AVIFAUNAL HABITATS IN THE CENTRAL COAST MOUNTAINS OF WESTERN OREGON

by

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MASTER OF SCIENCE

June 1950
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In Charge of Major

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Chairman of School Graduate Committee

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Dean of Graduate School
Acknowledgements

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Inestimable assistance has also come from my wife in field observations and in the preparation of the thesis.
<table>
<thead>
<tr>
<th>Table of Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>The Problem</td>
<td>1</td>
</tr>
<tr>
<td>The Area.</td>
<td>2</td>
</tr>
<tr>
<td>Description of Area.</td>
<td>4</td>
</tr>
<tr>
<td>Physiography.</td>
<td>4</td>
</tr>
<tr>
<td>Climate</td>
<td>9</td>
</tr>
<tr>
<td>History</td>
<td>11</td>
</tr>
<tr>
<td>Roads</td>
<td>13</td>
</tr>
<tr>
<td>Research Methods</td>
<td>14</td>
</tr>
<tr>
<td>Distribution Schemes</td>
<td>17</td>
</tr>
<tr>
<td>Background.</td>
<td>17</td>
</tr>
<tr>
<td>Proposed Solutions</td>
<td>20</td>
</tr>
<tr>
<td>The Biome</td>
<td>21</td>
</tr>
<tr>
<td>Faunas and Faunal Areas</td>
<td>24</td>
</tr>
<tr>
<td>Habitats and Constituents</td>
<td>35</td>
</tr>
<tr>
<td>Boreal Habitats</td>
<td>35</td>
</tr>
<tr>
<td>Noble Fir Forest</td>
<td>35</td>
</tr>
<tr>
<td>Coniferous Forest</td>
<td>39</td>
</tr>
<tr>
<td>Boreal Deciduous Tree Layer</td>
<td>44</td>
</tr>
<tr>
<td>Brush Layer</td>
<td>47</td>
</tr>
<tr>
<td>Austral Habitats</td>
<td>50</td>
</tr>
<tr>
<td>New Growth Brush</td>
<td>50</td>
</tr>
<tr>
<td>Old Growth Brush</td>
<td>52</td>
</tr>
<tr>
<td>Bracken Fern</td>
<td>55</td>
</tr>
<tr>
<td>Austral Deciduous</td>
<td>56</td>
</tr>
</tbody>
</table>
### contents continued:

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superficial Habitats</td>
<td>59</td>
</tr>
<tr>
<td>Aerial</td>
<td>59</td>
</tr>
<tr>
<td>Permanent Aquatic</td>
<td>60</td>
</tr>
<tr>
<td>Seasonal Aquatic</td>
<td>61</td>
</tr>
<tr>
<td>Habitats Provided by Man</td>
<td>63</td>
</tr>
<tr>
<td>Fencerows</td>
<td>63</td>
</tr>
<tr>
<td>Wires</td>
<td>65</td>
</tr>
<tr>
<td>Field and Pasture</td>
<td>66</td>
</tr>
<tr>
<td>Orchard</td>
<td>66</td>
</tr>
<tr>
<td>Habitat Preferences</td>
<td>68</td>
</tr>
<tr>
<td>Discussion</td>
<td>92</td>
</tr>
<tr>
<td>Summary</td>
<td>96</td>
</tr>
<tr>
<td>Explanation of Plates</td>
<td>99</td>
</tr>
<tr>
<td>Bibliography</td>
<td>104</td>
</tr>
<tr>
<td>Appendix A</td>
<td>107</td>
</tr>
<tr>
<td>Appendix B</td>
<td>117</td>
</tr>
</tbody>
</table>
Plates

I. Outline Map of Central Coast Mountains . . . . . . . . 4

II. Approximate Location of Areas Sampled . . . . . . . . 5

III. Diagrammatic Cross-section, Noble Fir Forest . . . . . . 36

IV. Diagrammatic Cross-section, Coniferous Forest . . . . . . 41

V. A - Coniferous Forest Habitat . . . . . . . . . . . . . . 100
   B - Old Growth Brush . . . . . . . . . . . . . . . . . . . . 100

VI. A - Boreal Deciduous Forest . . . . . . . . . . . . . . 101
    B - Noble Fir Forest . . . . . . . . . . . . . . . . . . . . 101

VII. A - Coniferous Forest; logged area . . . . . . . . . . . 102
     B - New Growth Brush Habitat . . . . . . . . . . . . . . 102

VIII. A - Bracken Fern Habitat . . . . . . . . . . . . . . . . 103
      B - Old Growth Brush . . . . . . . . . . . . . . . . . . . 103

Tables

1. Elevations of Mountains . . . . . . . . . . . . . . . . . 7

2. Sample Areas Visited . . . . . . . . . . . . . . . . . . . 16

3. Boreal Assemblage . . . . . . . . . . . . . . . . . . . . . 28

4. Austral Assemblage . . . . . . . . . . . . . . . . . . . . 29

5. Faunal Elements - Number of Species . . . . . . . . . . 31

6. Faunal Elements - Per cent of Species . . . . . . . . . . 32

7. Faunal Elements - Occurrences . . . . . . . . . . . . . . 33

8. Faunal Elements - Per cent of Occurrences . . . . . . . 34

9. Summary of Faunal Elements . . . . . . . . . . . . . . . 98
AVIFAUNAL HABITATS IN THE CENTRAL COAST MOUNTAINS OF WESTERN OREGON

Introduction

THE PROBLEM. The Oregon Coast Mountains, except for their heavy stand of timber, are relatively unknown, even to many Oregonians. They are today considered most frequently as a barrier that must be traversed in order to reach the coast; they are not noted for height or ruggedness, just for the vegetation that they support. The denseness of that vegetation has been quite an effective barrier to travel, and still discourages most people who might hike in the area. It is the coast or the Willamette Valley that attracts the masses, not the low range of mountains between. Even the Indians exhibited this bias, leaving the mountains to themselves for the most part. The Indians settled principally along the lower stretches of the coastal rivers because of the abundant fish supply; these same streams—the Siletz, Yaquina, Alsea, Yachats, Siuslaw, and other rivers and their major tributaries—are still popular fishing waters, and bring some fame to the region. Agricultural pursuits are limited to the wider of the narrow valleys and a few cleared hillsides. It is the lumbering industry that has prospered and has given the Coast Range a degree of recognition.

It is not surprising, then, that the bird population of
such an area has not been studied in detail. Even this survey is not as thorough as the author wishes it could have been; it is intended herein to indicate habitat preferences of most of the bird species, to attempt a thorough description of the habitats, and to demonstrate possible allocations within broader distribution schemes.

THE AREA. Optimistically, extensive boundaries were laid out so that the study area would be a thorough representation of the Oregon Coast Mountains. Ultimately, a number of accessible regions have gone unvisited—not to mention that little ingress was made into the remote sections of the domain.

Field work extended to the north as far as the South Yamhill and Salmon rivers, southerly to the Siuslaw River. The study area merges with the Willamette Valley on the east, but ends abruptly at the narrow coastal strip bordering the Pacific shoreline. This includes most of Lincoln, Benton, and Polk, and a portion of western Lane counties.

It is this area in which I have conducted my study and about which the following descriptions are made; nevertheless, the material presented herein should apply, by and large, to the remainder of the Oregon Coast Mountains with little variation. Field notes are included for every month from November, 1949 through April, 1950.

Plate I illustrates the extent of the area and
Plate II shows the dispersion of habitats from which samples were taken.

Evenden, in his thesis (7:6), defined the Willamette Valley as extending up to the 1,000 foot elevation on all sides; this, I consider much too high for the ecotone between the two areas. The division, actually, is more distinct, but does not follow a definitive elevation contour: the valley tending to continue up open and level areas along streams, the Coast Range reaching eastward on higher ridges.
Plate I. Outline Map of Central Coast Mountains
Plate II. Approximate Location of Areas Sampled
Description of Area

PHYSIOGRAPHY. The existing Coast Range of western Oregon is considered to be of rather recent geological origin, its formations being of the Tertiary period for the most part. These formations are largely sandstone and shale with some igneous rock and flows of basalt and andesite. Geologists describe their structure as a moderate anticlinorium (broad-arched structure with minor folds) produced in the process of mountain-forming upturnings of the sedimentary layers. Some of the higher elevations were at least partially augmented by volcanic intrusions. Little faulting has occurred. This geological structure has produced an area with no apparent petroleum deposits and virtually no minerals of economic value—to a large measure responsible for its late settlement. This same construction has had an important role, aided by the climate, in the development of generally mature soils for the support of the dense vegetation originally characteristic of this expanse. (23:25-28)

The Coast Range has generally lower elevations, less volcanic material, and less ruggedness, by and large, than the other major mountain ranges in Oregon. Most of the mountains have summits less than 2,000 feet above the adjoining Pacific. Further cognizance of the lowness may be gained by mentioning the altitudes of highway passes.
Of the major roads crossing the study area between the Willamette Valley and the coast, the Coast Range summit is about 800 feet elevation on the Newport and Salmon River highways, at 1,331 feet on the Alsea Highway, and at less than 1,200 feet on the Siuslaw Highway. In contrast, the lowest pass over the Cascades has an elevation only slightly less than 4,000 feet. The higher mountains within the region covered by this survey are tabulated with their elevations in Table 1. Of these, Mary's Peak was most visited because of its proximity to Corvallis; the summit of Prairie Mountain was reached once, and several other observations were made along the road and trail of its northern approach. Where the road into Valsetz Lake crosses over the northern extensions of Monmouth Peak, at an elevation above 2,000 feet, other records were obtained.

Table 1. Elevations of Ten High Points in the Thesis Area

<table>
<thead>
<tr>
<th>Mountain</th>
<th>Feet Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Mary's Peak</td>
<td>4,097</td>
</tr>
<tr>
<td>Grass Mountain</td>
<td>3,612</td>
</tr>
<tr>
<td>Prairie Mountain</td>
<td>3,437</td>
</tr>
<tr>
<td>*Riley Peak</td>
<td>3,287</td>
</tr>
<tr>
<td>*Monmouth Peak</td>
<td>3,230</td>
</tr>
<tr>
<td>*Green Peak</td>
<td>2,697</td>
</tr>
<tr>
<td>Cummins Peak</td>
<td>2,479</td>
</tr>
<tr>
<td>Diamond Peak</td>
<td>2,458</td>
</tr>
<tr>
<td>Euchre Mountain</td>
<td>2,446</td>
</tr>
<tr>
<td>Table Mountain</td>
<td>2,150</td>
</tr>
</tbody>
</table>

* Designates mountains helping form Coast Range divide; other points are in area of coastal drainage.
These mountains are not rugged; some slopes may be quite steep, but I know of no actual cliffs or precipices other than the headlands facing the ocean. Atop the headlands, the study area may extend almost to the crest. All peaks are more or less rounded, and rock outcroppings are very scarce.

The divide between coastal and Willamette Valley drainage is rather near the valley in the southern section, but is more centrally situated to the north (Plate I). Thus, rainfall on the east-facing slopes is emptied into the Willamette by the Long Tom, Mary's, Luckiamute, and South Yamhill rivers, and Rickreal Creek. Water is carried coastal by the Salmon, Siletz, Yaquina, Alsea, Yachats, and Siuslaw rivers, aided by a number of small to large creeks--such as Beaver, Drift, and several Cape creeks--which flow directly into the ocean. The Siletz, Yaquina, Alsea, and Siuslaw rivers open into bays, but because of shifting sands and shallowness do not regularly accommodate large, ocean-going vessels; the rivers, themselves, are scarcely navigable. All of these bodies of water are well-supplied with tributaries which present quite an entangled appearance on any map that attempts to chart them all. Many of the tributaries are flanked by steep slopes, and almost buried by vegetation; their descent is rapid, but there are no high waterfalls. The larger streams and rivers are situated in narrow valleys with flat floors (to
which most farming is limited); although wide and relatively shallow, the streams are not sluggish. Generally, their courses to the sea are in very circuitous channels; for example, the Siletz has headwaters only about 20 miles from where it empties into Siletz Bay, but its waters meander 60 miles or more to reach their destination!

Lakes are not a characteristic feature of the Coast Mountain landscape, although some do occur naturally near the coast. Within the defined area, Devil's Lake, in the northwest corner, is the largest of these, while just south of the thesis limits are several lakes even larger. Inland, large bodies of water are even less frequent. Triangle Lake, at the southern boundary, is a natural lake of fair size; Valsetz Lake is of similar area, but is man-made as a log repository; Klickitat Lake is smaller and at a higher elevation, but was not visited. All of the above lakes provide suitable habitat to a number of water birds, especially migrants and winter visitors. In addition, a number of streams have been blocked to create log ponds, but they are generally not utilized by waterfowl.

CLIMATE. High annual precipitation is a widely known feature of western Oregon, and this condition attains its maximum in the Coast Mountains. Two factors are responsible: the Pacific Ocean with its westerly winds laden with moisture, and the orographic influence of the low-lying mountains. Part of the rainfall comes in persistent
showers carried by the northwesterly cyclonic winds—which also surprise west Oregonians with snow occasionally. The residuum is conveyed by southwesterlies in a steady drizzle that keeps coming for days at a time—almost without ceasing, it seems.

At Newport the average annual precipitation amounts to about 70 inches; in Corvallis it totals about 40 inches; in between it could well be measured in feet! Unfortunately, weather stations are lacking in the mountains, as in most other sparsely populated areas. However, unofficial records are kept by one of the logging companies at Valsetz, and they lay claim to the highest, unofficial rainfall in the United States—an average exceeding 200 inches a year (nearly 20 feet of rain!).

The wet season extends from October through March, but rain is never out of season—just less frequent during the summer. Summer fog is common in all of the coastal valleys (Plate V. A.), and may occasionally linger on for a few days at a time. On such occasions, only the higher peaks (Table 1) remain aloof.

Snow is reportedly a rarity in the Coast Range, except on Mary's Peak, and frequently on the peaks above 3,000 feet elevation; but the past two winters have had snow down to the surf. Hail is seldom seen. Winds of hurricane force are virtually nonexistent, although winter storms may bring damaging winds to the coastal areas; such winds are
generally soon slackened by the mountains and forests.

The proximity of the Pacific also has a moderating effect on the temperatures of the Coast Range. Sub-freezing temperatures are of about the same frequency as snow; the absolute minimum at Newport is 12°F., but nears 0°F. inland. Summer temperatures are alleviated by ocean breezes and by the fog, but even so, open situations and brushlands can become uncomfortably warm on clear, still days.

Another obvious characteristic of the temperate marine climate is that there are many days, especially in winter, without sunshine.

HISTORY. Early settlement of the Northwest took place all around the central Coast Mountains—but not in them: Spanish and English explorers in the 1500's and 1700's viewed the coast and named its prominent features; Lewis and Clark hastened the settling of the Columbia River region in the early 1800's, and settlement soon spread into the Willamette Valley; the '49ers overflowed from California into the Siskiyou and Klamath mountains. Settlement of the small coastal valleys came later. The railroad from Corvallis to Newport was put through in 1885; only two other tracks have been added since then, a logging railway from Valsetz down the Big Luckiamute River and a branch line along the Siuslaw River to Florence and southward from there. (23:29-30)
The ornithologists who toured Oregon during the 19th century paid little attention to the Coast Range, although they covered much of the Cascades in searching out new species. In 1902, Woodcock (28) published his "Annotated List of the Birds of Oregon" as an Oregon Agricultural College Experiment Station Bulletin, and in 1940 Gabrielson and Jewett (8) produced *Birds of Oregon* which has been an important reference in the work for this thesis. Shelton (26), at the University of Oregon in 1917, wrote "A Distributional List of the Land Birds of West Central Oregon". Notwithstanding, no study of the birds or their habitats has been confined to the Coast Mountains of Oregon.

Fire is an ever-present factor in a forest area and, despite the heavy rainfall on the coastal slopes, has had its effect on the history and development of the area. In the area under study there is no record or evidence of any fire having covered an area as extensive as the famous Tillamook burns just to the north. Nevertheless, an immense portion of this section has been burned over within historical times; apparently vast tracts were burning for long periods about 100 years ago, and fires frequently spread over a few thousand acres during the dry season. Slash-burning following logging operations is a common cause of burns today; although some of these do not invade heavy timber stands, they do have a severe effect upon secondary plant succession in their devastation (Plates VII, VIII).
ROADS. A brief account of roads and travel conditions is discussed here to emphasize one phase of difficulties in securing field data.

Access to habitat areas was determined effectually by road conditions. Four "all-weather" east-west highways completely traverse the region, but one of them—the Alsea—has been under reconstruction for the past two years and in late winter, although passable, has been discouraging. Another, the Siuslaw, was closed to traffic for three weeks in early winter, 1949-50, by a landslide. In addition, all roads are made hazardous for much of the time by log trucks with their heavy wear on roads and with their effect on driving conditions. The Pacific Coast Highway skirts the western edge of this area, and is kept in the most reliable condition of any of these roads.

Several gravel-surfaced roads branch from the above and can generally be traveled at any time. Numerous smaller roadways and log roads (in use and deserted) lead into almost all the remote sections. Many of these are impassable for all except a few weeks in late summer; one such road extends from Beaver Creek on the coast to Harlan on Big Elk Creek, and in mid-September still contained several mud-holes where extreme caution was essential. Most of the log roads, once abandoned, are rapidly over-grown with red alders and brush, so that even hiking is retarded.
Research Methods

When I arrived in Oregon in September, 1948, to begin graduate study in zoology, the Coast Range was an unknown entity to me. With Dr. Gordon's counsel, I briefly appraised the mountains and decided to develop my thesis on the birds that inhabit the range. My previous exposure to zoology and to field methods had been very insufficient; my knowledge of the birds had been acquired in the field, on sight identification only, in the year and a half preceding.

Thus, the first several months were invested in making acquaintance with the Coast Mountains, their roads, the plants, the birds, and in developing methods of accumulating records on these so that an acceptable thesis would result. Needless to say, the results are not spectacular—I only hope that they are of sufficient value.

Principally, I have kept notes on the numbers of times a species has been observed in a particular habitat on the basis of presence; the numbers have been tabulated and used as a designation of presence, or "species-occurrence", denoting the actual number of times a species was seen in each habitat. These results indicate varying degrees of habitat preferences, and permit grouping into tentative communities.

The habitats are dealt with in terms of plant and bird components, the extent of their variations, and their
positions in the distribution schemes. The plant composition is illustrated by diagrammatic drawings (Plates I-IV) and by photographs (Plates V-VIII). The avifauna is then considered by species, enlarging upon their range throughout the central Coast Mountains, their preferences, and their significance in the distribution schemes.

I had hoped to develop some data based on abundance and density, but feel that my estimates on numbers of birds in flocks feeding in the tops of tall forest trees are too unreliable to be of actual value. Records of countable numbers of individuals were kept, but have not been utilized for comparisons because of the discrepancies in larger flocks.

Notes have been collected from as much of the area as conditions would permit, many hundreds of miles being traveled in doing so. Approximately 130 areas were visited for records in more than 70 days; frequently several areas could be worked in one day, and one area might contain more than one habitat. Distribution of field trips in terms of the number of areas visited per month is given in Table 2.

No efforts have been expended toward subspecies differentiation, either in field identification or in habitat preferences, beyond the usage adopted by Peterson. (20: 203-206) The status of subspecies in Oregon is adequately handled by Gabrielson and Jewett (8) for anyone desiring a detailed presentation. Common names of birds and plants
will be used throughout the text; scientific names are
given in Appendix A and B, respectively.

Table 2. Sample Areas Visited Per Month
November, 1948 to April, 1950

<table>
<thead>
<tr>
<th>Month</th>
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<tr>
<td>January</td>
<td>3</td>
</tr>
<tr>
<td>February</td>
<td>3</td>
</tr>
<tr>
<td>March</td>
<td>11</td>
</tr>
<tr>
<td>April</td>
<td>14</td>
</tr>
<tr>
<td>May</td>
<td>5</td>
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<td>June</td>
<td>3</td>
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<td>July</td>
<td>20</td>
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<td>August</td>
<td>32</td>
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<tr>
<td>September</td>
<td>8</td>
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<tr>
<td>October</td>
<td>9</td>
</tr>
<tr>
<td>November</td>
<td>2</td>
</tr>
<tr>
<td>December</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>136</td>
</tr>
</tbody>
</table>

Average per month: 11.3
Distribution Schemes

BACKGROUND. The combined effects of operations attributable to man (logging, burning, road building, farming, grazing, home and barn construction, and so on) have had a very critical influence upon the Coast Mountains in regard to this study of the environments for birds. Originally an area of reasonably uniform growth of dense coniferous forest which would have been easily handled by any of several world-wide or continental distribution plans, the region is now one of very heterogeneous vegetative aggregations.

The changes involved are not easily described. Removal of the climax forest does not, of course, alter the macro-climate (at least, not directly), but in addition to obliterating the tree layer as a habitat, this obliteration leads to absence of shade and thus increases temperature, evaporation, and available sunlight--three factors which would probably cause several changes in the plant composition of the habitat and which would also have direct effect upon the avifauna (its species also are to some extent controlled by the macro-climate). The normal logging operation, however, leaves behind broken and uprooted plants, bare soil where logs have been dragged, and a quantity of debris of limbs, tops, and diseased logs. This merely extends the above conditions, or makes them more severe--but still produces a fairly well advanced secondary
succession. However, if extensive slash-burning is included, or if the slash fires escape control, succession is retarded even further, and the environment is, for the first few years, entirely different from the original climax. The avifauna is equally affected.

Moreau, in describing African habitats, states that the most extreme micro-climatic conditions are encountered on the surface of bare ground, while forest undergrowth is "perennially cooler, damper, and darker" than the general climate. (18:64) It is quite evident that logging succeeding by burning may very rapidly switch the environment from one extreme to the other in relation to the three important factors: temperature, humidity, and light. Moreau further asserts that the forest canopy tends to be hotter by day and cooler by night than the general climate (18:64)—the refraction of heat and light by the exposed surface presents more austral conditions than are found beneath it. The same conditions can be seen to apply to the canopy of a brush layer. It is also rather obvious that the denser, or more closed the canopy, the cooler, damper, and darker are conditions beneath. Thus, a bird which feeds inside the brush layer may be experiencing boreal micro-climatic conditions, while a bird only a few feet above, feeding on the exposed surface of the brush canopy may find himself in a definitely austral micro-climate.
Most of the habitats which will be considered austral in this study are hardly distinguishable from boreal habitats during the winter when the heavy rains and sunshine shortage impose virtually equal climatic conditions throughout the district. It might be more appropriate to state that austral habitats are present only in summer, or at least are most distinct then. This is substantiated by the number of migratory summer residents showing distinct austral preferences. Probably, it is unnecessary to say that even the austral species are not expected to prefer the most austral conditions, viz., direct sunshine in midday. From this point one may well ask where the division between austral and boreal conditions should be made. A dividing line could be determined on the basis of certain degrees of temperature, certain ranges of relative humidity, certain amounts or qualities of light, and other factors, but even then the separation might not be infallible. Thus, for this work, fairly general distinctions are arbitrarily suggested—the author does not claim that his findings are free from disagreement. It might be well to specify at this point that the most value from this thesis will be derived by considering opinions expressed on debatable points as being suggestive of possible conclusions—the most logical that has occurred in each case to the author in his work.

A moderately thorough comprehension of all this is
prerequisite to a proper understanding of the complexities involved in fitting the Coast Range habitats to geographic distribution plans.

PROPOSED SOLUTIONS. The pioneer work of Merriam in developing the Life Zones might have applied satisfactorily to the Coast Mountains before the advent of the European races, but for the present-day complex, it is very inadequate. The Life Zones have been widely criticized for several years, so that it is not necessary here to repeat these arguments.

With the beginning of faultfinding of the Life Zone system, other schemes were introduced, several of which have not been very widely accepted because of various insufficiencies or difficulties in usage. One or two have received some support, but have not encountered general approval. One such plan is Dice's Biotic Provinces (5, 16), which would include the coast forest in the Oregonian Biotic Province, with three climatic divisions in western Oregon: coast, valleys, Cascades. In trying to apply this plan, however, one is aware of at least three weaknesses which reduce one's enthusiasm for its use in the Coast Mountains: (1) Dice would prefer the major divisions to be continuous—actually, they are too frequently discontinuous; (2) there is no indication of relationships between the various Biotic Provinces—some of the plants and animals of the Oregonian Province do occur in other provinces, so
that some indication of affinities is desirable; and (3) a static or rigid quality is inherent to the scheme which makes it difficult to apply to an area in such a state of change as is the Coast Range. We shall pass on, then, to two schemes which are more dynamic and present better pictures of the thesis area.

THE BIOME. One of the most widely accepted distribution schemes at present is that of the biome (2, 3, 4, 21, 22, 24, 25) which is an incorporation of the entire plant and animal community into the classification originally designed for plants (27:99 and 481). A thorough account of this system is beyond the present needs; detailed descriptions are available in any of the references mentioned. The biome has many desirable features in that it expresses the unity of plants and animals as components of a dynamic community and it provides developmental stages toward a major climatic climax. Since plants are the most significant members of the community, they are designated dominants and subdominants, while the effect that animals have upon the community is specified by classifying them as major and minor influxents and subinfluxents.

Units and subdivisions within the biome are not lacking (2, 3) and broad applications have been made to the grassland and coniferous forest biomes. Pitelka (21) has performed an important task in correlating the distribution of several species of birds to various biomes. The
specific procedures for local studies on a portion of a biome are, nevertheless, none too clear. A complete study of all plant, invertebrate, and vertebrate life would be the ultimate aim; however, such detailed work is practically beyond the abilities of a student with the normal amount of time available for studies such as this one. Likewise, a partial study cannot be considered conclusive. This thesis will not attempt a detailed association of the study area with the units of the biome; a few suggestive statements can be made at this point and at intervals through the remainder of the text in reference to the biome.

The coastal forests from San Francisco through the Alaska panhandle are justifiably considered as a separate biome, but grave doubts exist over the appropriateness of the title suggested (25): Cedar-Sitka Deer. The range of the Sitka deer restricts the animal to only a fragment of the biome, yet I know of no animal endemic to the region as a whole.

"Each climax is the product of climatic differentiation operating upon an original community of vast extent and fairly uniform composition." (4:243) Such a climax existed once in this area, but is not here today—and has little chance of returning under the influence of man. It is a temptation to label the entire region a disclimax maintained by man—this may well be its future when forest
planning attains full development! Nevertheless, the climax is essential to the unity of the plan and does not actually impair its effectiveness, for despite the absence of the climax, it is the end toward which the various seral stages are developing.

The preferences of birds are more closely correlated to life forms than to particular species of plants (21:135); that is, certain birds are characteristic of the tree layer of coniferous forests, although not necessarily confined to it, while others prefer thickets of brush regardless of the constituent species. Birds can adapt more easily to species variations within the habitat than to changes in the life form: whether the tree be Douglas fir or western hemlock matters little to the red crossbill, but the removal of the trees restricts its feeding area. Thus, the avifaunal habitats utilized in this study conform more readily to life forms than to units of the biome.

Since the climax is virtually non-existent within the bounds of this study, most of the habitats are of seral status, or are disclimaxes directly maintained by man. The new growth and old growth brush habitats are early and relatively early developmental stages, while the brush layer habitat approximates climax conditions. The various arboreal habitats are relatively later seral units, some are subclimax; but the noble fir habitat deserves a microclimax designation.
FAUNAS AND FAUNAL AREAS. The following proposal is one of the most recent and, thus, has not been widely publicized or extensively applied to groups of birds. This method organized by Gordon (9) has an entirely different basis in comparison with others, and has the quality of being the most dynamic of any scheme yet produced. Its basis is concerned with the places of origin and development of the various members of a group of animals within a particular vegetative cover. A group of animals commonly occurring together and occupying a distinctive habitat, or range, is termed a fauna. The region occupied by a characteristic fauna is a faunal area; it may be of variable size. The members of a characteristic fauna are not restricted to that fauna or to that faunal area, so that adaptable members of other faunas may range into one or more additional faunal areas. The distinctions between the terms fauna and faunal area should be given particular stress: A fauna is "a mobile assemblage of animals that has adapted itself to a particular set of conditions, and is constantly changing in its adjustment to new conditions". (9:28) A faunal area has emphasis placed on "a certain geographical area with its characteristic physical and biotic conditions, and the way in which that area comes to be inhabited by animals that in part originate within it and in part enter it from various sources of origin." (9:28-29)
In reference to North America, its aggregations of animals can be classed within the following faunas:

Boreal Faunas
  Tundran Fauna
  Coniferan Fauna

Austral Faunas
  Sonoran Fauna
  Deciduan Fauna

Tropical North American Fauna

The above faunas are, in general, found in faunal areas corresponding to the vegetation type suggested by their names. Since this plan has not been fully applied to birds, and since more knowledge is necessary than is available at this time, it is not practicable to attempt a division of the birds in this study into faunas.

The greatest value in the present application of Gordon's scheme will be derived from a study of the elements involved in the habitats surveyed. An element embraces a group of species of more or less common geographic origin. The allocation of species to their respective elements is no simple matter, and can be accomplished only on a tentative basis because of insufficient evidence for the majority of birds. Tentative lists for the Coast Mountains have been compiled with the assistance of Dr. Gordon and a number of references, principally Mayr (17), Gabrielson and Jewett (8), Grinnell and Miller (11),
Peters (19), and the A.O.U. Check-list (1). It is recognized that a number of these assignments are subject to disagreement, so the criteria used in the most debatable species are discussed in the section on Habitat Preferences.

Species appearing to exhibit boreal affinities, or preferences, through present distribution and habitat selection are unified into a Boreal Assemblage. Within the Boreal Assemblage are four elements, expressing to varying degrees the geographic associations of each species. Thus, the Old World Element of the Boreal Assemblage lists those species which, in America, express boreal inclinations, but which possess linkage with the Old World through development and generic relations. Distinct from this are the North American Element whose species have developed in the northern portions of this continent without close kinship in other continents, and the Pan-American Element which includes species now preferring boreal habitats but developing from families with strong ties in southern North America and/or South America. Less distinct, but still separate from the Old World and the North American elements, is a Panboreal Element containing species which range through at least parts of both regions, but which lack evidence for being placed in either group. For example, the creeper occurs as a single species in both Old and New Worlds, but apparently developed in Eurasia and recently immigrated to North America (17:18) and so is considered in
the Old World Element. On the other hand, the golden eagle soars over both hemispheres, but no indications are given as to its place of origin; it typifies the Panboreal Element. The sooty grouse is endemic to the forested regions of northwestern North America, and is exemplary of the North American Element. Finally, the western tanager is found in boreal situations, but is a member of a family with Pan-American affiliation.

The Boreal Assemblage is presented in Table 3.

The Austral Assemblage is arranged on similar foundations embodying three elements: The Old World Element incorporates species which are most frequently found in austral environments, but which retain close bonds with their place of origin. In this case, several species (barn owl, horned lark, barn swallow, and cliff swallow, at least) are present in both Eurasia and North America, but are considered by Mayr (17:15 and 20) to be recent immigrants to the New World. The English sparrow must be included here in spite of its different history—likewise the starling, when it eventually arrives in this region. The North American and Pan-American elements of this division are analogous with the same elements of the Boreal Assemblage.

The Austral Assemblage is set forth in Table 4.

After tallying the two assemblages, there remain several species with such wide range in their north–south
Table 3. The Boreal Assemblage of Faunal Elements

I. OLD WORLD ELEMENT
- Belted Kingfisher
- Raven
- Black-capped Chickadee
- Chestnut-backed Chickadee
- Red-breasted Nuthatch
- Creeper
- Robin
- Varied Thrush
- Golden-crowned Kinglet
- Ruby-crowned Kinglet
- California Purple Finch
- Pine Siskin
- Red Crossbill

II. PANBOREAL ELEMENT
- *Common Loon
- *Pacific Loon
- Red-throated Loon
- *Holboell's Grebe
- *Horned Grebe
- *Emperor Goose
- *White-fronted Goose
- *Lesser Snow Goose
- Pintail
- *Green-winged Teal
- *Shoveller
- Greater Scaup
- *American Golden-eye
- *Barrow's Golden-eye
- *Old Squaw
- *Harlequin Duck
- *American Scoter
- American Merganser
- *Red-breasted Merganser
- Golden Eagle
- Little Brown Crane
- *Glaucous-winged Gull

III. NORTH AMERICAN ELEMENT (continued)
- White-winged Scoter
- Surf Scoter
- *Hooded Merganser
- Goshawk
- Sharp-shinned Hawk
- Bald Eagle
- Sooty Grouse
- Ruffed Grouse
- Mountain Quail
- Wilson's Snipe
- *California Gull
- Ring-billed Gull
- *Snowy Owl
- *Pygmy Owl
- *Spotted Owl
- *Great Gray Owl
- *Long-eared Owl
- *Saw-whet Owl
- Red-shafted Flicker
- Pileated Woodpecker
- Red-breasted Sapsucker
- Oregon Jay
- Steller's Jay
- Dipper
- Western Winter Wren
- Hermit Thrush
- Russet-backed Thrush
- Western Bluebird
- Townsend's Solitaire
- *American Pipit
- *Bohemian Waxwing
- Cedar Waxwing
- Myrtle Warbler
- Audubon's Warbler
- Townsend's Warbler
- Hermit Warbler
- Evening Grosbeak
- Oregon Junco
- White-crowned Sparrow
- Golden-crowned Sparrow
- Fox Sparrow

IV. PAN-AMERICAN ELEMENT
- Traill's Flycatcher
- Olive-sided Flycatcher
- Western Tanager

(* marks species not observed in my field study)
### Table 4. The Austral Assemblage of Faunal Elements

#### I. OLD WORLD ELEMENT

- *Barn Owl*
- *Horned Lark*
- Barn Swallow
- Cliff Swallow
- Western Crow
- White-breasted Nuthatch
- *Sterling*
- House (English) Sparrow
- House Finch
- Common Goldfinch
- Green-backed Goldfinch

#### II. NORTH AMERICAN ELEMENT

- *Wood Duck*
- Turkey Vulture
- Cooper's Hawk
- Western Red-tailed Hawk
- Marsh Hawk
- Sparrow Hawk
- California Quail
- Band-tailed Pigeon
- Western Mourning Dove
- Screech Owl
- Horned Owl
- *Pacific Nighthawk*
- Vaux's Swift
- Lewis's Woodpecker
- Hairy Woodpecker
- Downy Woodpecker
- Violet-green Swallow
- Tree Swallow
- Rough-winged Swallow
- Purple Martin
- California Jay

- Bush-tit
- Wren-tit
- Western House Wren
- Bewick's Wren
- Long-billed Marsh Wren
- Hutton's Vireo
- Solitary Vireo
- Western Warbling Vireo
- Orange-crowned Warbler
- Calaveras Warbler
- Yellow Warbler
- Black-throated Gray Warbler
- Macgillivray's Warbler
- Yellowthroat
- Pileolated Warbler
- Long-tailed Chat
- Spotted Towhee
- *Savannah Sparrow*
- Vesper Sparrow
- Chipping Sparrow
- Song Sparrow

#### III. PAN-AMERICAN ELEMENT

- Rufous Hummingbird
- *Western Kingbird*
- *Say's Phoebe*
- Western Flycatcher
- Western Wood Pewee
- Western Meadowlark
- Red-wing
- *Bullock's Oriole*
- Brewer's Blackbird
- Black-headed Grosbeak
- Lazuli Bunting

(* marks species not observed in my field study)
distribution and in Old and New Worlds that they cannot easily be restricted to any of the above elements. For lack of indications of their relationships, they are here listed with "uncertain status":

*Eared Grebe  
Western Grebe  
*Pied-billed Grebe  
Great Blue Heron  
*Anthony's Green Heron  
*Black-crowned Night Heron  
*American Bittern  
Mallard  

(* marks those not observed in my field study)

The results of applying the above allocations to the Coast Range habitats are presented in five tables. Table 5 is formulated on the basis of the number of species in each habitat; Table 6 expresses the same information in percentages. The presence records of my field observations are utilized in Tables 7 and 8; these tabulations indicate the number of occurrences of the species in each habitat, and thus are a partial expression of preferences. Again, Table 7 is in numbers of occurrences, while Table 8 is in percentages. Table 9 summarizes all four of these, and is contained in the summary.

The check-list referred to is Appendix A.
Table 5. Faunal Elements in Coast Range Habitats
(Numbers are species in each category.)

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Table 6. Faunal Elements in Coast Range Habitats
(Per cent of species in each category.)

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Table 7. Occurrences of Species by Faunal Elements
(Number of occurrences for each category.)

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<td>8 0 10 0 18</td>
<td>1 4 4 9 0</td>
<td></td>
</tr>
<tr>
<td>Total observed: 1,286</td>
<td>266 14 437 24 741</td>
<td>38 400 75 513 32</td>
<td></td>
</tr>
</tbody>
</table>
Table 8. Occurrences of Species by Faunal Elements
(Per cent of occurrences for each category.)

<table>
<thead>
<tr>
<th>Area</th>
<th>Boreal Assemblage</th>
<th>Austral Assemblage</th>
<th>Total</th>
<th>Uncertain Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Old World</td>
<td>% Pan-boreal</td>
<td>% North American</td>
<td>% Pan-American</td>
</tr>
<tr>
<td>Noble Fir: 83</td>
<td>40</td>
<td>0</td>
<td>45</td>
<td>3</td>
</tr>
<tr>
<td>Coniferous Forest: 351</td>
<td>34</td>
<td>0</td>
<td>47</td>
<td>4</td>
</tr>
<tr>
<td>Boreal Deciduous: 113</td>
<td>33</td>
<td>0</td>
<td>31</td>
<td>3</td>
</tr>
<tr>
<td>Brush Layer: 106</td>
<td>1</td>
<td>0</td>
<td>42</td>
<td>0</td>
</tr>
<tr>
<td>New Growth Brush: 45</td>
<td>4</td>
<td>0</td>
<td>38</td>
<td>0</td>
</tr>
<tr>
<td>Old Growth Brush: 191</td>
<td>13</td>
<td>0</td>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>Bracken Fern: 31</td>
<td>3</td>
<td>0</td>
<td>32</td>
<td>0</td>
</tr>
<tr>
<td>Austral Deciduous: 56</td>
<td>18</td>
<td>0</td>
<td>20</td>
<td>2</td>
</tr>
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<td>Aerial: 72</td>
<td>10</td>
<td>3</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Permanent Aquatic: 47</td>
<td>13</td>
<td>19</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>Seasonal Aquatic: 32</td>
<td>13</td>
<td>9</td>
<td>28</td>
<td>0</td>
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<td>Fencerows: 55</td>
<td>5</td>
<td>0</td>
<td>43</td>
<td>0</td>
</tr>
<tr>
<td>Wires: 28</td>
<td>14</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Field and Pasture: 49</td>
<td>10</td>
<td>0</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Orchard: 27</td>
<td>30</td>
<td>0</td>
<td>37</td>
<td>0</td>
</tr>
<tr>
<td>Total observed: 1,286</td>
<td>21</td>
<td>1</td>
<td>34</td>
<td>2</td>
</tr>
</tbody>
</table>
Habitats and Constituents

This section will be presented in a somewhat complex manner; it is hoped that this will give a comprehensive description of the habitat as a community. To accomplish this, the following order of presentation will be followed as carefully as possible: (1) list of typical plants in the habitat; (2) discussion of extent of variation and other pertinent data concerning the vegetation; (3) list of birds recorded for the habitat; (4) elaboration on avifauna as it applies, first, to Gordon's faunal area plan, and, second, in general relation to habitat. The habitats will be covered in the same order as in Tables 5-8.

Boreal Habitats

1. Noble Fir Forest Habitat (Plates III, VI. B)

Dominants: Noble fir, Douglas fir, western hemlock.

Subdominants: Grasses, numerous herbs.

Douglas fir and western hemlock replace noble fir around and below the 3,500 foot elevation level on Mary's Peak, and extend higher in decreasing numbers. This situation makes the noble fir habitat the smallest in extent of those under study, and also provides the sharpest ecotone for any of the habitats. Most of the noble fir area is composed of fairly young trees, particularly in the arms invading the meadow on the summit. The noble fir growth is
Plate III. Diagrammatic Cross-section of Noble Fir Forest Habitat
typically dense, undergrowth being virtually nonexistent. Because of the limited size of both forest and meadow growth, the habitat was not subdivided; the notes taken on birds indicate that little increase in numbers is caused by the differing life forms of the plants.

This habitat is the recipient of the most extreme climatic conditions in the study area—in fact, the only habitat with a climate noticeably different. Reports are that this winter, 1949-50, the summit has received in excess of 15 feet of snow, probably a near-record, but indicative of the weather conditions: early fall and late spring frosts, with generally low temperatures.

Boreal Species: 23

<table>
<thead>
<tr>
<th>Species</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raven</td>
<td>11</td>
</tr>
<tr>
<td>Sooty Grouse</td>
<td>9</td>
</tr>
<tr>
<td>Oregon Junco</td>
<td>7</td>
</tr>
<tr>
<td>Red-breasted Nuthatch</td>
<td>6</td>
</tr>
<tr>
<td>Golden-crowned Kinglet</td>
<td>6</td>
</tr>
<tr>
<td>Chestnut-backed Chickadee</td>
<td>4</td>
</tr>
<tr>
<td>White-crowned Sparrow</td>
<td>4</td>
</tr>
<tr>
<td>Hermit Warbler</td>
<td>3</td>
</tr>
<tr>
<td>California Purple Finch</td>
<td>3</td>
</tr>
<tr>
<td>Evening Grosbeak</td>
<td>2</td>
</tr>
<tr>
<td>Audubon's Warbler</td>
<td>2</td>
</tr>
<tr>
<td>Pileated Woodpecker</td>
<td>2</td>
</tr>
<tr>
<td>Red-shafted Flicker</td>
<td>2</td>
</tr>
</tbody>
</table>

Austral Species: 6

<table>
<thead>
<tr>
<th>Species</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chipping Sparrow</td>
<td>4</td>
</tr>
<tr>
<td>Calaveras Warbler</td>
<td>2</td>
</tr>
<tr>
<td>Band-tailed Pigeon</td>
<td>1</td>
</tr>
<tr>
<td>Rufous Hummingbird</td>
<td>1</td>
</tr>
<tr>
<td>Solitary Vireo</td>
<td>1</td>
</tr>
<tr>
<td>Vaux's Swift</td>
<td>1</td>
</tr>
</tbody>
</table>

Total occurrences 10
Boreal Species: (cont.)

<table>
<thead>
<tr>
<th>Species</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olive-sided Flycatcher</td>
<td>2</td>
</tr>
<tr>
<td>Steller's Jay</td>
<td>2</td>
</tr>
<tr>
<td>Creeper</td>
<td>1</td>
</tr>
<tr>
<td>Red-breasted Sapsucker</td>
<td>1</td>
</tr>
<tr>
<td>Ruffed Grouse</td>
<td>1</td>
</tr>
<tr>
<td>Western Winter Wren</td>
<td>1</td>
</tr>
<tr>
<td>Western Tanager</td>
<td>1</td>
</tr>
<tr>
<td>Pine Siskin</td>
<td>1</td>
</tr>
<tr>
<td>Varied Thrush</td>
<td>1</td>
</tr>
<tr>
<td>Western Bluebird</td>
<td>1</td>
</tr>
</tbody>
</table>

Total occurrences: 73

(Numbers are records of times seen in this habitat.)

The boreal species not only outnumber the austral species 23 to 6, but on records of occurrence dominate by 7 to one, substantiating what one would expect: that the noble fir habitat is the most typically boreal area to be found in the Coast Mountains (Tables 5-8). The chipping sparrow and white-crowned sparrow were the only species showing a definite preference for the grassland, and they sought shelter in the firs on being disturbed. The austral species were observed in the summer only, but even so, all but the chipping sparrow were found within, or in the top of, the fir stand. The Calaveras warblers were apparently in migration (August 14), and definitely out of their normal habitat.
Both the raven and the sooty grouse could well be considered major influents in the biome outline, the other species being minor influents and subinfluents. I would designate this habitat as of climax status of restricted extent for it possesses the principal characteristics of a climax: (1) It is reproducing itself in its own shade, and encroaching upon the meadow above; (2) there is no evidence that it is being, or is due to be, replaced by any other species; and (3) it is probably climatically controlled due to its elevation. The noble fir habitat could be either a consociation or a lociation depending upon the definitions involved. The raven is the most characteristic animal in the climax; thus the community could be termed Abies procera–Corvus corax consociation (or lociation).

My records through the spring and early summer of 1949 make note of the hooting of the sooty grouse as early as March 22, when snow was still two feet deep through the forest (Plate VI. B), and as late as July 10; this would indicate quite an extended breeding season. The grouse and the raven are two species that can be expected to be seen and heard on almost every journey to the summit of Mary's Peak. Most of the species with only one record of occurrence are casual visitors to the habitat, principally during the summer, from lower elevations.

2. Coniferous Forest Tree Layer Habitat (Plates IV–VII)

Dominants: Douglas fir, western hemlock, western red
cedar, grand fir, and Sitka spruce (coastally).

Subdominants: Vine maple, Pacific yew, red alder, bigleaf maple, Garry oak.

This is the most variable, and the most problematical, of the habitats being studied. It varies from the mature climax to fairly young second growth forest, from dense stands with brush layer habitat beneath to open stands where an old growth of brush is subdominant, and to scattered clumps of old trees that survived the axe and the flame. It is difficult to group all of this as one habitat, but there are no satisfactory subdivisions that will stand the tests. This extensive variation is responsible for the invasion of many austral birds into apparently boreal conditions, and thus explains some of the questionable avifaunal records.

Locally Douglas fir and western hemlock may grow in dense stands, almost to the exclusion of other dominants, but such areas are not particularly common or extensive. Typically, the dominants are unevenly mixed, cedar never being abundant and usually preferring moist situations. Mature climax stands are notably scarce and inaccessible (and rapidly disappearing down the log road as accessibility is gained); neither are they teeming with bird life. The climax forest would not include the extensive list of species herein recorded for the coniferous forest.

As the name specified, this is a layer habitat—
Plate IV. Diagrammatic Cross-section of Variations in Coniferous and Brush Habitats
lamiation or lamies in the biome(3); birds were considered in it only when they were distinctly separate from the brush layer beneath, i.e., on the trunk or in association with the upper reaches of the trees. The subdominants are normally too low to participate in the habitat, but occasionally attain heights well above the brush layer, and at such times were recorded as members of the tree layer.

Boreal Species:  33  
Steller's Jay  49  Hairy Woodpecker  9  
Chestnut-backed Chickadee  24  Band-tailed Pigeon  7  
Pileated Woodpecker  24  Cooper's Hawk  4  
Red-breasted Nuthatch  21  Turkey Vulture  3  
Golden-crowned Kinglet  19  Western Mourning Dove  3  
Red-breasted Sapsucker  14  Solitary Vireo  3  
Creeper  13  Western Warbling Vireo  3  
Evening Grosbeak  12  Western Wood Pewee  3  
Oregon Jay  12  Downy Woodpecker  2  
Sooty Grouse  10  Western Red-tailed Hawk  2  
Pine Siskin  10  Screech Owl  2  
Raven  10  Black-headed Grosbeak  2  
Oregon Junco  9  Western Crow  2  
Ruby-crowned Kinglet  8  Hutton's Vireo  1  
Russet-backed Thrush  8  Yellow Warbler  1  
Olive-sided Flycatcher  7  Brewer's Blackbird  1  
Red Crossbill  6  Rufous Hummingbird  1  
Hermit Warbler  6  Horned Owl  1  
Austral Species:  20  

### Boreal Species: (cont.)

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Tanager</td>
<td>6</td>
</tr>
<tr>
<td>Varied Thrush</td>
<td>4</td>
</tr>
<tr>
<td>Cedar Waxwing</td>
<td>4</td>
</tr>
<tr>
<td>Red-shafted Flicker</td>
<td>4</td>
</tr>
<tr>
<td>Sharp-shinned Hawk</td>
<td>2</td>
</tr>
<tr>
<td>Ruffed Grouse</td>
<td>2</td>
</tr>
<tr>
<td>Mountain Quail</td>
<td>2</td>
</tr>
<tr>
<td>Robin</td>
<td>2</td>
</tr>
<tr>
<td>Western Bluebird</td>
<td>2</td>
</tr>
<tr>
<td>California Purple Finch</td>
<td>2</td>
</tr>
<tr>
<td>Goshawk</td>
<td>1</td>
</tr>
<tr>
<td>Western Winter Wren</td>
<td>1</td>
</tr>
<tr>
<td>Traill's Flycatcher</td>
<td>1</td>
</tr>
<tr>
<td>Hermit Thrush</td>
<td>1</td>
</tr>
<tr>
<td>Townsend's Solitaire</td>
<td>1</td>
</tr>
</tbody>
</table>

**Total occurrences:** 297

### Austral Species: (cont.)

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellowthroat</td>
<td>1</td>
</tr>
<tr>
<td>Common Goldfinch</td>
<td>1</td>
</tr>
<tr>
<td>Great Blue Heron</td>
<td>2</td>
</tr>
</tbody>
</table>

**Total occurrences:** 52

Although the austral species account for 37 per cent of the species found here, they make up only 14 per cent of the occurrence records—an indication that they are, for the most part, less adaptable to the coniferous forest. Because it is the most extensive habitat in the Coast Range, the coniferous forest tree layer is the principal stronghold, or center of distribution, for the Boreal Assemblage.

In the biome plan, Steller's jay and the pileated...
woodpecker can probably be classed as major influents; the chestnut-backed chickadee, red-breasted nuthatch, and golden-crowned kinglet might well be included as major influents also, for they occur in flocks which make up for their small sizes.

It is difficult to conceive of subdivisions of the biome which would satisfactorily handle the variations of this habitat, and yet it seems that to conform to the scheme there should be divisions, such as between mature and young growth. Perhaps a more detailed study of this habitat in relation to the biome is necessary to achieve proper adjustment.

3. Boreal Deciduous Tree Layer Habitat (Plates VI. A and VII. A)

Dominants: Red alder, bigleaf maple, cottonwood, Oregon ash, Garry oak, willows.

Subdominants: Brush layer species.

Red alder, bigleaf maple, and willows are the major components of this habitat in forming the growth along most of the streams, small and large, in the Coast Range. In addition to streamside growth, maple and alder occur in seral stands (generally pure alder, or pure maple) on northern exposures, poorly drained sites, and other situations. Along the larger streams bordering the Willamette Valley, the other species may enter the habitat, but are not of great importance. This habitat is frequently
adjacent to roads, fields, pastures, and other of man's alterations, which generally increase the bird population in the habitat through an increased food supply. The coniferous forest normally adjoins, and cedar is commonly found mixing with the deciduous growth. Elsewhere, small patches of alder may surround a spring at the headwaters of a creek well up on a mountainside.

This is another layer habitat (or lamies); usually the shrubby undergrowth is best placed in the brush layer habitat.

Boreal Species: 22

Chestnut-backed Chickadee 11
Robin 9
Red-shafted Flicker 7
Evening Grosbeak 6
Golden-crowned Kinglet 6
Varied Thrush 5
Russet-backed Thrush 4
Steller's Jay 3
Sooty Grouse 3
Hermit Thrush 3
Traill's Flycatcher 3
Ruffed Grouse 2
Red-breasted Sapsucker 2
Ruby-crowned Kinglet 2
Pine Siskin 2

Austral Species: 17

Downy Woodpecker 5
Western Warbling Vireo 5
Western Wood Pewee 5
Solitary Vireo 3
Band-tailed Pigeon 2
Yellow Warbler 2
Black-throated Gray Warbler 2
Pileolated Warbler 2
Black-headed Grosbeak 2
Song Sparrow 2
Hairy Woodpecker 1
Western Flycatcher 1
Tree Swallow 1
Bush-tit 1
Hutton's Vireo 1
Boreai Species: (cont.)   Austral Species: (cont.)
Oregon Junco            2 Calaveras Warbler       1
Mountain Quail          1 Spotted Towhee         1
Olive-sided Flycatcher  1 Total occurrences  37
Red-breasted Nuthatch  1
Creeper                 1
Myrtle Warbler          1
Audubon's Warbler       1
Total occurrences       76

My field records for this group justify, at least partially, the "boreal" affix arbitrarily attached to the habitat name. It was anticipated that this habitat would be less boreal, or at least not typically boreal, because of its deciduous nature. The species occurrences indicate an even more boreal environment than I had expected.

On the basis of this study, no species, except perhaps the chestnut-backed chickadee, can be termed a major influential in this community. In the biome, this group would be classed as a seral stage; certain parts of it might well be edaphic disclimaxes, as along stream banks.

During the summer of 1949 the red alder was very heavily infested with a tent caterpillar in many localities; this undoubtedly had some effect upon the birds as an increased food supply, but no particular species was noted as being exceptionally fond of the insect.
\textbf{A. Brush Layer Habitat (Plate IV)}

**Dominants:** Vine maple, western yew, salal, salmonberry, thimbleberry, Oregon grape, dogwood, devil's club, ocean spray, syringa, gooseberries, huckleberries, western hazel, serviceberry, rhododendron; very locally, shield fern.

**Subdominants:** Foxglove, wild iris, bleeding heart, Oregon lily, bear grass, trilliums, fairy lanterns, fairy bells, wild ginger, vanilla leaf, oxalis, shield fern, other ferns, mosses.

In its best development, the brush layer is very well shaded by the towering tree layer, and thus has the most uniform climate in this region; it is the type of growth that Moreau (18: 64) identifies as "perennially cooler, damper, darker". In such a role in the mature climax forest, it apparently appeals to few birds: to the winter wren all year, and in summer to pileolated and yellow warblers.

Since this community in the above restricted sense occurs only under dense old growth, it is, of course, as scattered and infrequent as the tree layer. Thus, in younger and more open stands, the brush layer becomes more and more similar to the old growth brush habitat in the open sun. Somewhere between is the line of division, but needless to say, it is not distinct. As the light factor is the most obvious difference between the two, only brush
receiving very little or no direct sunlight was recorded as of the brush layer. Included in this habitat, then, is most of the streamside brush beneath boreal deciduous trees and the most shaded brush beneath coniferous trees.

The height of brush layer vegetation may be less than two feet in local conditions, but normally is much taller, tending to merge with the layer formed by vine maple and yew where these occur. Devil's club, salmonberry, thimbleberry, and syringa are more commonly encountered blanket- ing the smaller mountain streams, with shield fern occasion- ally taking a major part. On the few northern exposures where old trees were met, the brush layer was open or scat- tered, and at higher elevations included clumps of rhodo- dendron.

In this thesis three brush habitats are distinguished; a number of plants are common to all three, but a few species are largely confined to each one. Separate from species differences, each has a characteristic habit of growth: (1) The brush layer is heavily shaded; because of the environmental conditions thus produced, this is regarded as a boreal habitat. (2) The new growth brush habitat is sparsely spaced, and thus quite austral. (3) The old growth brush is very dense, exposed to the sun, and therefore, austral also. Since these are of similar growth structure, it is only natural that several species of birds will be characteristic of all three, while a few species
will be distinctive for each, as in the case of plant components.

<table>
<thead>
<tr>
<th>Boreal Species:  9</th>
<th>Austral Species: 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Winter Wren</td>
<td>23</td>
</tr>
<tr>
<td>Oregon Junco</td>
<td>9</td>
</tr>
<tr>
<td>Sooty Grouse</td>
<td>4</td>
</tr>
<tr>
<td>White-crowned Sparrow</td>
<td>4</td>
</tr>
<tr>
<td>Fox Sparrow</td>
<td>2</td>
</tr>
<tr>
<td>Mountain Quail</td>
<td>1</td>
</tr>
<tr>
<td>Hermit Thrush</td>
<td>1</td>
</tr>
<tr>
<td>Russet-backed Thrush</td>
<td>1</td>
</tr>
<tr>
<td>Golden-crowned Kinglet</td>
<td>1</td>
</tr>
<tr>
<td>Total occurrences</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Total occurrences</td>
<td>60</td>
</tr>
</tbody>
</table>

The predominance of austral species here expresses the kinship of all three brush habitats with austral conditions, but the high occurrence of the winter wren is indicative of the boreal environment within the brush layer. That is, the micro-environmental conditions do not construct a formidable barrier to austral species of the avifauna. As mentioned above, however, the austral species in general do not successfully invade the most boreal development of the brush layer.

None of the species can be rated as major influents in the biome concept, for even the winter wren is not present
in sufficient abundance to justify consideration. The layer is a lamination of the climax (3), or lamies of the later seral stages.

Austral Habitats

5. New Growth Brush Habitat (Plate VII. B)

Dominants: Thistles, groundsel, fireweed, and other annuals; survivors of logging and/or fire from the preceding brush layer or old growth brush habitat.

Subdominants: Generally, remnants of previous herb layer; occasionally, annuals new to the community; bracken fern.

New Growth Brush is rather arbitrary nomenclature for the low, sparse growth occurring in the first three to five years following severe fires. The areas supplying most of the data here used had been completely logged off in recent years, and slash fires had burned freely through the area of devastation; in at least one situation, fire had occurred two successive years.

Stumps and rejected logs usurp much of the ground surface; frequently they have not decayed sufficiently to be of interest to woodpeckers. Snags may be common, but live tree survivors are quite rare. In an area on Mary's Peak, a plant ecology class study found 45 per cent of the total abundance of all plants consisting of groundsel and thistle. Of the total abundance, 17 per cent was made up by Oregon
grape and salal, the two most numerous brush survivors, while five remnant species of the original herbaceous layer comprised 20 per cent.

Severe logging operations alone are capable of creating conditions assignable to this habitat for the first year or two succeeding the removal of the trees. The log runs and tractor trails are usually scraped free of all vegetation. When fire follows, the area is made suitable for invasion by annuals as described above. In all areas, bracken fern will appear, but as long as it remains subdominant, the habitat is still new growth brush. When bracken fern crowds out most other growth, it creates an entirely different habitat, which is considered later in this study.

**Boreal Species: 10**  
Oregon Junco 5  
Red-shafted Flicker 4  
White-crowned Sparrow 3  
Sooty Grouse 1  
Ruffed Grouse 1  
Pileated Woodpecker 1  
Red-breasted Sapsucker 1  
Winter Wren 1  
Robin 1  
Red Crossbill 1  
Total occurrences 19

**Austral Species: 12**  
Spotted Towhee 4  
Song Sparrow 4  
Rufous Hummingbird 3  
Common Goldfinch 3  
Chipping Sparrow 2  
Western Flycatcher 2  
Bewick's Wren 2  
Violet-green Swallow 2  
California Quail 1  
Black-throated Gray Warbler 1  
Macgillivray's Warbler 1
Austral Species: (cont.)

Pileolated Warbler 1
Total occurrences 26

If one recognizes that the three boreal species recorded more than once in the recently burned areas are wide-ranging forms (that is, not confined to boreal situations), it is all the more apparent that this is an austral niche. Actually, few species nest here because of the scarcity of protective cover; all of the records were obtained for this group after the breeding season. Several "counts" in this habitat yielded only one or two records, so that no species is thoroughly typical of it.

6. Old Growth Brush Habitat (Plates V, VIII. B)

Dominants: Salal, Oregon grape, salmonberry, thimbleberry, ocean spray, hazelnut, serviceberry, huckleberries, blackberries, black raspberry, gooseberries, cascara, elderberry, red alder reproduction, coniferous reproduction, and other species; snags and occasionally trees.

Subdominants: Bracken fern, wild iris, foxglove, many low herbs, grasses, and sedges; few mosses, if any.

Chaparral-like in appearance, heavy growths of brush occupy large portions of the Coast Mountains from a few years following fire or logging until a new stand of trees replaces them—their dominance frequently extending over many years.
The plant composition of this habitat varies widely, any of a number of species being most abundant in differing localities. The large number of constituents producing edible fruits infers a large bird population, which is exactly the situation.

There is considerable intermingling of this community with the coniferous forest as shown in Plate V. A. As earlier stated (p. 48), old growth brush receives most of the available sunlight, and thus is typically austral. Nevertheless, the frequent existence of conifers within the brush habitat, and the frequent invasion of brush into open stands of timber allow some interchanging of austral and boreal species of birds.

**Boreal Species: 24**

- Oregon Junco 10
- Black-capped Chickadee 5
- Chestnut-backed Chickadee 5
- Robin 5
- Sooty Grouse 4
- Winter Wren 4
- California Purple Finch 4
- White-crowned Sparrow 3
- Red-shafted Flicker 3
- Steller's Jay 3
- Hermit Thrush 3
- Western Bluebird 3

**Austral Species: 26**

- Song Sparrow 15
- Spotted Towhee 14
- Rufous Hummingbird 11
- Bush-tit 10
- Pileolated Warbler 10
- Orange-crowned Warbler 8
- Macgillivray's Warbler 7
- Hutton's Vireo 6
- Western Flycatcher 5
- Bewick's Wren 4
- Western Mourning Dove 3
- Downy Woodpecker 2
Boreal Species: (cont.)

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden-crowned Kinglet</td>
<td>3</td>
</tr>
<tr>
<td>Ruffed Grouse</td>
<td>2</td>
</tr>
<tr>
<td>Mountain Quail</td>
<td>2</td>
</tr>
<tr>
<td>Pileated Woodpecker</td>
<td>2</td>
</tr>
<tr>
<td>Varied Thrush</td>
<td>2</td>
</tr>
<tr>
<td>Ruby-crowned Kinglet</td>
<td>2</td>
</tr>
<tr>
<td>Golden-crowned Sparrow</td>
<td>2</td>
</tr>
<tr>
<td>Fox Sparrow</td>
<td>2</td>
</tr>
<tr>
<td>Townsend's Warbler</td>
<td>1</td>
</tr>
<tr>
<td>Wilson's Snipe</td>
<td>1</td>
</tr>
<tr>
<td>Russet-backed Thrush</td>
<td>1</td>
</tr>
<tr>
<td>Traill's Flycatcher</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total occurrences</strong></td>
<td><strong>73</strong></td>
</tr>
</tbody>
</table>

Austral Species: (cont.)

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violet-green Swallow</td>
<td>2</td>
</tr>
<tr>
<td>Wren-tit</td>
<td>2</td>
</tr>
<tr>
<td>House Wren</td>
<td>2</td>
</tr>
<tr>
<td>Yellow Warbler</td>
<td>2</td>
</tr>
<tr>
<td>Black-headed Grosbeak</td>
<td>2</td>
</tr>
<tr>
<td>Common Goldfinch</td>
<td>2</td>
</tr>
<tr>
<td>Sparrow Hawk</td>
<td>2</td>
</tr>
<tr>
<td>California Quail</td>
<td>2</td>
</tr>
<tr>
<td>California Jay</td>
<td>2</td>
</tr>
<tr>
<td>Hairy Woodpecker</td>
<td>1</td>
</tr>
<tr>
<td>Western Wood Pewee</td>
<td>1</td>
</tr>
<tr>
<td>Western Warbling Vireo</td>
<td>1</td>
</tr>
<tr>
<td>Black-throated Gray Warbler</td>
<td>1</td>
</tr>
<tr>
<td>Vesper Sparrow</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total occurrences</strong></td>
<td><strong>118</strong></td>
</tr>
</tbody>
</table>

Again, the austral character of the community is partially obscured by the long list of boreal species recorded for the area; the boreal occurrences in some instances (e.g., Steller's jay, chestnut-backed chickadee, kinglets) are aided by the scattering of conifers through the brush; others, as the junco and the robin, are species not limited to boreal conditions. And, in spite of the numerous boreal species observed, the austral species make up 62 per cent of the occurrences, and thus are the more
typical inhabitants of the community. Nesting records would also give a better indication of the austral affinities, for many of the Austral Assemblage nest in this habitat, while few of the boreal species do.

7. Bracken Fern Habitat (Plate VIII)

Dominants: Bracken fern; occasionally conifers and shrubs.

Subdominants: Many low-growing wild flowers, some grasses.

Bracken fern forms extensive cover on many hillsides throughout the Coast Range, often taking over many acres without the occurrence of any trees or tall shrubs, and only infrequent snags. As such, it offers little of interest to the avifauna, but, of course, is of utmost importance in prevention of erosion in logged and burned areas. Following severe fires, it may receive little assistance from other plants in forming an erosion-preventing cover.

Often the fern is broken here and there by young Douglas firs, or a clump of bushes. It is when these are more numerous that birds become more abundant in the fern. In winter, the fern has even less to offer birds; one may search large areas and encounter only a lone winter wren, or possibly a song sparrow, or maybe nothing at all.
### Boreal Species: 4

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Winter Wren</td>
<td>5</td>
</tr>
<tr>
<td>White-crowned Sparrow</td>
<td>3</td>
</tr>
<tr>
<td>Oregon Junco</td>
<td>2</td>
</tr>
<tr>
<td>Robin</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total occurrences</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>

### Austral Species: 10

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Song Sparrow</td>
<td>3</td>
</tr>
<tr>
<td>Spotted Towhee</td>
<td>3</td>
</tr>
<tr>
<td>Macgillivray’s Warbler</td>
<td>2</td>
</tr>
<tr>
<td>Pileolated Warbler</td>
<td>2</td>
</tr>
<tr>
<td>Orange-crowned Warbler</td>
<td>2</td>
</tr>
<tr>
<td>Common Goldfinch</td>
<td>2</td>
</tr>
<tr>
<td>Western Flycatcher</td>
<td>2</td>
</tr>
<tr>
<td>Bewick’s Wren</td>
<td>2</td>
</tr>
<tr>
<td>Western Wood Pewee</td>
<td>1</td>
</tr>
<tr>
<td>Green-backed Goldfinch</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total occurrences</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

That the fern niche is austral is evident, especially when it is noted that the winter wren was seen only in winter when temperatures make the fern superficially boreal. It is doubtful that any of the birds nest within the fern proper; most of them use it as foraging grounds only.

### Austral Deciduous Habitat

**Dominants:** Garry Oak, madrone, chinquapin; infrequently bigleaf maple, Oregon ash, and others; Douglas fir in mixed growth.

**Subdominants:** Hawthorn, wild roses, blackberries, snowberry, poison oak, Indian peach, Oregon grape; wild strawberry, adder’s tongue, shooting star, spring queen, spring beauty, buttercup, grasses.
Perhaps inadequately named (two of the frequent dominants are evergreens), this habitat approaches Willamette Valley conditions, and is largely restricted to the eastern slopes of the Coast Mountains. It includes the more or less woodland-like stands of Garry oak, madrone and chinquapin, and the mixed stands of these with Douglas fir. To some extent, this habitat forms the ecotone between the Willamette Valley and the Coast Range, and occupies much of the foothill regions. Near the valley, oak is the common dominant, but in the typical foothill situation it may be less abundant than madrone and/or chinquapin. Douglas fir does not mix with the woodland growth so much as it shares situations with it; the woodland occupies dry and exposed sites, Douglas fir taking the shaded slopes. The woodland is very often used for pasturage, which helps keep it in an open-growth structure, with clumps of brush providing browse.

Stratification differences were not maintained here because of the lower heights of the tree layer and the open situation which reduces the distinctions made by the birds inhabiting this community. Fewer counts were made in this habitat since it is not extensive in the Coast Mountains proper.

Boreal Species: 15

| Black-capped Chickadee | 4 |
| Red-shafted Flicker | 3 |

Austral Species: 16

| White-breasted Nuthatch | 4 |
| Downy Woodpecker | 4 |
Boreal Species: (cont.)  
Red-breasted Sapsucker  3  
Olive-sided Flycatcher  1  
Red-breasted Nuthatch  1  
Creeper  1  
Robin  1  
Varied Thrush  1  
Hermit Thrush  1  
Russet-backed Thrush  1  
Western Bluebird  1  
Audubon's Warbler  1  
California Purple Finch  1  
Pine Siskin  1  
Oregon Junco  1  
Total occurrences  22

Austral Species: (cont.)  
Spotted Towhee  4  
Bewick's Wren  3  
Chipping Sparrow  3  
Solitary Vireo  2  
California Quail  2  
Western Wood Pewee  2  
Bush-tit  2  
Mourning Dove  2  
Lewis's Woodpecker  1  
California Jay  1  
Hutton's Vireo  1  
Orange-crowned Warbler  1  
Pileolated Warbler  1  
Long-tailed Chat  1  
Total occurrences  34

The austral list can hardly be considered complete, for several species common to the Willamette Valley are not included. However, it is not necessary that this community be thoroughly examined; it is brought in principally to indicate the more austral situations prevailing in the neighboring valley. The 60 per cent austral occurrences for the few records taken are sufficiently indicative of this point.

How this area would best be handled in the biome is difficult to say; occurring in the rain shadow of the Coast
Range as it does, it could be contended that Garry oak forms a climax, and that the mixtures with madrone, chinquapin, and Douglas fir are ecotonal. However, the matter remains debatable.

Superficial Habitats

9. Aerial

Records of birds observed in prolonged flight, soaring, or in migratory flight deserve consideration, but cannot be adjusted to other habitats in every instance. Such records are herewith presented.

Boreal Species: 9

Austral Species: 10

<table>
<thead>
<tr>
<th>Species</th>
<th>Total occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raven</td>
<td>5</td>
</tr>
<tr>
<td>Canada Goose</td>
<td>3</td>
</tr>
<tr>
<td>Goshawk</td>
<td>1</td>
</tr>
<tr>
<td>Golden Eagle</td>
<td>1</td>
</tr>
<tr>
<td>Bald Eagle</td>
<td>1</td>
</tr>
<tr>
<td>Little Brown Crane</td>
<td>1</td>
</tr>
<tr>
<td>Pileated Woodpecker</td>
<td>1</td>
</tr>
<tr>
<td>Robin</td>
<td>1</td>
</tr>
<tr>
<td>Pine Siskin</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total occurrences</strong></td>
<td><strong>15</strong></td>
</tr>
<tr>
<td>Turkey Vulture</td>
<td>25</td>
</tr>
<tr>
<td>Violet-green Swallow</td>
<td>12</td>
</tr>
<tr>
<td>Red-tailed Hawk</td>
<td>6</td>
</tr>
<tr>
<td>Barn Swallow</td>
<td>3</td>
</tr>
<tr>
<td>Band-tailed Pigeon</td>
<td>3</td>
</tr>
<tr>
<td>Western Crow</td>
<td>2</td>
</tr>
<tr>
<td>Western Mourning Dove</td>
<td>1</td>
</tr>
<tr>
<td>Tree Swallow</td>
<td>1</td>
</tr>
<tr>
<td>Cliff Swallow</td>
<td>1</td>
</tr>
<tr>
<td>Purple Martin</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total occurrences</strong></td>
<td><strong>55</strong></td>
</tr>
</tbody>
</table>

Although no comparison was intended for this group of
species, it is interesting to note the preponderance of austral species observed in flight. Also noteworthy is that 7 of the austral species either feed in flight, or locate their food while in flight, and 6 of the 7 are migratory. In contrast, only three boreal species rely on flight for spotting food; all 3 are rather rare in occurrence in western Oregon, and none of the 3 are truly migratory.

10. Permanent Aquatic Habitat

Rivers and lakes are not actually superficial, but they have no distinctive vegetative associations. Only one marsh was visited in field work, so it is placed here for simplicity.

Boreal Species: 13

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belted Kingfisher</td>
<td>6</td>
</tr>
<tr>
<td>American Merganser</td>
<td>6</td>
</tr>
<tr>
<td>Dipper</td>
<td>3</td>
</tr>
<tr>
<td>Whistling Swan</td>
<td>2</td>
</tr>
<tr>
<td>Canvas-back</td>
<td>2</td>
</tr>
<tr>
<td>Lesser Scaup</td>
<td>2</td>
</tr>
<tr>
<td>Baldpate</td>
<td>2</td>
</tr>
<tr>
<td>Red-throated Loon</td>
<td>1</td>
</tr>
<tr>
<td>Pintail</td>
<td>1</td>
</tr>
<tr>
<td>Greater Scaup</td>
<td>1</td>
</tr>
<tr>
<td>White-winged Scoter</td>
<td>1</td>
</tr>
</tbody>
</table>

Austral Species: 4

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough-winged Swallow</td>
<td>1</td>
</tr>
<tr>
<td>Purple Martin</td>
<td>1</td>
</tr>
<tr>
<td>Common Goldfinch</td>
<td>1</td>
</tr>
<tr>
<td>Long-billed Marsh Wren</td>
<td>1</td>
</tr>
</tbody>
</table>

Total occurrences 4

Uncertain Status: 6

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Blue Heron</td>
<td>6</td>
</tr>
<tr>
<td>American Coot</td>
<td>3</td>
</tr>
<tr>
<td>Western Grebe</td>
<td>2</td>
</tr>
<tr>
<td>Mallard</td>
<td>1</td>
</tr>
</tbody>
</table>
Boreal Species: (cont.)

Surf Scoter 1
Ring-billed Gull 1
Total occurrences 29

Uncertain Status: (cont.)

Spotted Sandpiper 1
Western Gull 1
Total occurrences 14

That the waterways of the Coast Mountains provide a boreal environment cannot be disputed; all the more so since several of the waterfowl are winter visitors from farther north. Vast numbers of water and shore birds winter along the Oregon coast, and inland along the rivers and larger creeks for some distance, especially during storms. Because of the distance to this coastal area and the weather of the previous two winters, the field notes are not complete.

Kingfishers and great blue herons are the only species really widespread over the study area, although mergansers are seen further inland than any of the other waterfowl. Dippers may be expected along any swift-flowing stream, but are not common in the Coast Range.

Of the austral species, the marsh wren, of course, was seen in the marsh; purple martins and rough-winged swallows were observed feeding and drinking over open water; and the goldfinches were recorded drinking from Big Elk Creek on rocks in midstream.

11. Seasonal Aquatic Habitat

From November into spring, many fields and pastures
along the coastal streams are inundated by the heavy rains; some of the flooded areas drain rapidly, others persist throughout the rainy season. The result is a unique feeding ground for both water and land birds during the season when food tends to be scarce. Again, because of distance and weather, only a few trips were possible for notes on these areas.

**Boreal Species: 10**

- Baldpate: 2
- Lesser Scaup: 2
- American Merganser: 2
- Wilson's Snipe: 2
- Robin: 2
- Varied Thrush: 2
- Red-shafted Flicker: 1
- Pintail: 1
- Canvas-back: 1
- Ring-billed Gull: 1

**Total occurrences: 16**

**Austral Species: 3**

- Redwing: 2
- Brewer's Blackbird: 1
- Western Crow: 1
- Uncertain Status: 4

**Total occurrences: 12**

Being of winter incidence, this habitat is expected to attract boreal species. It should be noted that the three austral species are not fully migratory species; in fact, the crow and the blackbird are among the most common wintering species in the agricultural areas.

At times the ducks in flooded pastures may be so numerous as to defy counting; several species will be
congregated in one large flock, totaling well into the hundreds.

Habitats Provided by Man

The remaining groups of birds represent principally notes that were made of observations while traveling to the above areas; that is, no efforts were directed toward a full coverage of the regions inhabited and directly controlled by man. Although admittedly incomplete, the four lists do present the most conspicuous birds for each division.

Presumably, this entire section would be designated as disclimaxes in the biome.

12. Fencerows

Dominants: Blackberries, Oregon grape, poison oak, apple trees, hawthorn, and several shrubs of brush habitats.

Subdominants: Grasses, volunteer field plants, many introduced weeds and wild flowers.

Fencerows support such a large bird population that it is difficult to keep complete records of the birds seen as one drives along, and still arrive at a destination. Occasionally, also, it is necessary to reach an objective in such a short time that one cannot direct full attention to the fencerows. Thus the following list is submitted as being merely representative of the birds most commonly seen
while traveling the roads in the Coast Range.

It is obvious, also, that records of this sort will be most numerous for winter as the birds are more conspicuous when the foliage is absent.

Boreal Species: 13

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>White-crowned Sparrow</td>
<td>4</td>
</tr>
<tr>
<td>Golden-crowned Sparrow</td>
<td>4</td>
</tr>
<tr>
<td>Oregon Junco</td>
<td>4</td>
</tr>
<tr>
<td>Fox Sparrow</td>
<td>3</td>
</tr>
<tr>
<td>Red-shafted Flicker</td>
<td>3</td>
</tr>
<tr>
<td>Steller's Jay</td>
<td>2</td>
</tr>
<tr>
<td>Black-capped Chickadee</td>
<td>1</td>
</tr>
<tr>
<td>Winter Wren</td>
<td>1</td>
</tr>
<tr>
<td>Robin</td>
<td>1</td>
</tr>
<tr>
<td>Hermit Thrush</td>
<td>1</td>
</tr>
<tr>
<td>Bluebird</td>
<td>1</td>
</tr>
<tr>
<td>Audubon's Warbler</td>
<td>1</td>
</tr>
<tr>
<td>California Purple Finch</td>
<td>1</td>
</tr>
</tbody>
</table>

Total occurrences 27

Austral Species: 7

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spotted Towhee</td>
<td>10</td>
</tr>
<tr>
<td>Song Sparrow</td>
<td>9</td>
</tr>
<tr>
<td>California Jay</td>
<td>2</td>
</tr>
<tr>
<td>Bush-tit</td>
<td>2</td>
</tr>
<tr>
<td>Orange-crowned Warbler</td>
<td>2</td>
</tr>
<tr>
<td>Common Goldfinch</td>
<td>2</td>
</tr>
<tr>
<td>Vesper Sparrow</td>
<td>1</td>
</tr>
</tbody>
</table>

Total occurrences 28

Despite the predominance of boreal species, it can be asserted that the fencerow is an austral habitat. For one thing, it should be noted that golden-crowned sparrows, fox sparrows, and hermit thrushes are winter visitors in the Coast Mountains; in addition, the records on winter wren, robin, flicker, and Steller's jay bear winter dates. Towhees and song sparrows are the most common inhabitants
of the fencerow, summer and winter; and are actually much more abundant than the records kept on them would indicate.

13. Wires

Most frequently located just above or near the fencerow is this superficial habitat, used principally as a perch for resting or seeking out prey.

<table>
<thead>
<tr>
<th>Boreal Species</th>
<th>Austral Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Belted Kingfisher</td>
<td>3</td>
</tr>
<tr>
<td>Traill's Flycatcher</td>
<td>1</td>
</tr>
<tr>
<td>California Purple Finch</td>
<td>1</td>
</tr>
<tr>
<td>White-crowned Sparrow</td>
<td>1</td>
</tr>
<tr>
<td>Total occurrences</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No comparison would be necessary here because of the superficial nature of this habitat, but, as with the aerial group, it is interesting to note the preponderance of austral birds: All of them except the towhee are fairly commonly observed perched on wires—even more so in the Willamette Valley. On the other hand, the kingfisher is seen on wires only near streams, which leaves an even smaller boreal representation.
14. Field and Pasture

Fields and pastures are open areas with very few trees, although often bordered by brush, fern, or timber in the Coast Mountains. Woodlands and forests where livestock is permitted to graze is not here classed as pasture lands.

Boreal Species: 5

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robin</td>
<td>5</td>
</tr>
<tr>
<td>Red-shafted Flicker</td>
<td>3</td>
</tr>
<tr>
<td>Oregon Junco</td>
<td>3</td>
</tr>
<tr>
<td>Wilson’s Snipe</td>
<td>1</td>
</tr>
<tr>
<td>Ring-billed Gull</td>
<td>1</td>
</tr>
<tr>
<td>Total occurrences</td>
<td>13</td>
</tr>
</tbody>
</table>

Austral Species: 10

<table>
<thead>
<tr>
<th>Species</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Crow</td>
<td>10</td>
</tr>
<tr>
<td>Brewer’s Blackbird</td>
<td>6</td>
</tr>
<tr>
<td>Western Meadowlark</td>
<td>5</td>
</tr>
<tr>
<td>Sparrow Hawk</td>
<td>4</td>
</tr>
<tr>
<td>Western Red-tailed Hawk</td>
<td>4</td>
</tr>
<tr>
<td>Cooper’s Hawk</td>
<td>1</td>
</tr>
<tr>
<td>Marsh Hawk</td>
<td>1</td>
</tr>
<tr>
<td>Band-tailed Pigeon</td>
<td>1</td>
</tr>
<tr>
<td>Barn Swallow</td>
<td>1</td>
</tr>
<tr>
<td>Common Goldfinch</td>
<td>1</td>
</tr>
<tr>
<td>Total occurrences</td>
<td>34</td>
</tr>
</tbody>
</table>

The exposed conditions make this a definite austral habitat, although the available food supply is responsible for the presence of several boreal representatives.

15. Orchard

Dominants: Cultivated fruit and nut trees.

Subdominants: Grasses, cultivated cover crops, weeds.

Orchards are generally small through the valleys of the Coast Range, but wherever apples remain hanging on the
trees into winter, one will encounter interesting aggrega-
tions of birds. It so happens that the notes collected for
this study bear winter dates only and were made on orchards
adjoining or near public roads.

Boreal Species: 9  

Austral Species: 6

<table>
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<td>Steller's Jay</td>
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<td>Total occurrences</td>
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Since the above observations were all in winter, the
boreal dominance is to be expected. Except for the
nuthatch and one occurrence of Steller's Jay in a filbert
orchard, all the birds seemed to be interested in the
apples as winter food.
Habitat Preferences

It is intended to present here the preferences for the various habitats as expressed by each species in my field notes. Any additional notes of interest will be included; and the explanation of criteria used in boreal and austral assignments will be made. Systematic order will be observed, grouping several species where possible to avoid repetition, as among water and shore birds.

LOONS AND GREBES. All loons are circumpolar in distribution and, therefore, definitely boreal. Since there is no evidence of their origin in either Old or New Worlds, they are placed in the Panboreal Element. Grebes occur in all parts of the world, and again give no evidence of their place of origin. The western grebe was the only grebe observed, but it ranges through most of the western hemisphere, and thus, is of uncertain status. The pied-billed and eared grebes are similarly placed in uncertain status, whereas Holboell's and horned grebes are of northern occurrence, and thus, are panboreal.

Loons and grebes are generally more abundant near the coast, in bays and the coastal lakes, and occasionally inland on the larger streams. The western and pied-billed grebes are likely to occur anywhere on large bodies of water.

HERONS AND BITTERNS. The great blue heron is the only
species for which I have field notes: 6 records along streams, 2 in flight, 2 resting in firs. Like other herons and bitterns, the great blue heron is so widely distributed that it must be placed in the uncertain status.

SWANS AND GEESE winter in western Oregon, although geese were not seen in the thesis area during the past two winters. The wintering birds will appear more commonly near the coast on the lakes and bays; whistling swans were seen twice on Siletz Bay and once on Devil's Lake. Some migrating birds cross the low mountains between the Willamette Valley and the coast; Canada geese were observed three times flying across the Coast Range.

The two species noted are boreal North American birds, while three other geese possible in the study area are panboreal.

SURFACE-FEEDING DUCKS. These ducks are frequently seen in large flocks on the shallow seasonal ponds, and occasionally on the lakes and streams. The mallard is the only permanent resident of the group, and it is not seen so commonly in summer. The mallard has such an extensive distribution that it must be placed in the uncertain list; the baldpate is boreal North American, while the pintail is panboreal. Of the unrecorded species, the gadwall is on the uncertain list, and the green-winged teal and shoveller are panboreal. The wood duck expresses austral affiliation by nesting in oaks; it is a North American species in
DIVING DUCKS are most common on the bays, lakes, and large rivers, but they do frequent the flooded fields and pastures in small numbers with the surface feeders in winter. Many of the group are commonly seen on the ocean feeding among or beyond the breakers, but are not noted here since that is outside the study area. Species tallied in the area are canvas-back, greater scaup, lesser scaup, and all three scoters. The canvas-back, lesser scaup, white-winged scoter, and surf scoter are North American species of the Boreal Assemblage, while the greater scaup and American scoter are panboreal in distribution. The unobserved members of this group are divided between the two elements also—all based on the distribution of species, largely.

Mergansers. The hooded and American mergansers are permanent residents and the red-breasted merganser is a winter visitor, but the American merganser is by far the most common species seen—it was often seen much farther inland than any of the other ducks. The American and red-breasted mergansers rate the Panboreal Element; the hooded merganser, also boreal, is North American.

The Turkey Vulture was observed 25 times in flight and 3 times in Douglas firs. It is unquestionably North American and in the Austral Assemblage.

Goshawk: observed once in aerial habitat; because of
northern distribution is considered in the boreal North American Element.

SHARP-SHINNED HAWK. Two records were taken in coniferous forest habitat—one made a dash at a flock of red crossbills (the hawk missed). Like the goshawk, it is boreal North American.

COOPER'S HAWK, seen 4 times in open coniferous forest and once on a snag overlooking field and pasture, is of more southern distribution, and seems to prefer more austral situations; it is, therefore, considered in the austral North American Element.

THE WESTERN RED-TAILED HAWK is the most common large hawk, although it is not frequently seen near the coast. Records for it are 6 aerial, 4 on perches near fields and pastures, 2 on wires, and 2 in coniferous forest. Its preference appears to be austral, although it commonly seeks out food in boreal habitats.

EAGLES were noticed twice, soaring at high altitudes; one was tentatively identified as a golden eagle (near Blodgett), the other was thought to be a bald eagle near the coast. The golden eagle is panboreal, but the bald eagle is North American and probably boreal also.

A PAIR OF MARSH HAWKS were watched once in their typical low scrutinization of a brushy pasture in one of the higher extensions of the Willamette Valley. Because of its range and its choice of open brushy areas, the marsh hawk
must be regarded as an American member of the Austral Assemblage.

THE SPARROW HAWK is tentatively considered austral North American: It ranges into Central America, and prefers open habitats. Being closely allied to the Old World kestrel, it might be a member of the Old World Element; lacking further evidence of its place of origin, it is retained in the American list. The sparrow hawk is more evident in winter, perhaps due to a partial migration from colder areas; my field records show predominately winter occurrences: 7 on wires, 4 in fields and pastures, one in flight over a grazed hilltop above Burnt Woods, and one on a perch above old growth brush.

SOOTY GROUSE. With notes of 10 occurrences in coniferous forest, 9 in noble fir, 4 in brush layer, 4 in old growth brush, 3 in boreal deciduous, and one in new growth brush, it is evident that the sooty grouse visits virtually all of the natural habitats in feeding, yet exhibits a fondness for the forest. It is one of the most characteristic species of the Coast Range, and is easily placed in the boreal North American Element.

THE RUFFED GROUSE is less typical of the boreal avifauna, but still belongs to the same unit as the sooty grouse. Being more typical of seral vegetation, the ruffed grouse was noted in open coniferous forest, boreal deciduous growth, and old growth brush—twice each; and once each
in noble fir and new growth brush.

CALIFORNIA QUAIL: 2 records from austral deciduous, one each from old growth brush and new growth brush. All of these occurrences are on the eastern slopes of the Coast Range, although the species may be present in the coastal valleys. It is a typical member of the austral North American Element.

MOUNTAIN QUAIL was observed twice in coniferous forest and old growth brush, once in boreal deciduous and brush layer. It is probably more abundant than these records indicate, for it is very difficult to detect. The mountain quail is easily placed in the boreal North American Element.

LITTLE BROWN CRANE. A flock of over 100 birds was seen in migration last spring on a northwesterly course that would take them just north of Mary's Peak. Their occurrence in the Old World with no hint of place of origin places them in the Panboreal Element.

THE KILLDEER (3 records around field ponds, twice in fields and pastures) is more common on the coast and in the Willamette Valley than in the coastal valleys between. It is of uncertain allocation.

WILSON'S SNIPER is of the boreal North American Element, and was noted twice at winter ponds, once in field and pasture, and once (in midsummer) along a narrow road through old growth brush habitat.

THE SPOTTED SANDPIPER is undoubtedly more common than
my notes record it, for I observed only one bird, an
immature, on the Alsea River. Uncertain status.

GULLS. Frequent winter visitors, and occasional in
summer, may be any of the gulls common along the coast.
Western gulls and ring-billed gulls were identified on
rivers, flooded pastures, and in fields as far inland as
twenty miles. Of the gulls most likely to be encountered,
the glaucous-winged is panboreal, the California and ring-
billed gulls are boreal North American, while the western
gull is among the uncertain species.

THE BAND-TAILED PIGEON, in spite of its common
association with coniferous growth, is probably a consti-
tuent of the Austral Assemblage. For this work it is so
considered because it typically migrates, and because most
of its relatives are of southern distribution. Field notes
placed it 7 times in coniferous forest, 3 times in flight,
twice in boreal deciduous, once in noble fir, and once (a
flock of 50) feeding in a field.

WESTERN MOURNING DOVE was noted 3 times in old growth
brush, 3 times in coniferous forest, twice on wires, once
in flight, and once in austral deciduous growth. It is of
less common occurrence at higher elevations and near the
coast, and is definitely austral.

OWLS: Of nocturnal habit, the owls almost escaped
detection; however, one dead screech owl was found on a
road in coniferous habitat and another was heard late one
evening on Prairie Mountain, and a horned owl (identification was not positive) was aroused from his sleep by a band of Steller's jays one afternoon in McDonald Forest. Both of the species noted are considered to be of austral preferences since their distribution extends mostly to the south and they prefer open coniferous or deciduous growth. The short-eared owl ranges more widely and is regarded with the uncertain group, while all of the other owls, so far as could be determined, are boreal North American species.

PACIFIC NIGHTHAWK, although unobserved, probably occurs in the coastal valleys, and is an austral North American species.

VAUX'S SWIFT. One bird permitted a fleeting glance as he zoomed low over the noble fir habitat on Mary's Peak summit for my only field record. It is an austral species, and is here considered in the North American Element.

RUFIOUS HUMMINGBIRD. Since hummingbirds are so typically South American, it is natural that the local species be placed in the Pan-American Element to show its southern relationships. Notes for its occurrence read 11 times in old growth brush, 3 times in brush layer, 3 times on wires, twice in recently logged and burned areas, and once each in coniferous trees and noble fir forest.

BELTED KINGFISHER. Mayr (17:20) ascribes Old World origin to the kingfishers, and despite its present distinctiveness, it is retained with the Old World Element to
express the connection. It is not typically boreal, but probably fits best with the boreal unit. Kingfishers were recorded 6 times for the permanent aquatic habitat, and 3 times on wires.

WOODPECKERS are a problematical group, for none of the local species are completely confined to either deciduous or coniferous growth, and the flicker is not even restricted to areas with trees. It is highly questionable whether the group developed principally in deciduous forests and have since spread into coniferous forest, or the other way around. Thus, it is rather arbitrarily and quite tentatively that the red-shafted flicker, pileated woodpecker, and red-breasted sapsucker are allocated to a boreal unit, while the hairy and downy woodpeckers are assigned to the Austral Assemblage. Lewis's woodpecker is more definitely austral. All are distinctively North American.

The red-shafted flicker was recorded 33 times in ten habitats, indicating its wide choice of feeding grounds. The pileated woodpecker is a very characteristic member of the coniferous avifauna in the Coast Range, with 24 notes for the coniferous tree layer, and only 6 in other habitats, all these containing snags and stumps. The red-breasted sapsucker was commonly seen visiting sap wells in coniferous trees—14 times; otherwise it was found 3 times in austral deciduous trees, twice in boreal deciduous, once in
noble fir, and once at a lone surviving conifer in a recent burn.

Lewis's woodpecker was seen once in oaks; it probably is more common in the ecotone with the Willamette Valley. Nine times the hairy woodpecker was observed in coniferous stands, only twice elsewhere. Downy woodpecker's records read: 5 in boreal deciduous, 4 in austral deciduous, 2 in conifers, and 2 in old growth brush.

FLYCATCHERS are members of a family which is very numerous throughout Pan-America; this points out their basically austral associations. However, on the basis of their distribution and choice of nesting habitats, two species, Traill's and olive-sided flycatchers, can be said to have developed boreal preferences.

The western kingbird and Say's phoebe were not encountered in my field study, largely because they are not at all common west of the Willamette Valley; it is possible for them to occur occasionally in some of the coastal valleys. Traill's and western flycatchers are difficult to distinguish in the field, and I am very dubious about some of my identifications on these two. Nevertheless, the austral preference of the western flycatcher is evident in the notes referring to it: 5 times in old growth brush, twice in bracken fern, and once in boreal deciduous habitat. My records on Traill's flycatcher are less conclusive: 3 times in boreal deciduous, once in coniferous
forest, once in old growth brush, and once on a wire.

Western wood pewee tends to select deciduous and open coniferous habitats: 5 notes for boreal deciduous, 3 for coniferous, 2 for austral deciduous, and one each for fern, old growth brush, and wires. The olive-sided flycatcher is almost invariably perched at or near the top of conifers or snags; it was noticed 7 times in coniferous forest, twice in noble fir, and once in boreal deciduous and austral deciduous.

THE HORNED LARK, although not observed, is likely to be seen occasionally in fields or pastures of the larger valleys. This preference places it with the austral species, and it is a recent arrival from the Old World (17:20).

SWALLOWS. The barn and cliff swallows are very recent arrivals from the Old World (17:15), while the remaining swallows of this area are of southern North American development—perhaps, but not definitely, Pan-American. All the swallows are members of the Austral Assemblage.

The violet-green swallow is a very abundant summer resident, especially along the valleys and in open areas through the mountains. It is quite commonly seen in flight (12 records), and in late summer is often seen by the hundreds, sometimes on wires (one notation) or around snags in old growth or new growth brush (3 times). Tree and rough-winged swallows are not numerous; I have 2 records
for the tree swallow, one in flight and one in boreal deciduous trees; and only one observance of rough-winged swallows along a stream.

Barn swallows inhabit barns and sheds through the valleys, and are occasionally seen in flight along the valleys. I noted the cliff swallow and the purple martin only once each; both notes were taken at Beaver Creek marsh near the coast.

THE OREGON JAY is practically confined to the coniferous forest; all of my notes (12 occurrences) are for that habitat. It is definitely boreal, but rather arbitrarily placed in the North American list: it is closely related to several Old World species, but the place of origin is highly debatable. For this reason, it could be placed in the panboreal unit; but rather than make that group too nearly a "catchall", it was thought best to consider the Oregon Jay a North American species. The distribution of the species in its present status is within the northern coniferous forest.

STELLER'S JAY is likewise boreal, but has a relatively long North American history. It is perhaps the most characteristic species in the coniferous forest habitat (51 records)—it may occur away from the habitat (3 records in old growth brush, 3 in boreal deciduous, 2 in fencerow, 2 in orchard), but it never strays far from a conifer. This jay is undoubtedly the most conspicuous bird in the Coast
Range, for it can be heard on almost every venture into the
area.

THE CALIFORNIA JAY is a regular inhabitant in the
Willamette Valley, but does not extend into the Coast
Mountains beyond the lower foothills. It is definitely
austral, and is as distinctively American as is the
Steller's jay.

THE RAVEN is a very old species and is almost world-
wide in distribution; fortunately, there are fossils which
indicate a European origin for the genus *Corvus*, and the
genus is well represented in the Old World. Thus, it is
most logical to put the raven in the Old World Element. It
is even more difficult to determine its austral or boreal
allocation, for the main requirement in its habitats seems
to be isolation from human settlements. Since, locally, it
is characteristic of higher (and therefore more remote)
regions (11 occurrences in noble fir, 10 in high coniferous
forest, 5 in flight), a boreal designation is tentatively
given.

THE CROW belongs to the same genus, and so is in the
Old World Element, but since it prefers agricultural areas,
it is rather definitely austral. The crow was recorded 10
times in fields and pastures, twice in open coniferous
forest, twice in flight (between Willamette and Alsea
valleys), and once around a winter pond.

CHICKADEES. Of Old World origin (17:20), chickadees
are typical inhabitants of forested areas; therefore, they are best considered in the Boreal Assemblage. The black-capped chickadee, locally, is usually associated with austral habitats, while the chestnut-backed chickadee is very typically boreal. The latter was noted 24 times in the coniferous habitat, 11 times in boreal deciduous, 5 in old growth brush, and 3 in noble fir. Occurring principally along the eastern edge of the Coast Mountains, the black-capped chickadee was seen less frequently: 5 times in old growth brush, 4 in austral deciduous, and once in the fencerow habitat.

THE BUSH-TIT conforms to its name with 10 occurrences in the old growth brush habitat, 2 in brush layer, once in fencerow, and once each for the deciduous tree habitats. The bush-tit is of American development, and by its habitat associations is definitely austral.

NUTHATCHES. The nuthatches have not differentiated sufficiently from their Old World relatives to be removed from that element. The red-breasted nuthatch is decidedly boreal, but the white-breasted species must be considered austral—its distribution in North America is in close association with deciduous trees. Their incidence in the study area substantiates this: red-breasted, 21 times in coniferous forest, 6 times in noble fir, once in boreal deciduous trees, and once in austral deciduous trees; white-breasted, 4 times in austral deciduous trees, and
once in a filbert orchard.

THE CREEPER is only subspecifically distinct from the Old World creeper, and is definitely boreal. In spite of being rather inconspicuous, its abundance in the Coast Range provides sufficient evidence: 13 records in coniferous habitat, and one each for noble fir, boreal deciduous, and austral deciduous habitats.

THE WREN-TIT presents a unique situation: It was not reported from its coastal habitat prior to the 1890's, at which time it seemed to be as abundant as it is today (8: 450). Gabrielson and Jewett also state that it "is distinctly a bird of the seashore, never wandering far from the salt water." Evenden (7:186-187) reports watching one wren-tit near Cottage Grove reservoir in June, 1948. On March 6, 1949, near Alsea lookout at an elevation of approximately 1,500 feet, my wife and I encountered a pair of wren-tits, apparently very much at home in the old growth brush habitat there. The two birds came out in the open and perched, chattering, within a few feet of us so that identification was positive; we watched them for about half an hour. Searches in the area a few weeks afterwards failed to reveal the pair again. However, on April 24, another—or perhaps the same—pair of wren-tits was met along the road toward Prairie Mountain at an elevation near 1,500 feet also. This pair was within the cover of a Douglas fir about 10 feet tall in a heavy brush stand and
were more secretive— but no less vociferous— than wren-tits at the coast. Speculation is opened up by these encounters; Wren-tits in California are inhabitants of the chapparal (11:325-327); along the Oregon coast they stay close to the dense shrubby growth; with the increase of the dense growth of brush through the Coast Range, will the wren-tit invade this region and become a typical species of the old growth brush habitat? It is entirely possible.

The brush association makes it a member of the austral North American Element.

DIPPER. Twice in the Alsea River, and once in Big Elk Creek are my notes on this bird. It certainly is not a common species along the streams of the Coast Range, probably because so many of the streams do not provide suitable rapids and large boulders for nesting sites. The coldness of the water testifies to its boreal choice, and it is in the North American Element.

WRENS are typical American birds in origin and development, and probably all but one can be placed in the Austral Assemblage. The winter wren, by its close affinity to brush habitats indicates austral relationships; but because the brush it inhabits is so often in the coolest part of the forest and because it is found in almost any brush or low growth in winter, it certainly chooses a boreal microclimate. My field notes bring out this preference: 23 times (throughout the year) in the brush layer, 5 winter
occurrences in bracken fern, 4 winter records in old
growth brush; one winter record each in noble fir, conifer-
ous forest, and fencerow; and one notation in the fall in
the edge of a logged and burned area adjoining a dense
stand of coniferous forest.

Other wrens are much less common throughout the Coast
Range. For instance, the western house wren was located
only twice, and both times in what can be termed foothill
situations. Bewick's wren seems to be more in evidence
along the eastern slopes of the Coast Range, although it
does range through a number of austral habitats: 4 times in
old growth brush, 3 times in austral deciduous growth, 3
times in brush layer situations, twice each in fern and new
growth brush. The long-billed marsh wren is largely
restricted to a few marshy areas near the coast; one was
seen in the Beaver Creek marsh.

THE ROBIN, although specifically American, is generi-
cally bound to the Old World Element. I have notes on it
from 11 habitats (9 times in boreal deciduous trees, 5 times
in old growth brush, 5 times in field and pasture, 4 times
in orchards, and one and two occurrences in new growth brush,
ferns, boreal deciduous, coniferous forest, wires, seasonal
aquatic, and aerial); thus its affiliation is difficult to
discern. Quite arbitrarily I have placed it in with the
boreal species, for it ranges far to the north and probably
was originally a bird of forested areas.
VARIED THRUSH. Because this bird breeds in the deep coniferous forest, it is certainly boreal. With winter weather it is found frequently in the valleys—very often around orchards where apples still remain. The varied thrush is an American species, but it has closely related forms in Europe and Asia. For this reason, it is placed in the Old World Element. It was seen 5 times in boreal deciduous trees, 4 times in coniferous trees, 3 times in orchards, 2 each around flood ponds and in old growth brush, and one in noble fir and austral deciduous trees (winter).

THE OTHER THRUSHES, hermit and russet-backed, western bluebird and Townsend’s solitaire, are all considered members of the boreal North American Element. The western bluebird is somewhat doubtfully placed in the boreal unit. The solitaire is irregular in its presence in the area—it probably is most regular in spring migration. My records for the 4 species are as follows:

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<th>Species</th>
<th>Noble Fir</th>
<th>Coniferous Forest</th>
<th>Boreal Deciduous</th>
<th>Brush Layer</th>
<th>Old Growth Brush</th>
<th>Austral Deciduous</th>
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<td>Townsend’s Solitaire</td>
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HERMITS
THE KINGLETS are Old World warblers (17:20) and quite definitely boreal. The ruby-crowned kinglet does not breed in the Coast Range (8:482-483), but is present from late September into May. It was seen in coniferous forests 8 times, boreal deciduous trees twice, and old growth brush twice. The golden-crowned kinglet is one of the characteristic species of coniferous forests; my notes for it are 19 times in coniferous forest, 6 times in noble fir, 6 times in boreal deciduous trees, 3 times in old growth brush, and once in the brush layer.

THE AMERICAN PIPIT is present in the Willamette Valley through the winter, and probably gets into some of the coastal valleys, but I did not obtain any records on such occurrences.

WAXWINGS. The Bohemian waxwing is an erratic winter visitor, but the cedar waxwing is a breeding species in the study area. I have no notes for the Bohemian waxwing, but the cedar waxwing was recorded 4 times in open coniferous forest. Both species are boreal North American species.

VIREOS are austral North American birds, although the Hutton's vireo has been seen several times during the past two severe winters, indicating an ability to tolerate boreal conditions. I have the following notes for the group:
Hutton's Vireo
Solitary Vireo 1 3 3 2
Warbling Vireo 3 5 1

**WARBLERS** are very typically North American, and all of them can be considered in the Austral Assemblage except the myrtle, Audubon's, hermit, and Townsend's warblers which show boreal preferences. My field observations of the warblers can best be presented in tabular form:

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<td>Townsend's Warbler</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hermit Warbler</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
List continued

Macgillivray's Warbler
Yellowthroat
Pileolated Warbler
Long-tailed Chat

THE ENGLISH SPARROW is an introduced species that occurs only around buildings, usually in villages. Several were seen in Eddyville, for instance. It is, of course, an Old World species, and exhibits austral preferences.

THE FAMILY ICTERIDAE has an affiliation with Pan-America in origin; all of the local species are rather distinctly North American as a result of the long process of development. Since it is my intention to show as much as possible the relationships with places of origin, these birds are retained in the austral Pan-American Element.

The western meadowlark, Oregon's state bird, is a permanent resident of the valleys, but it is a little more conspicuous in winter and early spring. That it never ventures away from open areas is pointed out by my notes for it: 5 times in field and pasture, 3 times on wires.
and once in an orchard in winter.

The red-wing, a bird of marshy areas, occurs in limited numbers in the valleys, but is a little more abundant near the coast; I have 2 records in streamside rishes near Toledo. Bullock's oriole was not seen, but is a possible species for the valleys. One of the most common winter species, and present all year, is the Brewer's blackbird; it inhabits agricultural areas where I have noted it 4 times in field and pasture, 3 times in orchards, once in coniferous forest, and once around a winter pond.

THE WESTERN TANAGER represents another South American or Pan-American family, but in this case the tanager has expressed a boreal preference in its close association with coniferous forests. It was recorded 6 times in the coniferous forest habitat, and once in noble fir.

THE SUB-FAMILY RICHMONDENINAE, which includes the black-headed grosbeak and the lazuli bunting, is also Pan-American (17:7-8 and 20), but its species choose austral habitats. The black-headed grosbeak was recorded twice each for old growth brush, boreal deciduous, and open coniferous forest. The lazuli bunting is typical of the Willamette Valley, but ranges into the foothill ecotone, and probably into the larger coastal valleys. My records for it were of birds perched on wires.

IN THE SUB-FAMILY CARDUELINAE, to follow the policy adopted for expressing relationships with places of origin
as much as possible, several species are delegated to the Old World Element that have only remote connections with that region today (17:7-8). This applies especially to the genus Spinus, including the pine siskin, common goldfinch, and green-backed goldfinch; among these the siskin is boreal, while the goldfinches are austral. The genera Carpodacus (purple finch and house finch) and Loxia (red crossbill) are more closely akin to Old World species; here the house finch is austral whereas the other two are boreal. The evening grosbeak has separated so clearly from the Old World that it has been placed in the boreal North American Element. The records for the group are given below:

<table>
<thead>
<tr>
<th>Species</th>
<th>Noble Fir</th>
<th>Coniferous Forest</th>
<th>Boreal Deciduous</th>
<th>New Growth</th>
<th>Bracken Fern</th>
<th>Old Growth</th>
<th>Deciduous</th>
<th>Aerial</th>
<th>Aquatic</th>
<th>Fencerows</th>
<th>Wires</th>
<th>Field</th>
<th>Pasture</th>
<th>Orchard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evening Grosbeak</td>
<td>2</td>
<td>12</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>California Purple Finch</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pine Siskin</td>
<td>1</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Goldfinch</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green-backed Goldfinch</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Crossbill</td>
<td>6</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

I have no records on the occurrence of the house finch, but since it is a very recent invader of the Willamette Valley, it will probably be found in the valleys of the
Coast Mountains soon.

SPARROWS are mainly birds of brushy and open areas, or of forest edges. They are distinctly North American, and are divided between the boreal and austral groups principally on the basis of distribution. Oregon junco, white-crowned sparrow, golden-crowned sparrow, and fox sparrow range farther to the north, and are considered boreal—the fox and golden-crowned sparrows are winter visitors from northern regions. The spotted towhee, vesper, Savannah, chipping, and song sparrows are austral. The occurrences of sparrows are as follows:

<table>
<thead>
<tr>
<th>Spotted Towhee</th>
<th>Oregon Junco</th>
<th>Vesper Sparrow</th>
<th>Chipping Sparrow</th>
<th>White-crowned Sparrow</th>
<th>Golden-crowned Sparrow</th>
<th>Fox Sparrow</th>
<th>Song Sparrow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>7</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Coniferous Forest</td>
<td>13</td>
<td>9</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Boreal Deciduous</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Brush Layer</td>
<td>14</td>
<td>10</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>New Growth Brush</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Old Growth Brush</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breckon Fern</td>
<td>10</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austral Deciduous</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Fencerows</td>
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<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wires</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field and Pasture</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orchard</td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion

The results of applying Dr. Gordon's faunal area plan, even tentatively, to the thesis area have been quite gratifying. When one considers the lack of data concerning the origins of birds--information that is significant in the actual operation of this scheme, it is indeed encouraging that the tentative allocations presented herein have produced such clear-cut evidence in favor of the plan. The dynamic nature of the plan and the relative ease of applying it to the avifauna of the Coast Mountains adds much to its value. In the thesis I have emphasized the changing conditions existing in the study area and the effects of logging and burning on the avifaunal habitats, and it seems to me that the faunal area plan is quite capable of presenting an accurate picture of the birds of the Coast Range at any time--and of keeping abreast with the future alterations.

The biome is probably capable of expressing the changing conditions also; but after thinking about the biome system in connection with my study, I am of the opinion that it is somewhat encumbered by units and terms that are not easily affixed without considerable special efforts. Be it understood that I am in full accord with the biotic concept of a unified vegetative and faunal community, but I have found no instances of the application of the scheme
to a local area of such dynamic constitution as is present in the Coast Range.

In the early stages of work on this project I had thought how nice it would be to present a comparison of the present avifauna in contrast to the avifauna of 100 years ago or more. The lack of any detailed writings of this nature was soon apparent, but why not get the information from the remnants of the climax forest? It took only a few attempts at locating a mature stand of old growth cedar-hemlock forest to convince me that all the photographs I had seen "back East" of the virgin forests of Oregon were pictures of by-gone days! I was successful, however, in finding two small patches (about 80 acres each) of old growth timber; one was too distant, the other proved educational, but disappointing: whatever stands of the forest primeval remain are insufficient to maintain more than a vestige of the original bird population. And so, I can make only a few general speculations about the nature of changes wrought in the past 100 years.

Principally, the reduction of coniferous forest and the increase of brush habitats has had a marked "edge effect" in providing more and better habitats for birds in general. The total population of birds in the area now is probably much greater than 100 years ago.

The increase does not hold for all species, however: Certain boreal species have undoubtedly undergone some
decrease in numbers; for example, the red crossbill, Oregon jay, raven, possibly the hermit warbler, winter wren, and others. An austral species, the condor, no longer occurs in the area at all.

The increase has come about through two channels, at least: (1) The improvement of conditions for species already in the area, such as woodpeckers, grouse, flycatchers, and many of the brush inhabitants. (2) The availability of habitats suitable for invasion by austral species from the Willamette Valley—particularly into the agricultural lands of the coastal valleys. It is not known that the meadowlark, Brewer's blackbird, crow, and other species were in the area before it was made more open. The English sparrow, of course, has entered the valleys with man. Other species, if not already in the area, are likely to be found there within the next few years; this will include the house finch, starling, and perhaps others as the lazuli bunting, long-tailed chat, or even the California jay.

It is also probable that the past trend will continue for many years to come—until the plant cover of the Coast Mountains is more nearly stable, perhaps under a well-controlled timber management program. It should be noted that the trend of the changes is toward more austral conditions; the large number of austral species within this study is indicative of the effect of alterations already made by man.
One other deviation should be mentioned: that it is likely in time for some of the boreal species to adapt themselves to the expanding austral environment, as perhaps the flicker, robin, and junco have already done.
Summary

An extensive area centrally located in the Coast Mountains of western Oregon has been studied in relation to its avifauna and the habitats available for them. Field work consisted principally of recording the presence of species within each habitat, and using the number of times present as an indication of the preferences of the species and of their importance to the community.

Two distribution schemes are considered for relating the study to broader areas. One of these, the biome, is only lightly covered because of the lack of information on the application of it to local studies. The scheme recently developed by Dr. Gordon was affixed to the avifauna in a tentative manner, since it has not previously been studied in reference to birds.

Fifteen habitats are delimited and described; eight of them are more or less natural, three are superficial, and four are directly controlled by man. The vegetative variations within each habitat are discussed, and the birds present in each habitat are noted.

The habitat preferences of each species is next indicated, with additional notes on each species, particularly in relation to the criteria used in assigning it to a faunal element.

Two appendices are included, one a checklist of birds
for the Coast Range with the scientific names for all species mentioned in the text. The other appendix lists the plants referred to in describing the habitats and provides the botanical names for each of these.

A few comments on the comparison of the biome and the faunal area plan are discussed, and the trend of changes in vegetation and avifauna is submitted to mild speculation.

The results of the tentative application of the faunal area scheme in the study may be briefly presented in the following table.
<table>
<thead>
<tr>
<th>Species</th>
<th>Number</th>
<th>Per cent</th>
<th>Occurrences</th>
<th>Number</th>
<th>Per cent</th>
</tr>
</thead>
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<tr>
<td></td>
<td>B</td>
<td>A</td>
<td>U</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>Noble Fir</td>
<td>23</td>
<td>6</td>
<td>0</td>
<td>80</td>
<td>20</td>
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<td>Coniferous Forest</td>
<td>33</td>
<td>20</td>
<td>1</td>
<td>61</td>
<td>37</td>
</tr>
<tr>
<td>Boreal Deciduous</td>
<td>22</td>
<td>17</td>
<td>0</td>
<td>56</td>
<td>44</td>
</tr>
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<td>9</td>
<td>11</td>
<td>0</td>
<td>45</td>
<td>55</td>
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<tr>
<td>New Growth Brush</td>
<td>10</td>
<td>12</td>
<td>0</td>
<td>45</td>
<td>55</td>
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<tr>
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<td>26</td>
<td>0</td>
<td>48</td>
<td>52</td>
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<td>71</td>
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<td>17</td>
</tr>
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<td>Seasonal Aquatic</td>
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<td>4</td>
<td>59</td>
<td>18</td>
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<td>Fencerows</td>
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<td>0</td>
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<td>35</td>
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<tr>
<td>Wires</td>
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<td>9</td>
<td>0</td>
<td>31</td>
<td>69</td>
</tr>
<tr>
<td>Field and Pasture</td>
<td>5</td>
<td>10</td>
<td>1</td>
<td>31</td>
<td>62</td>
</tr>
<tr>
<td>Orchard</td>
<td>9</td>
<td>6</td>
<td>0</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Total Observed</td>
<td>58</td>
<td>54</td>
<td>7</td>
<td>49</td>
<td>45</td>
</tr>
<tr>
<td>Check-list</td>
<td>87</td>
<td>64</td>
<td>16</td>
<td>52</td>
<td>39</td>
</tr>
</tbody>
</table>

A - Austral Assemblage
B - Boreal Assemblage
U - Uncertain Status
Explanation of Plates

Plate V. A - Looking west near Alsea Summit, showing summer fog in Alsea Valley. Coniferous forest habitats; foreground, open forest mixed with old growth brush. July 10, 1949.

Plate V. B - Cummins Peak Lookout Road, east of Cape Perpetua. Old growth brush habitat, foreground, with closed stand of young western hemlock (coniferous forest habitat) beyond. July 3, 1949.

Plate VI. A - Horse Creek and Meadow Creek area between Harlan and coastal Beaver Creek. Boreal deciduous and coniferous tree layer habitats. Western red cedar growing with red alder along streamside. August 28, 1949.


Plate VII. A - Lobster Valley. Recently logged area adjacent to coniferous forest, streamside boreal deciduous and some mixture of boreal deciduous and coniferous forest. Field and pasture habitat in foreground—note absence of fencerow habitat. August 7, 1949.

Plate VII. B - Southwest slope of Mary's Peak. New growth brush habitat in area recently logged; uncontrolled slash burning two years before picture was taken and controlled slash burning one year before picture was taken. Note abundance of annuals. July 20, 1949.

Plate VIII. A - Near Alpha, along Deadwood Creek. Bracken fern habitat, background showing invasion of Douglas fir. Such a mixture provides for an increase in the bird population. July 4, 1949.

Plate VIII. B - View northwest from Valsetz Lake. Principally old growth brush habitat, with high mixture of bracken fern in area heavily logged and burned. The view is almost the same in all directions from the lake which is being used by logging companies. October 9, 1949.
Plate VI. A

Plate VI. B
Plate VII. A

Plate VII. B
Bibliography


APPENDIX A.

Check-List of Birds for the Oregon Coast Mountains

* 1. Common Loon, Gavia Immer, permanent resident more apt to be seen coastaly.

* 2. Pacific Loon, Gavia arctica pacifica, winter visitor coastaly.

3. Red-throated Loon, Gavia stellata, winter visitor coastaly.

* 4. Holboel's Grebe, Columbus grisegena holboelli, winters along coast.

* 5. Horned Grebe, Columbus auritus, winters on coast and large streams inland.

* 6. Eared Grebe, Columbus nigricollis californicus, can be expected along coast in fall and winter.

7. Western Grebe, Aechmophorus occidentalis, abundant in winter coastaly and can be expected inland on larger streams.

* 8. Pied-billed Grebe, Podilymbus podiceps, permanent resident.

9. Great Blue Heron, Ardea herodias, common permanent resident.

*10. Anthony's Green Heron, Butorides virescens anthonyi, rare summer resident.

*11. Black-crowned Night Heron, Nycticorax nycticorax hoactli, occasional; may be resident locally.

*12. American Bittern, Botaurus lentiginosus, summer resident, not common.

13. Whistling Swan, Cygnus columbianus, winter visitor and migrant, especially coastaly.

14. Canada Goose, Branta canadensis, in migration, and some wintering birds.

*15. Emperor Goose, Phalætæ canagica, occasional straggler.


29. Lesser Scaup, *Aythya affinis*, common winter visitor (apparently more common than Greater Scaup); some birds throughout the year.


*32. Bufflehead, *Glaucionetta albeola*, migrant and winter visitor; not so abundant as formerly.

*33. Old Squaw, *Clangula hyemalis*, coastal visitor in winter, not common.


37. American Scoter, *Oidemia americana*, coastal all year; not common, less common in summer.


42. Turkey Vulture, *Cathartes aura*, common from February 16 to October 7.

43. Goshawk, *Accipiter gentilis*, permanent resident, not common.

44. Sharp-shinned Hawk, *Accipiter striatus velox*, permanent resident.

45. Cooper's Hawk, *Accipiter cooperi*, permanent resident.

46. Western Red-tailed Hawk, *Buteo borealis calurus*, permanent resident, common.


49. Marsh Hawk, *Circus cyaneus hudsonius*, permanent resident, less common coastaly.

50. Osprey, *Pandion haliaetus carolinensis*, summer visitor, rare.

51. Sparrow Hawk, *Falco sparverius*, permanent resident.
52. Sooty Grouse, *Dendragapus fuliginosus*, permanent resident.


54. California Quail, *Lophortyx californica*, introduced in Willamette Valley; occurs locally in austral situations in the Coast Range.


56. Little Brown Crane, *Grus canadensis canadensis*, in migration only.

57. American Coot, *Fulica americana*, permanent resident.


59. Wilson's Snipe, *Capella gallinago delicata*, permanent resident, more common in winter.

60. Spotted Sandpiper, *Actitis macularia*, permanent resident, not common in winter.


62. Western Gull, *Larus occidentalis*, permanent resident of coast, inland during winter.


64. Ring-billed Gull, *Larus delawarensis*, winters on coast, wanders inland.


66. Western Mourning Dove, *Zenaida macroura marginella*, summer resident, less common coastally; winters east of the Coast Range.


68. Screech Owl, *Otus megal., permanent resident.

*70. Snowy Owl, Nyctea nyctea, occasional in winter.

*71. Pygmy Owl, Glaucidium gnoma, permanent resident.

*72. Spotted Owl, Strix occidentalis, permanent resident.

*73. Great Gray Owl, Strix nebulosa nebulosa, rare permanent resident.

*74. Long-eared Owl, Asio otus wilsonianus, occasional winter visitor.

*75. Short-eared Owl, Asio flammeus flammeus, permanent resident.

*76. Saw-whet Owl, Aegolius acadicus acadica, permanent resident, not common.

*77. Nighthawk, Chordeiles minor, May 24 to September 23.

78. Vaux's Swift, Chordeiles vauxi, April 27 to September 22, not common.

79. Rufous Hummingbird, Selasphorus rufus, February 16 to September 24.

80. Banded Kingfisher, Megaceryle alcyon, permanent resident along rivers.

81. Red-shafted Flicker, Colaptes cafer, permanent resident, common.

82. Pileated Woodpecker, Hylatomus pileatus, permanent resident.

83. Lewis's Woodpecker, Asyndesmus lewis, permanent resident along Willamette Valley oak areas.

84. Red-breasted Sapsucker, Sphyrapicus varius ruber, permanent resident.

85. Hairy Woodpecker, Dendrocopos villosus, permanent resident.

86. Downy Woodpecker, Dendrocopos pubescens, permanent resident.

*87. Western Kingbird, Tyrannus verticalis, April 6 to August 30, not common.
88. Say's Phoebe, *Savornis sava sava*, late February to late October, no records coastally.

89. Traill's Flycatcher, *Empidonax trailli*, April 21 to September 17.


94. Violet-green Swallow, *Tachycineta thalassina lepida*, February 20 to October 6; very common.


96. Rough-winged Swallow, *Stelgidopteryx ruficollis*, April 7 to August 28.


99. Purple Martin, *Progne subis subis*, summer resident; more common coastally.


103. Raven, *Corvus corax*, permanent resident of higher mountains.

104. Western Crow, *Corvus brachyrhynchos hesperis*, permanent resident of valleys.

106. Chestnut-backed Chickadee, *Parus rufescens*, permanent resident of forested areas.


111. Wren-tit, *Chamaea fasciata*, permanent resident coastally.

112. Dipper, *Cinclus mexicanus unicolor*, permanent resident of streams, not common.

113. Western House Wren, *Troglodytes aedon parkmani*, April 8 to October 1, not common.


121. Western Bluebird, *Sialia mexicana*, permanent resident.


123. Western Golden-crowned Kinglet, *Regulus satrapa olivaceus*, permanent resident.
124. Ruby-crowned Kinglet, Regulus calendula, winter visitor, September 18 to May 2.

*125. American Pipit, Anthus spinicollis, September 10 to April 30, valleys.

*126. Bohemian Waxwing, Bombycilla garrula pallidiceps, possible winter visitor.

127. Cedar Waxwing, Bombycilla cedrorum, permanent resident.


129. Hutton's Vireo, Vireo huttoni, permanent resident.

130. Solitary Vireo, Vireo solitarius, April 13 to September 21.

131. Western Warbling Vireo, Vireo gilvus swainsoni, April 21 to October 1.

132. Orange-crowned Warbler, Vermivora celata, March 12 to October 1.

133. Calaveras Warbler, Vermivora ruficapilla ridgwayi, migrant in August and September; possible summer visitor in brushy areas.

134. Yellow Warbler, Dendroica petechia, April 24 to September 21.

135. Myrtle Warbler, Dendroica coronata, October to May; migrant; not common.

136. Audubon's Warbler, Dendroica auduboni, permanent resident.

137. Black-throated Gray Warbler, Dendroica nigrescens, March 31 to October 1.

138. Townsend's Warbler, Dendroica townsendi, migrant and occasional visitor.

139. Hermit Warbler, Dendroica occidentalis, April 29 to August 16.

140. McCullivray's Warbler, Oporornis tolmiei, April 20 to October 12.
141. Yellow-throat, *Geothlypis trichas*, March 22 to October 6; Willamette Valley, perhaps valleys through the Coast Mountains.


143. Long-tailed Chat, *Icteria virens longicauda*, May 2 to September 9; no records coastally.

144. House (English) Sparrow, *Passer domesticus domesticus*, permanent resident.

145. Western Meadowlark, *Sturnella neglecta*, permanent resident, valleys.


*147. Bullock's Oriole, *Icterus bullocki*, possible summer resident of valleys.*


*154. House Finch, *Carpodacus mexicanus*, possible summer visitor.*


156. Common Goldfinch, *Spinus tristis*, permanent resident.


158. Red Crossbill, *Loxia curvirostra*, permanent resident.
159. Spotted Towhee, *Pipilo maculatus*, permanent resident.


163. Western Chipping Sparrow, *Spizella passerina arizonae*, March 9 to October 11.


166. Fox Sparrow, *Passerella iliaca*, September 23 to April 30.


* Designates species not recorded in field notes for this thesis, but likely to be found in this area, according to Gabrielson and Jewett (8).
APPENDIX B

Scientific Names of Plants Mentioned in Text

Shield fern, *Polystichum munitum*
Bracken fern, *Pteridium aquilinum* var. *lanuginosum*
Western yew, *Taxus brevifolia*
Sitka spruce, *Picea sitchensis*
Douglas fir, *Pseudotsuga taxifolia*
Noble fir, *Abies procera*
Grand fir, *Abies grandis*
Western hemlock, *Tsuga heterophylla*
Western red cedar, *Thuja plicata*
Bear grass, *Xerophyllum tenax*
Oregon lily, *Lilium columbianum*
Adder's tongue, *Erythronium oregonum*
Fairy lanterns, *Disporum smithii*
Fairy bells, *Disporum oreganum*
Trillium, *Trillium sessile* and *ovatum*
Wild iris, *Iris tenax*
Cottonwood, *Populus trichocarpa*
Willow, *Salix* spp.
Red alder, *Alnus rubra*
Hazelnut, western hazel, *Corylus rostrata* var. *californica*
Garry oak, *Quercus garryana*
Chinquapin, *Castanopsis chrysophylla*
Wild ginger, *Asarum caudatum*
Buttercup, *Ranunculus* spp.
Oregon grape, *Berberis nervosa*
Vanilla leaf, *Achlys triphylla*
Bleeding heart, *Dicentra formosa*
Spring beauty, *Dentaria tenella*
Syringe, *Philadelphus gordonianus*
Red-flowering current, *Ribes sanguineum*
Gooseberries, *Ribes* spp.
Nine-bark, *Physocarpus capitatus*
Hardhack, *Spirea douglasii*
Ocean spray, *Holodiscus discolor*
Indian peach, *Osmaronia cerasiformis*
Serviceberry, *Amelanchier florida*
Western hawthorn, *Crataegus douglasii*
Wild strawberry, *Fragaria* spp.
Salmonberry, *Rubus spectabilis*
Thimbleberry, *Rubus parviflorus*
Black-cap, black raspberry, *Rubus leucodermis*
Wild blackberry, *Rubus laciniatus, vitifolius*, and *nivalis*
Wild rose, *Rosa* spp.
Lupine, *Lupinus* spp.
Oxalis, wood sorrel, *Oxalis oregana, trilliifolia*, and *suksdorfi*
Poison oak, *Rhus diversiloba*
Bigleaf maple, *Acer macrophyllum*
Vine maple, *Acer circinatum*
Cascara, *Rhamnus purshiana*

Violet, *Viola* spp.

Fireweed, *Epilobium angustifolium* and others

Devil's club, *Onopanax horridum*

Dogwood, *Cornus nuttallii* and *occidentalis*

Rhododendron, *Rhododendron macrophyllum*

Salal, *Gaultheria shallon*

Madrone, *Arbutus menziesii*

Huckleberries, *Vaccinium* spp.

Shooting star, *Dodecatheon vulgare* and *hendersonii*

Oregon ash, *Fraxinus oreana*

Foxglove, *Digitalis purpurea*

Spring queen, *Sweathys reniformis*

Snowberry, *Symphoricarpos albus* and *mollis*

Elderberry, *Sambucus caerulea* and *racemosa*

Groundsel, *Senecio vulgaris*

Bull thistle, *Cirsium lanceolatum*

Edible thistle, *Cirsium edule*