heard from these birds except their flight call. Flying with the long undulating bounds of the true woodpecker across the open valley or swamp the Hairy Woodpeckers often times are recognized very easily by their habit of uttering at fairly regular intervals a loud reverberating call ' plick, plick'; at times at every bound, at other times at varying distances, the call is given. Alighting on a tall cottonwood, if in the bottoms, or in a tall fir snag in the higher areas, he gives a loud rolling warwhoop as he begins hitching his way up the tree : a call made up of a rapid combination of the flight call.

During the autumn and winter, to some extent, and to a greater extent in the spring, these birds are noisy, and may be traced considerable distances by their calls or by the tattoo they drum out. They love to tattoo upon some dry well-seasoned pole. An unusual musical ability is at times manifested, rapid tattooing on different branches giving off a far-carrying variety of notes. To the writer, the tattoo of the woodpeckers seems to stir up some sort of primitive emotion : a longing to seek the forest trails with no thought of return or responsibility.

The birds of this group are true woodpeckers in every way. They are very active, hitching their way up or down the tree trunks with nonchalant ease, and during the

winter and spring, publishing reports of success at intervals with a joyful call, or by seeking some dry limb and drumming out a sudden tattoo. They are among the most vigorous in tunneling for insects, and may work for minutes at desperate speed, the chips flying in every direction, before stopping to probe the larval tunnel with the long tongue.

Due to their similarity to the Eastern Hairy, the earlier students seem to have failed to record the habits of these birds. Later writers have done so briefly, but Capt. Bendire (19) gives a full discussion. The nests of these birds are excavated in trees; in the case of the Harris, dead cottonwoods, alders, willows, etc., are commonly used. The mountain species utilize those trees of these species that may be found growing along the mountain streams or in the mountain meadows, and utilize dead snags of the coniferous trees as well. The height of the cavity may vary from 3 to 100 feet; convenience is the deciding factor. The hole is large and roomy. The eggs are laid at any time from March till late May, and are four or five in number, glossy white. Only one brood is raised in a season. The male bird often becomes insanely pugnacious when the young are hatched and his screeches at an intruder may be heard for a long distance in the forest. Bendire believed that these birds remained mated for life.

#### Food Habits - Review.

Beal (15), in his study of birds of California,

studied the Harris and Cabanis types of the Hairy group. Only 27 stomachs were available, and of these none were taken in March, May, August, and October. This was only sufficient to give a very general idea of the foods that were preferred, but not of the relative proportions taken. Animal food totalled 78.00 % of the years food, while vegetable food made up the remaining 22.00 %. See Graph I.

Animal Food : The larvae of wood-boring beetles, Cerambycids and Buprestids, composed 49.00 % of the total. This total is unexceeded in the Federal studies. Since these two groups of borers include species doing enormous damage to both forest and ornamental trees, as well as to orchards, this item of food alone almost settles the question. And 9.00 % more was composed of beetles of various harmful and destructive families. Ants, generally a favorite food, were taken only to a total of 3.00 %, and bees and wasps, added 2.00 % more. Caterpillars, some of them wood-borers, averaged 11.00 % . Miscellaneous insect matter, spiders, millipedes, etc, made up the remainder.

Vegetable Food : The vegetable food was of little value economically. Fruits, of small wild varieties, totalled 6.00 %. Seeds, mostly of coniferous trees, averaged 12.00 %. The remaining 4.00 % was composed of rubbish, cambium, bark, and rotten wood fibre and sawdust.

These studies failed to show evidence of several of the very beneficial tendencies of these birds, which are well known to all bird students, and to many farmers.

Prof. Beal's personal conclusion was that these birds were exceedingly beneficial, far more than half of their food being composed of injurious insects or larvae.

Many complaints are made against this group as 'sapsuckers'. McAtee (17) and Forbush (16) have discussed these questions fully. The former says : " it would be surprising if any of our woodpeckers were entirely innocent of this practise. ----- not a single instance is on record of the killing of a tree by girdling --- ( by this group )". It is the loss of cambium, not of sap, which is the dangerous factor, and Forbush records many statements that these birds never penetrate the cambium layer unless in pursuit of some insect, in which case it is legitimate surgery. The incisions reach only into the outer bark, and cause no deformations, etc. Fuller discussion of this question is given later.

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### PRESENTATION OF ORIGINAL DATA

#### Field Observations.

The present investigation of these types has to some extent exceeded the work done by Prof. Beal in California some 25 years ago. During the course of this study several interesting comparisons have come to light. In general, field work in the Willamette Valley was concerned almost exclusively with the Harris, while the work in the

Rogue River and Klamath areas was centered about the Modoc type. In reality, several of the birds in the Southern Oregon area were real Harris, while a few of those in the Willamette Valley were apparently Modoc. There seems to be much over-lapping, and field identification of these types is sometimes of little, or no, value.

These woodpeckers are conspicuously attached to dead or partially dead trees and snags. In this type of growth, especially in a swampy area, they flourish. The dead willows and cottonwood and alder growth in the lower levels of the Willamette Valley, and the alders, willows, and dead conifers close to the streams or along the edges of the mountain meadows, are their rendezvous, from which they forage over every tree and shrub in the locality.

The writer has yet to see any bird of this group do any real injury to a living tree. Insects may be taken from the crevices of the bark, and larvae may at times be dug from the wood beneath. There has been no evidence of the removal of cambium from a living tree for the purpose of eating the sap or the inner bark; there has been no evidence that these birds ever visit the pits made by the true sapsuckers, for the purpose of drinking sap.

Near the Peoria Ferry in May, 1925, the writer observed one Harris Woodpecker which, by the casual observer or prejudiced, might have been called a 'sap-sucker'. In truth, the tree had been girdled long before that season.

After watching the bird for some time the tree was examined. There was an extensive injury similar to the one pictured in Plate XI, Fig. 2, in which all of the bark was dead, loose, and had made a hanging catch-all for the dirt and refuse of several seasons. The Woodpecker had started work at one side of the old injury and had cleared away all of the old bark, dirt, moss, etc, leaving the wood bare and shining. Examination of the stomach of this bird showed a quantity of ants and spiders, as well as other small insect parts.

These woodpeckers are not abundant in the orchard. This is unfortunate, yet when they do enter the orchard area at times, they are worth consideration. They, with the next group, are consistent enemies of the codling moth. A small hole through the bark, a small vacant cocoon : the tale is short. The amazing thing is the unerring accuracy with which they locate the larva, and the ridiculously small number of them that are overlooked.

In the apple trees along North Twentyfifth Street, Corvallis, during the autumn of 1924, several Harris Woodpeckers, with others, were observed working energetically on the trunks and branches day after day. In mid-October a close examination was made. The percentage of empty cocoons was exceedingly high, considering the early date, and a high degree of accuracy was noted. Table I gives the data for this count. Since in October the activity in this

line is only just begun, it is extremely doubtful if a single larva would have survived the winter.

#### Food Habits.:

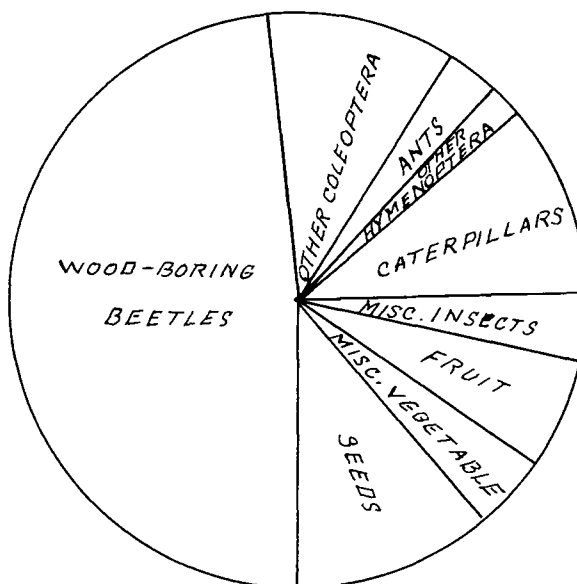
A total of 57 stomachs of this group were taken; over three fourths of these were of the Harris type. Each month in the year was represented by a fairly even number of specimens. The analysis of these stomachs has made clear a considerable variation from the California studies. The total animal food averaged 82.00 %, while vegetable matter made up the other 18.00 %. See Graph 2, and Table I.

Animal Food : The Coleoptera, or beetles, again furnish most of the food of this group. Predatory Carabid beetles, often found under the dead bark of trees, totalled 2.00 %; most of these were eaten during January and February and almost none were taken in the summer. Tenebrionidae, a group of unimportant insects of decayed wood and loose bark, averaged 5.00 %. Scarabidae, of the June Bug or white grub type, averaged 5.60 %, all being taken in June and July. Weevil averaged 1.00 %. There was only a trace of adult borers.

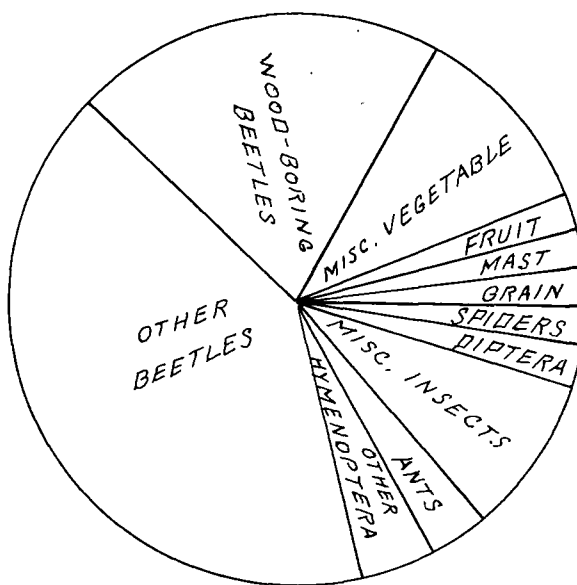
The larvae of the round-headed or Cerambycid borer averaged 10.61 %; flat-headed or Buprestid borers averaged 10.18 %. These two extremely injurious types of insect larvae were the favorite food. Unidentified beetle larvae averaged 22.67 %. Only in July were such larvae missing from the diet of these birds. There was a trace of aphids,



FOOD OF THE HAIRY WOODPECKERS



Graph I. After Beal.



Graph II. Original.

and of scale, representing the Hemiptera. Caterpillars were found to average 1.10 %, none being identified. Ants averaged 5.22 %, very low for these birds; other Hymenopterous insects made up 2.22 % more, and included the gall insects of the oak, Cynipidae, and their Chalcid parasites. Miscellaneous insects, 5.73 %, included one Lampyrid and the many insect fragments that were unrecognizable. The species of insects found were as follows :

Colcoptera	Hymenoptera
<i>Philophuga amoena</i>	<i>Andricus californicus</i>
<i>Helops edwardsii</i>	<i>Camponotus herculeanus</i>
<i>Platynus piceolus</i>	<i>Camponotus maculatus</i> , var.
<i>Odontaeus obesus</i>	<i>vicinus</i> .

Vegetable Food : The greater part of the vegetable food is classed as Miscellaneous, averaging 11.29 & %. This group includes sawdust, fibres, moss, cambium, and all rubbish. Fruit, all elderberry ( *Sambucus* ), averaged just 2.14 %. Corn, the only grain found, was eaten in October, and averaged 2.20 % for the year. Mast, mostly acorn, was taken during the autumn to an average of 2.13 %. Five of the stomachs contained seeds; *Arctostaphylos* ( manzanita ), and *Rhynchospora* were identified.

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#### CONCLUSION

From the answers to questionnaires, it is very

evident that less than 40 % of the fruit growers of the state are able to distinguish between these woodpeckers and the true sapsuckers. This situation might be very easily overcome by the utilization of the papers and magazines. In most cases the people are lovers of birds, but have not the facilities at hand with which to make correct identifications. This condition should be remedied with all speed.

In consideration of the activities recorded for the types of the Hairy Woodpecker group, it is the inevitable conclusion that they are very beneficial in their choice of foods and activities, and that they are worthy of the highest consideration and closest protection. It is very regrettable that these birds are not more abundant in the orchard areas. The Willamette Valley is exceedingly fortunate in having within its midst the approximate center of abundance : the swampy lands along the river bottom, in which the Harris Woodpecker is very much at home. These birds should be protected at all times, and all places, and every possible method of attraction should be utilized in an effort to persuade them to inhabit the orchard or the farm wood-lot.

THE DOWNY WOODPECKER GROUP( *Dryobates pubescens*, subsp.)

There are three subspecies of the Downy Woodpecker group which inhabit the orchards and woodlots of Oregon. The typical Eastern Downy is illustrated in Plate II.

The Gairdner's WoodpeckerA.O.U. No. 394 a. *Dryobates p. gairdneri* (Aud.).

This species, the exact miniature of the Harris Woodpecker, was also first collected by Townsend on the shores of the Columbia, and was named by Audubon, apparently for the Scotch physician at Vancouver, whose place was filled by Townsend after his arrival there (3).

Description : Male : Upper parts black with dingy whitish forehead, scarlet nape, and white stripe down back; middle and greater wing coverts plain black, or only lightly spotted with white; outer tail feathers white, barred with black; underparts smoky gray or light smoky brown. The female is identical, except that she lacks the nape marking.

Range : From British Columbia to Southern California, east beyond the eastern slope of the Cascade - Sierra systems.

The Batchelder WoodpeckerA.O.U. No. 394 b. *Dryobates p. homorus* ( Cab.).

This type was first collected somewhere in the Rocky Mountain chain by von Wurttemberg, and was first described by Hartlaub. The studies of Cabanis and Heine in 1863 resulted in the classification which obtains today.

Description : Very slightly larger than Gairdner's Woodpecker; underparts pure white; outer tail feathers pure white; under tail coverts pure white, unspotted.

Range : Breeds in the Transition and Canadian zones of the Rocky Mountains, from British Columbia southward, and in Southern California.

#### The Willow Woodpecker

A.O.U. No. \_\_\_\_\_. *Dryobates p. turati* ( Malh. ).

This type was first known as *Dryobates p. meridionalis*, called by this name by Nuttall (1) in 1840 and by Gamble in 1847. The name was changed to 'turati' after Malherbe studied the group in 1861.

Description : Somewhat smaller than the previous types, and interlapping in many parts of its range on the north with the Gairdner's, and on the south with the Batchelders. In this way there are blending types, which make the absolute identification a difficult matter.

Range : Said by Dawson (12) to be wholly in the state of California ; the writer disagrees. There are a great many birds of this type in all of the western part of Oregon.

Note : These birds are easily distinguished from the

Hairy group by their small size. From the eastern species illustrated they differ in that the wings are almost unspotted, and, in case of the Gairdner's, the outer tail feathers are barred. Bendire (19) only recognized two of these subspecies in his 'Life Histories', in 1895.

Distribution in Oregon : Gabrielson states the range of the *Dryobates pubescens* group as follows : " Gairdner's Woodpecker is found throughout western Oregon including the Cascades, except in the Rogue River Valley where they intergrade, or begin to approach the Willow Woodpecker. I have one specimen from the Rogue River labeled 'turati' by Dr. H.C. Oberholser, and several others as light colored as this form. The birds in southern Klamath County are also of this same type. Batchelders Woodpecker is found throughout eastern Oregon from the eastern edge of the Cascades to the Idaho line. All of these forms are more commonly found in the deciduous timber of the river bottoms, among the willows and cottonwoods, than in the coniferous timber.

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#### HABITS

The Downy Woodpeckers, are exact minatures of the Hairy Woodpeckers. They are much more abundant, in most areas, than those last discussed, and much given to inhabiting the more civilized areas; the farm woodlot, the alders along the small streams, and the older and neglected orchards, are their ideal home. They are not especially common

in the deeper forests.

The Downy Woodpeckers are not at all shy; when the birds are busy searching for food they are relatively easy to approach, even to within arms length, before the bird will choose to move away; even then it is apt to move over to the opposite side of the branch or trunk and peep over the edge at the intruder. During the winter the Downy loves cheerful company. One may hear the cheerful calling of a troupe of chickadees, a few kinglets, a nuthatch, and possibly a few wrens, and creepers, as they work their way along some area of woodland; investigation will show that in a majority of instances a Downy Woodpecker is the real leader of the group, and that the rest merely follow where the woodpecker leads.

While the Gairdner's Woodpeckers are found more abundantly in the marshes and swamps, and the Willow and Batchelders to a slightly greater extent in the uplands, all three are birds of the orchard and the home plantings. Innumerable entomologists, from every section of North America, have freely stated that the birds of this group are by far the most beneficial of all bird groups in the orchard. Although their normal range is the deciduous forest, the wooded stream border, or the swampy bottoms, they forage widely into every type of territory. Willows and alders are the preferred vegetation, yet these birds are perfectly at home in the midst of the farm areas, and

even in the village streets and parks.

Their flight is the normal undulating bound of the true woodpecker, often accompanied by a whirring of the wings that is audible for several rods. Their calls are much the same as those of the Hairy group, yet softer in modulation, and easily distinguished. They are very noisy most of the year, excepting the nesting season, and dearly love to roll off a rattling tattoo; any dry limb, or post, will do.

Their tameness is well described by Suckley (4), who said : " They ( the Gairdner's ) are extremely common on the lower Columbia, especially among the willow trees lining its banks. They are winter residents, and in these situations very abundant. In January, 1856, I found them so very abundant in the delta of the Willamette -----, At this season they are very unwary, giving little heed to the presence of man, scarcely allowing the close discharge of a gun to interfere with their search for food ".

As was the case with the first group, the historical references gave little data concerning their life ; they were too well known in the east. Later writers only sketched their activities, until Bendire (19) gave a full life history of the species he recognized.

In vigor and persistency these little birds are as outstanding as the Hairy Woodpeckers. They do not excavate so deeply, but are just as persistent, and just as skilled



in locating the grubs they are seeking. Their nesting cavities are excavated in almost every type of tree; alders, ash, willow, cottonwood, orchard trees, crabs, haws, service berry, and many others are used; they never utilize a living tree. Even fence posts may be utilized in the area where dead snags are scarce. The eggs are small, pure white, and four to seven in number. The cavity is generally relatively close to the ground, from 3 to 30 feet.

#### Food Habits - Review.

Beal, in his study of California birds (15), had probably two types of this group to deal with : the Willow, and the Gairdner's. He was furnished with 80 stomachs, covering every month in the year, and forming a very systematic series. In this study, 77.00 % of the annual food was animal matter, and 23.00 % was vegetable matter.

Animal Food : Wood-boring larvae totalled 16.00 %. Other beetles, mostly harmful, but including a few predatory Carabids, totalled 13.00 %. Ants averaged 12.00 %, and all other hymenoptera added 2.00 %. Caterpillars aggregated 21.00 %; a great many of these were codling moth larvae, as high as 16 and 20 worms in single stomachs. Plant lice or aphids and scale insects were also eaten, amounting to 10.00 %. In one of the stomachs Black Olive Scale ( *Saissetia oleae* ) formed 83.00 % of the contents; in another stomach aphids totalled 94.00 % of the whole. Miscellaneous bugs and spiders, 3.00 %, were the remainder.

Vegetable Food : Fruit totalled 9.00 % ; cherries, and apples were identified, although the information available was insufficient to determine whether or not these fruits had any commercial utility; small wild berries made up the rest. Seeds, mostly poison oak, made up 7.00 %. Miscellaneous items, 7.00 %, were acorn, rubbish, cambium, etc.

Prof. Beal's conclusion was that these birds are of very great value to the horticulturist. The foods taken are composed mostly of orchard, shade tree, or forest pests, and the fruits taken are insignificant. See Graph III.

The Downy Woodpeckers are also popularly under indictment as cambium-eaters and sap-suckers. They are probably the most often described as the perpetrators of the girdling injury, being more common than the true sap-sucker, and far more confiding. However, the statements made in a general discussion of this question which will follow cover this species in detail also.

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### PRESENTATION OF ORIGINAL DATA

#### Field Observations.

The present investigation has, as concerns these birds, fallen slightly short of Professor Beal's studies in extent and in systematic collections, due mostly to the very widespread flooding of the Willamette Valley during

the winter months which made collecting in the swamps impossible. Field observation has only served as a check on previously reported life history of the group; no original findings can be recorded.

In general, field work in the Willamette Valley was concerned with the Gairdner's Woodpecker, although a few very white-bellied specimens were collected; in the Rogue River Valley there is much intergradation of these two types, and many birds were killed which were difficult to place; typical specimens of each were collected. In the latter region these birds are not abundant; they are regularly distributed, and are constant residents, yet are nowhere abundant. In the Willamette Valley they reach the maximum of abundance.

At Peyton, in August, Gairdner's Woodpeckers were observed working busily for several days removing the larvae, pupae, and adults of weevil from the stems of common mullen, *Verbascum thapsus*. Near Eagle Point during the same month groves of Garry Oak, *Quercus garryana*, were seen in which one might walk for yards without stepping off the galls, or dust from these galls or 'inkballs', torn open and off the trees by the Willow and Modoc Woodpeckers. These galls are made by a Hymenopterous insect, Andricus californicus, Bass.

During June and July, 1925, whole families of the Gairdner's Woodpecker were observed in the huge cottonwoods

which abound near the Willamette River, feeding on the aphids and scale. They often numbered as high as ten birds in one tree; they worked from the lowest limb to the highest leaf. While paying some attention to the branches, their chief interest was the cluster of leaves. They clambered out each small branch to the cluster of leaves at the tip, peered under each leaf intently, even swinging around sidewise and up-side down in their earnestness. Through the binoculars it was easy to see them remove small objects; the later stomach analysis showed that most of these objects were scale insects.

In late February and early March, 1926, the same activity was noted, this time in the opening cottonwood blossoms and catkins. Stomach analysis showed that scale and a very long-snouted weevil were the attraction at this time.

These woodpeckers have yet to be observed doing any injury to a living tree; the writer has been unable to find any evidence of their doing so in this area. While they nested abundantly in the river-bottom lands in very close companionship with true sapsuckers, they were never seen to visit the flowing sap pits.

The study of the activity of these birds, in conjunction with the Harris Woodpecker, feeding on the codling moth larvae in Corvallis, Table I, is a very typical one. From the observations of fifteen years of bird

study and orcharding, the writer has yet to find any creature more instrumental in the work of checking and controlling the codling moth.

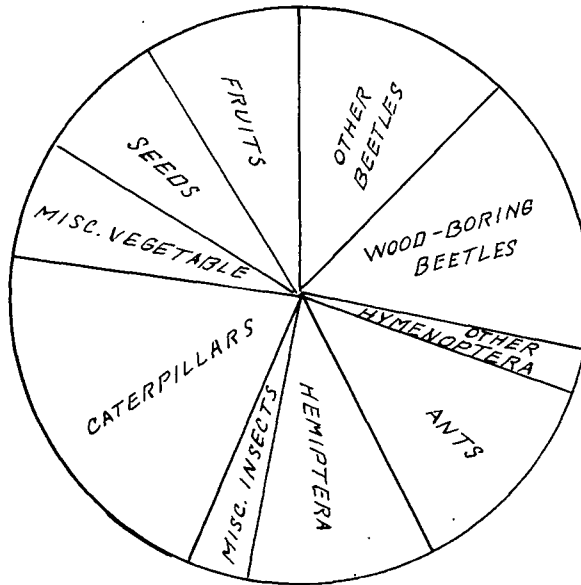
### Food Habits :

A total of 68 stomachs were available for study, most of them from the Willamette Valley. Each month in the year was represented, although not systematically in a few instances. The analyses of the group showed a wide variation from Prof. Beal's study. See Graph III and IV. The animal food items averaged 82.07 % of the annual food. Vegetable matter, the remainder, averaged 17.93 %.

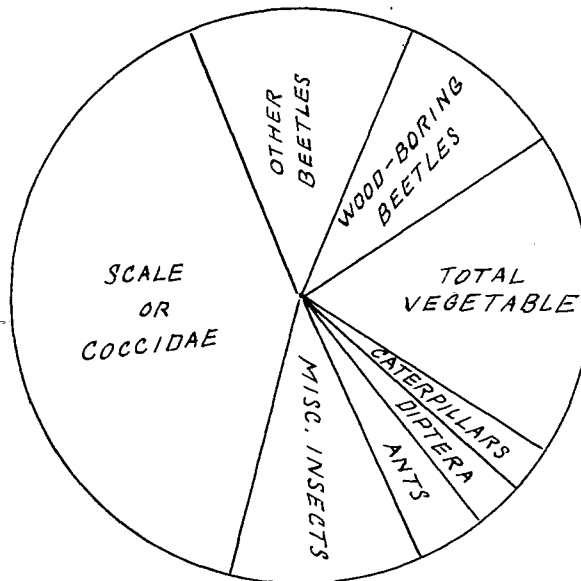
Animal Food : Predaceous beetles averaged only 0.81 %; most of these were ground beetles or Carabidae, only taken in April, and the Chalcid parasites of the oak-gall insect in August. The destructive leaf-eating Chrysomelidae averaged 0.32 %. Adult Buprestid borers averaged 2.20 %. Weevil totalled 5.10 %. Other beetles totalled 5.24 %. The larvae of beetles were not a common food; the larvae of Cerambycid borers averaged 1.50 %; one bird had eaten a few larvae of a Scolytid borer. Unidentified beetle larvae averaged 8.14 %.

By far the largest single item of food was scale insects or Coccids, 39.50 %; these were not identified, but were taken from cottonwood and willow trees in every month except August. It was impossible to count the individuals, but in many cases as high as 98.00 % of the stomach content

FOOD OF THE DOWNY WOODPECKERS



Graph III. After Beal.



Graph IV. Original.

was composed of the armors of these scale insects. Other Hemiptera were found only in one stomach, aphids. Scale insects were not found commonly in the stomachs of birds collected in southern Oregon. In one stomach scale from an apple tree had the appearance of the San Jose scale.

Ants averaged only 5.62 %; this is extremely low. Other Hymenoptera totalled 1.80 %; these were the larvae of the Cynipid gall insect of the oaks, as discussed before. Caterpillars averaged 2.40 %; most of these were wood-boring types, but a few codling moth were identified; one stomach held 12 larvae of the codling moth. Diptera averaged 2.33 %, all of which were Tipulid flies. Spiders were rarely eaten. Miscellaneous insect fragments totalled 8.14 %.

#### Coleoptera

*Dicerea*, sp.

*Paria*, sp.

*Bembidium*, sp.

*Nebria*, sp.

*Chalcoides helxines*

#### Hymenoptera

*Andricus californicus*.

*Camponotus herculeanus*, var.

*Camponotus maculatus*, var.

*Formica rufa obscuripes*.

*Formica fusca*, var.

#### Lepidoptera

*Carpocapsa pomonella*, Linn.

Vegetable Food : Fruit was hardly touched by these birds; elderberry ( *Sambucus* ) and Madrona ( *Arbutus* ) were the two types found, averaging only 0.46 %. Miscellaneous vegetable matter totalled 17.47 %; this includes bark, wood fibre, sawdust, cambium, etc. One stomach was

completely filled with the cottony fibre of the willow blossom, rolled and tangled into an impervious mass. No seeds were found. Mast did not appear as a food. Grain was not harmed.

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### CONCLUSION

The Gairdner's, Willow, and Batchelder's Woodpeckers, within their respective ranges, are worth their weight in gold to the fruit grower. There is no other bird worth as much in insect control. They should be protected, and every known means of attraction should be used in the attempt to persuade them to remain habited about the ranches.

From the answers to questionnaires it is evident that nearly 75.00 % of the fruit growers call this group the 'sapsucker', and feel that it is responsible for the damage found on their trees. In abundance, these birds rank only second to the Flickers, and far more abundant than any of the others. It is not at all surprising that they are the most commonly seen, and thus receive the blame for injury done by others. Publicity is needed in order to inform the farmer and fruit grower of the true identity of this bird, and of the differences between them and the true sapsuckers.



THE SAPSUCKERS

The true Sapsuckers are a distinct genus of the great Woodpecker group. This genus, *Sphyrapicus*, includes three species and two subspecies, four forms being found in Oregon. The Yellow-bellied Sapsucker of the East is the only type not found in this state.

The true sapsucker is characterized by its habit of girdling trees, or of removing the bark from large areas of the trunks or branches of trees; various explanations of the object are given; among these are: cambium, sap, insects, and exercise. The true sapsucker differs in anatomy. The tongue is short and not capable of extension further than about  $\frac{1}{2}$  inch beyond the tip of the bill. Its tip is flattened and fringed with stiff bristle-like cilia.

Red-naped Sapsucker

A.O.U. No. 402 a. *Sphyrapicus varius nuchalis* (Baird).

This subspecies, the western form of the Yellow-bellied, seems to have first been collected by some of the parties of the Pacific Coast Railroad Survey, and was first described by Baird in 1858 (19).

Description : Adult male (9) : Upper parts black, thickly marked with white; wing coverts plain black, with a wide white outer stripe; head with red crown and nuchal patch separated by a plain black area; sides of head with white stripes; chest black between red throat and pale yel-

low belly. The female is similar, but duller and with the black throat patch mottled with gray. These birds can be distinguished very readily.

Range : The entire Rocky Mountain area from Texas to Canada, and from western Kansas to the summit of the Cascades.

Distribution in Oregon : Gabrielson states the range of this bird in Oregon as follows : " This bird is found throughout the pine timbered sections of Oregon east of the Cascades including the eastern slope. I have found them nearly to the summit in Klamath and Deschutes counties, and have taken them in the pine timbered sections in Lake, Crook, Grant, Wallowa, and Union counties, and have seen them in other timbered sections".

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The Red-naped Sapsucker, according to Bendire, is a resident of the Blue Mountain area and the eastern slope of the Cascades. He met with it first in Grant county and later near Camp Harney and Fort Klamath. He found them breeding sparsely at 5,000 feet elevation, and conjectured that they were more plentiful at higher elevations. In the Blue Mountains the nests were found at 7,000 feet. His observations show them to be very similar in habits to the Red-breasted Sapsucker.

On the eastern slope of the Cascades the Red-naped and the Red-breasted Sapsuckers may be found occupying the

same area. Eastward, in the other mountain ranges, the last named species is not found, and all sapsucker injury may be laid to the present species. Although considerable time was spent on the east side of the Cascade summit at varying elevations, not a single specimen of this type was located. The habits are so closely alike that one discussion will be applicable to both.

### The Williamson Sapsucker

A.O.U. No. 404. *Sphyrapicus thyroideus* ( Cassin ).

Because of the difference in appearance of the sexes, they were for many years classed as separate types. A female was collected about 1850, described by Cassin, and named the 'Brown-headed Woodpecker' in 1851. A male was collected by Newberry in 1857 and named for Williamson, the leader of the expedition. Not until 1872 did Henshaw find one of each type feeding the same nest of young (12).

Description : Male : Upper parts glossy black, except white rump, large white patch on wings, and fine white spots on quills; sides of head with two white stripes; throat and breast black with a median line of bright red; belly bright yellow. Female : entire body barred with brown or black and white, except for brown head and white rump and, rarely, the red median line on throat; chest usually with a black patch; middle of belly yellow. The young of either sex are generally duller than the parent.

Range : Western North America, from the western slopes

of the Rockies to the Coast, from British Columbia to the northern part of Mexico.

Distribution in Oregon : Breeds in the higher Cascades and in the higher altitudes of the mountains in northeastern Oregon, mostly in the Boreal and Canadian life zone areas. It generally winters south of the Oregon country; it is often found as a transient at low altitudes during the migration periods.

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The Williamson Sapsucker is a striking bird, and very beautiful, characteristic of the high mountains. It is found only at high altitudes during the breeding season. Major Bendire (19) found his first specimen of this species near Fort Klamath, near to the place where Newberry obtained the type specimen (4). It is a solitary bird, rarely found with others of its own kind.

Bendire stated that its breeding range was from 5,000 feet upward; he stated also that on the mountain slope about Crater Lake it seemed to reach its maximum abundance. It prefers the open pine or fir forests. It is a migratory bird, wintering in the Southwest. This species has very little connection with the present investigation, as it rarely enters any orchard or ornamental plantings except by accident during migration. In October, 1924, the writer saw a male Williamson on 5th Street, Corvallis, near Van Buren Street. This bird was working down the row of shade

trees seeking insects, making no attempt to injure the trees in any way.

In August, 1925, a few of these birds were seen on Huckleberry Mountain, near the boundary of Crater Lake National Park. Two of this species were collected during the course of this study. The first, collected on the Dead Indian road between Ashland and Lake-of-the-Woods, was in an open fir grove with a number of the next species. Its stomach contained nothing but ants. The second, a female, was collected in a dense fir grove at Peyton in December, also in the company of the next species. Its stomach held only the fruit of the madrona.

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#### The Red-breasted Sapsucker

A.O.U. No. 403. *Sphyrapicus ruber ruber* (Gmel.).

#### The Northern Red-breasted Sapsucker

A.O.U. No. 403 a. *Sphyrapicus r. notkensis* (Suckow).

When the Indians brought skins of birds to the Captain Cook expedition, one of those brought was that of the Northern Red-breasted Sapsucker, in 1778, at Nootka Sound, Vancouver Island. Suckow described it in 1800. Gmelin, 1788, also described some type of this species under the first given technical name; no information is available as to which was meant. The first *S. ruber ruber* type specimen of which a locality is given was one described by Vigors in 1839, from Monterey, California.

Description (1) : Whole head, neck, and chest plain red or black and white markings of a nuchalis faintly suggested; wings, back, and tail black, heavily marked with white; belly dusky or yellowish. The Northern type differs only in that it is darker, and the belly is yellower. Its length is from 8 to 10 inches.

Notes : From the Downy and Hairy species this bird is easily recognizable by its brightly colored head, as it resembles the eastern Red-head. From other Sapsuckers it differs by absence of the white stripes on each side of the head, and by the absence of the black breast patch.

Range : Breeds in the Transition and Canadian zone forests of the Pacific Coast region from northern Lower California to British Columbia, and occasionally to Sitka, Alaska; and from the eastern slope of the Cascades to the beaches.

Distribution in Oregon : Gabrielson, as well as other students, allows Oregon only the Northern type. The range is stated as follows : " This bird is found throughout western Oregon including the Cascades. It is found regularly along the eastern side of the summit, and frequently down well into the eastern foothills of the Cascades".

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#### HABITS

The Red-breasted Sapsucker is a very interesting and a showy bird, reaching near its maximum abundance in the state of Oregon. The first records of it are given by

Townsend (3) who wrote that it inhabited the Cascades and the Blue Mountains. The latter statement is undoubtedly wrong, in the light of present day knowledge, and it is likely that he included the Red-naped variety in the one group. He also spoke of it inhabiting the forests of the Columbia.

Cooper and Suckley (4) saw this species only four times. They knew very little about it. Anthony (19), in Washington County in 1891, found it common there; he found them nesting in alders and firs, and said they seemed to prefer the orchard to the forests. Bendire (19) made the first definite records of its life and habits while he was stationed at Fort Klamath during the years from 1882 to 1884. He called this species a summer resident north of California, and found it very abundant near the Fort; he believed that they wintered in the deep canyons of the Lower Klamath River.

The first observation he made concerning these birds was that they were apparently so congenial; they had just arrived in the spring and were so common as to be almost in flocks. They mated early, and while the females began to excavate the nesting cavity the males loafed, and drummed vigorous tattoo's, spending most of the day at the task. Townsend (6) called them very noisy birds.

The nesting cavity was in every instance a living aspen tree of good size. The entrance was placed immediate-

ly under the first limb of the tree, and was ridiculously small for so large a bird. In locating nests Bendire always looked for chips on the ground, which were easily located. Only one brood was raised.

Bendire described their noise in spring, and the relative silence in mid-summer. He found them impossible to approach unseen, yet not at all shy, and allowing one to approach closely. His observations tended to show that the aspen was a more popular tree than the conifers. Merrill, in the same area, made the same observation (6). Cooper spoke (11) of them as very silent. The Sapsuckers have the normal habits of the woodpecker family. They fly with the undulating bounds that are so characteristic, and scramble unconcernedly about over the trunks of trees.

#### Girdling and Sap-sucking.

Their importance to the fruit grower and forester is directly due to their habit of digging pits in the bark. For many years this has been an ever-present question. Maj. Bendire again laid himself open to contradiction by saying that at least during the nesting season this species did not indulge to the same extent as did the Eastern species. One year later, Cook wrote (20) that there was far more loss from this species than from the Eastern type.

Dawson (12) gave a very fine description of the bark-eating activities of the sapsuckers : " Starting well up toward the top of an evergreen, or well up on the major



branches of an orchard tree, the bird works successively downward in perpendicular rows, whose borings are sometimes confluent. In this way the bird secures an ever-fresh flow of sap. If carried on too extensively, or persisted in for successive seasons, these operations will cause a tree to bleed fatally ---- ".

Grinnell (14) also described the injury : " Willow trees, which were growing in good-sized clumps, seemed to offer especial attraction, but curiously enough the attention of the birds was confined to a single clump in a locality, and not distributed among many ". It appeared that they worked upon one clump so long as life lasted. He described one clump which had all its upper trunk and branches dead from 2 to 4 feet above the ground; the bark was all weathered off and the branches were bare and shining. " This clump must have been worked on for at least three seasons, for on several of the trunks, ----, were three zones of the borings, the latest ones lowest ". Just below each of the zones was a ring of sprouts.

McAtee (17) has gone into this question most thoroughly. Briefly summarized, his conclusions follow. The work of the true sapsucker is so very uniform and so characteristic as to be easily distinguished. The holes are drilled clear through the bark and cambium, often into the wood. They vary in outline from circular to nearly square, with the longest diameter across the limb. In gen-

eral, they are arranged in rings or partial rings, although they may fall into vertical series. After the original pattern is completed they often continue their work, taking out the bark between holes until large areas are cleanly removed.

All holes or grooves penetrate to the non-growing part of the tree. This results in the removal of the outer sap-carrying layer, and thus the attack is fatal. Each ring of punctures severs at its level the sap vessels; another ring at another level severs other vessels, and if the process is continued to the extreme the tree will die. Even when not extreme, some branches may be killed, or the tree may be devitalized for years. If the attacks cease before becoming severe the tree will eventually recover.

In many cases distorted growth follows from the development of adventitious buds below the punctures. All such injury is followed by more or less opportunity for infection and consequent weakening of the trees. These girdles may in some trees be the cause of exudations of gum, pitch, etc, or may be followed by fungus growths.

The injury most prominent, yet invisible and not estimable, is the damage caused to lumber trees. The sap-sucker's girdle stimulates growth, and the wood layers at these points becomes thickened, resulting in a slight swelling. When these wounds are re-opened every year, successive thickenings cause the protrusion of narrow shelf-like rid-

ges. On trees with stiff bark these ridges break, and a gaping furrow on the summit of the swelling is the result.

Remarkable deformations are formed by these girdlings. When such work is continued for generations, the grain of the wood is distorted, or may become impregnated with pitch, etc. Knotty protuberances, resin deposits, fat streaks, and other blemishes, lower the value of the lumber from these trees. The actual loss in this case can not be estimated accurately.

These forest losses are unimportant in the present paper, excepting as they relate to the deforming and contorting of costly ornamentals and lawn plantings. In such cases this activity may be costly and irritating. In orchard trees, at times greater bearing has been stimulated; this is undesirable; in most areas it is by no means beneficial to the orchard. In most well-cared for orchards, where the injury is moderate and is not long continued, the girdles heal up without material damage other than the energy necessary for healing; this may mean the lowering of the vitality of the tree. Many aged apple trees, worked upon for many years, healing annually, seem to bear no ill effect other than their disfiguration.

There is still confusion concerning the object of this work, whether for sap, cambium, insects, or exercise. All four are acquired in greater or lesser proportion. The persistent return of the birds to the same tree for years,

and the habit of working only upon one species of tree at a time, are also little understood.

### Food Habits - Review.

When Beal finished his work in California, only 24 stomachs of this species were available. In his later work (21) he had studied 34 stomachs. The latter work is reviewed here. None of the 34 were taken between April and August, while 29 of them were taken in the last quarter of the year. 69.00 % of the annual food was animal matter, and 31.00 % was vegetable matter. See Graph V.

The Animal Food : Ants amounted to 42.49 %. Other Hymenoptera averaged 7.00 %. Beetles of all kinds averaged only 4.00 %; most of them were Chrysomelids, and none were beneficial. Caterpillars and miscellaneous insects made up the remaining 15.00 %.

The Vegetable Food : Fruit constituted 12.69 %; this included pepper berry ( *Schinus molle* ), Cascara, and figs, the latter the only cultivated type. Seeds of the wax myrtle ( *Myrica* ) and of Poison Oak ( *Rhus* ) made up 5.96 %. Cambium was found in only six stomachs, and averaged 11.13 percent.

Beal could draw no definite conclusion, stating that further observations and more material was necessary before settling this question. However, he personally considered these birds injurious.

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## PRESENTATION OF ORIGINAL DATA

The present study has to some extent exceeded the Federal studies, and has brought to light some additions, as well as some changes.

Field Observations.

Field work has proven that these birds, while having some migratory movement, are as abundant in winter as in summer, even on the Upper Rogue River where the elevation is above 2,000 feet. They are to be found as not uncommon residents of the Willamette Valley lowlands, inhabiting the alder, willow, and cottonwood associations so common there.

They were found fairly abundantly at higher altitudes in both the Cascade and Coast ranges, being reported as abundant residents at Florence. During the breeding season they gather into the areas of semi-swamp land, and the forests along the water courses; after the young are matured they move rather freely about over the entire district and may be seen occasionally even in the closely settled areas. They are of frequent occurrence even in the towns, and on the Oregon Agricultural College campus.

They nested at Lake of the Woods, Klamath County, in fair numbers, and were found quite commonly in the higher Cascades. The area of greatest abundance was located in the thickets of Four Mile Creek, in the extensive area that drains eastward from Lake of the Woods toward Pelican Bay.

In August, 1925, this area was almost alive with these birds, by far the most common of the family in the area.

They have not been found to be particularly quiet excepting during the hotter summer months. At other times they have been neither noticeably noisy or silent. The outstanding features have proven to be pugnacity and noise during the mating season and while incubating and feeding the young, and an extreme curiosity at other times. In many instances the writer has located them by utilizing this curiosity; sitting motionless on a log or rock after failing to find them, any sapsucker in the community would soon make its presence known by a characteristic interrogative call, at first from a distance, gradually drawing nearer.

In winter they seem to be quite belligerent, for on several occasions one has been located by the angry noise of a pitched battle; on closer investigation it would be found that the Sapsucker was attempting to drive some other Woodpecker, generally the Gairdner's, from some particularly enticing tree.

The nests of these birds are placed in whatever trees are abundant in their vicinity. In Klamath County, on the foothills and in the lower valleys, alders, cottonwoods, and aspens were utilized; in the higher altitudes, firs were the common site, with the alder and willow along the small streams. In the Willamette Valley the firs, cottonwoods,

willows, alders, and others, are used indiscriminately. Nothing has been observed to prove Bendire's statement that the nest cavity was excavated immediately beneath the first limb; nor were partially living trees ever utilized. The eggs are white , and number from four to seven.

#### Girdling and Sapsucking.

It appears that a relatively small percent of the fruit growers know the true Sapsucker by sight, although most of them recognize the work done by these birds. The following complaints are taken from the questionnaire-answers recieved from fruit growers all over the state.

S. H. Van Trump, Salem, wrote : " I have seen at least twelve or fifteen large walnut trees completely girdled and killed, and many other trees very seriously injured". M. A. Stout, Sheridan, wrote : " I have had three or four large walnut trees isolated at the edge of a prune orchard girdled and killed back to the ground. The sapsucker came regularly every spring, just before the trees leafed out, and worked on these trees until midsummer. Trees are about 20 years old. By watching, managed to save the fourth tree, although seriously damaged ".

Chas. Trunk, Dundee, wrote : " He is very harmful. He is of especial interest to walnut growers because of his damaging work on the trees, very seriously injuring many of them and in some cases killing them. They so completely riddle the trees with small holes that no sap can

pass up into the limbs. These holes are generally always directly under the limbs, mostly a strip about six inches wide. At this time of year, January, he is noticed working on apple trees, and on maples."

C. R. Dyer, Newberg, wrote : " The Sapsucker damaged fir and yew considerably, hawthorne even more, for the trees are forced to give so much strength in healing over the wounds, and in the hawthorne large bumps and knots are formed". W.W. Jaquith, Laurel, wrote : " Sapsuckers injure prunes and walnuts especially, frequently girdling the tree, and killing one or more large limbs or the whole tree ". E. S. Rueter, Forest Grove, wrote : " The Sapsucker is injurious to fruit trees; it will attack a perfectly healthy tree and apparently put all its energy to one variety at a time for, some time".

J. Gyger, Ashland, wrote : " Is injurious to the apple and almond, working regularly every year in early winter ". G. V. Nichol, Ashland, wrote : " Cherry, almond, walnut, and every other fruit tree have the bark full of tiny holes made by some woodpecker". J. B. Webster, Phoenix, wrote : " Our walnut trees are pecked until the bark looks like fine network".

Field investigations have shown that the work of girdling is carried on well into the nesting season, and that casual or random work is continued throughout the year. From early spring until late autumn it appears that decid-



nous trees are chosen : apple, peach, almond, haw, maple, and many others. During late November, December, January, and February, there is a tendency to confine activity to the fir, pine, yew, etc. There can be no question as to the seriousness of consistent activity upon trees by these birds. In the course of the field work many trees were found which were seriously injured, and such work is well illustrated in the plates, from Plate VII to Plate XII, inclusive.

On the L. E. Aldrich ranch near Albany was one apple tree dead, or nearly so, ( Plate VIII, Fig. 2 ), from about three years of activity. Several other trees were showing serious injury, and if re-injured during the 1926 season they will be likely to fail to survive another dry summer. Every peach tree in this orchard was knotted and lumpy with swollen girdles, oozing gum, and otherwise disfigured.

On this same ranch 90.00 % of the maple trees, *Acer macrophyllum*, have been killed or seriously injured and many of them have been girdled from 30 to 50 feet above the ground, the tops rising dead and glistening out of a mass of adventitious growth arising just below the girdle. Some of these trees were killed a decade ago, and the new sucker growth has, in some cases been killed by these birds. See Plate XII, Fig. 1.

In December, 1926, fir trees in the same field

showed huge fresh girdled areas, both in horizontal rings and in three and four foot vertical series. One huge fir showed the effect of many years of this work, its top dead, the remaining trunk white and encrusted with dripping pitch. Nearly 90.00 % of the cottonwoods in that area show the protruding shelves and other deformities already spoken of, as well as some freshly girdled areas.

During the spring of 1925 a maple tree, *A. macrophyllum*, was located near Peoria, in a serious condition. During the 1923-4 season every scaffold branch had been completely girdled, ranging from 15 to 40 feet from the ground. During the dry season of 1924 the remaining small veins of bark dried out and broke from the wood layers; this can be noted in Plate XI, Fig. 2.

In April, 1925, and in May and June, this tree leafed out, then died. During this period numbers of the Sapsuckers were still working upon it, girdling others of the branches, and re-investigating old rings. During the latter part of this period they worked solely above the existing rings. This is possibly explained by the supposition that with increasing dryness the sapwood was unable to furnish sufficient moisture, the top was dying, and the sap was flowing downward toward the sap pits under gravitational force.

One May morning the writer spent in ambush watching five Sapsuckers enjoy themselves upon this maple tree.

The birds spent most of the morning upon the tree, rarely, if ever, leaving it. Only one of the five, during the morning, tasted sap, although it was dripping from the open wounds. The other four birds sat silently or flitted about the tree, working at rather regular intervals upon the girdles of pits they were excavating.

On the Oregon Agricultural College campus few species of plants fail to carry the marks of this active bird. In some cases, such as Norway Spruce, Austrian Black Pine, and others, the injury is severe. Every aged apple tree in the Willamette Valley shows the disfiguration of decades of this work; not extreme, these pits have healed annually without involving loss.

At Medford many apple trees show the same display of aged healed girdles; these are illustrated in Plate X, Fig. 1. In the same vicinity are numerous injured fruit trees, and nut trees; the damage is naturally more severe in those sections not under irrigation. At Payton a Yellow Pine was found killed by a girdle about fifteen feet above ground, and in December, 1925, the writer was shown a fine big pine in a nearby wood lot which was almost girdled by fresh pits. In the same area were numerous distorted alders; apples, pears, and black walnut trees in the orchard were rather seriously injured.

On an earlier page four conjectures as to the true object of this work were stated. It is the conclusion

of the writer that cambium is a primary objective, but that the bird is urged on by a relentless instinct. This latter phase is strengthened by the fact that many of these birds when seriously wounded made no attempt to escape, but immediately began to peck frenziedly at the branch upon which they perched, a thing no other species was seen to do. This seemed to indicate some deeply ingrained instinct which came to the fore under the stimulus of the wounds.

The list of trees or shrubs known to be attacked by the Red-breasted Sapsucker, as listed by McAtee (17), numbered only 21. In the field work of the present study the list has been increased to 67 species of fruit, forest, and ornamental plants. Only six of those in McAtee's list are not included in the present list; most of these are sub-tropical, and found in California only. The list in full follows, (22).

List of Injured Trees.

Western Yellow Pine	-	<i>Pinus ponderosa</i> (Law.).
Lodgepole Pine	-	<i>Pinus contorta</i> (London).
Sugar Pine	-	<i>Pinus lambertina</i> (Dougl.).
Norway Spruce	-	<i>Picea excelsa</i> (Link.).
Douglas Fir	-	<i>Pseudotsuga douglasii</i> (Brit.).
Grand Fir	-	<i>Abies grandis</i> (Lindl.).
Noble Fir	-	<i>Abies nobilis</i> (Lindl.).
Western Red Cedar	-	<i>Thuja plicata</i> (Don.).
Western Yew	-	<i>Taxus brevifolia</i> (Nutt.).

Shasta Fir	-	<i>Abies magn. shastensis</i> (Lemmon).
Mountain Hemlock	-	<i>Tsuge mertensiana</i> (Sarg.).
Aust. Black Pine	-	<i>Pinus nigra austriaca</i> (Sohn.).
Eastern White Pine	-	<i>Pinus strobus</i> (Linn.).
Incense Cedar	-	<i>Libocedrus decurrens</i> (Torr.).
Port Orford Cedar	-	<i>Chamaecyparis lawsoniana</i> (Parl.).
Larch	-	<i>Larix decidua</i> (Mill.).
Lombardy Poplar	-	<i>Populus nigra italia</i> (Linn.).
Black Walnut	-	<i>Juglans nigra</i> (Linn.).
N. Calif. Black Walnut	-	<i>Juglans californicus</i> (Wats.).
English Walnut	-	<i>Juglans regia</i> (Linn.).
Western Black Willow	-	<i>Salix lasiantha lyalli</i> (Sarg.).
Cut-leaf Weeping Birch	-	<i>Betula alba laciniata</i> (Hort.).
Oregon Alder	-	<i>Alnus oregona</i> (Nutt.).
Chinquapin	-	<i>Castanopsis chrysophylla</i> (A.D.C.).
Western White Oak	-	<i>Quercus garryana</i> (Hook.).
Calif. Black Oak	-	<i>Quercus californica</i> (Coop.).
Oregon Crab	-	<i>Pyrus rivularis</i> (Dougl.).
Western Serviceberry	-	<i>Amelanchier alnifolia</i> (Nutt.).
Black Haw	-	<i>Crataegus douglasii</i> (Sarg.).
Bitter Cherry	-	<i>Prunus emarginata</i> (Dougl.).
Western Plum	-	<i>Prunus subcordata</i> (Nutt.).
Choke Cherry	-	<i>Prunus demissa</i> (Nutt.).
Almond	-	<i>Amygdalus communis</i> (Linn.).
Apple	-	<i>Pyrus malus</i> (Linn.).

Pear	- <i>Pyrus communis</i> (Linn.).
Peach	- <i>Amygdalus persica</i> (Linn.).
Plum	- <i>Prunus domestica</i> (Linn.).
Apricot	- <i>Amygdalus armeniaca</i> (Linn.).
Sweet Cherry	- <i>Prunus avium</i> (Linn.).
Quince	- <i>Pyrus oblongata</i> (Linn.).
Willow	- <i>Salix sessilifolia</i> (Nutt.).
Willow	- <i>Salix piperi</i> (Babb).
Mountain Ash	- <i>Sorbus sitchensis</i> (Roem).
Western Dogwood	- <i>Cornus nuttalli</i> (Aud.).
Red Osier	- <i>Cornus occidentalis</i> (Cov.).
Dogwood	- <i>Cornus pubescens</i> (Nutt.).
Lilac	- <i>Syringa vulgaris</i> (Linn.).
Cascara Sagrada	- <i>Rhamnus purshiana</i> (ADeC.).
Madrona	- <i>Arbutus menziesii</i> (Pursh.).
Blue Elderberry	- <i>Sambucus glauca</i> (Nutt.).
Filbert	- <i>Corylus avellana</i> (Linn.).
Hazel	- <i>Corylus californica</i> (ADeC.).
Sassafras	- <i>Sassafras variifolium</i> (Marot).
Ailanthus	- <i>Ailanthus glandulosa</i> (Desf.).
Honey Locust	- <i>Gleditsia tricanthus</i> (Linn.).
Oregon Ash	- <i>Fraxinus oregona</i> (Nutt.).
American Elm	- <i>Ulmus americana</i> (Linn.).
Mackenzie Willow	- <i>Salix m. mackogemma</i> (Ball).
Black Cottonwood	- <i>Populus trichocarpa</i> (T. & G.).
Aspen	- <i>Populus tremuloides</i> (Mich.).

Broad-leafed Maple	-	<i>Acer macrophyllum</i> (Pursh.).
Vine Maple	-	<i>Acer circinatum</i> (Pursh.).
Norway Maple	-	<i>Acer platanoides</i> (Linn.).
Sycamore Maple	-	<i>Acer pseudo-platanus</i> (Linn.).
Calif. Box Elder	-	<i>Acer negundo calif.</i> (Sarg.).
Cut-leaf Silver Maple	-	<i>Acer neg. argenteum</i> (Linn.).
California Sycamore	-	<i>Platanus racemosa</i> (Nutt.).

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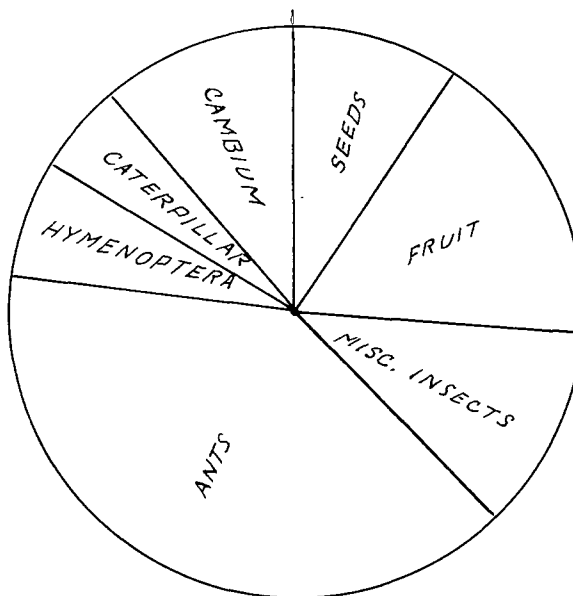
### Food Habits.

A total of 64 stomachs were available for this study, representing every month in the year. These were mostly collected in the Willamette Valley, although a few were collected in Klamath and Jackson Counties. The stomach analysis showed them to be 40.47 % vegetable food, and 52.53 % insect food.

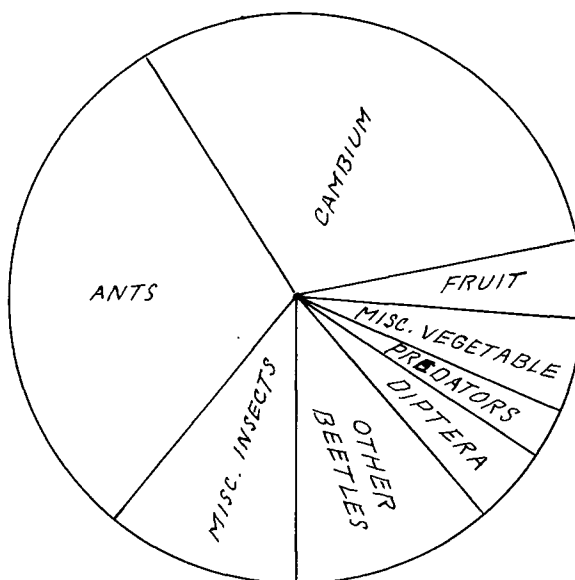
Animal Food : Only 32.01 % of the food of this group was found to be ants, although in July the average was 80.00 % of the total. No other Hymenopterous insects were taken. Since the months of low ant averages seem to be those of highest cambium averages, Graph VI , there should be no correlation between the two, as suggested by Beal.

The beneficial predators totalled 2.76 %; one Coccinellid was identified, and the remainder were Carabids or ground beetles. Cerambycid and Buprestid borers and their larvae totalled only 2.10 %, weevil 3.89 %.

FOOD OF THE RED-BREASTED SAPSUCKERS



Graph V. After Beal.



Graph VI. Original.



Other beetles averaged 4.86 %. Remains of Caddice Flies, Trichoptera, were found in two stomachs, amounting to an average of 65.00 % of the content of these two stomachs. Aphids were found in two stomachs, and other Hemiptera in a like number, totalling 1.79 %. Diptera averaged 4.10 %; these were all remains of Tipulid Flies or Crane Flies. A mite and spiders were found sparingly. Unidentified insects averaged 7.10 %.

#### Coleoptera

*Psyllobora taedatus.*

*Agonoderus pallipes*

*Dicerea*, species.

#### Hymenoptera

*Formica fusca*, var.

#### Vegetable Food : Fruit averaged 3.96 %; Elder-

berry ( *Sambucus glauca* ), Wild Cherry ( *Prunus*, sp.),

Haw ( *Crataegus brevispinus* ), and Dogwood ( *Cornus occi-*

dentalis ) were the four forms of wild fruits identified;

no cultivated fruits were taken. Seeds were almost a minus quantity. True cambium or soft inner bark averaged 31.35 %;

most of this was taken between October and April. Outer bark, fibre, and miscellaneous vegetable matter averaged 5.14 %.

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#### CONTROL MEASURES

There are a few preventative measures of varying merit. Fine wire netting has been used to protect the trunks of costly trees, but is too expensive to consider in

cases of large acreage. Good results are obtained by plastering cow droppings or fish glue over the trunks. In some cases grafting wax has been used to aid the tree in its recovery, and serves as a protective covering as well. Many disinfectant washes, etc, are used. Heavy whitewash, lime sulfur concentrate, and others are effective at times. Mrs. L. A. Banks of Roseburg used a dilute carbolinum paint with success; care must be taken that some strong toxic material is not used.

The gun is not recommended as a method of control for these birds. It is, in the hands of the unskilled, a destructive weapon. Due to the more confiding habits of the other Woodpeckers, the Sapsucker will probably be the least injured by a gunning campaign.

The recommended method of control is by poisoning (23). Two formulae are used. The first, originated by Elwood Cooper in California (17), is as follows : " Mix thoroughly one eighth ounce of powdered strychnine ( the alkaloid, not easily soluble, and therefore giving off no flavor ) with one pint of honey or syrup. Apply this to the tree just above or on the last row of punctures". This is a very effective method, very effective, also, in killing any bird or insect that samples it. Therefore, during the early spring and in the autumn, whenever there is no natural honey flow, this method would prove disastrous to all of the honey bees in the community, being more attract-

ive to bees than to birds. During the spring and summer when there is a full honey flow this method can be used with relatively small danger.

The Dearborn method (3) is better, and simpler. Powdered alkaloid strychnine is placed directly into the holes in the bark by means of a knife blade or straw. The small quantity that can be so placed in each pit will be effective for two or three days, which is generally as long as the pits will bleed freely. Using this method there is almost no danger of destroying the neighbor's bees, for relatively few bees are attracted to these bleeding wounds.

To some people these methods may seem cruel, yet are not so cruel as the gun in the hands of an irate landowner. By poisoning, one allows the victims to choose their own fate. Sapsuckers, a few tanagers, warblers, and hummingbirds, may be killed by poisoning; none of these species have great economic value. The gunner is most apt to bag a number of the Gairdner, Willow, Harris, or Modoc Woodpeckers; these will be of far more value than the few of those doubtful species which will be killed by the poison. Poisoning is also far cheaper, both in time and materials.

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### CONCLUSION

The Red-breasted Sapsucker is unquestionably injurious to the fruit grower, the owner of costly ornaments, and to the forests. It is not accurate to say that

every bird of this species is injurious, or that they are destructive at all times. However, when the Sapsucker does begin to pay unwelcome attention to expensive plantings, it is time to consider protective measures.

Injury is done in rather restricted localities, and to rather restricted or localized types of plants in each season. Few people will take the trouble to fight this bird; severe measures will be used only in those few instances where the bird is doing considerable damage ; that is, when a large money or time loss may be the result. Whenever such losses may be prevented, no person should be restrained from self-protection. Dearborn's poisoning method is the better method of control.

The pressing need is that the farmer and fruit grower should be made acquainted with the distinction between the true Sapsucker and the two previously discussed groups. In many instances the farmer or fruit grower is destroying his best friend under the misapprehension that the small black-and-white Woodpecker is a Sapsucker. Since all species are protected by law, the State Game Warden should be consulted, and should cooperate in the matter.

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DO OTHER BIRDS TAP TREES FOR  
SAP OR CAMBIUM ?

Other Woodpeckers occasionally borrow the habit of the Sapsucker, but only in rare instances do they take also the consistency and energy of that bird in the pursuit of the activity, and their work differs radically in its nature.

Mr. C. A. White (24) tells of watching a Red-headed Woodpecker tapping holes in the bark of a Sugar Maple tree on the Iowa University campus. The holes were as deep as those of the Sapsuckers, and the sap was flowing. The birds were observed to drink sap from the holes.

The California Woodpecker, a close relative of the last, has been observed (19) drinking sap from fresh holes in a live oak tree, although the ownership of the holes was unknown. Grinnell (14) records an instance in which a California Woodpecker drove a Sapsucker from the alder tree where it had been at work, and went the rounds of the fresh pits, drinking sap from each one. There is no available record of this species drilling its own pits.

The Hairy and Downy Woodpecker groups in the east are reported (16) in many instances as pecking needless holes in the bark. There are no available records of this being done by the Western types, although it is likely that they do so. The work of these groups is, as

a rule, easily distinguished. The bark pits often do not penetrate even into the softer bark layers, and very rarely into the cambium or wood-layers. These birds rarely work upon the bark when it is in a healthy condition, and even then are not consistent and energetic in their activity, as are the true Sapsuckers. It is very seldom that the work of the small woodpeckers becomes injurious. Many noted bird students vouch for the characteristic differences in the work of these two types of birds : the small Woodpeckers, and the Sapsuckers.

These woodpeckers are never known to return to such pits as they may make for further excavation of the bark, and are never recorded as visiting sap pits for the purpose of obtaining sap - at pits they themselves have made, although they are known to visit sap pits made by the Sapsucker in the East. In the case of these birds there is no cumulative injury, such as is true of the Sapsucker. During the field work on this problem no single indication of any such work on the part of the Downy or Hairy Woodpeckers was noted. Stomach analysis was rarely found to result in the finding of a quantity of cambium; what cambium was present was no more than is legitimately taken in the excavating for insect larvae, the favorite pastime of these birds. There are no records of trees or shrubs being injured by these groups of birds.

THE CALIFORNIA WOODPECKER

A.O.U. No. 407 a. *Melanerpes formiciv. bairdii*(Ridg.).

This group of birds was first collected in the northern part of Mexico by Bullock, and described by Mr. Swainson (2) in 1827. Later studies brought out other characteristics, and from specimens taken at Petaluma, California, and at Monterey, described by Lesson (1) in 1837, and by Vigors in 1839, in 1881 Ridgway obtained the present classification of the group (18). This bird is illustrated in Plate IV.

Description : Male : Feathers around the base of the bill and chin black, bordered with a band of white or pale yellow; crown red; sides of head, upper parts, and chest band solid black, sometimes with greenish cast; blue-black chest, streaked with white; rump, wing patch, and belly, white. The female varies only in that there is a black band separating the white or yellow of the forehead from the red crown. Length, about 10 inches.

Range : Breeds in the Upper Sonoran or Lower Transition zones of the Pacific Slope, from central Oregon to Lower California, from the Guadeloupe River, Texas, to the Coast. Rarely ranges north of latitude 44° in Oregon.

Distribution in Oregon : Gabrielson states the range of this species in Oregon as follows : " This species is found in a comparatively restricted area in southeastern

Oregon. It is quite common in various localities in the Rogue River Valley, less common in the Umpqua Valley, and I have seen it occasionally in the open valleys of Coos County. It is also known as a straggler from the Fort Klamath section and cannot be considered more than a straggler in any section of Oregon except that outlined above".

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### HABITS

In the oak forests of Southern Oregon and California one of the most common sights, and often the most abundant bird, is the California Woodpecker. It is a resident where ever found, although at its northern limits its movements are not regular, and it moves casually about over a moderate area north of its breeding range.

The California Woodpecker is an energetic, restless bird, rarely still for any length of time. It is very closely related to the Red-headed species of the east, and its flight and call are somewhat similar; too, like the eastern bird, it will sit for hours drumming a tattoo. It is a very sociable bird, and where ever found is generally colonial in habit. It seldom quarrels with any of its own kind, but seems to bitterly resent the impudence of any one invading its stores of food.

This food-storing habit, not peculiar to this species alone, is one of the marvels of bird activity. The



Red-headed Woodpecker of the East stores food in varying manners. The California Woodpecker drills holes into whatever is handiest : barn wall or beams, poles, sides of buildings, dead and partially rotted limbs or trunks of trees, or the thick bark of the pine or fir. In each hole an acorn is stored; see Plate VII, Fig. 1. These holes are drilled to fit the acorn, or else the acorns are fitted to the holes, for they are difficult to remove. In a few instances when acorns were scarce pebbles have been substituted.

This food storing work is a community affair, and is shared in by all of these birds in a community. They seem to carry on this work in a spirit of play, with all manner of diversion, tag, and bamboiling about from tree to tree. They choose only the sweeter acorns, a fact that can be proven in the field. At one time it was thought that these acorns were stored only as an insectary, as a great many acorns are found to be wormy. This idea is not accepted at present. The acorns are not always extracted from these holes before they are eaten; if they are removed they are taken to some crotch, stub, or pole, and firmly wedged into a crevice or fissure, where the bird can eat at leisure. These stores are sources of constant strife between these birds and the jays, squirrels, etc, which are sent hurriedly away from the vicinity.

Bendire (19) found this species very abundant in

the Rogue River Valley. On a trip from Fort Klamath to Jacksonville in 1883 he states that he found them soon after crossing the summit of the Cascades, in the oaks that are found abundantly on the western slope. Only once did he find them on the eastern slope; this was in an area of oaks on the shores of Pelican Bay. J. K. Lord found this species on the headwaters of the Deschutes River. E. F. Hadley (25) reported having seen them in the Coast Range Mountains of Tillamook County in June and July.

These birds are partial to canyons and foothills, rather than to the open valley floors, although found in colonies quite abundantly in the floor of the Rogue River Valley even at its widest points. Wherever found, it seems that some of the birds are continually in sight, and are very rarely passed by undiscovered; the characteristic call, "tchurr, tchurr ", may be heard in all directions.

The nests are generally quite high, and the hole opens on the underside of a partially dead main branch; the variety is sometimes cottonwood, sycamore, willow, etc, but oak is most commonly used ; poles are utilized where they are more convenient than trees. Both sexes incubate, and both sexes aid in the excavation of the cavity. The eggs number from four to six, and are pure white.

The leading complaint against the California Woodpecker is its acorn-storing habit, which may be extended to telephone, telegraph, or electric line poles, buildings,

etc., as well as to trees. When a dead tree is used there can be no resultant damage. When a living tree is used it is generally a pine or fir; in this case the bark is so thick that the holes bored do not penetrate to the cambium, and consequently no damage results to the tree.

Injury to telephone and other poles is great only in the imagination of the persons seeing the damage. The weakening of the pole due to the excavating of a nest cavity is much greater than that due to the storing of the acorns in the outer rim of the pole. There is no appreciable loss from this activity of the Woodpeckers. Injury to buildings is a matter of individual activity, and may occur in widely scattered communities; it may prove to be serious at times. These holes into enclosed buildings are often used as sleeping quarters as well as for nesting and for food storage. Henshaw (17) found a school house in Mendocino County, California, which was so seriously damaged as to be worthless. These injuries are not commonly serious. They appear to be individual traits not common to all of the birds in the locality. When such injury is persisted in by an individual, that bird has laid itself open to destruction.

#### Food Habits - Review.

In the study of food habits, Dr. Beal had 75 stomachs available for study. February, April, and July, were unrepresented. 22.43 % of the food was animal matter,

while the remaining 77.57 % was vegetable matter.

Animal Food : Beetles averaged only 3.00 %, most of which were eaten in July. No wood-boring larvae were found. Ants totalled 8.21 %, and other Hymenoptera added 6.88 % more, over half of which were taken in August. A few Hemiptera, including Black Scale, some grasshoppers, and a few caterpillars, made up the remaining 4.50 %.

Vegetable Food : Corn totalled 1.00 %. Fruits averaged 24.00 %, most of it pulp of the cultivated types, taken in August and September, and consisting mainly of over-ripe fruits of the larger varieties which could have had little commercial worth. Elderberries were the only wild fruit taken. Mast, mostly acorns, averaged 52.45 % of the annual food, being eaten during every month; in a few months it averaged near to 100.00 %. There was no evidence that worms were taken with these acorns. In a few cases almonds were taken, and stored in the manner of acorns.

Prof. Beal was faced with a difficult problem in formulating conclusions for this study. He stated that the food of this species is of very little economic importance. Neither can the bird be charged with destroying useful insects, or very large quantities of fruit. While it does eat some fruit, it is not numerous enough in the orchards to cause serious loss, and it does not move in flocks.

Beal stated that to save the almond crop in some localities in California where this bird was more common

than it is in Oregon, it was necessary to exterminate the species in that particular locality. He considered that the acorn storing habit was unimportant unless costly buildings were utilized, which is not a usual occurrence. From the aesthetic viewpoint the bird is unique and picturesque, and deserves protection.

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### PRESENTATION OF ORIGINAL DATA

#### Field Observations.

The California Woodpecker has proven the easiest of the series to study systematically, directly due to its residential status, and to its abundance in Southern Oregon. From Roseburg southward the writer has found these birds fairly abundantly where-ever oak trees are common. Mr. E. A. McCornack of Motor Route C, Eugene, has written that there is a large colony of these birds about his ranch, which have been there for some years. Mr. C. E. Stewart of Cottage Grove reports that they are occasional visitants there in late summer and autumn. None of these birds were seen above Peyton on upper Rogue River, nor were any seen in Klamath County, nor on the Coos Bay Highway west of Camas Valley.

The congeniality of these birds is amply proven by the fact that they are abundant in all of the city streets from Roseburg southward. A telephone pole one half from the main street of Medford, and alongside a public

school ground, is stored full of acorns from the ground to the top. Every pole along Oakdale Avenue, Medford, is utilized by these birds either for food storage or for nesting cavities.

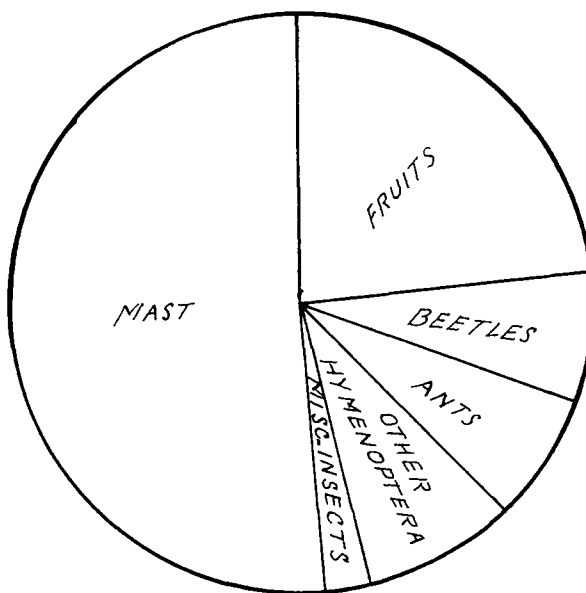
No complaints concerning injury to fruit were recieved. None of these birds were seen frequenting the orchards during the fruit season. The only fruit found in the course of stomach analysis was taken in December, and had no value. No complaints were made concerning losses in almonds, which are grown extensively in that area. The only complaints received related to damage to buildings. Most of the recorded life history was checked over in the course of this work.

#### Food Habits.

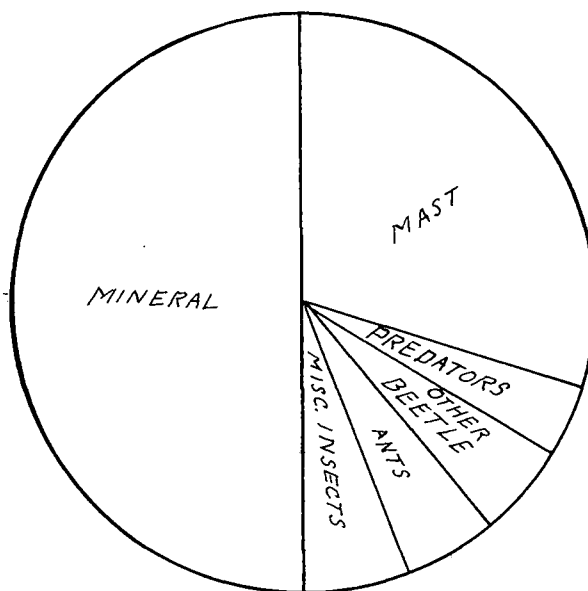
Collections represented every month in the year, and 72 stomachs were examined. All were collected in the heart of the Rogue River Valley. Vegetable food averaged 38.57 %; mineral matter or grit averaged 49.75 %; and the insect matter averaged 11.68 %.

Grit or Mineral Matter : Nearly every bird in the list was found to contain a large quantity of grit. As high as 100.00 of certain stomachs was this item. Very few drab or dark colored gravels were found; most of this mineral matter was white, pink, green, or some other very showy color which had proven attractive to the bird. In percentage, the white quartz gravels were by far most num-

FOOD OF THE CALIFORNIA WOODPECKERS



Graph VII. After Beal.



Graph VIII. Original.

erous, averaging possibly 80.00 % of the total of 49.75 %.

Insect Food : Predatory beetles averaged 4.30 %; these were entirely Carabids or ground beetles. Leaf-eating Scarabids were sparsely taken. Weevil averaged 1.83%. Of Chrysomelids only a trace was found. Buprestid borers averaged 1.18 %. Unidentified beetles averaged 1.75 %. The larvae of beetles were rarely taken; only a few individual larvae were found, and the percentage was very small. Ants totalled 5.18 %; in June they reached 22.30 %, and in a few stomachs ran as high as 70.00 %. Other Hymenoptera were only a trace. Diptera, mostly Crane Flies, were also merely a trace. Miscellaneous insects averaged 2.13 % ; among these was one Scorpion Fly or Mecopteron.

#### Coleoptera

Aphodius pardalis.

Agonoderus pallipes.

#### Hymenoptera

Camponotus maculatus, var.

Vegetable Food : Fruit averaged less than 1.00 %, all taken during December, and of no commercial value. The seeds of manzanita ( Arctostaphylos ) averaged 3.50 %, as high as 40.00 % being recorded in certain months. Acorn or mast was the commonest vegetable food, averaging 2989 for the year; mast was the most consistent item of food. The miscellaneous vegetable items, 4.39 %, was rubbish, bark, and etc.

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### CONCLUSION

This bird is distinctive, and, aesthetically speaking, undoubtedly merits protection. Strictly speaking, its economic status is very nearly neutral, but it may be given the benefit of the doubt and called slightly beneficial. It is not an inhabitant of orchards. It is not abundant in the orchard areas in any locality excepting the Rogue River Valley, and is not over-abundant there. Most of the insects it takes are harmful. Generally speaking, it is well liked by the people of the Valley.

When one or more of these birds become neighborhood nuisances and begin to drill countless holes in the buildings, it will become necessary to kill off the annoying individuals. When they do not attack buildings they should be left strictly to their own devices. This is relatively the treatment that is now accorded them in the area in which they are abundant.

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THE LEWIS WOODPECKER

A.O.U. No. 408. *Melanerpes torquatus* (Wils.).

This splendid bird was first discovered by the men of the Lewis and Clarke Expedition of 1804-6. It was first seen about 12 miles northeast of Helena. Mont., according to Lewis's diary. The first description is in the Journal of Patrick Gass, one of the party, and appeared four full years before Wilson named the bird, and over seven years before the official Journal of the Expedition appeared.

Description : This species is mono-generic, and is the most remarkable of its kind. In appearance it is : "shining black above, with a greenish bronzy lustre; face, including extreme forehead, space above eye, cheeks, and chin, rich carmine or ox-blood red; a collar around the neck, continuous with the breast, hoary ash; this ashy mingled intimately with carmine or spectrum red on the remaining underparts, save thighs, flanks, and crissure, which are black; feathers of nape and underparts black and compact at base, but finely divided on colored portion of tips, each barb lengthened and bristly in character. Bill and feet black; length from 10 to 12 inches. Illustrated in Plate V .

Range : Breeds in the Transition and Upper Sonoran zones from the Black Hills of the Dakotas to the Pacific.

Casual in eastern Kansas (26) and Oklahoma (27).

Distribution in Oregon : The range of this species in Oregon, stated by Gabrielson, is as follows : " It is found throughout the state in the more open country. It is very common in eastern Oregon in most sections except the heavily timbered districts and the dry desert country. It is less common, but found regularly throughout the Willamette Valley and is abundant in the Rogue and Umpqua Valleys. It is also less common in the coast country, but I have seen it in Tillamook, Lincoln, Coos, and Curry counties, in the open valleys. Therefore, the bird may be said to be found throughout the State.

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### HABITS

The Lewis Woodpecker is a memorable bird; once seen, it will never be erased from memory. The writer's acquaintance with this exotic brilliant woodpecker began in the mountains of Colorado, and even now the thought of this bird calls to mind the picture of that bleak, wind-blown area at an elevation of 8,500 feet, where these birds were very much at home in the dead trunks of spruce and hemlock that had once covered the mountains. In Oregon it is more intimate, more civilized, yet peculiar to the mountain meadows and burns on the Cascade slopes.

Due to its great difference from the others of its race, more data is available concerning it than the

others. Generally speaking, these birds are migratory in Oregon, although numbers of them winter in various sections of the state, and even into Washington in mild seasons. A great deal of the migrational movement is altitudinal and local in nature.

Bailey (9) called these birds 'erratic wanderers'. This is an excellent characterization; they are here today, gone tomorrow; wintering abundantly one season, but totally absent the next. It is a semi-gregarious species, first so-called by Suckley (4), in winter flying singly, but keeping more or less flock formation. Nuttall (11) spoke of seeing a flock of 10, about 60 miles up the Wahlamet, and said that the flocks arose as one when a single bird became alarmed.

Its notes are few, but distinctive. It has a very characteristic harsh call, rarely uttered in summer. In autumn, when flocks are moving, they keep up a constant chattering. Nuttall, however, spoke of extreme shyness and silence, while Dawson (12) said that they reminded him of children playing tag.

In activity it is also characteristic. Its traveling flight has none of the undulatory motion of the true woodpecker, but is a labored flapping, resembling the flight of the Jaybird. In gathering food, most of which it takes on the wing in true flycatcher fashion, another aerial fancy is expressed; after perching for some time

upon the top limb of some dead tree the bird will suddenly dart into the air, perform several peculiar circular gyrations, then, spreading its wings horizontally in the manner of a hawk it will soar back to the identical perch it quitted.

These birds love the hottest sunshine, and are commonly found perched in the tiptop of some tall partly-dead tree, whence they scan the air for insect food. They rarely sit vertically upright on a branch as do other types, but perch cross-wise with ease. They seldom climb up the trunk or branches, although perfectly capable of doing so, and are rarely heard tapping upon the tree or branch.

The nest, often in the same excavation for several years, is excavated in the top of a tall dead pine or fir, or in a partially decayed limb of cottonwood, oak, or other deciduous tree. The nests are usually high, although they may range from 4 to 100 feet. On the breeding ground the Lewis is stupid and sluggish, paying very little attention to any intruders. It is not a bird of the deep forests; when found in such associations it generally frequents the edges of burns or the borders of the meadows. It frequents the cottonwoods in the lowlands along the Willamette. Bendire stated that he found it more common near Camp Harney in the Blue Mountains than at any other point.

Bendire also described concisely the food habits

of the species, enumerating many of the wild fruits it ate, and stated that while it did some damage to orchards, this loss was more than repaid by the noxious insects taken.

This species, of all its kin, moves in flocks in the autumn. After the nesting season it gathers up into flocks of from 10 to 300 or more. In such numbers it drops down into the fruit districts of Southern Oregon and of Northern California, and disaster results. Merriam (29), Myers, and Ferry (30), besides many other writers, have spoken of the huge flocks in Shasta and Siskiyou Counties, California, which were fought bitterly by the orchardists of that area.

In the eastern Oregon area where fence posts are more abundant than trees, these birds use the posts as the vantage point from which they feed, and during the winter season they may be found at times quite abundantly far from wooded areas. This species is recorded (31) in Colorado as storing acorns, although in a different manner from the last species. Another man, quoted by Beal (21), mentions this fact, without substantiation. Very recently, Michael (37) has given definite data concerning this activity. The species is, however, known to gather up various articles of food, such as cherries, wild fruits, Mayflies, and grasshoppers, sticking them into crevices in posts of the fence line, or into cracks in the bark of trees until it is ready to use them.

### Food Habits - Review.

Beal, in his California study, had so little material that he refused to commit himself. However, he quoted Merriam (15) : " These Woodpeckers are very fond of ripening apples, and in early September descend in flocks upon the orchards, particularly those of the higher foothills, and in certain cases, if let alone, destroy practically all the fruit. At Beswick, Siskiyou County, they are so destructive that during the ripening of the fruit gunners are employed to shoot them, and frequently kill 25 in a day -----".

In a later work, Beal (21) discusses the species thoroughly. He mentions one case in Washington wherein the birds tore the paper at the corners of packed boxes of apples left in the orchard over night, picking into every apple within reach, and causing the repacking of every box attacked. He also quoted a letter from Alameda County, California, to the effect that these birds were observed picking the codling moth larvae from apples on the trees in September.

In the stomach analysis, 59 stomachs were available for study, collected from Montana to California, and so irregularly scattered throughout the year as to be very unsystematic. Animal food constituted 37.48 %, while the vegetable food averaged 62.52 %.

Animal Food : Beneficial or predatory insects totalled

6.72 %; these were Carabids and Coccinellids. Other types of beetles averaged only 2.40 %. No beetle larvae were taken. Ants averaged 11.87 %, and other Hymenoptera added 11.57 %. Bugs, or Hemiptera, averaged only 1.36 %. A few grasshoppers made up 3.20 % of the total. No caterpillars were found. Miscellaneous insects made up about 1.00 %.

Vegetable Food: Corn totalled less than 1.00 %. Fruit, supposedly cultivated, averaged 10.90 %. Wild fruits, including elderberry, holly, serviceberry, haw, dogwood, and wild cherry, averaged 14.55 %. The largest item of food was acorns, averaging 34.46 %. Seeds of poison oak and of amaranth made up 2.05 %.

Professor Beal drew no definite conclusions, but stated that considered as a species the Lewis Woodpecker showed very beneficial tendencies. Its taste for fruit was insufficiently studied, and further work was recommended. Only one of the many students mentioned the taking of grit. Dr. Suckley (4) speaking of a bird collected at Fort Dalles, stated that its stomach was filled with grubs and small white gravels.

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### PRESENTATION OF ORIGINAL DATA

#### Field Observations.

The phases of the life history of this species which have been touched upon in this preliminary study of the species have proven very interesting. They have opened



up to the writer many new lines of study which would prove very enlightening.

The question of migration and distribution has proven complex, yet interesting. During the winter of 1924 - 5 these birds were very abundant in the Rogue River Valley with its surrounding foothills. They nested in considerable numbers at widely varied points. However, in early July, 1925, Mr. Richardson observed that they were moving slowly toward the higher altitudes, passing over his ranch at Peyton.

During July none were seen in the Valley, except a few absolute residents which have not varied their location during the past 21 months. Inquiry among the foresters and rangers brought out the fact that the birds were well up toward the summit of the Cascades. On August 14, a flock of 30 birds was observed in the huge burn at Silver Camp, just above Union Creek. On August 16, one bird, and on August 23, two birds, were noted passing over Peyton bound in the direction of the Valley. On August 17, these birds were found fairly abundant in the meadows on Huckleberry Mountain, near the boundary of Crater Lake National Park. By August 25, they were quite abundant at Peyton.

On August 29, the writer, accompanied by Mr. Richardson, made a trip to Lake of the Woods, Klamath County. Just south of Ashland a few scattered individuals were seen. As the Cascade summit was approached many were seen in the

open fields and meadows. In the flats near the lake, and in the open meadows near Rainbow Creek, numbers were found feeding upon the mountain huckleberries. Returning to Ashland on September 1, huge flocks of these birds could be seen moving steadily toward the lower Valley.

On September 4 they were abundant from McLeod to near Union Creek. None were seen in the Crater Lake area, nor northward toward Diamond Lake. On September 7, they were found very abundantly in the yellow pine area between Sand Creek and Fort Klamath.

On September 7, also, the growers in the vicinity of Medford reported the arrival of the first birds there. Flocks were present until September 19, when almost every bird in the area disappeared. A few scattering individuals were left in various foothill areas, but these left during November. The areas in which they wintered so abundantly during the 1924-5 season were totally deserted during the 1925-6 season, and not until spring did they return to this area.

This distributional study has resulted in so diverse data that it arouses curiosity. Erratic wanderers as they may be, Dawson (12) was surely correct when he said that their movements were subject to little understood fluctuations. Food supply is advanced as a factor; it may be a partial cause; in 1924 the acorn crop was especially heavy, while in 1925 it was very light.

The movement toward the Cascades, and across to

the eastern slope causes another question to arise. Numbers of people have asked the reason for this movement. The area of greatest abundance is located east of the Cascades; this statement is made by Bendire, and was found correct during the course of this study. Years ago, when there was little cultivated fruit in the Rogue Valley, it is quite possible that there was no such eastward movement in late summer. However, when the fruit industry developed in the Rogue River area, the birds began to move westward in the autumn, then a few began to remain over winter, and later they came to nest there; but after the young are reared they follow instinct and move back toward the old range. This is mere theory, but has been suggested by old-timers in the area.

Flocking is still a factor. It seems probable that the flocks today are not so large as they once were, yet one grower near Medford states that they are constantly increasing, and Dawson (32) states that they are increasing in the Yakima Valley. At any rate, the flocks are sufficiently large to cause consternation among the growers of the foothill area. Flocks of from 6 to 300 were commonly observed; far more than that number were seen flying toward Ashland on September 1, the flight being almost continuous, and covering a wide area.

Mr. W. E. Sherwood of Eagle Point told the writer by letter of seeing these birds utilize fence posts in the Imnaha Canyon. In crevices of the posts he found egg shell,

snail shells, insects, cherry pits, and live Salmon flies. About the base of the posts he found snail shells and some cherry pits. The salmon flies were alive, and wedged into the crevices. Willis Boegli of Culver, Jefferson County, told the writer of the manner in which these birds carried off cherries and wedged them into cracks in the posts. He described them as being very destructive in that area, as orchard plantings are very limited. These birds were seen carrying cherries for nearly one half mile from the trees to a line of fence posts near their nest between Corvallis and Albany, in June, 1925.

Complaints against these birds are numerous in the Rogue River Valley. The activity of the species touches the sorest spot : the pocketbook. Tables III, IV, and V attempt to briefly summarize the minor complaints against this species. A few charges are here quoted verbatim, in order to fully elucidate the charges made.

S. D. Hill, Medford, wrote : " In some sections and seasons they will destroy carloads of fruit, especially in orchards near the timber. I have known them to do 50. % damage to a pear crop in the Peyton district on upper Rogue River". Jackson Gyger, Ashland, wrote : " In 1924 the loss on Spitz and Delicious apples was about 75. %, on Newtowns about 15. %; Bosc and Anjou pears about 10. %. The loss near oak timber was nearly 100. %. This season (1925) by hunting them every day the loss was possibly 50. % less.

I bought \$ 18.00 worth of ammunition to combat them this year. One man can not keep them out of a seven acre orchard, as they will work on one end while you are scaring them out of the other ",

T. B. Farmer, Rogue River, wrote : " They always do much damage to pears, late peaches, and apples, alternating on corn. They rip up the husks and eat a 2-inch strip. I would estimate all damage conservatively at 5.00 % ". Mr. O. V. Richie, Ashland, wrote that in 1924 if he had not shot continuously they would have cleaned out the crop.

These complaints can not be totally over-looked. The stomach analyses show only the volume of fruit eaten, not the percentage of fruit damaged per tree, nor the real loss to the orchardist. This, the writer attempted to study in the field. Unfortunately for this type of work, the 1925 season was the one of unusually low numbers; this scarcity of the birds must be remembered in considering the complaints, also, for the damage was relatively low.

A flock of close to 100 birds frequented the Belmont Orchards, near Medford. This orchard, illustrated in Plate XIV, Fig. 1, is a typical foothill orchard such as is frequented by these birds. Mr. Fitch, the owner, a keen bird student, began to harvest his crop of Bosc pears on September 10, three days after noting the first of these birds. He used a large crew, and carried a shotgun as he supervised the work, attempting to frighten them away. However, after such precautions, he lost an approximate 7 %

of the crop, due to the activity of these birds.

On the Richardson ranch at Peyton the writer inspected apple and pear trees on which these birds had worked from August 17 till September 19. Two trees of Red-cheeked Pippin, with a possible crop of 30 boxes, were closely inspected; in the top two thirds of the trees the damage was close to 75.00 %, and many of the lower fruits were damaged. Plate XIII, Fig. 1, shows this injury. Trees of Bartlett, Anjou, and Howell pears showed a conservative 10. % injury. A few trees of prunes, unharvested, showed much injury.

On the J. H. Darby ranch, near Medford, there were about 30 of these birds. Mr. Darby considered the loss to his Comice pears to be fully 5.00 %. In this orchard the writer made counts of the injured apples on some trees in a large orchard. The data is given in Table II, and the fruit from one tree is illustrated in Plate XIII, Fig. 2. These trees were in a large orchard, on the side away from the oak timber. The fruit was of good quality, and would have filled boxes rapidly. No injury was found on the larger portion of the orchard, of the Yellow Newton variety.

On this ranch these birds were seen in a corn field. Since several instances of this type had been noted, their activity in this field was investigated. Inspection showed a serious infestation of Corn-ear Worm, *Heliothus obsoleta*, and counts were made to determine the part played

by these larvae.

Eight rows next the fence, each approximately one eighth mile long, were selected. Out of about 2,600 ears of corn inspected, only 60 had been touched by the birds, or an approximate 2.00 %. Of this number, 52 ears had contained worms, while 8 ears were perfect. In 35 instances the birds disturbed no grains, but ripped open the shuck and took out the larva. In 17 instances they had eaten a few perfect kernels from the area around the worm injury. This study leads one to believe that complaints concerning damage to corn in the field may be over-estimated; in this case the percentage of perfect ears tampered with was less than 0.35 %, and the birds had proven their taste for a very destructive insect pest.

The writer has yet to find any evidence that any bird digs the codling moth larvae out of a fruit, as was suggested to Beal by some Californian. Inspection of hundreds of partially eaten fruits taken from neglected trees alive with codling moth has failed to bring forth any such evidence. Even if this be true, it is not a desirable factor, for the wormy apple may be used by the cannery or vinegar plant, while the bird pecked apple is too quickly rotted, and has absolutely no value.

#### Food Habits.

During the 1925 season, specimens were collected from the Klamath and Rogue River areas, but only four were

taken in the Willamette area. A total of 60 stomachs were available for study, representing nine months of the year. None were taken in January, July, or December, due to the odd movements of the species which took them beyond the reach of the collectors. The laboratory analyses showed 26.15 % mineral or grit, 30.05 % insect or animal matter, and the remaining 43.80 % vegetable matter.

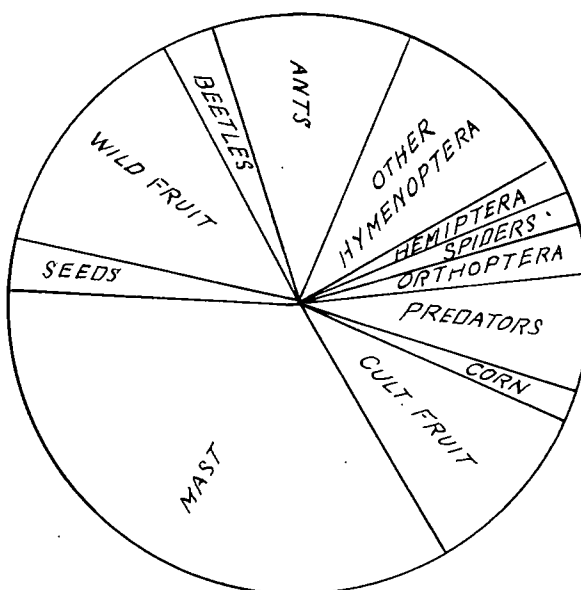
Mineral : Found in the stomachs of this species, was almost identical to that found in the last species. 75 % of the grit was shining white, and very showy to the eye. As high as 98.00 % of certain stomachs was composed of this gravel. The summer specimens had a much lower percentage, and the four taken in the Willamette Valley did not contain any gravel.

Animal Food : Predatory insects were eaten to the extent of 1.84 %, ( Graph X ). This total was made up of Carabids or ground beetles, Coccinellidae or lady-bird beetles, one Syrphid Fly, and one Ichneumon Fly. Weevil were taken during the autumn, averaging 6.78 % . Buprestid borers, Scarabidae or leaf-eating beetles, and other beetles, averaged 2.82 %.

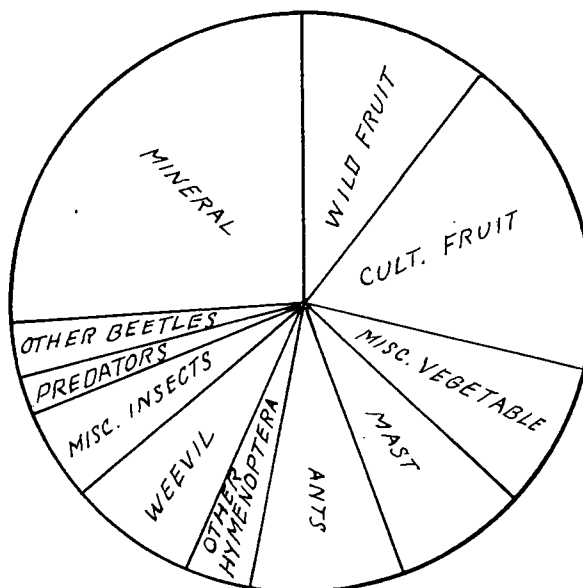
Traces of beetle larvae were found during August. One grasshopper was taken in May, one cricket in August. Squashbugs or Coreidae represent the Hemiptera, found in only four stomachs. Flies were rarely taken. Ants totalled 9.33 %, while other Hymenoptera averaged 2.96 %. No cater-



## FOOD OF THE LEWIS WOODPECKERS



Graph IX. After Beal.



Graph X. Original.

pillars were found. Miscellaneous insects averaged 4.53 %; among these was one Water Boatman, Corixidae.

#### Coleoptera

*Coccinella sanguinea*.

*Adalia bipunctata*.

*Hippodamia convergens*.

*Coccinella 9-notata*.

*Anates 15-punctata*.

*Hippodamia 13-punctata*.

*Agonoderus pallipes*.

*Helops edwardsii*.

*Temnochila virescens*.

#### Hymenoptera

*Camponotus Merculeanus*, var.

*Campon. maculatus vicinus*.

*Liometopum apiculatum*, var.

*Aphaenogaster subterranea*, var.

#### Hemiptera

*Acrosternum hilaris*.

Vegetable Food : Corn was found in several of the stomachs taken in September, and averages 1.30 %. Cultivated fruit amounted to 62.20 % of the total amount of fruit taken, or 18.35 %. This fruit was all apple and pear pulp, taken from commercial fruit. Wild fruits averaged 11.21 %; eight groups were represented : *Vaccinium parviflora*, *Crataegus brevispinus*, *Cornus pubescens*, *Cornus nuttallii*, *Arbutus menziesii*, *Amelanchier alnifolia*, *Sambucus glauca*, and one each of the *Ribes* and *Rubus* groups. Mast averaged only 7.30 % of the food. Seeds of *Arctostaphylos*, and a few unidentified seeds averaged 1.64 %. Miscellaneous vegetable items, rubbish, bark, cambium, etc., made up 5.26 %.

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### CONTROL MEASURES

There is no easy method of disciplining this bird. Pearson (33) drew a moral, saying that cultivated fruits may be protected by the preservation of native wild fruits in the vicinity of the orchards. It is the judgement of the writer that this method would have no effect in the present case, although very effective with the next species. On the date of the height of migration westward toward the Valley from the higher altitudes, wild berries and fruits were still super-abundant at high altitudes, and the weather was balmy and summerlike ; even the most exotic birds were still in residency. The writer saw these birds sit about in both Madrona and Elderberry trees, using them as perches between trips to cultivated fruit trees, without touching the fruit they contained. One food, only, drew these birds from the apple and pear trees; this was the seed of the Sugar Pine.

The gun is the only method of control, and it should be used with judgement. It is a very expensive and inefficient method, as related by many of the growers. Many growers told the writer that gunshot only drove the birds to the opposite end of the orchard where they continued to feed unconcernedly.

It seems criminal to kill such a beautiful bird, and many ornithologists are not yet convinced of the case. Yet at times extreme measures must be adopted.

### CONCLUSION

From the results of laboratory analyses one must conclude that the Lewis Woodpecker is beneficial in its selection of foods. Speaking of the species throughout its great range, that conclusion would hold good. Its food includes a great many injurious insects such as weevil, the borers, leaf-eating beetles, etc. Its exotic beauty and picturesqueness add to its claims for protection.

In most of Oregon it does not become an economic question. During the breeding season it is so scattered as to cause no more loss than any one of numerous others of the common birds. Only in autumn when the flocks gather into the valleys is it really injurious. It is so uncertain and whimsical in its movements that no man can foretell where or when it will arrive in damaging numbers.

In Oregon, although it sometimes becomes a nuisance in the small fruits plantings of various areas, it directs the brunt of its activities toward the Rogue Valley; there it flocks in the greatest abundance. It rarely goes into the open valley floor, but remains in large numbers on the outskirts : in the rolling foothills. The greatest concentration occurs in the area south of Medford, where the valley narrows considerably, and from Talent and Phoenix to Ashland, and southward; the flocks are very large, and concentrate into a small area.

In this area there can be no question of the status of the Lewis Woodpecker. If the birds would finish each fruit injured, there would be little complaint. But this bird is restless, energetic, and always moving about; one stroke of the bill ruins a fruit for commercial use. If one were to allow only one bite for each fruit, some of the stomachs studied would have contained the remains of as high as two bushels of fruit.

In these restricted areas the Lewis Woodpecker is a pest, varying from year to year in abundance, but very essentially a nuisance. Even Dawson, ultra-conservationist, admits that they need disciplining. Permits for the control of such pests are provided for under the state and Federal laws, and may be obtained by consulting the State Game Warden; He should be consulted before-hand in planning the autumn campaign. At no time, and in no area should this species be removed from the protected list and placed for extermination ; it is too beneficial, when in normal numbers, for such treatment.

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### THE FLICKERS

Three types, possibly four, of the Flickers are found in Oregon at various times, as well as various hybrid combinations representing inter-breeding between types.

#### The Northern Flicker

A.O.U. No. 412 a. *Colaptes auratus luteus* (Bangs).

This Eastern representative quite frequently invades the state of Oregon, coming from the northward, where it works across the Rockies from central Alberta. This is the typical 'Yellow-hammer' of the East. Possibly one dozen of these birds were seen in the vicinity of Corvallis during the severe weather in the winter of 1924-5. None have been seen since that time, as only during the more severe weather do these birds move so far southward.

Some authorities recognize a second yellow-winged form which may enter Oregon. This is the Boreal Flicker, *Colaptes auratus borealis*, which ranges in the far North, and rarely comes south of British Columbia. It is very possible that both of these forms may enter Oregon at times, the first type on the east side of the Cascades, the latter type on the west side. This question has not been decided.

#### The Red-shafted Flicker

A.O.U. No. 413. *Colaptes cafer collaris* (Vigors).

The original Red-shafted type was collected in Mexico by Bullock, and described by Swainson in 1829 (20).

The present type was separated from the Mexican type by Vigors after study of specimens collected near Monterey, California.

Description : Male : Ground color of head and body brownish, back barred and underparts spotted with black; rump white, and tail black; no nuchal band; moustache mark red; chest marked with black crescent; under side of wings and tail red. The female is the same, except for a buffy or brown moustache mark.

Range : The Rocky Mountain area from British Columbia south to Mexico; west to the Coast Range in Oregon, and to the Pacific in California (9).

#### The Northwestern Flicker

A.O.U. No. 413 a. *Colaptes cafer saturator* (Ridg.).

This form was among the skins brought to Captain Cook at Nootka Sound in 1786. It was not until late in the last century, however, that the present division of types was made by Ridgway.

Description : Very similar to the last described type, but darker.

Range : The humid Transition and Canadian zones of the Northwest coast from California to Sitka, Alaska.

Note : The Northern and Boreal Flickers are easily distinguished from the others by their yellow underparts. The two Red-shafted types are difficult to distinguish in the field; they interbreed, and inter-mingle at the edges of their range. A great many variations are seen.

Distribution in Oregon : The range of the last types, as stated by Gabrielson, is as follows : " The Red-shafted Flicker is found throughout eastern Oregon and is the most abundant woodpecker found in that section. It is found from the eastern slope of the Cascades to the Idaho line and throughout the state north and south. The Northwestern Flicker is found in Western Oregon and on the western slope of the Cascades. Birds in the Rogue River Valley grade off toward the Red-shafted type, but I have seen too few of them to be able to say which form they approach most closely. In both sections of the state hybrid forms and intergrades between this and the Eastern Flicker are found more or less commonly.

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#### HABITS

Bendire (19 ) states that the Northwestern type is found only on the summit of the different mountains west of the Cascade summit during the breeding season, while in the drier low-lands such as the Willamette, Rogue, and Umpqua Valleys it is replaced by the true Red-shafted type. However true this statement may be in general, it is too arbitrary to hold good, for there is a great deal of intermingling of the two types.

The 'Yellow-hammer' is one of the commonest of the Woodpecker family, known by nearly every person who knows any bird. The colloquial name, is of course a misnomer, for



only the eastern forms are 'yellow-hammers'; but the name was brought west by the settlers, and has stuck tightly.

The Flickers are pre-eminently drummers; the rolling tattoo is a common sound in every rural and village community. Dry limbs, fences, posts, and buildings, are utilized freely. It also learns to utilize sheet iron or tin roofing, smoke stacks, cornices, etc, which have a far greater sounding capacity than the dead limb. When a Flicker locates a metal sounding board close to some dwelling house, it beats a morning reveille at the first sign of dawn; in many instances sleep is impossible after dawn, due to the noise of these birds. They also have a variety of calls, widely known and recognized.

The Flickers are the most sociable of our woodpeckers; rarely are they on bad terms with other birds or with people. They are especially demonstrative during the courting season. It is amusing, almost ridiculous, to see two or three males addressing a shy and demure female. They display a pantomime of shy advances, retreats, sidlings back and forth, and play at coquettishness; yet in few cases do the males work themselves into such a state that fighting occurs.

These birds nest where-ever their fancy strikes. Bendire (19) records that in Iowa a pair were known to make their nest in a haystack, and that another pair nested in a hole in a creek bank near Nicasio, California. Taylor (34)

also records a nest in a haystack, in Nevada. The favored nesting sites are holes in stubs or stumps of trees, such as cottonwood, willow, sycamore, juniper, oak, pine, fir, and others. The eaves and sides of buildings, steeples, etc., posts, poles, and nest boxes, are utilized as they become convenient. The height ranges from the ground to 100 feet. The eggs are large, pure white, and number from 4 to 10. In one case, wherein one egg was removed each day, one bird deposited a single series of 72 eggs.

The Flickers are at home from the Coast to the limit of trees, being especially fond of wooded foothills, or the banks of streams where rotten stubs abound. A common resident of all settled communities, where trees or posts are not available, the birds will fall to upon any building. Nesting facilities are furnished by beams and rafters in the walls of weatherboarded buildings. The only complaint against this bird is this damage to buildings. These birds seem to revel in drilling such holes in the eaves, roosting within the weatherboarding; during the winter they roost within such holes, holes in trees, or may cling upright to the inside of the barn wall or silo; they sleep soundly while clinging to an apparently smooth wall.

Dawson (12) mentions four possibilities for the occurrence of the yellow-winged types. Three of these are also possible explanations of the hybrid types. These are :  
(a) a true Boreal or Northern Flicker, from Alaska or from

central Alberta; (b) a hybrid between one of these, most likely the Boreal Flicker, and the Northwestern Flicker, which inter-breed in northern British Columbia; (c) a true hybrid between the Red-shafted and the Northern Flickers which intermingle in the plains of Alberta; or (d) it might be a true diorphic phase of the resident forms; this is a very rare occurrence, however.

The Flickers are in some ways even less like a Woodpecker than is the Lewis Woodpecker. They perch cross-wise upon some limb or branch with ease, although often seen in normal position, vertically. They spend much of their time upon the ground, and consequently their food consists largely of ground-inhabiting forms such as ants and weevil. They are abundant in all farming country.

#### Food Habits - Review.

Professor Beal's study in California covered 118 stomachs of the two western types, taken in every month excepting January and May (15). The study showed 54.00 % animal food and 46.00 % vegetable food.

Animal Food : Beetles totalled 3.00 %; most of these were harmful, although a few were predatory Carabids; the destructive species were weevil, Elaters, and others. Ants averaged 45.00 % of the years food; as high as 5,000 ants were taken in one stomach. Other Hymenoptera totalled only 1.00 %. Miscellaneous insects, including caterpillars, crickets, spiders, and others totalled only 5.00 %.

Vegetable Food : Acorns formed 10.00 % of the yearly food; a trace of the English Walnut was found in one bird. Grain amounted to 4.00 %, and included rye, corn, barley, and oats. Fruits averaged 15.00 %; the varieties identified were pear, apple, grape, cherry, and prune. Very few complaints are recorded against these birds, and it seems that most of this fruit must have been taken after the normal harvesting season, therefore was of no commercial value. Wild fruits included the pepper berry, sumac, and elderberry, also some form of Rubus. Seeds, mostly poison oak, and weeds, made up, with the miscellaneous vegetable rubbish, a total of 17.00 %. The Flicker is thought to be very instrumental in the dissemination of poison oak.

Prof. Beal stated as his conclusion that these birds are very beneficial, and should be protected and encouraged. He did not, however, condone the damage done to buildings, which must be prevented by any means that will prove efficient.

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### PRESENTATION OF ORIGINAL DATA

#### Field Observations.

The present study has not covered so wide an area as Prof. Beal's work, yet was sufficiently systematic and extensive to outline the status of these birds in Oregon.

The only complaints recieved against these birds were regarding damage to buildings. These complaints are,

at times, actuated more by annoyance at the noisy jubilation of these birds than at the actual damage sustained. In some cases the placing of a few large oblong bird boxes which in general roughly resemble the tree-cavity will act as an inducement for the bird to desert the buildings. If such measures do not succeed, then more severe must be used. The Flicker will utilize a great variety of nest boxes.

The Flickers have even more beneficial habits than were touched upon in the present laboratory work. In a great many instances they are known to feed upon the larvae of the codling moth (35) (36), having been reported by a great many students; an occasional Flicker visited the trees on North Twenty Fifth Street, which are mentioned in the first chapter, and in Table I. It is reasonable to say that a great many larvae of this pest fall before these big Woodpeckers.

Mr. W. M. Petri, Talent, recommended the Flicker very highly. : " I have seen the Flickers work for days on the peach trees, low down near the ground. I began to wonder what they were doing; upon investigation I found that they were digging out the borers just at the surface of the soil ". If this observation be correct, this is a valuable service to the fruit grower.

Several birds were collected which had a partial red nuchal band; this showed a strain of the blood of the Eastern types, although in every other way the specimens

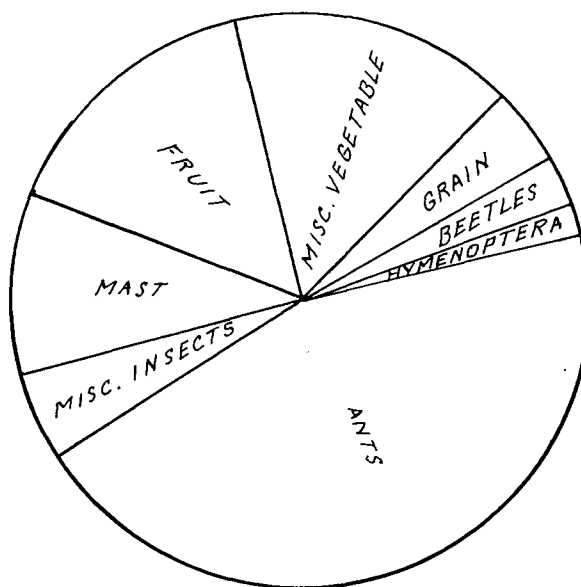
were typically western. No specimens of the yellow-winged types were taken, as the season during which the collecting was done was too mild. The Flickers are slightly migratory, yet are so abundant, and so widely distributed, that this seems to make no apparent difference in numbers; it is mostly an altitudinal movement.

#### Food Habits.

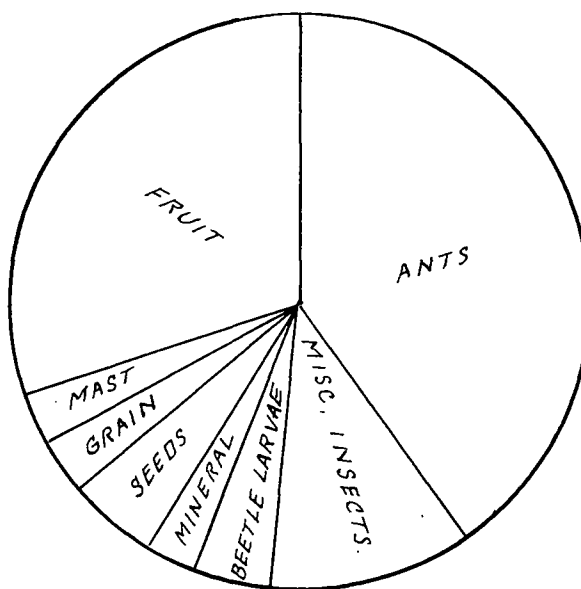
In the present study 62 stomachs were available for study. These represented both the Red-shafted and the Northwestern types. The Rogue River, Klamath, and Willamette Valley areas were represented, and each month in the year was covered. Animal food was found to compose 52.12 %, vegetable food, 44.58 %, and dirt and mineral rubbish, 3.3 % of the years food; the mineral was all taken when digging for ants, and was surface soil, with very little grit.

Animal Food : All beetles averaged only 1.61 %, of which predatory Carabids were only a trace. Beetle larvae averaged 3.63 %. Ants were the largest item of food for the year, averaging 40.30 %. They were taken during every month of the year; several stomachs held over 2,000 ants, and many of them contained over 500. No other Hymenoptera were found. A trace of caterpillars were found, and some of these were codling moth larvae. Crickets completely filled some of the stomachs in the autumn, averaging 1.80 percent for the year; grasshopper was found only in one. Aphids, and one squash bug, were the only Hemiptera found.

FOOD OF THE FLICKERS



Graph XI. After Beal.



Graph XII. Original.

Only two birds had eaten these. Diptera, Crane Flies, were about 1.00 %. Miscellaneous insects averaged 2.00 %. Some spiders averaged about 1.00 %.

#### Coleoptera

*Dicerea sexualis*.

*Platynus piceolus*.

*Agonoderus pallipes*.

*Blaptistinus lecontei*.

#### Hymenoptera

*Tapinoma sessile*.

*Camponotus macul. vicinus*.

*Camponotus herculeanus*, var.

*Formica fusca*, var.

*Aphaenogaster subterranea*, var.

*Lasius niger americana*.

*Formica rufa obscuripes*.

*Liometopum apiculatum luctuosum*.

Vegetable Food : Mast, only taken during the four winter months averaged 3.10 %. Manzanita berries and seed (*Arctostaphylos*), and poison oak (*Rhus*), averaged 7.50 %; in December the percentage was 33.30. Grain averaged 3.50 %; perhaps half of this was taken from the surface of newly planted fields of wheat; the remainder was corn from standing fields in late autumn. Fruit averaged 29.70 %. Only a minor part of this was of cultivated types, and all of that taken was during the winter months when it was of no value. Wild fruits taken included : Madrona (*Arbutus*), Dogwood (*Cornus pubescens, occidentalis, and nuttalli*), Haw, (*Crataegus brevispinus*), Serviceberry (*Amelanchier*), Elderberry (*Sambucus glauca*), Oregon Crab (*Pyrus rivularis*), and Huckleberry (*Vaccinium*). Miscellaneous vegetable rub-



bish averaged less than 1.00 %.

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### CONCLUSION

The Flickers, more than any other species, show a fondness for boring holes into buildings, into the walls or eaves, and into steeples. Often many holes will be bored into the same wall; they seem to be unable to profit by experience, and will continue to bore large holes into cavities that are useless to them after they enter, unless used for roosting sites, where they might roost clinging to the walls.

This trait is more individual than unanimous. When an individual becomes obnoxious, and there is no way of discouraging its attack upon the building, then the offending individual must be destroyed. Killing one or two birds which have acquired this habit will often stop the activity.

The study just completed had produced no evidence which would change the preconceived notion of the status of these birds. They are a very beneficial group. It is very probable that their activities may be more beneficial to the general farmer than to the fruit grower, but they destroy many dangerous fruit pests, such as the codling moth and the peach and prune root borer.

They should be protected, and the available means of attraction should be utilized to keep them at home.

### METHODS OF ATTRACTING BIRDS

Three species or groups of the Woodpeckers have proven themselves worthy of protection. These are the Hairy, the Downy, and the Flicker groups. There are a few simple methods of attraction which may aid the fruit grower in the task of habiting these birds about the ranch and the orchard. It is well that the other species, either doubtful, or really injurious, do not take so kindly to these methods of attraction, and will not be materially abetted in their mischief.

#### Nesting Facilities.

The Flicker is much given to nesting in a hollow stub, or in the walls of a building. It is easily attracted to the vicinity by the providing of a few long wooden boxes of some what the same shape as a section of post or branch. Natural cavities in dead limbs, posts, etc. can be cut off and placed about the ranch grounds. The Hairy seldom nests close to the orchard, but the small Downy is often found nesting in dead and decaying stubs in haws, maples, willows, or other trees in the corner of the fences, and in stubs in the trees about the ranch grounds. A few such locations left in isolated corners will be of great use in attracting these birds to the orchard.

#### Foods.

The Flicker is attracted to any type of the

grain or fruit. The planting of native fruits and berries as parts of the ornamental plantings of the home grounds is a feature generally overlooked. There are myriads of very fine ornamental shrubs growing wild in Oregon, whose fruit is adaptable to the diet of the birds. The Flicker, especially, may be attracted in this manner. The California Woodpecker may be induced to take its small percentage of fruit from this type of planting, rather than from the more usable types. Very occasionally the Lewis Woodpecker might be restrained from visiting the cultivated fruits, but this method can not be relied upon in this case.

The Hairy and Downy groups are lovers of meat scraps, suet, cracked nuts, and sunflower seed. These choices can be applied in field practise. Meat scrap and suet can be hung in the trees in various sections of the orchard during the winter, and will attract manu other beneficial species of birds besides these mentioned.

#### Water.

Even a Woodpecker needs moisture. It is an accepted fact among ornithological students that during extreme draenth birds are forced to resort to soft, juicy fruits for moisture, and that damage is consistently higher during such seasons. In the irrigated areas there is little need for artificial supply. Mr. Fitch, Medford, sustained a heavy loss in 1924, from Lewis Woodpeckers. He gave as a reason the fact that the irrigation ditches

were dry, and for long distances in the Rogue River Valley there was no water available for bird or animal.

Protection.

The indiscriminate use of firearms about the vicinity is a very effective way to frighten the bird population. The gun should be used only when there is reason for its use, and then used judiciously. Half starved and unattached cats have no place on the ranch where birds are expected to thrive. When treated with consideration and kindness birds quickly acquire courage and become intimate to the point of tameness.

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**TABLE I**  
**STUDY OF THE NUMBER OF LARVAE OF CODLING MOTH**  
**EATEN BY WOODPECKERS AFTER HIBERNATION**  
**ON TRUNKS OF TREES**

Tree No.	Larvae alive, but evidently discovered.	Larvae alive, and undiscovered.	Cocoons open & empty.	% kill.
1	2	2	13	77
2	2	3	15	75
3	0	4	21	84
4	0	0	24	100
5	0	2	18	90
6	0	0	51	100
7	0	4	41	92
8	1	1	19	90

**TABLE II**  
**FRUIT PER TREE**  
**INJURED BY THE LEWIS WOODPECKER**

Tree No.	Variety	Boxes Est. Crop	No. inj. fruits.	Approx. % loss.
1	Spitz.	8	190	20. -
2	Spitz.	6	60	8. /
3	Spitz.	8	115	12.
4	Spitz	4	60	15.
5	Jonathan	3 -	96	35. -

TABLE III

COMPLAINTS CONCERNING THE LEWIS WOODPECKER

Name	Town	Crops	1924 % loss	1925 % loss	Average % loss.	Remarks
A.H. Davenport	Ashland	Crop of corn-pears			5	Pears in tops of the trees all eaten.
W. Tavenor	"	apples		7 - 10		
F.L. Nutter	"	"		5		
G.A. Hamilton	Gr. Pass	peaches			10	also some pears
C.H. Taylor	Cent. Pt.	pears				often $\frac{1}{2}$ bu. per tree.
C.Y. Tengwald	Medford	cherries				about 5,000 lbs. Are assisted by crows.
J.B. Webster	Phoenix			2 - 5		
W.E. Brayton	Medford	pears			2 - 5	
C.I. Homes	Ashland	"			10 - 25	average of over 35 seasons
T.B. Farmer	Rog. Riv.	corn-pears			5	very bad all years.
R.L. Ray	Medford	corn-pears				same as No. 1, above.

TABLE IV

COMPLAINTS CONCERNING THE LEWIS WOODPECKER

Name	Town	Crop	% loss 1924	% loss 1925	Average loss	Remarks
C. Richardson	Peyton	apples		60		on upper Rogue Riv.
		pears		10		near the timber.
W.E. Petri	Talent	fruits			10	Very destructive
E.W. Carlton	Ct. Pt.	cherries	90			Aided by the crows.
C. Fitch	Medford	pears	20	6		Impossible to control.
J.H. Darby	Medford	pears	10	5		Near oak timber.
J. Gyger	Ashland	red apples	75	38		Spent \$ 18.00 on
		gr. apples	15	8		ammunition in 1925,
		pears	12	7		with the result that is shown in these figures.
S.D. Hill	Medford	fruits				Have seen as high as 50 % of the pears taken at Peyton.
L.E. Aldrich	Albany	cherries				Warried off cherries for long distances around nesting tree

TABLE V.

## COMPLAINTS CONCERNING THE LEWIS WOODPECKER

Name	Address	Complaint
E.I. Applegate	Klamath Falls	At intervals of years is very destructive.
T. J. Hamlin	Medford	Cherries, apricots, and pears. Is increasing.
W.L. Finley	Jennings Lodge	Takes a great many cherries.
H. M. Glem	Talent	Especially destructive to pears in 1924.
Geo. Crist	Veneta	Numerous and very destructive to apples.
C.T. Hamilton	Cent. Point	Takes quantities of almonds every year.
H.J. Jordan	Talent	Considerable damage to Comice pears in 1925.
J.B. Dimmick	Mt. Hood	Did a lot of damage to fruit in home orchard, 1925.
G.W. Nichols	Ashland	Do a considerable amount of damage every year.
A.H. Davenport	Ashland	A most destructive pest.
W.P. Barnum	Medford	Considerable damage to Howell and Comice pears.
W.E. Sherwood	Salem	East of here eats a great many strawberries.
Edna Hoover	Cent. Point	Certainly loves cherries, as well as other fruits.



THE HAIRY WOODPECKER  
(*DRYOBATES VILLOSUS*)

PHOTO FROM  
U.S. BIOL. SURV.

FROM SKETCH  
BY RIDGWAY.



THE DOWNY WOODPECKER  
(*DRYOBATES PUBESCENS MEDIANUS*)

PHOTO FROM  
U.S. BIOL. SURV.

FROM PAINTING BY  
L. A. FUERTES



THE NORTHERN RED-BREASTED SAPSUCKER  
(*SPHYRAPICUS RUBER NOTKENSIS*)

PHOTO OF MOUNTED SPECIMENS





THE CALIFORNIA WOODPECKER  
(*MELANERPES FORMICIVOROUS BAIRDI*)



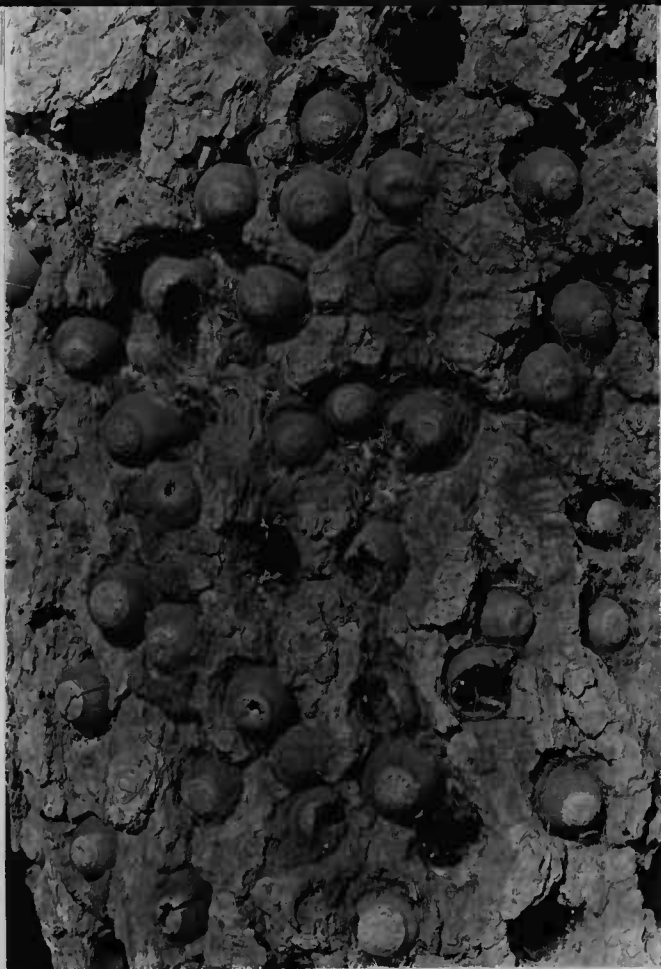
THE LEWIS WOODPECKER  
(*MELANERPES TORQUATUS*)

PHOTO FROM U.S. BIOL. SURV.

FROM A PAINTING.



THE NORTHWESTERN FLICKER  
(COLAPTES CAFER SATURATOR)



ACORN-STORING BY THE CALIFORNIA  
WOODPECKER

FIG. 1

PHOTO FROM MUSEUM OF VERTEBRATE ZOOLOGY - U. OF CALIF.



EXTENSIVE SAPSUCKER INJURY  
ON DOUGLAS FIR

FIG. 2

ORIGINAL PHOTO.



SHOWING DETAILS OF THE GIRDLING  
HABIT OF THE SAPSUCKERS.



FIG. 1.

SAPSUCKER WORK ON

APPLE TREE - MEDFORD.

FIG. 2.

APPLE TREE,



GIRDLED AT CROTCH -

ABOUT  $\frac{2}{3}$  DEAD.

(ALBANY).





FIG. 1.

SAPSUCKER WORK ON  
AGED APPLE TREE.  
MEDFORD.

FIG. 2

SAPSUCKER WORK ON  
ENGLISH WALNUT.  
MEDFORD.







FIG. 1.

ENGLISH WALNUT TREE  
SERIOUSLY INJURED BY  
SAPSUCKERS.

MEDFORD.

FIG. 2.

BROAD-LEAFED MAPLE  
KILLED BY SAPSUCKER  
ACTIVITY IN 1924-5-

NEAR PEORIA FERRY.







FIG. 1.

BROAD-LEAFED MAPLE  
SHOWING OVER A DECADE  
OF SAPSUCKER ACTIVITY.

NEAR CORVALLIS.

FIG 2.

NORMAL TRANSITION LIFE ZONE.

THE WILLAMETTE BOTTOMS,  
HABITAT OF THE DOWNY AND  
HAIRY WOODPECKER GROUPS  
AND OF THE RED-BREASTED  
SAPSUCKERS.



FIG. 1.



RED-CHEEK PIPPIN APPLES INJURED BY  
THE LEWIS WOODPECKER

FIG. 2.



APPLES FROM ONE ESOPUS TREE - THE  
TOLL OF THE LEWIS WOODPECKERS.

FIG. 1



TYPICAL FOOT-HILL ORCHARD IN THE  
ROEWE RIVER VALLEY

BELMONT ORCHARDS - MEDFORD

FIG. 2.



THE NORMAL TRANSITION LIFE ZONE -  
REPRESENTATIVE OF THE HIGHER SLOPES.