

STUDIES ON THE VERTEBRATE ECOLOGY  
OF A BOTTOMLAND WOODS  
IN THE CENTRAL WILLAMETTE VALLEY

by

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A THESIS

submitted to

OREGON STATE UNIVERSITY

in partial fulfillment of  
the requirements for the  
degree of

MASTER OF SCIENCE

June 1962

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Date thesis is presented May 18, 1962

Typed by Wanda Beck

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INTRODUCTION

Description

The area encompassed by this study is a strip of densely wooded and overgrown riverbottom land, bounded on the west side by the Calapooya River in T 12 S, R 4 W, W.M., Section 11. It is two miles due west of Tangent, Oregon. The eastern boundary of the area is marked by agricultural land which bore a heavy crop of field corn during the summer of 1961 when the major portion of this study was undertaken. To the south of the site, a graveled county road runs east-west between Tangent and Peoria, and to the north lies the paved State highway which connects Corvallis and Lebanon; however, the north and south boundaries of the region under consideration are considerably within the limits defined by these two roads.

Within the boundaries of the study area lie a series of sloughs which appear to be ox-bows resulting from the meandering of the river in earlier years when the stream channel had not yet been cut to its present level. It is interesting to note that the action of the river remains at this time a dominant factor in the

topography of the area. The collapse of undercut banks and the heavy deposition of sands along the shorter bank of a curve in the river has changed the course of the stream to some extent even during the brief period of this survey.

The above cited location was chosen for this study for two reasons. 1) It offers an excellent situation for an ecological study of pristine riparian conditions, and 2) it is easily accessible and within convenient driving distance of the Oregon State University campus.

The vegetation found in this area is typical of the Willamette Valley flora, and has the now rare and salient characteristic of indicating little disturbance for many years. There is no evidence of fire, and the last man-made disturbance of major impact occurred an estimated thirty years ago when a small stand of Douglas fir was logged.

This logged-over area of approximately ten acres borders the northern edge of the largest slough, and appears to have been cleared completely except for the larger broadleaf trees, Acer macrophyllum, Quercus garryana, and Fraxinus oregona, which were undisturbed.

In the shade of these trees, wild blackberry (Rubus macropetalus), poison oak (Rhus diversiloba), wildrose (Rosa), hazel (Corylus californicus), ninebark (Physocarpus capitatus), mock orange (Philadelphus Gordonianus), and dogwood (Cornus nuttalli) have a good start, and the grasses and herbaceous plants are well established throughout the clearing. In such ideal and fertile conditions, one would normally expect a rapid continuing succession which, from all indications, would have occurred but for one factor. Once the grasses and herbs established themselves, this area, which is bounded on two sides by the river and the major slough and has the remaining two sides fenced, formed an ideal pasture. It was subjected to the grazing of sheep and, from physical evidence, would appear to have been so used almost continuously since the completion of the logging activity. Such grazing has had the effect of hampering or completely preventing the succession of most plants. However, some exceptions can be seen in the presence of poison oak, wild berry, and thistle, all of which could be assumed to be unpalatable, even to sheep.

The continued utilization of this area for pasture has the total effect of preventing succession, keeping the area exposed to sun and wind, and causing conditions

of more extreme temperatures and dryness than are to be found in any other portion of the study site. The logged-over area was not investigated extensively because the disruptive influence of man's endeavors had obviously prevented the region from returning to its natural state. A description of the prevailing conditions is included only as an indication of its ecological relationship to the slough area which constitutes the area of specific study.

The barely distinguishable remnants of a logging road, which can now be described as only a path at best, can be identified at points running roughly north-south several yards east of the river. The path is overgrown with thimbleberry, wild blackberry, and poison oak, and is choked with large, decaying windfalls of various species. This dense mass of entangled vegetation underlies a towering overstory composed for the most part of deciduous trees. The soil, as revealed by the cut made by the river, is predominantly rich loam with a base of black clay. Such highly fertile conditions provide unusual health and vigor to the plants.

Especially remarkable were the wild blackberry vines which produced an amazing number of plump, sweet berries. The fruit, which ripened some two to three

weeks later than that observed growing in open country and along roadsides in the valley, averaged about one inch in length and  $3/4$  inch in diameter. It is assumed that the exceptional quality of these berries is immediately attributable to the ideal soil and moisture conditions, coupled with a prolonged maturation period resulting from the heavy shadows which protected the ripening fruit from direct sunlight throughout most of the day.

### Objectives

A cursory examination was adequate to indicate that such a diversity of information was available for study that no single aspect of it could be adequately reported in a paper of this scope. This being the case, the study was undertaken with the intention of providing a broadly based survey of existing conditions, with the hope that the potential for definitive study inherent in such an active community would be exploited by other ecologists in the future.

It should be pointed out that so far as is now known, there has been no comparable study made of any riparian community in the Willamette Valley. The author has been unable to locate a similar work from which to

draw information, and publications of record at the Oregon State University library contain little data of more than general relationship to this study. For these reasons, the work reported herein should be considered as an initial effort.

### Acknowledgements

The author wishes to express his appreciation to the Oregon State University Department of Zoology for the use of its facilities and equipment, and acknowledges his sincere gratitude to the individuals who were instrumental in the undertaking and completion of this work:

Dr. Kenneth Gordon, who acquainted the author with the area and offered his continuing assistance and support throughout the study.

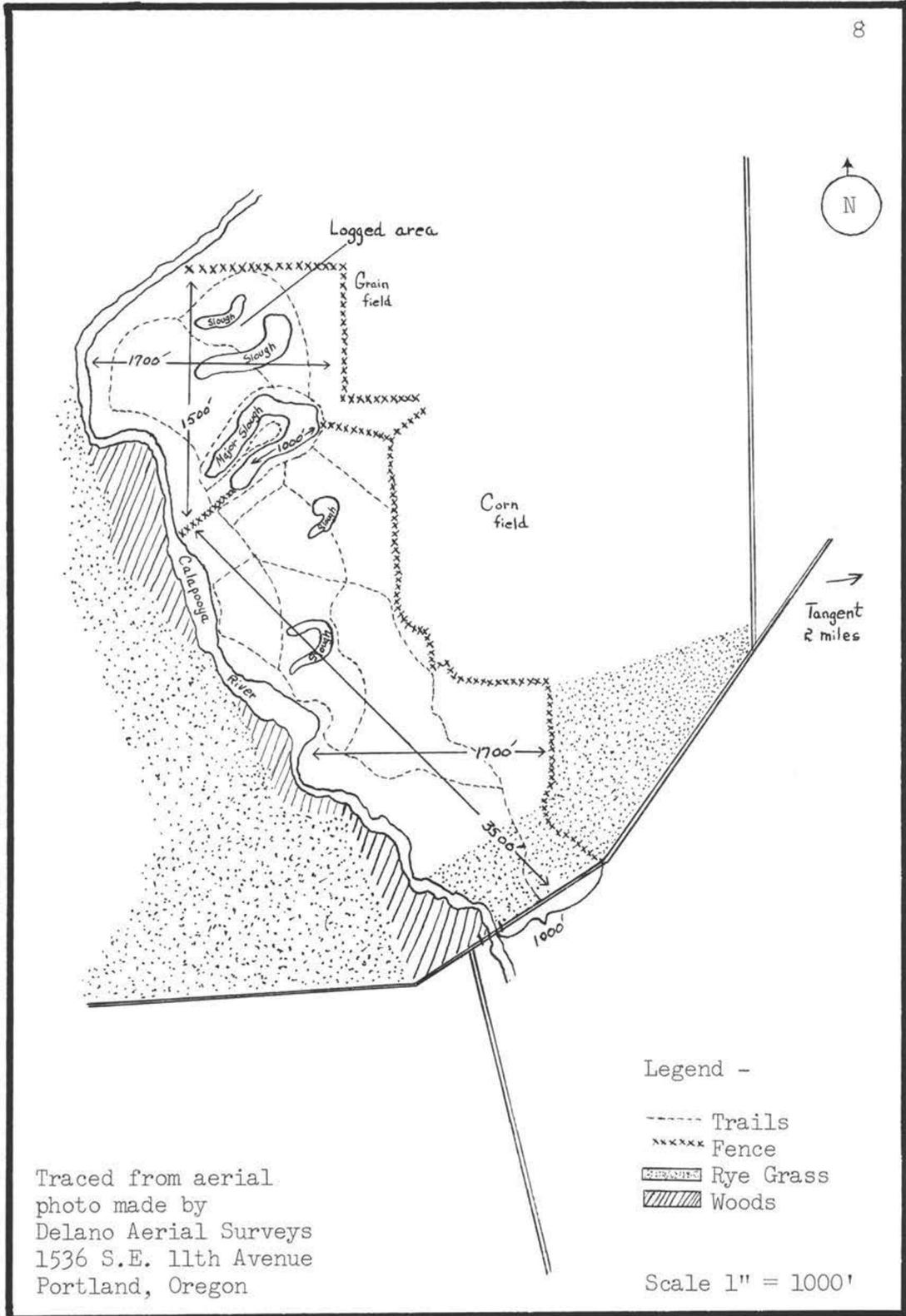
Dr. Robert M. Storm, who provided his willing guidance and his comprehensive knowledge.

Messrs. John Neeley and Douglas Neeley, who assisted immeasurably in the initial clearing of pathways and transporting of necessary equipment.

Mr. Eugene Bawden, who provided aid in identifying calls of some of the more elusive birds.

Mr. High Black, who arranged for the use of invaluable collecting equipment.

My wife, Wanda, who has been my most loyal supporter, and whose editing and typing were essential to the final compilation of this report.



Traced from aerial  
photo made by  
Delano Aerial Surveys  
1536 S.E. 11th Avenue  
Portland, Oregon

Legend -

- Trails
- xxxxxxx Fence
- [Stippled Box] Rye Grass
- [Hatched Box] Woods

Scale 1" = 1000'

## METHODS AND MATERIALS

### Obtaining Access

In order to obtain access to selected areas within the whole, it was first necessary to spend one complete week in vigorous use of a machete, merely opening trails through the massive entanglement of underbrush. The trails were slashed along and outward from the east bank of the Calapooya at random intervals, resulting in their intersection with the series of sloughs described earlier. The course of the access trails led across areas heavily overgrown with both terrestrial and aquatic plants, giving what would appear to be an excellent cross-section of the predominant flora.

To initiate the phase of the survey which, in the final analysis, produced the most informative data, the physical difficulty of transporting requisite equipment to the desired location had to be overcome. The heavily overgrown remnant of an old logging road could be negotiated by a high-centered vehicle into the area for some 100 yards, but only when the ground was dry. Beyond this point, only foot travel was feasible.

## Procedures

Both live traps and snap traps were set in the varied groups of terrestrial habitats and in the sloughs themselves. The usual routine followed throughout the course of the entire study was to place the traps in early morning and spend the remainder of the day in observation of animal activity, classification of plant life, stomach analysis of the captured animals, and attempted identification of bird life frequenting that sector. In explanation of the term "attempted identification", the following facts relative to the general structure of the study area are pointed out. The combined density of the broad-leaf overstory and tangled, jungle-like underbrush is such that it is difficult, if not impossible, to ascertain the usual distinct stratification. There is virtually no spot within the area where one can obtain an unhampered view of aerial activity, short of setting oneself afloat in the center of the largest slough of the group. Even this vantage point offers a greatly restricted field of vision, as the slough ranges from two to six feet below the surrounding ground level, nurtures a variety of aquatic plants which protrude well above the water level, and is massively overhung with the broad-leaf plants which grow along its banks.

Obviously, such surroundings provide an ideal habitat for a surprising number of birds, but the difficulties thus placed on the observer make visual identification of most of them almost impossible. Long, quiet concealment along the banks of the sloughs will sometimes be rewarded with a good view of feeding water birds, but the normal field of vision is restricted to a short distance and, as a result, a sudden flash of wings is about the best one can hope for in most instances.

The conditions described above have made it necessary to rely primarily upon calls to identify most of the species listed on page 34. A number of the characteristic calls heard during this study were identified by Dr. Robert Storm and Mr. Eugene Bawden during a reconnaissance made in early summer.

In a further attempt toward accuracy and in order to complement observations and identifications made during the most concentrated period of activity, repeated visits were made to the area during and after the slow abscission of the leaves. In this way a number of visual verifications were made; however, since the presence of a number of the bird species is largely dependent upon the flowering and fruit-bearing cycles of the native flora, it must be assumed that many species heard or

briefly observed during the warmer periods would have migrated from the area before the initiation of the non-productive season and inclement weather.

Because of the difficulties in visual observation described above, it appeared expedient to utilize several data-gathering devices rather than rely upon a single procedure in investigating the small mammal population. Toward this end, it was deemed best to begin an extensive program of trapping, supplemented by the use of dropping boards and track identification. The study of tracks proved to be most interesting and revealing, largely as a result of the ideal track recording surfaces left along the banks of the sloughs as the water receded during the course of increased evaporation in the heat of summer. Evidence obtained from the combined methods used is believed to give an ample and fairly reliable cross-section of the species present.

The large-mammal population of the area was extremely limited. Deer were observed during early morning and late evening in the rye grass fields which border either end of the region under investigation, and tracks indicated their presence along the sloughs. One set of tracks observed on the slough bank seemed to indicate that a large cat passed through the area during the period of

the study; however, the evidence was not conclusive enough to merit actual inclusion of this observation in the factual analyses.

A thorough investigation was made of the aquatic animal life in the major slough by means of traps and hook-and-line, using a wide variety of bait. (See p. 36) Because the adjacent, smaller, sloughs were completely dry for an appreciable period of the year, few animals appear to be in permanent habitation there. To all intents and purposes, these smaller sloughs may be considered temporary ponds; however, their mere presence gives evidence of the history of the region, and exerts an influence on the over-all ecological picture.

A variety of amphibians and reptiles abound in this ideal habitat, and a number were caught by hand and in traps during the investigation. The red spotted garter snake is especially prevalent, and has been observed feeding upon tadpoles and Taricha along the edges of the slough. Stomach analyses were made of captured specimens, as with the small mammals and aquatic life, and some of the common parasites of the intestinal tract identified in each case. A checklist of known species of reptiles and amphibians appears on page 36.

Supplementary to the procedures indicated in the foregoing, a number of specific methods and techniques were employed in an attempt to obtain as complete and accurate a set of data as possible. The following section sets forth these efforts in detail.

### Traps

Although the metal Havahart small mammal live-traps and the museum special snap traps were placed at appropriate intervals along the trails into the heart of the study area, the most cumbersome equipment, i.e., the coarse wire mesh traps used for capturing animals in the aquatic habitat, heavy O steel traps, and the minnow traps, had to be transported on foot an estimated one mile to the major slough. The largest equipment consisted of two rectangular wire mesh traps, approximately 4' x 2', and two cylindrical mesh traps, approximately 3' long and 2' in diameter, with ends made of inverted wire cones terminating in partitions which hinged inward at the innermost openings. Considerable difficulty was encountered in transporting these structures through the machete-cut footpaths.

Proper placement of the aquatic traps required partial submergence with several inches of the mesh

enclosure protruding above the water line to prevent drowning of lung-breathing captives. Heavy silt deposits in the slough basin, coupled with a scarcity of stationary objects to which the traps could be attached, posed the problem of how to locate these traps in deep water. A leaky but usable boat was found near the slough, making it possible to attach a line to the base of a tree, pole across the slough playing out the line, raise the line to the desired height, and attach the other end of the line to a tree on the opposite side. In this manner the traps could be suspended from the line at any location desired, and trap success by this method was found to be quite satisfactory.

Although many of the specimens obtained were released without harm, a representative specimen of each catch was dissected. The stomach contents were identified and recorded, and in most cases the specimen was preserved to aid in positive identification. Only in the case of the Pacific pond turtle (Clemmys marmorata) was it deemed unnecessary to retain a specimen. The reptiles, amphibians, fishes, and mammals were identified and either preserved in alcohol or by drying and curing of the skin and skull, in the manner currently accepted.

## Baits

In the large, wire mesh traps, a variety of baits were used for capturing turtles. The most successful proved to be trout, caught elsewhere and frozen until used. The trout were suspended inside the cage and submerged completely to prevent their being attacked by the diptera and as a protection from the sun. Aquatic vegetation was placed over the traps to prevent rapid decay of bait and to shade the captives during the warm summer afternoons.

An ear of corn was used in these same traps to lure many other creatures, and proved effective for muskrat, fish, and one bullfrog.

Chicken entrails, which had been suggested as effective bait for raccoon, were used in 0 steel traps without success. When it was observed that the bait was being taken but the traps were not being sprung, unbaited snap traps were placed nearby in an attempt to catch the scavengers. Although several Peromyscus maniculatus were taken in the snap traps, the bait continued to disappear and the use of that particular lure was discontinued.

Some domestic apples from a neighbor's tree, clover hay, and an occasional vegetable were used in the large

live traps which were set on the land surfaces close to the slough. Twelve of these traps were set on nine nights, with a change of trap location made after three unsuccessful attempts; however, no animal of any kind was ever caught in this manner.

Small fish and frogs were used in the minnow traps with some success in the way of a number of small fish, several aquatic insects, and some Taricha. It would seem surprising that aquatic salamanders were never seen during the entire study. There were two young Plethodon dunni uncovered in an old rotten log, but although a vigorous search was made, no further evidence of these animals was obtained.

A rolled oats, bacon fat, and peanut butter mixture was used with the museum special snap traps to lure small mammals. Peromyscus were the only animals obtained by this arrangement.

The remains of dissected turtles were used to bait steel traps, but the result was unsuccessful. On each attempt the bait was gone and the traps were apparently undisturbed. Since no tracks were observed in the trap areas where the ground surface would have provided a record, it can be assumed at least that the scavenger was not a large carnivore.

On several occasions apples were heaped on the soft mud in the receding margin of the large slough. Tracks indicated that these were taken by several deer. The only chipmunks seen in the area at any time were a pair observed also partaking of this delicacy. These inquisitive animals were identified as the Townsend chipmunk (Eutamias townsendii). No other animals, from the evidence available, were tempted by this particular bait.

### Turtles

The turtle population is extremely heavy in the major slough; however, very little success was realized in the attempt to estimate the population size through the use of traps. On several occasions as many as eleven turtles were counted on a single log, and on one occasion twenty-seven individuals were sighted in the course of a single excursion along the length of the slough. This latter number can be considered especially interesting, in view of the fact that only at intervals could one obtain a good view of the slough without creating disturbances which alerted the turtles and resulted in their seeking concealment.

During the course of this study, seventeen specimens of these turtles were captured, of which six were dissected.

In each case the presence of intestinal parasites was noted and determined to be the same Oligochaete of the family Branchiobdellidae reported by Thatcher (#16) as being common to the Pacific pond turtle. The stomach of each specimen was empty, and efforts to obtain any pertinent data in regard to food habits were abandoned after the sixth attempt. This complete dearth of stomach contents may be attributed to one of several reasons, the most likely being the lapse of time between the ingestion of the animal's last meal and the attempted analysis. The dissections were made at varying times of the day; the last, which was performed at 7:00 a.m., resulted in the conclusion that further attacks on the population would be unjustified and probably fruitless.

### Snakes

Among the reptiles observed in the area, the most frequently seen was the red spotted, or common, garter snake (Thamnophis sirtalis concinnus). It was not uncommon to count as many as a dozen of these snakes during a mile walk through the study area. Numerous specimens were forced to regurgitate their stomach contents, with the result that their diet was determined to be predominantly frog tadpoles, the small tree frog (Hyla), and the rough-skinned newt (Taricha). On the

occasion mentioned earlier when one of the snakes was observed ingesting a newt from the slough, the distal segment of a hind limb was grasped tightly by the predator as it backed away from the water toward the adjacent foliage. The other limbs of the newt made this a difficult task for the snake, as the newt would grasp any object within reach and hang on mightily. In order to pull his victim free, the snake would coil the posterior part of its body around a twig and contract, thus forcing the victim to release its grasp and try again a few inches away. This silent but frantic tableau finally disappeared into the dense growth along the bank, and the eventual outcome, although fairly obvious, can only be assumed.

One fall afternoon two red spotted garter snakes were observed in a shrub some seven or eight feet high. A ray of sunlight, covering only a small portion of the shrub, shone directly on them and made their presence most conspicuous. Although it is understood to be fairly common for these reptiles to climb trees, this was the first personal observation which had been made of such an activity. The warmth of the direct sunlight made the pair highly active, and this circumstance, coupled with the fact that the shrub was poison oak with entangled, spiny berry streamers, prevented an observation of the stomach contents of these individuals.

The method used in forcing the stomach contents from the mouth of a snake was learned from Glenn Stewart, a friend and fellow graduate student. Seizing the specimen by the tail in the left hand, the collector starts the thumb of the right hand along the ventral side from just anterior to the cloaca, applying moderate pressure as the thumb is worked cephalad. The stomach contents are thus forced out through the mouth, usually without much difficulty and with little or no harm to the specimen. This method presents a convenient and rapid way to obtain stomach contents in the field.

Thamnophis sirtalis is known to harbor several trematodes, roundworms, and a tapeworm (Sumwalt, #15. The basis of this information was a study done in the San Juan Islands in 1926.) Verification of each of these parasites in the red-spotted garter snakes of the study area remains unsubstantiated; however, Glenn Anderson, doctoral candidate in invertebrate zoology at Oregon State University, confirmed the presence of three trematodes of the genera Alaria, Lechriorchis, and Ophioxenas. The roundworms obtained from the specimens remain unidentified. Mention of these endoparasites is made merely to inform the interested reader of their existence.

Waterfowl

Throughout the year on every occasion when the area was being observed, a small flock of woodducks which inhabits the slough was seen. The largest number counted at a single sighting was nine. As time passed, the birds became less sensitive to the presence of an observer, and during the legal season, one male was eventually shot. A check of the intestinal tract for parasites was made, but, despite an extensive search, none was found. This negative result was the determining factor in the decision to abandon further efforts in that particular phase of study, as many time-consuming parasite checks had been made during the summer on several animals with little success and, although the attempted parasite study was of great interest, it was nevertheless somewhat out of focus with the defined purpose of this particular investigation.

On several different occasions, mallards were observed on the water among the woodducks, and one morning a mallard hen was found in a steel trap which had been baited with chicken intestine for raccoon. Unfortunately, the trap had snapped on its head, thereby making its preservation as a specimen impossible.

The most impressive winged visitor to the slough was a great blue heron, which was assumed to be the same individual, seen clearly on three different occasions. Being unusually alert to sounds or visual evidence of a foreign presence, this bird was extremely difficult to observe at close range; nevertheless, one afternoon while I was concealed partially by a heavily-leafed overhang on the slough bank, the bird was seen to enter the area in flight and land in the slough not more than 25 feet away. He stood at rest for several seconds, apparently scrutinizing the shoreline before him. Then, possibly sensing the alien figure of his observer, he took flight again and disappeared from view. Although not sighted again, the characteristic call, described by Petersen (#12, p. 13) as having the quality of a bullfrog's croak issued three or four times in rapid succession, was heard repeatedly on subsequent visits to the slough area.

#### Scat Analysis

In the case of the raccoon, some birds, and the small rodents, an analysis of their respective scats was relied upon for determination of food preference. After some weeks in the area, it was observed that some animal had chosen as a dropping station the rather firm surface of areas immediately adjacent to the landward-side of large trees near the water's edge. Some of these

droppings were collected, analyzed as to content, and determined to have been deposited by a raccoon. The areas were marked and visited each day for two weeks. Not all the stations were visited nightly by one individual animal; however, the fact that most were used each night was easily discernible by the freshness of the droppings.

In order to aid in the collection of the scats, pieces of scrap plywood and metal roofing material, measuring approximately two feet square, were placed in four of these locations. This method, based on the apparently instinctive desire of certain small mammals to seek out smooth, flat surfaces on which to defecate, has been used with considerable success in studies of population densities of small mammals. In this particular study, however, the raccoon did not visit any of these stations while the materials were in place, but fresh scats were found periodically when the materials were removed. During late summer the scats contained a high percentage of blackberry seeds, and were dark purple, almost the natural color of berry stain or juice. During seasons when berries were not available, few constituents could be discerned; however, remnants of crayfish and small bones of fish were identifiable in every case. The

negative response of the raccoons to the collecting boards might have been overcome through experimentation with a variety of different materials used for collecting boards, but this particular possibility was not pursued. Without any definite data from scats, it was necessary to use the numerous tracks made by this animal to determine its frequency in the area.

### Track Study

The value of track observations became increasingly apparent in the course of this investigation, as continuing familiarization repeatedly disclosed areas so overgrown by masses of vegetation as to inhibit the placement of traps. Since it could logically be assumed that at one time or another most of the vertebrates in the study region would visit the slough for water or food, points of easy access to the water were cleared, wet down to a muddy consistency, and smoothed over. Each morning these prepared surfaces were observed and the tracks identified. At times the tracks of various animals were so numerous that it was virtually impossible to count them accurately. The track records found on these artificially prepared surfaces, together with those noted on the naturally occurring silt surfaces surrounding the slough, were instrumental in providing an appreciable portion of the final data reported.

Several days of working with track observation indicated that a considerable amount of activity was taking place during the hours of darkness, although a number of tracks belonging to animals not nocturnal in habit were also found. The evidence suggested that it would be desirable to make checks of the visitation points during the night and just before or at dawn. With the aid of another graduate student, such a night check was undertaken. The study area was entered at 1:00 a.m., but it was quickly determined that to move quietly in the extreme darkness cast by the shadows of the dense foliage was impossible. The few areas that were checked disclosed that much activity had already occurred prior to our arrival. Recognizing that the handicaps provided by night conditions in the study area rendered observation futile during darkness, a series of audits at early dawn were made on the assumption that fresh tracks of animals observed at that hour would have had to be made during the night.

On the single night excursion which was made, several identifiable sounds could be distinguished above the croaking of multitudes of frogs. The splashing noises made by our footsteps in the marshy terrain had the effect of silencing the nearby sound of the frogs as immediately as if a switch had been thrown. The

sudden flapping of wings against water and the accompanying vocalizations of the ducks as they became airborne created a startling disturbance in the stillness and brought a vivid mental image of their activity.

#### Small mammal activity

Some of the inhabitants of the area left other evidence of their presence, as seen near the slough on the many alder and ash trees which displayed marks of beaver teeth. Some of these trees had been notched well over halfway through the base; still others had only the bark missing. A network of trails in the way of tunnels through the underbrush connected the series of sloughs. Although many of these had been abandoned, others indicated signs of the constant passage of rather large animals which were assumed to be beaver. This assumption was partially based on the fact that beaver are known to travel some distance for browsing. On one tree of approximately ten inches diameter, which had been gnawed almost to the pith, several small marks were placed in the incision with a lead pencil. However, the tree had apparently been abandoned by the beaver, as the pencil marks were still in evidence upon completion of this phase of the study. The only definite statement which

can be made relative to the beaver population is that it does exist in the area and does contribute to the ecological balance of the community.

More easily observed than the beaver are the muskrat (Ondatra zibethica) that inhabit the major slough. In the first few weeks of study, some half dozen of these animals were seen in an area some 200 feet in length. On one occasion two muskrat were observed piling up great quantities of pond lilly and lesser amounts of other aquatic plants in the middle of a more shallow part of the slough. From a nearby log overlying the water, the pair were scrutinized closely through binoculars. One of the animals was involved in the gathering or retrieving process, while the other kept busy in and around the cache. It appeared that a nest or den might be the end product, but as time passed the activity ceased and the close observation was discontinued. As the days went by, there was never any indication that the object of these attentions had become a place of residence. After wading out to this heap of now withered vegetation and carefully removing each piece, it was discovered that the muskrat had apparently never molded living quarters in this material at all. The motive behind this apparently meaningless project remains a mystery.

Five muskrat were trapped during the course of this study, one of which was skinned, the skull prepared and marked as an exhibit. All of the animals were dissected and the stomach contents were listed. When examined, the stomach of each specimen was packed with a green, masticated plant matter. In only one instance was any other identifiable material observed ... a piece of a small fish bearing a definitely discernible fin. The intestinal tracts in three were checked for parasites with negative results. One of the animals was found dead at the water's edge of causes unknown, and one other had dislodged the trap in which it was caught, causing the trap to submerge completely and thereby drown its catch.

Inspection of the genitalia of the first muskrat specimen obtained revealed that the animal possessed well developed reproductive organs, both male and female. This evidence of hermaphroditism was confirmed and photographed by Mr. John Neeley, and the organs were preserved in formalin. A thorough investigation of the reproductive systems was subsequently made on each specimen thereafter obtained but, as was to be expected, a similar aberration was not observed again.

Fish

On several occasions, fishing tackle was taken into the area and a hook-and-line sampling was made of the slough and the nearby river. Three different species of fish were taken in this manner, and two additional species were taken from the wire mesh turtle traps submerged in the slough. On one collection, a small minnow trap yielded eleven fish, some of which were made available to other graduate students for study in their area of interest. The stomachs of all the specimens which were dissected were filled with numerous varied insects, most of which appeared to be of the order coleoptera. A few pieces of stoneflies, water striders, and damselflies could also be identified.

## CHECKLIST OF MOST PROMINENT PLANTS

1. Rubus parviflorus Nutt. - Thimbleberry
2. Rhamnus Purshiana Pursh. - Cascara; chitim
3. Rosa nutkana Presl. - Common wild rose
4. Achillea millefolium L. - Yarrow or milfoil
5. Cornus nuttalli Nutt. - Common dogwood
6. Urtica Lyallii Wats. - Nettle
7. Symphoricarpos albus L. - Snowberry
8. Philadelphus Gordonianus Lindl. - Mock orange
9. Salix L. - Willow
10. Crataegus Douglassii Lindl. - Western hawthorn
11. Amelanchier alnifolia Nutt. - Service berry
12. Sambucus glauca Nutt. - Blue elderberry
13. Berberis aquifolium Pursh. - Oregon grape
14. Holodiscus discolor Pursh. - Ocean spray
15. Physocarpus capitatus Pursh. - Nine-bark
16. Fraxinus oregona Nutt. - Oregon ash
17. Alnus oregona Nutt. - Red alder
18. Populus trichocarpa Torr. & Gray - Cottonwood
19. Quercus Garryana Dougl. - White oak; Oregon oak,  
Garry oak
20. Pseudotsuga taxifolia Britt. - Douglas fir, red fir
21. Abies grandis Lindl. - Grand fir, lowland white fir
22. Rubus laciniatus Willd. - Evergreen blackberry
23. Rubus macropetalus Dougl. - Wild blackberry

## Plants - Continued

24. Cirsium arvense Scop. - Canada thistle
25. Vicia sp. L. - Vetch
26. Rhus diversiloba Torr. & Gray. - Poison oak
27. Lilium columbianum Hanson. - Tiger lilly, Oregon  
lilly
28. Smilacena sp. Nutt. - Solomon seal
29. Trillium ovatum Pursh. - Wood lilly
30. Polystichum munitum (Klauf.) Presl. - Western  
sword fern
31. Pteridium aquilinum (L.) Kuhn. - Bracken fern
32. Acer macrophyllum Pursh. - Big-leaf maple
33. Daucus carota L. - Wild carrot
34. Corylus rostrata L. - Western hazel
35. Equisetum arvense L. - Horsetail
36. Disporum Smithii Hook. - Fairy lanterns
37. Montia perfoliata (Donn.) How. - Miner's lettuce
38. Dicentra formosa Andr. - Bleeding heart
39. Fescue - Grass
40. Hymphaea polysepala Engelm. - Pond lilly
41. Brasenia Schrieberi Gmel. - Water shield

## CHECKLIST OF MAMMALS

1. Odocoileus hemionus columbianus (Richardson) -  
Black-tailed deer
2. Ondatra zibethica (Elliott) - Muskrat
3. Castor canadensis (Kuhl) - Beaver (Not captured  
or observed)
4. Procyon lotor (Merriam) - Raccoon
5. Peromyscus maniculatus (Osgood) - Deer mouse
6. Eutamias townsendii (Bachman) - Townsend's chipmunk

## CHECKLIST OF BIRDS

1. Ardea herodias (Linnaeus) - Great blue heron
2. Anas platyrhynchos (Linnaeus) - Mallard duck
3. Aix sponsa (Linnaeus) - Woodduck
4. Cathartes aura (Linnaeus) - Turkey vulture
5. Buteo jamaicensis (Gmelin) - Red-tailed hawk
6. Falco sparverius (Linnaeus) - Sparrow hawk
7. Bonasa umbellus (Linnaeus) - Ruffed grouse
8. Lophortyx californica (Shaw) - California quail
9. Phasianus colchicus (Linnaeus) - Ring-necked pheasant
10. Oxyechus vociferus (Linnaeus) - Killdeer
11. Capella gallinago (Linnaeus) - Wilson's snipe
12. Zenaidura macroura (Linnaeus) - Western mourning dove
13. Bubo virginianus (Gmelin) - Horned owl
14. Selasphorus rufus (Gmelin) - Rufous hummingbird
15. Megaceryle alcyon (Linnaeus) - Belted kingfisher
16. Colaptes cafer (Gmelin) - Red-shafted flicker
17. Dryocopus pileatus (Linnaeus) - Western pileated  
woodpecker
18. Dendrocopos villosus (Linnaeus) - Hairy woodpecker
19. Empidonax traillii (Audobon) - Traill's flycatcher
20. Nuttallornis borealis (Swainson) - Olive-sided  
flycatcher
21. Contopus richardsonii (Sclater) - Western wood pewee
22. Iridoprocne bicolor (Vieillot) - Tree swallow
23. Tachycineta thalassina (Swainson) - Violet-green  
swallow

## Birds - Continued

24. Corvus brachyrhynchos (Brehm) - Crow
25. Cyanocitta stelleri (Gmelin) - Steller's jay
26. Aphelocoma californica (Vigers) - California or  
scrub jay
27. Parus atricapillus (Linnaeus) - Black-capped chickadee
28. Sitta carolinensis (Latham) - White-breasted nuthatch
29. Thryomanes bewicki (Audobon) - Bewick's wren
30. Hylocichla ustulata (Nuttall) - Russet-backed thrush
31. Turdus migratorius (Linnaeus) - Northwestern robin
32. Operornis tolmiei (Townsend) - Macgillivray's warbler
33. Dendroica nigrescens (Townsend) - Black-throated  
gray warbler
34. Icteria virens (Linnaeus) - Long-tailed chat
35. Sturnella neglecta (Audobon) - Meadowlark
36. Euphagus cyanocephalus (Wagler) - Brewer's blackbird
37. Piranga ludoviciana (Wilson) - Western tanager
38. Hedymeles melanocephalus (Swainson) - Black-headed  
grosbeak
39. Carpodacus mexicanus (Müller) - House finch or linnet
40. Spinus tristis (Linnaeus) - Common goldfinch
41. Pipilo maculatus (Linnaeus) - Spotted towhee
42. Junco oreganus (Townsend) - Oregon junco
43. Passer domesticus (Linnaeus) - English sparrow
44. Zonotrichia leucophrys (Forster) - White-crowned sparrow
45. Spizella passerina (Beckstein) - Western chipping  
sparrow
46. Melospiza melodia (Wilson) - Song sparrow

## CHECKLIST OF REPTILES AND AMPHIBIANS

1. Clemmys marmorata (Strauch) - Pacific pond turtle
2. Thamnophis sirtalis concinnus (Hallowell) - Red-spotted  
garter snake
3. Hyla regilla (Baird & Girard) - Pacific tree frog
4. Rana catesbeiana (Shaw) - Bullfrog
5. Rana aurora (Baird & Girard) - Red legged frog
6. Bufo boreas (Baird and Girard) - Western toad  
(not captured)
7. Plethodon dunnii (Bishop) - Dunn's salamander
8. Taricha granulosa (Skilton) - Rough-skinned newt

## CHECKLIST OF FISH

1. Chaenobryttus sp. - War-mouth
2. Cottus asper - Prickly scalpin
3. Ptychocheilus Oregonensis - Squaw fish
4. Ictalurus nebulosis - Catfish



Plate 1

The Calapooya River at a point immediately west of the largest slough.

This is a typical view of the river with the water line obscured by the heavy growth of vegetation. The river is slow-moving, and during late summer only a small amount of water flows from the deeper holes.



Plate I



Plate 2

The portion of the study area, covering an estimated ten acres, which was logged approximately thirty years ago.

The stump remnants are covered with wild blackberry and poison oak; a few of the remaining fir trees are seen in the background. The path in the foreground is all that remains of the road used to haul out the logs.



Plate 2



Plate 3

Winter view of the large slough indicating the entangled masses of poison oak, alder, maple, and wild blackberry which grow along the banks.

Some of the larger trees lying across the water were felled by beaver; others were uprooted by wind.



Plate 3



Plate 4

Mid-winter view of a muskrat den located close to the shallow southwest end of the largest slough.

During the period of the year when the picture was taken, the water levels are high and most trees and shrubs are bare.



Plate 4



Plate 5

The large slough in late summer, after the water level has been lowered by evaporation.

The curling and wrinkling of the leaves of the aquatic plants is due to the scarcity of standing water. The pictured area remained in this condition for two months until the fall rains began.



Plate 5



Plate 6

Douglas fir partially submerged in the major slough.

This is a favorite sunning place for turtles,  
woodduck, and muskrat. Turtles and muskrat have  
both been seen on this log at the same time.



Plate 6



Plate 7

Heavy mid-summer plant growth along the eastern border of the Calapooya River.

The rapid growth of vegetation in the area made frequent use of the machete necessary throughout the summer in order to keep open the trails which had been previously cut.



Plate 7

## CONCLUSION

To the ecologist, the value of this research area as a pristine riparian community cannot be overemphasized. Its accessibility, coupled with the fortunate minimum of man-made disturbance, makes it an ideal site for the intensive and specialized studies which, it is hoped, may follow this survey.

An attempt has been made in this paper to innumerate the most obvious ecological factors in the study area, from which a logical inference may be made as to the significance of the interrelationships involved, as well as the relative numbers of the vertebrate populations present. The vertebrates and most common flora have been listed and discussed; however, the invertebrates have been deliberately excluded. Although it is impossible to avoid frequent contact with the various invertebrate forms which abound in the region, and despite their bearing on the total ecology of the area, their specific study falls outside the scope of this investigation.

Sufficient material is most certainly available in this locality for the researcher interested in statistical population analyses, determination of the biomass of the

community, botanical investigations, or invertebrate studies, as well as more specialized ecological inquiry. If the contents of this paper are adequate to lessen the basic problems and pose a challenge to future researchers in the various applicable fields of endeavor, it is felt that its primary purpose will have been attained.

Although it would appear that the marshy soil and constant threat of flooding would act as deterrents to large-scale interference by man, the region is privately owned and the possibility of destruction by grazing or other agricultural pursuit cannot be discounted in the Willamette Valley where productive land is at a premium. It is hoped that a comprehensive history of present conditions will have been recorded before such a possibility may become a fact.

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