C. Ruby

DISTRIBUTION, ABUNDANCE, AND HABITAT ASSOCIATIONS OF DECLINING AND STATE SENSITIVE BIRD SPECIES BREEDING IN WILLAMETTE VALLEY GRASSLANDS

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INTRODUCTION

Conservation of grassland birds and habitats is receiving increased attention throughout the western hemisphere (International Conference and Training Workshop in Conservation and Ecology of Grassland Birds, 26-28 October, 1995, Tulsa, Oklahoma). Grassland bird species in North America, particularly neotropical migrant species which often comprise the majority of bird species in these habitats (Freemark et al. 1991), have been reported as declining more than any other avian group since the mid-1960s (Peterjohn and Sauer 1993, Knopf 1994). Conversion of perennial grassland to annually cultivated cropland, and intensification of agricultural practices have often been implicated in these declines (Johnson and Schwartz 1993, Rodenhouse et al. 1993).

Prior to European settlement, much of the Willamette Valley of western Oregon (Figure 1) was native grassland and oak savannah maintained by periodic fires. Settlement, fire suppression, and cultivation resulted in the loss of most of these native grasslands. Populations of bird species associated with native grasslands may have been reduced, but some species began to use newly created "secondary" grassland habitats such as hayfields and pasture. In more recent times, Willamette Valley grassland bird species have been further impacted by loss of secondary grassland habitat to urban and residential development, and conversion of these habitats to row crop agriculture and large grass seed fields. Additionally, grassland bird species in the Willamette Valley may be adversely affected by intensification of farming practices such as earlier and more frequent mowing, and increased use of pesticides and other agricultural chemicals.

Grasslands in the Willamette Valley support a diversity of breeding bird species. The most highly associated species are Oregon vesper sparrow (*Pooecetes gramineus affinis*), streaked horned lark (*Eremophila alpestris strigata*), grasshopper sparrow (*Ammodramus savannarum*), western meadowlark (*Sturnella neglecta*), common nighthawk (*Chordeilies minor*), western bluebird (*Sialia mexicana*), lazuli bunting (*Passerina amoena*), northern harrier (*Circus cyaneous*), western kingbird (*Tyrannus verticalis*), killdeer (*Charadrius vociferus*), short-eared owl (*Asio flammeus*), and savannah sparrow (*Paserculus sandwichensis*). The burrowing owl (*Speotyto cunicularia*) formerly nested in Willamette Valley grasslands, but has likely been extirpated as a breeding species.

The Oregon Department of Fish and Wildlife (ODFW) recently designated the Oregon vesper sparrow and streaked horned lark as State Sensitive Species (Critical Status) because of concerns about declining populations and habitat in the Willamette Valley (OAR 635-100-040, Oregon Sensitive Species List, December, 1995). The burrowing owl is also listed as Critical, and western bluebird has been designated as Vulnerable by the ODFW (Marshall et al. 1996). Substantial declines have been reported in the Willamette Valley for the western meadowlark (Altman 1994).

This project was initiated in response to the overall lack of information on grassland bird species in the Willamette Valley, particularly considering the declining and sensitive status of several of these species. Five species, Oregon vesper sparrow, streaked horned lark, western meadowlark, grasshopper sparrow, and common nighthawk were designated as target species based on concerns about declining populations and their close association with grassland habitat. The term "grassland"

as used in this report refers to agricultural fields such as pasture, hayfields, and cultivated cropland (e.g., grass, grain, vegetable, berry fields and Christmas tree farms); and non-agricultural fields such as native prairies and fallow fields. Bird species associated with these types of fields often were formerly native grassland species.

OBJECTIVES

Specific project objectives included:

1) locate and quantify the abundance of populations of target species,
2) characterize habitat features associated with target species occurrence and breeding sites,
3) determine the population viability (i.e., productivity) and area requirements (i.e., densities and territory sizes) of target species within different habitat types,
4) characterize the breeding bird composition of Willamette Valley grasslands, and
5) provide conservation and management recommendations to protect, enhance, and restore grassland birds and their habitats.

The project is designed to occur over two years. This progress report presents results from the first year, which focused on broad-scale censusing to describe target species abundance and habitat associations and characterize the avian community in grassland habitats. These data will direct the focus during the second year for an intensification of efforts at several sites to determine the significant components important in conserving populations.

This study will provide the initial data on grassland bird/habitat relationships in the Willamette Valley. The data will be essential for managing grassland habitat to support bird species, particularly several sensitive and declining species, and for predicting effects on the avian community in grassland restoration or enhancement projects. It will also identify important habitat types and sites to help focus conservation efforts where they can be most effective. It is projected that application of the knowledge gained from this study will form the basis for developing conservation strategies and agreements to avert threatened and endangered listing status for several species.

METHODS

Data collection integrated multiple methods at extensive and intensive scales. Extensive censusing was conducted throughout the Willamette Valley to characterize the grassland breeding bird community and quantify target species abundance and habitat associations. Extensive censusing also established baseline conditions at permanent monitoring stations for long-term monitoring of population trends. To a lesser degree, intensive research was conducted at selected sites using territory-mapping and nest-monitoring to quantify species habitat area requirements and population viability, the two principal parameters being used for developing landbird conservation strategies (Mueller 1993, Bonney and Pashley 1994).

Extensive Scale

Bird Censusing: The primary censusing method was roadside point counts. Area searches, walking transects, and automobile transects (for common nighthawks) were also conducted to provide supplemental census data relative to specific conditions (off-road habitat), purposes (density estimates), or species requirements (i.e., common nighthawks).

Point count censusing was conducted during a five-minute period (Ralph et al. 1995). Detections were recorded within fixed radii of 50 meters, 100 meters, beyond 100 meters, and flyovers. Based on recent research, 100 meters may be the most effective point count radius to use in grasslands (Cyr et al. 1995, Savard and Hooper 1995), and this was the data set used for all analyses. The 50 meter data set may be used for comparisons with most other point count censusing, and the unlimited distance data set may be used for comparisons with Breeding Bird Survey (BBS) data.

Point count censusing was conducted primarily by three individuals with two others assisting incidentally during an eight week period between May 5 and July 1. Censusing occurred between official sunrise and 10:00 AM under favorable weather conditions. Recommendations for extensive point count censusing suggest one visit per point during the breeding season (Ralph et al. 1995); however, the variability in breeding seasons among our target species necessitated two visits. One census was conducted at each point count station in May for the resident target species western meadowlark and streaked horned lark, and one in June for the long distance migrants vesper sparrow and grasshopper sparrow.

Area searches were conducted where access to off-road habitats was available. A single observer walked through a defined grassland area (approximately 10-12 acres) recording species abundance during a 20-minute census (Ralph et al. 1993). Detections outside the area search plot (often in non-grassland habitat) were also recorded. Area searches occurred during the same daily and seasonal time frames as described for point count censusing.

Several roadside walking transects were conducted on June 11 to estimate relative densities of western meadowlarks and horned larks. These occurred in areas known to have relatively high populations of these species.

Automobile transects were used to census foraging common nighthawks during late evening foraging bouts. Volunteer participants were assigned an area and censusing occurred during the last 1-2 hours before dark on June 26 and July 10. A data form with instructions is included as Appendix A.

Site Selection: Selection of point count stations was based primarily on known locations of target species and locations of potentially suitable habitat. Additional considerations included: 1) spatial sampling throughout the valley, 2) sampling of a broad range of potentially suitable habitat, 3) sampling of physiographic regions (valley floor and foothills), 4) sampling within "historic grasslands" (e.g., French Prairie, Elliott Prairie, Howell Prairie) and known remnant grasslands (Alverson 1990), 4) maintaining a straight-line distance of at least 1/4 mile between point count stations to ensure

statistical independence of the points, 5) avoiding highways and heavily traveled roads for personnel safety and species detectability concerns, and 6) avoiding BBS routes to ensure statistical independence for any comparisons with BBS data.

Known locations of target species included recently documented sites (e.g., Marshall et al. 1996, Altman 1994, field notes in Audubon Society newsletters), 1995 Breeding Bird Atlas records, and reconnaissance inventories conducted prior to censusing. Suitable habitat was based on project staff knowledge of target species habitat requirements, examples of suitable habitat from reported locations of target species, and reconnaissance surveys prior to and during censusing. Suitable habitat for target species was described by 12 grassland habitat types (Appendix B) including agricultural fields such as cultivated grass fields, row crops, and pasture; and non-agricultural fields such as fallow fields, roadside right-of-ways, and wet prairie. Some unique grassland habitat types on the basis of target species use were Christmas tree farms and gravel/dirt roads.

Habitat Characterization: Qualitative habitat characterization was conducted at each point count station during the May and June census to evaluate target species habitat associations. Habitat characterization within the 100 meter fixed-radius point count circle included categorization of field type (Appendix B), ocular estimates of percent coverage of each field type, average vegetation height by height classes (Appendix C), and presence of non-vegetative structures (e.g., fences, powerlines). Additionally, habitat type and vegetation height was recorded for each detection of a target species during censusing or when encountered incidentally. Incidental detections of several non-target grassland associated species such as western kingbird, northern harrier, western bluebird, short-eared owl, and lazuli bunting were also classified by habitat type and vegetation height class and plotted on topographic maps.

Intensive Scale

Target Species Area Requirements: Territory-mapping was conducted to provide data on target species densities and territory size. Site selection was based on a high degree of target species use and permission and ease of access. Territory-mapping was a modification of spot-mapping (International Bird Census Committee 1970) and the repeat-flush technique (Wiens 1969). A single observer walked through the study plots and recorded on plot maps the location, territorial behavior (e.g., singing, territorial aggression), sex, and flight paths of target species individuals. The objective was to record a minimum of 20 locations for each male (Weins 1969). Determination of territories was based on clusters of observations (International Bird Census Committee 1970) with observations of singing males being given highest priority. The number of territories on the plot was used to estimate species densities.

Target Species Productivity: Nest monitoring was conducted to provide data on target species productivity and the incidence of predation/parasitism. Nest monitoring was conducted by systematic searches using behavioral cues as described in Martin and Conway (1994). Nests were marked and revisited in a manner to reduce predator attraction and investigator-induced predation (Martin and Conway 1994). Follow-up monitoring to determine outcome at each nest occurred every third or

fourth day until either the young fledged or the nest failed. A nest fledging at least one young was considered successful. Causes of nest failure were surmised based on examinations of the nests and the surrounding area (Best 1978).

Habitat Characterization: Habitat variables and measurement techniques used at nest sites were selected based on a review of the literature, knowledge of likely important structural features for birds in Willamette Valley grasslands, and the time and relative cost to collect the data. Data collected included vegetation cover by growth form (i.e., grass, forb, shrub, tree, litter/residue, bare ground, rock), vegetation structure including horizontal and vertical diversity and density, vegetation height, nest concealment, and several distance variables (Appendix C). Techniques for measurement of habitat variables are based on several sources including Wiens (1969), Rotenberry and Wiens (1980), Basore et al. (1986), Bryan and Best (1991), Herkert (1994), and Camp and Best (1994). Habitat characterization was supplemented with photo-documentation of each nest site.

DATA ANALYSIS AND INTERPRETATION

Point count census data was pooled into regional data sets for analysis and interpretation. Forty regions were established on the basis of clusters of point count stations in similar habitats, physiographic areas (e.g., valley floor, foothills, river bottom lowlands), or established geographic areas such as historic prairies (e.g., French Prairie, Elliott Prairie) (Figure 2). The number of point count stations in a region varied from 5 to 29 (Appendix D). Comparisons of indices of target species abundance were made between regions to discern patterns throughout the valley.

Analyses of most point count data is presented as relative abundance, the mean number of individuals per point count within a 100 meter fixed-radius. Analysis of target species occurrence by habitat type included all detections during point count censusing. Transect density estimates were based on detections of singing males and converted to pairs/mile.

Some limitations in study design affected the analysis and interpretation of the data. Point count stations were not located in a random or systematic manner due to the relative rarity of the target species. Since the principal objective was to locate individuals and populations of target species, random sampling would have been ineffective. The lack of random sampling results in some statistical constraints in analysis and potential biases in interpretation of the data due to the absence of randomness in the design and the presumed lack of representative sampling of habitat types. Thus, the data are presented descriptively rather than as inferential statistics, but reasonable inferences were made where the data clearly indicate patterns of abundance, distribution, or habitat associations of target species.

Since over 90 percent of the land in the Willamette Valley is privately owned, the location of intensive sites could not be randomly or systematically distributed. Sites where nest-searching and territory-mapping occurred were selected based on the presence of target species and the availability of access. Thus, data on target species productivity and densities in different habitat types is not necessarily

representative of these habitat types throughout the Willamette Valley. However, in lieu of the absence of data on these parameters for target species, the data is presented descriptively and patterns are discussed where appropriate.

Most of the population data on target species is based on point count censusing for western meadowlark, vesper sparrow, and horned lark. Grasshopper sparrow was only recorded as an incidental detection at two locations. Data presented for the common nighthawk is based on a specialized census (automobile transects).

RESULTS AND DISCUSSION

Point Counts

Habitat Characterization: Habitat type at point count stations was dominated by cultivated grass fields (52.7 percent) (Table 1). Each of the other 11 habitat types comprised less than 10 percent of the habitat sampled. Some of these included pasture (9.5 percent), fallow fields (6.3 percent), Christmas tree farms (5.1 percent), roadside right-of-ways (4.2 percent), herbaceous row crops (3.9 percent), recently plowed fields (3.5 percent), gravel/dirt roads (3.0 percent), and recently mowed grass fields (2.5 percent). Habitat types only incidentally sampled included maintained fields (0.5 percent), bare ground (0.3 percent), and wet prairie (0.2 percent). Additionally, 8.4 percent of the habitat at point count stations was non-grassland types (e.g., forest, residential areas, paved roads).

Bird Community Abundance: A total of 99 species were recorded during censusing at 544 point count stations (Appendix E). Most of the species were associated with grassland habitat, but some of the habitat sampled was non-grassland, and some birds detected beyond 100 meters of a point count station occurred in forest and other non-grassland habitats. Eighty-four of the species were recorded within 100 meters of point count stations, and 15 species were only recorded beyond 100 meters. An additional 7 species were only recorded as incidentals outside of censusing.

Savannah sparrow was the most abundant species (n=1,784; relative abundance=1.64 birds/point count) followed by European starling (*Sturnus vulgaris*) (n=1,205) and Brewer's blackbird (*Euphagus cyanocephalus*) (n=865) (Table 2). These three species accounted for 37 percent of all detections within 100 meters of point count stations.

Among the 12 most abundant species (Table 2), only savannah sparrow could be considered a species characteristic of native grasslands (Knopf 1988). The next three species, European starling, Brewer's blackbird, and red-winged blackbird (*Agelaius phoeniceus*), and the 12th most abundant species, killdeer, are species characteristic of agricultural lands. Of the remaining species, three swallows, barn swallow (*Hirundo rustica*), cliff swallow (*Hirundo pyrrhonota*), and violet-green swallow (*Tachycineta thalassina*), are open country aerial foragers; and four other species, American robin (*Turdus migratorius*), American goldfinch (*Carduelis tristis*), song sparrow (*Melospiza melodia*), and common yellowthroat (*Geothlypis trichas*) are relatively common generalist or edge species.

Target Species Abundance and Distribution: Target species detections within 100 meters of point count stations were: vesper sparrow, 62; horned lark, 154; and western meadowlark, 165. Beyond 100 meters, there were an additional 38 detections of vesper sparrow, 68 of horned lark, and 196 of western meadowlark. The relatively high number for western meadowlark beyond 100 meters may be due to the greater detectability of its song at longer distances. These numbers do not reflect the total number of individual birds because the data included both the May and June census. Thus, some birds were likely counted twice in these totals.

Vesper sparrow was lowest and western meadowlark highest among the three target species in all measures of abundance and distribution (Table 3). Vesper sparrow had the lowest relative abundance (0.06 birds/point count), occurred at the fewest number of point count stations (7.3 percent of 544 stations), and occurred in the fewest number of regions (20 of the 40 regions). Horned lark and western meadowlark were similar in relative abundance (0.14 and 0.15 birds/point count, respectively), occurrence at point count stations (12.5 and 14.5 percent of 544 stations, respectively), and occurrence by region (23 and 25 of the 40 regions, respectively).

Although target species occurrence in total number of regions was similar (20, 23, and 25 regions for vesper sparrow, horned lark, and western meadowlark, respectively), different patterns of distribution for each species were evident. Horned larks occurred primarily within the central Willamette Valley, with the highest abundance in areas around the Baskett Slough National Wildlife Refuge (Figure 3). Other areas of high abundance occurred west of Interstate 5 in the northern portions of the southern Willamette Valley such as south of Tangent, east of Peoria, and north of Harrisburg.

Western meadowlarks were nearly absent in the northern Willamette Valley, occurred in relatively low abundance in the central Willamette Valley, but were most abundant in the southern Willamette Valley (Figure 4). Western meadowlark abundance was highest around Indian Head Hills (1.43 birds/point count) between Brownsville and Coburg along the east side of the valley. Other areas of high abundance in the southern Willamette Valley included areas north of Cheshire and Coburg.

Vesper sparrows occurred in relatively low abundance in the central Willamette Valley, were slightly more abundant in the eastern part of the northern Willamette Valley, but were most abundant in the southern Willamette Valley (Figure 5). Two areas where vesper sparrow was most abundant were north of Cheshire, and around Ward Butte, which is east of Interstate 5 in the southern valley. Vesper sparrows were also relatively abundant (0.31 birds/point count) southeast of Portland between Redland and Estacada which was censused, but not included in our regional analysis due to an absence of habitat characterization for this region.

Target Species Habitat Associations: The principal habitat types used by target species were pasture, Christmas tree farms, cultivated grass fields, and to a lesser extent fallow fields (Figure 6). The near absence of target species in wet prairies (only one detection, a western meadowlark) indicates the primary association of these species is with xeric grasslands. Other grassland habitat types which provided little or no habitat for target species were maintained fields and harvested grass fields.

Patterns of target species occurrence by habitat type indicate a relatively high degree of specialization for vesper sparrow and western meadowlark (each predominantly in two habitat types), and a relatively broad range of habitat types used by the horned lark (Figure 6). Pasture was a predominant habitat type for western meadowlark and vesper sparrow. It accounted for nearly 50 percent of the detections of both these species, despite less than 10 percent of the sampling in pasture. Christmas tree farms were the other high use habitat type for vesper sparrow (approximately 45 percent of the detections), and cultivated grass fields were the other high use habitat type for western meadowlark (approximately 35 percent of detections). Percent detections of western meadowlarks in fallow fields (10.6) were also greater than the percent of this habitat type that was sampled (6.3). The four principal habitat types used by horned larks included gravel and dirt roads, roadside right-of-ways, plowed fields, and cultivated grass fields. Horned lark detections in bare ground, Christmas tree farms, and herbaceous row crops were also a greater percent than the percent sampling effort in those habitat types.

Western meadowlark and horned lark occurrence in cultivated grass fields was further described by the type of field (i.e., annual or perennial). Western meadowlarks (n=80) were detected nearly equally in annual and perennial grass fields, but horned larks (n=29) were substantially more abundant in annual grass fields (Figure 7). This difference may be due to increased bare ground in annual grass fields in the spring due to planting and the row crop like appearance of annual grass fields; whereas, perennial grass fields are vegetated to a greater extent during this time period.

Target Species Associations with Vegetation Structure: The occurrence of western meadowlarks and vesper sparrows in pastures was further described by the amount of vertical structure provided by shrubs. Both species occurred primarily in herbaceous pastures or pastures with less than 10 percent coverage of shrubs; although western meadowlarks were most often associated with herbaceous pastures, and vesper sparrows with a low percentage of shrubs rather than herbaceous pastures (Figure 8). Pastures with greater than 10 percent shrub cover were moderately used by vesper sparrows, but rarely used by western meadowlarks. The presence of shrubs is important to both species for singing perches (Wiens 1973). Where shrubs were absent, fence and telephone posts and lines served the same purpose, particularly for western meadowlark.

Another opportunity for an examination of target species patterns of occurrence relative to vegetation structure was for vesper sparrow in Christmas tree farms. Although not quantified as part of data collection, subjective observations indicate that vesper sparrow presence in Christmas tree farms was dependent upon the degree of maintenance of competing herbaceous vegetation (i.e., grasses, forbs). Vesper sparrows rarely occurred in "manicured" farms where herbaceous vegetation was controlled, and the understory and ground were bare ground and needle debris. They were regularly detected in "weedy" farms where herbaceous vegetation was mixed with bare ground. The amount and height of herbaceous vegetation where vesper sparrows occurred was not quantified, but seemed variable, often being clumped and dense at some sites, and sparse with more bare ground in others. Christmas tree farms where vesper sparrows occurred were also often characterized by structural diversity in the soil with relatively deep furrows between the rows of trees, and many large clods of dirt and tree stumps.

Target Species Associations with Grass Height: In general, most horned lark detections were in short grass (0-6 inches), vesper sparrows occurred in relatively short grass (1-12 inches), and western meadowlarks were the most tolerant of different grass heights (up to 36 inches) depending on the type of field. These data are generally supportive of other studies (Smith 1963, Patterson and Best 1996). The rarity of grasshopper sparrow precludes even a subjective judgement about grass height. At the two locations where it occurred, grass height was in the 12-18 inch class.

Patterns of occurrence for western meadowlark and vesper sparrow in pastures was also described by grass height (Figure 9). Both species were substantially more abundant in fields characterized by the shorter height classes (less than one foot tall), although western meadowlark was more tolerant of taller grasses.

Patterns of occurrence of western meadowlark relative to grass height were different among the three habitat types in which it most frequently occurred - pasture, cultivated grass, and fallow fields (Figure 10). In pastures, it occurred where grass height was up to two feet tall, although it was most frequently detected if the grass was less than 12 inches tall. In fallow fields, it occurred almost exclusively in fields less than 18 inches tall. In cultivated grass fields, it occurred infrequently in shorter grasses, but predominantly in fields 1-3 feet tall.

Area Searches

A total of 19 area searches were conducted at 10 sites (Appendix F). This included a U.S. Fish and Wildlife Service (USFWS) National Wildlife Refuge, two sites on Bureau of Land Management (BLM) land, a State Wildlife Management Area, two State Parks, and two sites on Conservation Reserve Program (CRP) private lands.

Fourteen sites were fallow fields, three were wet prairies, one was a tree farm, and one was a pasture. Forty species were recorded within grassland area search plots, and an additional ? species in adjacent habitat outside of the plots.

Some of the results from area search censusing were noteworthy of comments. Bird abundance and species richness was highly variable, although abundance was greatest in the wet prairies and the tree farm (Appendix F). Savannah sparrow, the most abundant species in point count censusing, was only recorded at two of the 14 area search censuses in the fallow fields, but relatively abundant in the two censuses in wet prairie on Finley National Wildlife Refuge.

Three individuals of target species were detected at three different sites (Appendix F). One western meadowlark was recorded at a BLM site in the East Eugene Wetlands complex along the Amazon Diversion Canal. Two vesper sparrows were detected, one on private CRP land west of Salem, and another at a BLM site north of Cheshire.

Transects

Fifteen walking transects were conducted along selected roads on June 11 to estimate densities of western meadowlark (7 transects) and horned lark (8 transects) (Table 4). Densities were similar for both species. Western meadowlark densities ranged from 2-5 pairs/mile except for Belts Road (12.8 pairs/mile). Horned lark densities ranged from 1.5-5.7 pairs/mile except for Harmony Road (11.6 pairs/mile). These estimates likely reflect maximum densities within the Willamette Valley since only locations known to have high densities of these species were selected.

Territory-Mapping

Territory-mapping was conducted at 25 sites including 15 Christmas tree farms, five pastures, and five fallow fields (Table 5). Most of the sites were visited only once or twice and lacked an adequate number of detections for plotting territories. At the sites where number of detections was adequate, field measurements have not yet been conducted to estimate territory size. This will be done in the 1997 field season and the results included with the final report. Some subjective comments on densities and territory size are included in Table 5.

Territory-mapping conducted in 1996 was considered to be a pilot effort to evaluate its feasibility and potential problems. This will be a major component of field work in 1997. To facilitate mapping, birds will be color banded at a few sites to ensure the accuracy of specific territories.

Nests

Eleven nests of target species were located; four vesper sparrow, three western meadowlark, three horned lark, and one common nighthawk (Table 6). Only three of the nests were successful. Apparent reasons for nest failure were varied. Predation was implicated as a factor at eight nests, including two successful nests that may have received partial clutch or brood predation. In most instances, the predator suggested was a bird or snake based on removal of eggs or young with no disturbance to the nest. Snakes have been associated with high predation rates of grassland birds (Best 1978, Miller and Knight 1993). One vesper sparrow nest appeared to have been destroyed by a mammalian predator. Two nests were abandoned (one western meadowlark and one vesper sparrow), and one horned lark nest was destroyed when the field was plowed.

All of the vesper sparrow nests and one nest of horned lark and common nighthawk were located in Christmas tree farms. It is noteworthy that three of the target species nested in this habitat type; however, most of the nest searching occurred in Christmas tree farms due to permitted access.

The small sample size of nests precludes any statements regarding target species productivity or factors limiting nesting populations. Increased effort for nest-monitoring in the 1997 field season will likely provide large enough sample sizes to examine these factors. Habitat data was collected at each nest site, but is not analyzed or presented due to the small sample size. These data will be pooled with data collected in 1997.

Common Nighthawk Census

One hundred eighteen people censused common nighthawks in 63 survey areas (Appendix A). Fifty-five of the 63 survey areas were censused on both nights, and eight areas were censused on only one night. Nighthawks were detected in 24 of the 63 survey areas, and 10 survey areas had nighthawk detections on both nights.

Survey effort and nighthawk detections were similar on both surveys. On June 26, there were 49 detections during 92 hours of censusing and 2,006 census miles (0.24 detections/mile and 0.53 detections/hour). On July 10, there were 51 detections during 91 hours of censusing and 1,846 census miles (0.28 detections/mile and 0.58 detections/hour).

Most nighthawk detections were associated with major waterways (i.e., Willamette River and tributaries) or adjacent to or within the foothills of the Willamette Valley. General areas where most detections occurred included:

1) the Waldo Hills/Stayton area southeast of Salem,
2) east of McMinnville along the Willamette River and Lambert Slough,
3) E.E. Wilson Wildlife Management Area, north of Corvallis,
4) north of Finley National Wildlife Refuge, near the town of Greenberry,
5) Riverside Drive, east of the Willamette River between Corvallis and Albany,
6) east of Monmouth near the Willamette River,
7) west of Fern Ridge Reservoir, and
8) Ingram Island along the Willamette River north of Harrisburg.

Species Summaries

The following brief accounts summarize the abundance, distribution, and habitat associations of target species on the basis of data collected in 1996. Species accounts are also included for several other grassland associated bird species on the basis of censusing data, incidental detections, and subjective observations. Detailed presentations on all the species will be included in the 1997 report after two years of data collection.

Horned Lark: Horned larks occurred in a diversity of habitat types including 1) gravel roads or gravel shoulders of lightly traveled paved roads, 2) recently plowed or burned fields, 3) row crop vegetable fields with dirt rows between vegetation, 4) recently planted (0-3 years) Christmas tree farms with extensive bare ground, and 5) bare or sparsely vegetated areas within or adjacent to grass seed fields, pasture, or fallow fields. The locations of the three horned lark nests, one in a Christmas tree farm, one on a gravel road, and one in a sparsely vegetated fallow field, further indicates the diversity of habitats used by this species. However, even with this versatility, horned lark populations in the Willamette Valley are likely vulnerable because these habitats are often ephemeral (e.g., plowed fields, bare or sparsely vegetated ground within fields), and subject to heavy disturbances (e.g., roads and roadside shoulders).

Horned lark occurrence and high densities was primarily in association with gravel roads. This was particularly true if the gravel road was adjacent to sparsely vegetated fields or moderately vegetated fields with some areas of bare ground. Two examples of these areas are Livermore Road north of Baskett Slough National Wildlife Refuge, and several gravel roads in the highly agricultural, lightly populated area between Tangent, Peoria, and Harrisburg.

Vesper Sparrow: Vesper sparrows occurred almost exclusively in two habitat types: 1) Christmas tree farms, particularly young farms 2-5 years post-planting, if extensive grasses and weeds were present, and 2) lightly grazed pasture with scattered shrubs where grass height is less than two feet high and preferably less than one foot high. Approximately 95 percent of all vesper sparrow detections (both within and beyond 100 meters) occurred in these habitat types, despite less than 15 percent of the sampling effort in these habitats. There was only one detection in cultivated grass fields, which comprise a large percentage of the Willamette Valley, and included 53 percent of our sampling effort.

There were relatively clear patterns of vesper sparrow occurrence by grass height class and shrub presence in pastures. They were only present in pastures with grass less than two feet tall, but most abundant where the grass was less than one foot tall. This association with shorter grass is exemplified by their absence from fallow fields, which often have the scattered shrub component, but grass height is usually greater than two feet tall due to lack of grazing.

Vesper sparrow occurrence was clearly tied to the location of the aforementioned habitat types. Christmas tree farms are mostly in the low foothills or at the edge of the Willamette Valley, concentrated in areas southeast of Portland near Molalla, west of Salem in the Eola Hills area, south of Monmouth, and a large area west of Highway 99 between Corvallis and Junction City. Most of the pastures where vesper sparrows occurred were in the southern valley east of Interstate 5 on buttes or in lowland foothills at the edge of the valley.

Western Meadowlark: Western meadowlarks occurred primarily in grass-dominated fields (i.e., cultivated grass seed fields, fallow fields, and pasture). Highest densities were in lightly grazed pastures or fallow fields with grass height less than two foot tall, and the shrub component less than 10 percent coverage. In cultivated grass fields, they occurred most frequently in the taller grass fields (between 1-3 feet tall), although generally only if fence lines or telephone poles were adjacent to the fields to serve as singing perches.

Western meadowlark occurrence was limited in the northern and central valley, but relatively dense in the southern valley, particularly at the edges of the valley and into the low foothills. The highest concentration occurs east of Interstate 5 between Coburg and Brownsville where some large pastures are interspersed with fallow fields and grass seed fields.

Grasshopper Sparrow: There were only two incidental detections, both in lightly grazed pastures with scattered shrubs or tall herbaceous plants, and grass height between 1-2 feet tall. A singing male was detected on consecutive mornings in early June along Belts Road in the southern valley

south of Brownsville, but not relocated. A pair with the male in breeding condition (based on cloacal protuberance) were present on Peterson Butte near Lebanon in June and July. Attempts to locate the nest were unsuccessful, and the pair were observed together in July with no young nearby.

Common Nighthawk: The occurrence of common nighthawk in association with the Willamette River and its tributaries was not unexpected since the survey was conducted for foraging birds and insect hatches often occur in riparian/aquatic habitats. It is also possible that nighthawks are nesting on gravel bars or sparsely vegetated/bare ground areas on islands within the river.

It is noteworthy that several nighthawk sightings were near areas with Christmas tree farms. Since nighthawks are opportunistic foragers and may travel relatively long distances to exploit foraging resources, the sightings do not necessarily indicate nesting nearby. However, the frequency of sightings near Christmas tree farms suggests the potential for nesting, and these areas will be a focus for nighthawk nest-searching in 1997. Additionally, one nighthawk nest (unsuccessful) was found in a Christmas tree farm in 1996 (Table 6). Another area for nighthawk nest-searching in 1997, as suggested by the survey data and behavior of some birds, is the gravel area around power substations (e.g., north of E.E. Wilson Wildlife Management Area). These have been reported as nesting sites in eastern Oregon (Craig Corder pers. comm.).

Savannah Sparrow: Savannah sparrow habitat associations were different from the target species in two ways: 1) they were most abundant in cultivated grass fields (point count data), and 2) they were relatively abundant in wet prairies (area search data). In general, savannah sparrows occurred only where the dominant vegetation was grass, and they were abundant in uplands and wetlands.

Although habitat type was not recorded for savannah sparrow detections, inferences were made between savannah sparrow abundance and habitat type on the basis of percent of each region that was cultivated grass field. Nine of the 12 regions with the highest percent of cultivated grass fields were also among the 10 regions with the highest savannah sparrow abundance (Table 7). Savannah sparrow abundance was greatest in the area between Corvallis and Harrisburg east to Interstate 5.

Northern Harrier: Northern harrier abundance is not presented due to the ineffectiveness of point count censusing for determining indices of abundance for raptors and other wide-ranging species. A highly visible species, northern harriers were detected incidentally more frequently than during point count censusing. Subjective observations indicate that they occurred throughout the valley, although perhaps in higher densities in the southern valley.

Lazuli Bunting: An examination was made of lazuli bunting and vesper sparrow occurrence at point count stations on the basis of subjective observations that these species were frequently detected together. Thirty-two percent of the 50 point count stations where lazuli buntings were detected also had vesper sparrows. Like vesper sparrow, most lazuli bunting detections were in the southern Willamette Valley. However, lazuli buntings seemed to be associated with a higher percent shrub component in fallow fields and pastures than vesper sparrow. In Christmas tree farms, lazuli buntings were more frequently present in older tree farms (3-7 years post-planting) than vesper sparrow.

Western Kingbird: Subjective observations indicated that the western kingbird was detected more during migration than the breeding season. Like the northern harrier, more detections occurred incidentally rather than during censusing. Four nests were located, all on telephone poles or transmission towers, and all in the central Willamette Valley south and southeast of Salem.

Western Bluebird: All western bluebird sightings were within or adjacent to the foothills of the Willamette Valley. They were only recorded at 5 locations during point count censusing, and four were in the southern valley just north and south of Eugene. Incidental detections ocurred elsewhere, but few were in the northern valley.

Short-Eared Owl: The short-eared owl was only detected once, on Glasser Road west of Lebanon in mid-June.

1997 OVERVIEW

During 1997, field work will be focused on 1) demographic research on productivity to determine target species population viability in different habitat types, and identify and characterize source habitats (Wiens and Rotenberry 1981, Pulliam 1988); and 2) territory-mapping to assess target species area requirements and habitat effects on target species density. There may also be some level of broad-scale censusing to further define patterns of habitat use.

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Table 1. Habitat composition at 544 point count stations in Willamette Valley grasslands, 1996.

HABITAT TYPE[a]	PERCENT OCCURRENCE[b]	REGION WITH HIGHEST PERCENT OCCURRENCE[c]
Recently harvested grass field	2.5	Morilo (9.8)
Cultivated grass field	52.7	Harno (82.0)
Low-growing herbaceous row crop	3.9	Aumsso (23.4)
Tall non-herbaceous row crop	5.1	Monrea (37.3)
Bare ground	0.3	Aumsso (2.1)
Recently plowed field	3.5	Aumsso (24.5)
Pasture	9.5	Dickpr (45.2)
Wet prairie	0.2	Staysw (2.6)
Fallow field	6.3	Richga (20.8)
Maintained field	0.5	Redpr (4.0)
Gravel or dirt road	3.0	Ballso (5.9)
Roadside right-of-way	4.2	Morilo (8.8)

[a] Habitat types and descriptions listed in Appendix B.
[b] Non-grassland habitat (e.g., forest, residential areas, paved roads) accounted for 8.4 percent of the sampling
[c] Regions listed in Appendix D.

Table 2. The 12 most abundant species during point count censusing in Willamette Valley grasslands, May-June, 1996.[a]

SPECIES	MAY DETECTIONS	JUNE DETECTIONS	TOTAL DETECTIONS	BIRDS/POINT COUNT
Savannah sparrow	832	932	1,764	1.62
European starling	409	796	1,205	1.11
Brewers blackbird	280	585	865	0.80
Red-winged blackbird	270	316	586	0.54
Barn swallow	254	320	574	0.53
American goldfinch	320	231	551	0.51
Song sparrow	214	295	509	0.47
American robin	231	268	499	0.46
Common yellowthroat	187	242	429	0.39
Cliff swallow	118	279	397	0.37
Violet-green swallow	112	102	214	0.20
Killdeer	92	100	192	0.18

[a] Based on detections within 100 meters of 544 point count stations.

Table 3. Target species measures of abundance and distribution in Willamette Valley grasslands, 1996.[a]

SPECIES	RELATIVE ABUNDANCE[b]	PERCENT OCCURRENCE[c]	REGION OCCURRENCE[d]
Vesper sparrow	0.06	7.3	20
Horned lark	0.14	12.5	23
Western meadowlark	0.15	14.5	25

[a] Based on detections within 100 meters of 544 point count stations; each station censused once in May and once in June.
[b] Mean number of individuals/point count.
[c] Percent of point count stations where species was detected.
[d] Number of regions (out of 40) in which species was detected.

Table 4. Western meadowlark and horned lark density estimates along selected road transects in Willamette Valley grasslands, June 11, 1996.

SPECIES	SITE	HABITAT	TRANSECT DISTANCE	MALES	DENSITY (Pairs/Mile)	COMMENTS
Western meadowlark	Belts Road	pasture 65%; cult grass 35%	0.7 mile	9	12.8	20-26 birds; 2 juv's; 8 males in pasture
Western meadowlark	Duckflat Road	cultivated grass	1.2 mile	3	2.5	
Western meadowlark	Riches Road	cult grass 80%; pasture 20%	1.7 mile	4	2.4	3 birds in pasture
Western meadowlark	Rodgers Mt Loop Road	pasture 60%; cult grass 40 %	0.8 mile	4	5	7 birds; all in pasture
Western meadowlark	Sandner Road	cult grass 85%; herb row crop 15%	1.0 mile	2	2	
Western meadowlark	Buyserie Road	cult grass 30%; herb row crop 45%; orchard 25%	0.9 mile	2	2.2	2 males in distance
Western meadowlark	Morris Road	fallow field 50%; cult grass 30%; pasture 20%	1.0 mile	4	4	
Horned lark	Glasser Road	cult grass 70%; herb row crop 30%	1.4 mile	3	2.1	4 birds; all on road

Horned lark	117th/ Kuenzi Road	plowed field 20%; cult grass 60%; burn field 20 %	0.7 mile	4	5.7	2 in plowed field; 2 in burned field
Horned lark	Bond Butte Road	cult grass 75%; herb row crop 25%	1.3 mile	2	1.5	1 in gravel road; other in herb row crop
Horned lark	Center School Road	cult grass 95%; herb row crop 5%	1.2 mile	3	2.5	7 birds; all on gravel road
Horned lark	Harmony Road	cultivated grass	0.6 mile	7	11.6	15 birds; all in bare patches in field
Horned lark	Kirk Road	cultivated grass	1.1 mile	3	2.7	5 birds; all on gravel road
Horned lark	Beck Road	cultivated grass	0.8 mile	2	2.5	4 birds; all on gravel road
Horned lark	Livermore Road	cultivated grass 90%; plowed field 10%	3.9 mile	6	1.5	5 pairs; 1 single male; all on gravel road

Table 5. Summary of target species territory-mapping in Willamette Valley grasslands, 1996.

LOCATION	HABITAT	SPECIES	VISITS	COMMENTS[b]
Sunnyside Road	pasture	vesper sparrow	2	1 pair
Peterson Butte	pasture	vesper sparrow	1	3-5 pairs; juveniles
Wilchire/Townsend	pasture	vesper sparrow	4	4-5 pairs; juveniles
Lafferty	pasture	vesper sparrow	1	3 pair
Ward Butte	pasture	vesper sparrow	2	4-5 pairs; juveniles
Kingston Prairie	fallow field	western meadowlark	4	1 male; 2 nests found
Morris Road	fallow field	western meadowlark	3	2 males; 1 nest
Mt. Pisgah	fallow field	vesper sparrow	2	5-6 pairs
Royal Avenue	fallow field	western meadowlark	2	3 males
Coburg Ridge	fallow field	vesper sparrow	1	3-4 pairs; juveniles
Dunn Forest Road (HTF)	Christmas tree farm	vesper sparrow/ horned lark	5	6-7 pairs vesp; 1 pair hola
Starr Creek Road (HTF)	Christmas tree farm	vesper sparrow/ horned lark	5	4 pairs vesp; 3 pairs hola
Bellfountain Road (HTF)	Christmas tree farm	vesper sparrow	1	1-2 pairs
Inavale School (HTF)	Christmas tree farm	vesper sparrow/ western meadowlark	4	1 pair vesp; 3 males weme
Kings Valley (HTF)	Christmas tree farm	vesper sparrow	1	1-2 pairs
Elkins Road (HTF)	Christmas tree farm	vesper sparrow/ horned lark	3	2-4 pairs vesp; 1-2 pairs hola
Parker Road (HTF)	Christmas tree farm	vesper sparrow	2	2-3 pairs
High Pass Road (HTF)	Christmas tree farm	vesper sparrow	4	4-6 pairs
Territorial Highway (HTF)	Christmas tree farm	vesper sparrow	2	2 pairs

Eby Road (YTF)	Christmas tree farm	vesper sparrow	3	2-3 pairs
Dryland Road (YTF)	Christmas tree farm	vesper sparrow	2	2-3 pairs
Elisha Road (YTF)	Christmas tree farm	vesper sparrow	3	4-5 pairs; 1 nest
Heinz Road (YTF)	Christmas tree farm	vesper sparrow	4	2-3 pairs
Schneider Road (YTF)	Christmas tree farm	vesper sparrow	2	2-3 pairs
Gerber Road (STF)	Christmas tree farm	vesper sparrow/ horned lark	2	3 pairs vesp; 2 nests 2 pairs hola

[a] HTF Holiday Tree Farms
YTR Yule Tree Farms
STF Signature Tree Farms
[b] Pairs based on number of singing males.

Table 6. Nest summaries for target species in Willamette Valley grasslands, 1996.

SPECIES	SITE	HABITAT	DATE FOUND	EGGS	FLEDGED	COMMENTS
Vesper sparrow	Starr Creek Road	Christmas tree farm	6/6	2	1	one egg gone
Vesper sparrow	Gerber Road	Christmas tree farm	6/13	4	0	eggs gone, nest intact
Vesper[a] sparrow	Gerber Road	Christmas tree farm	6/23	4	0	eggs gone, nest destroyed
Vesper sparrow	Elisha Road	Christmas tree farm	5/31	2	0	nest abandoned
Horned lark	Harris Road	fallow field	5/27	3	0	field plowed
Horned lark	Beck Road	roadside gravel	6/11	3	0	eggs gone
Horned lark	Starr Creek Road	Christmas tree farm	6/28	3	1	2 young gone
Western meadowlark	Morris Road	fallow field	6/1	5	0	2 eggs gone: nest abandoned
Western meadowlark	Kingston Prairie	fallow field	5/16	5	0	nest abandoned
Western[a] meadowlark	Kingston Prairie	fallow field	5/29	5	3	one egg didn't hatch; one young gone
Common nighthawk	Starr Creek Road	Christmas tree farm	6/18	2	0	two eggs gone

[a] probably a renesting (see previous record).

Table 7. Regional savannah sparrow abundance relative to percent cultivated grass fields in the Willamette Valley, May-June 1996.[a]

REGION	PERCENT CULTIVATED GRASS[b]	SAVANNAH SPARROW ABUNDANCE[c]	SAVANNAH SPARROW RANK[d]
Harrno	82	2.4	9
Amitso	79	2.4	8
Anknbo	77	0.4	
Corvso	77	4.4	1
Peorea	75	2.8	5
Shedne	73	3.5	2
Bobulo	73	2.4	10
Wardbu	69	2.7	6
Frprwe	68	2.3	12
Browno	66	2.0	
Tangse	65	3.4	3
Waldhi	62	1.8	

[a] Based on detections within 100 meters of 544 point count stations; each station censused once in May and once in June.
[b] Percent cultivated grass within 100 meters of all point count stations in the region.
[c] Mean number of individuals/point count.
[d] Order of abundance.

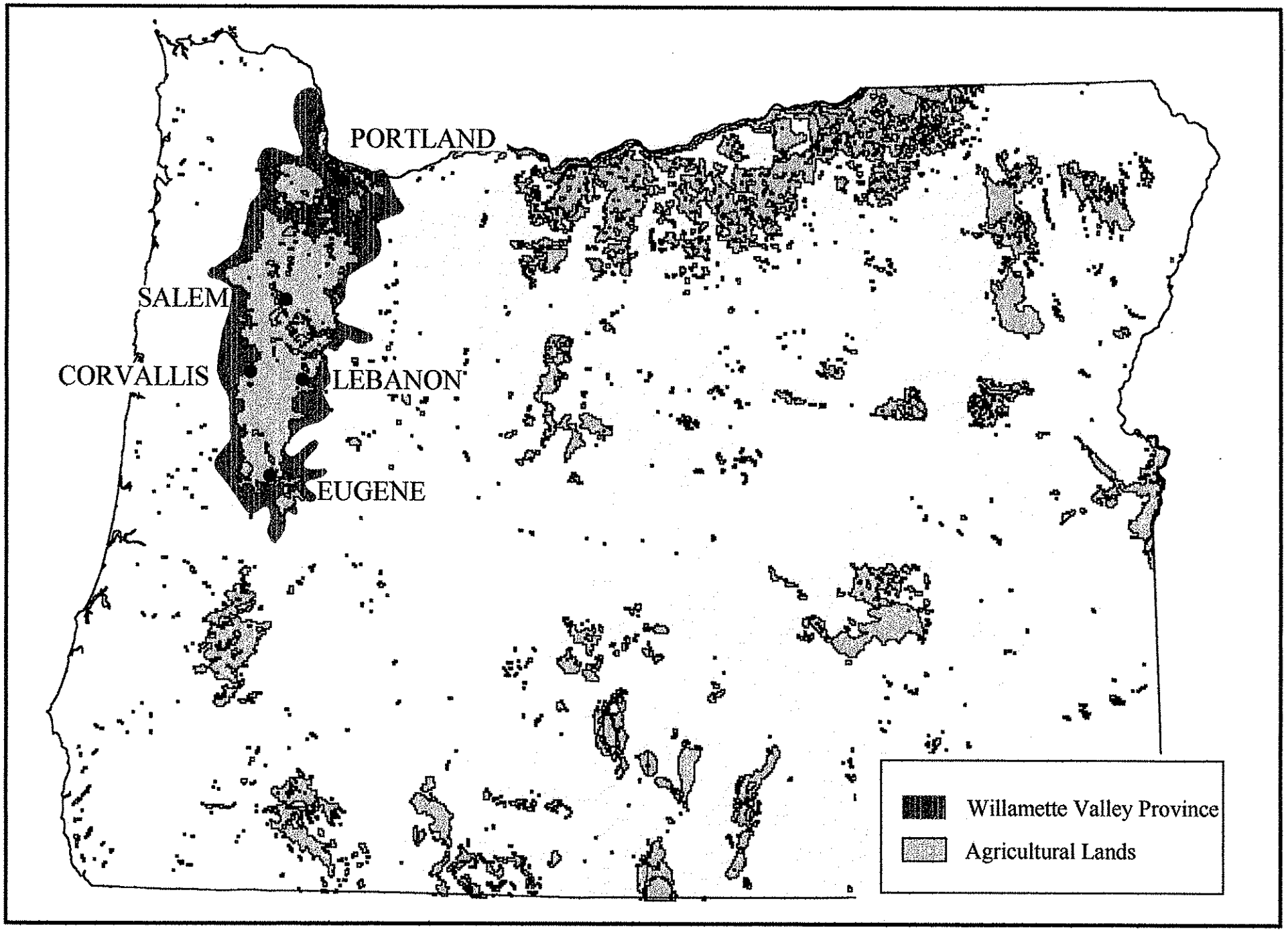


Figure 1. Location of Willamette Valley Within Western Oregon

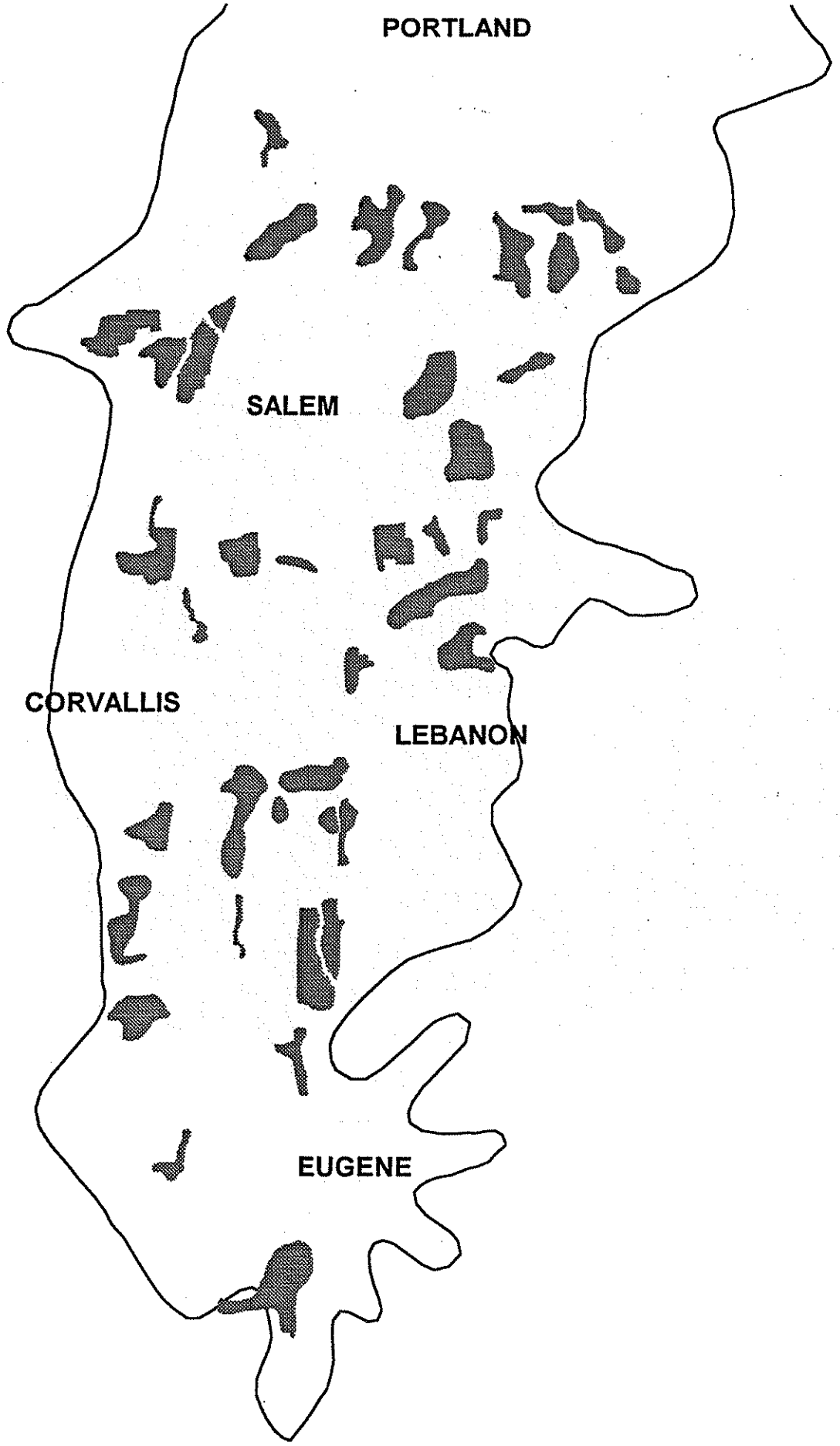


Figure 2. Location of point count station regions in Willamette Valley grasslands.

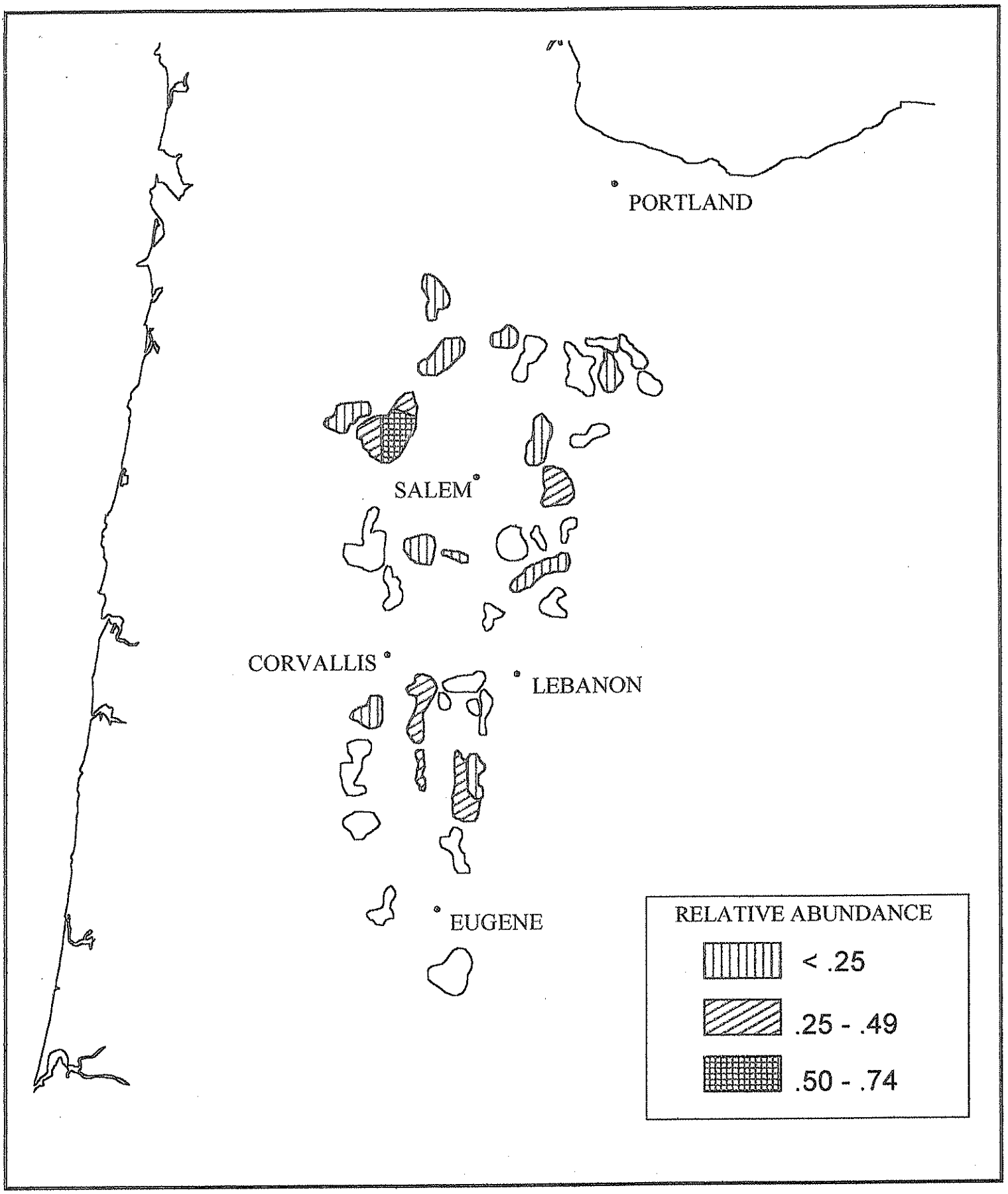


Figure 3. Horned Lark Relative Abundance by Region Based On Point Count Censusing in Willamette Valley Grasslands, May - June 1996.

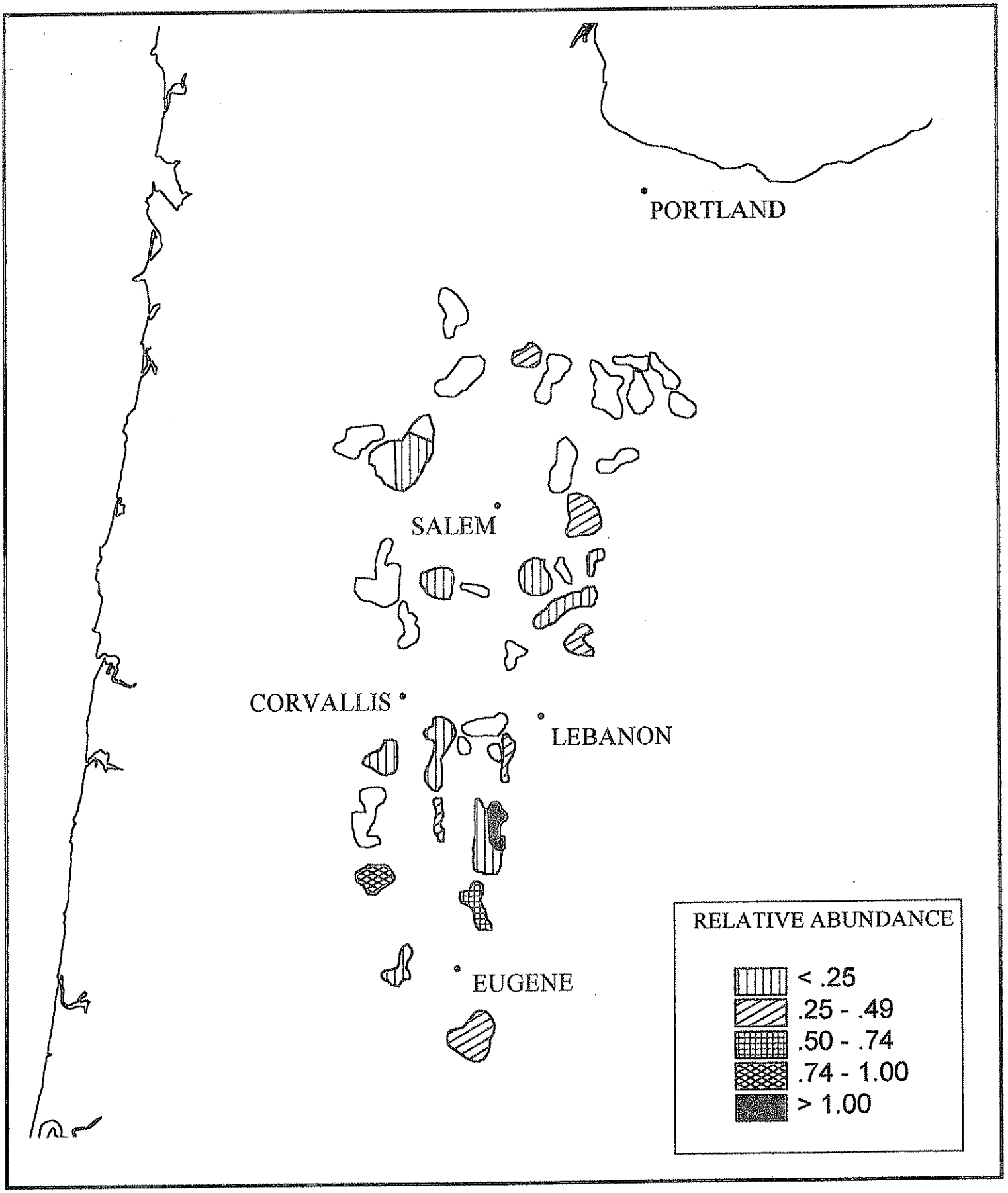


Figure 4. Western Meadowlark Relative Abundance by Region Based on Point Count Censusing in Willamette Valley Grasslands, May - June 1996

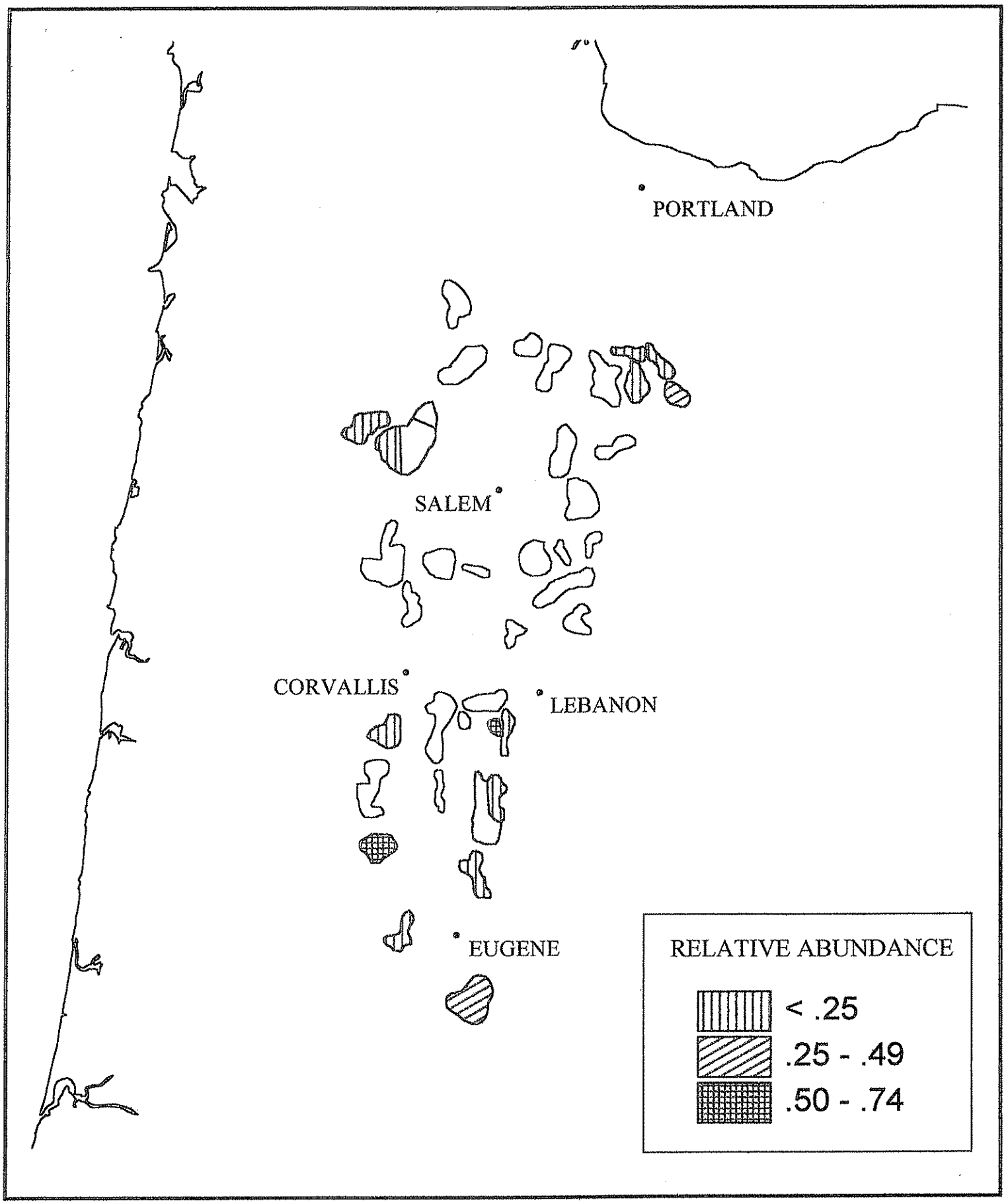
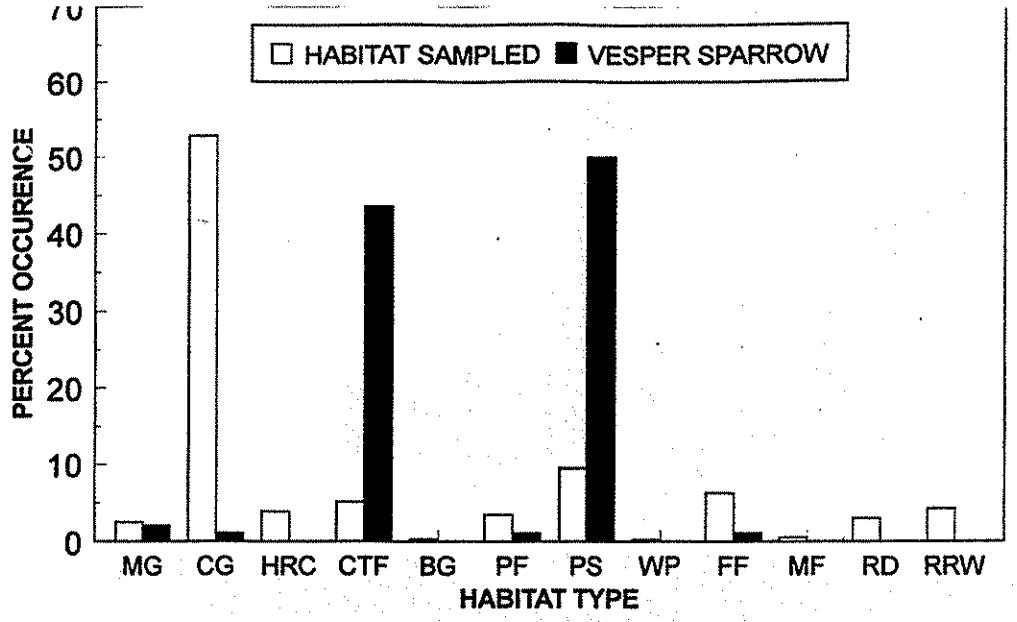
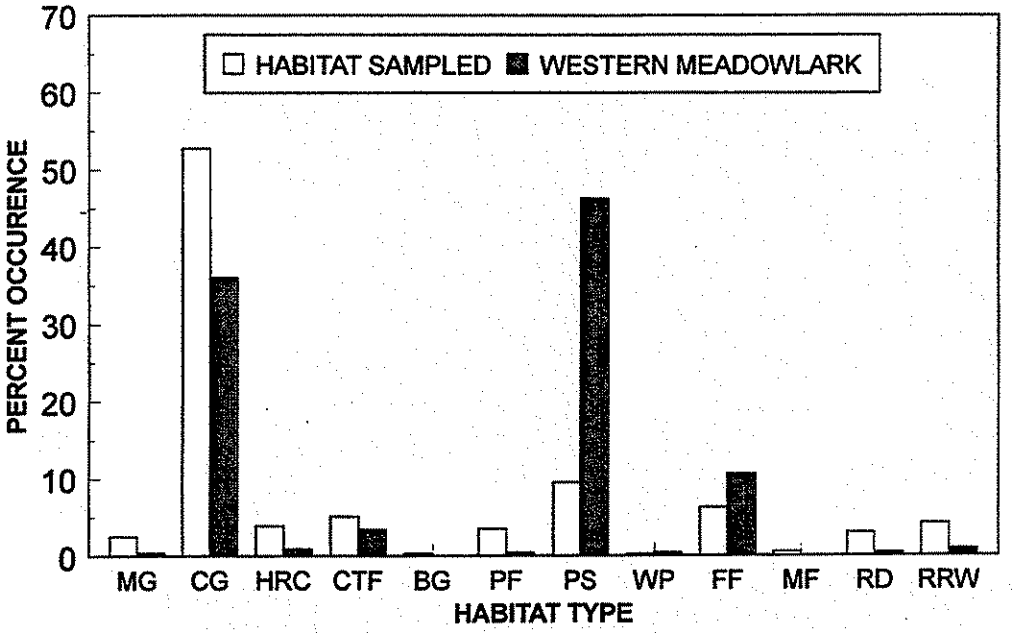
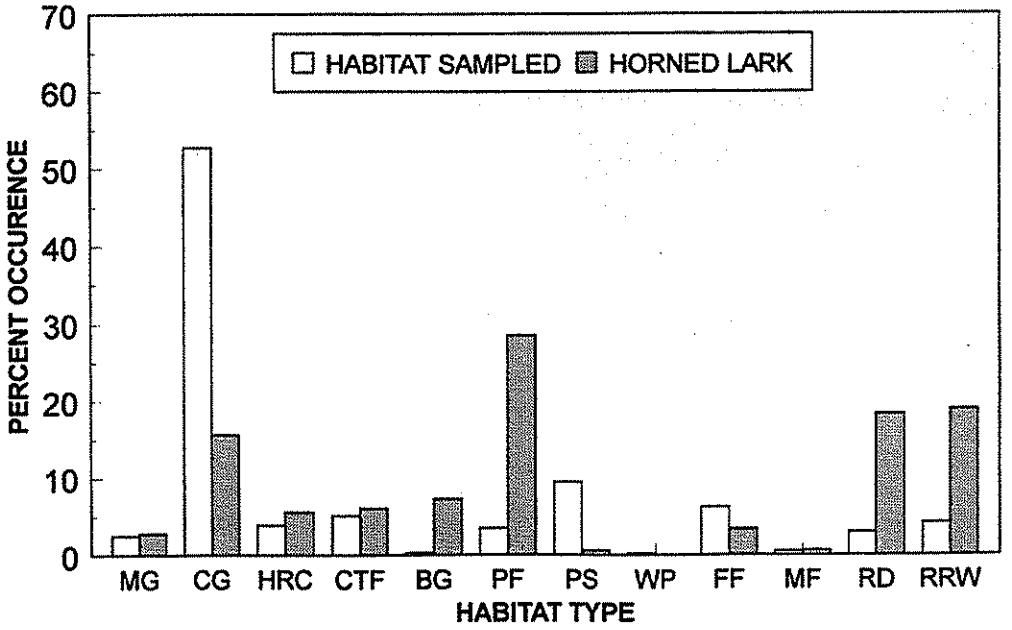


Figure 5. Vesper Sparrow Relative Abundance by Region Based On Point Count Censusing in Willamette Valley Grasslands, May - June 1996







MG - Mowed grass
CG - Cultivated grass
HRC - Herbaceous row crop
CTF - Christmas tree farm
BG - Bare ground
PF - Plowed field
PS - Pasture
WP - Wet prairie
FF - Fallow field
MF - Maintained field
RD - Gravel/Dirt road
RRW - Roadside right-of-way

Figure 6. Target species occurrence by habitat type based on point count censusing in Willamette Valley grasslands, May-June, 1996.

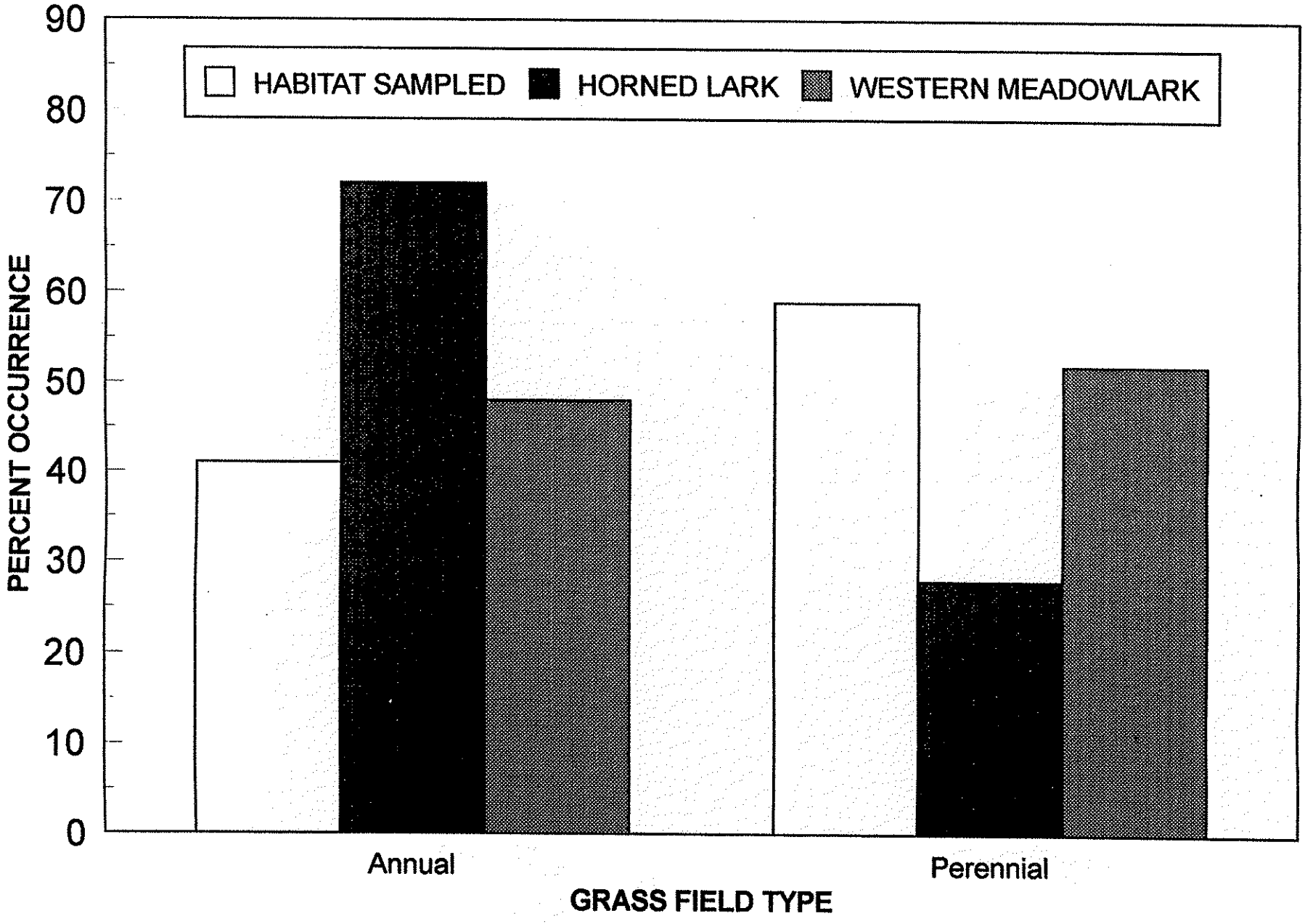


Figure 7. Western meadowlark and horned lark occurrence in annual and perennial grass fields based on point count censusing in Willamette Valley grasslands, May-June, 1996.

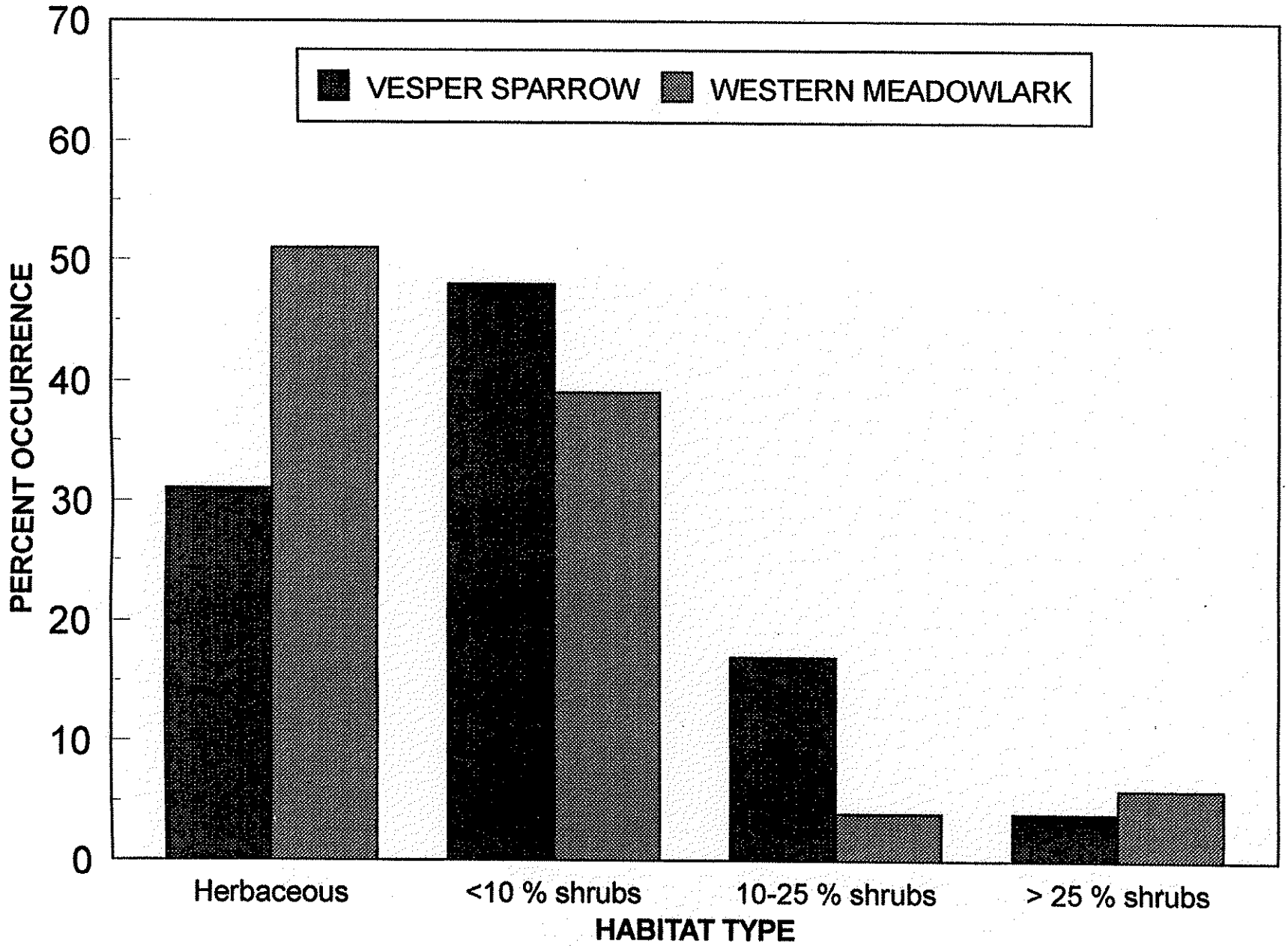


Figure 8. Vesper sparrow and western meadowlark occurrence in pasture types based on point count censusing in Willamette Valley grasslands, May-June, 1996.

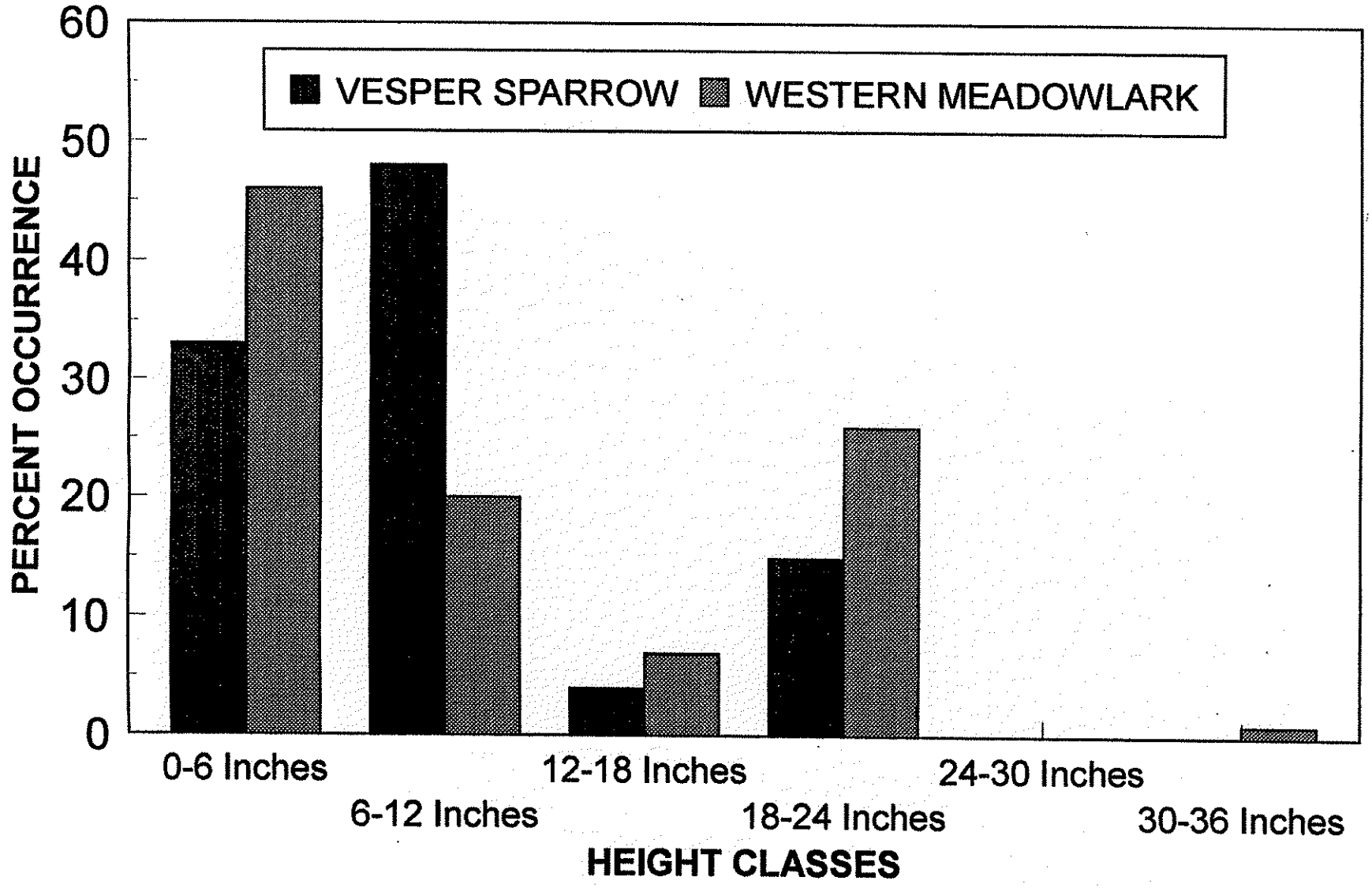


Figure 9. Vesper sparrow and western meadowlark occurrence by grass height in pastures based on point count censusing in Willamette Valley grasslands, May-June, 1996.

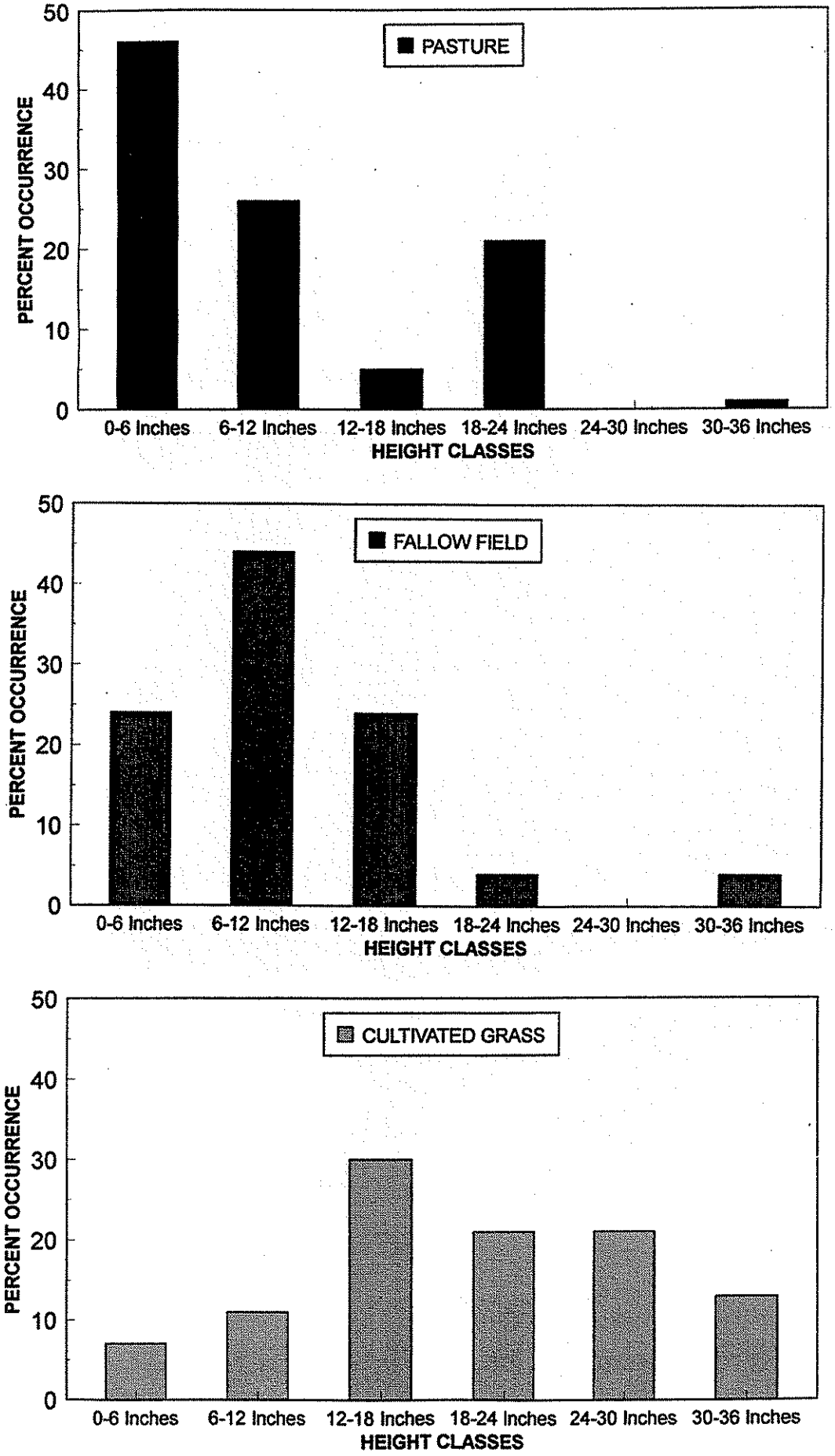


Figure 10. Western meadowlark occurrence by grass height in three habitat types based on point count censusing in Willamette Valley grasslands, May-June, 1996.

APPENDICES

APPENDIX A. Common nighthawk census forms, instructions, and summaries.

Protocol for Surveying Common Nighthawks in the Willamette Valley

This survey is being conducted to provide information on the abundance and distribution of common nighthawks foraging in the Willamette Valley. It is part of a larger project assessing the status of Willamette Valley grassland bird species. The common nighthawk historically nested in grassland habitat in the Willamette Valley, but is now uncommon to rare and may no longer be nesting in the Valley.

Instructions

*Conduct surveys covering the same area on two evenings - June 26 and July 10.

*Begin at 8:15pm and continue until dark.

*To survey, drive roads in your assigned area (map attached) as slowly as traffic will allow, looking and listening for nighthawks. Bring along a friend, a spouse, a date - two people per car is more effective than one. You can listen outside of the car at places with adequate room to pull over. Keep windows down and avoid roads with heavy traffic or limited visibility. Use vehicle emergency lights if needed. BE SAFE!

*Cover your area as completely as possible - particularly places where nighthawks are likely to be foraging (e.g. near rivers and reservoirs, over fields) or where you have seen them before. Stay within the Willamette Valley and lowest foothills.

*Complete and return map/data forms even if you had no nighthawk detections. Mark nighthawk detections on the attached map. Return forms to ODFW by July 15.

*Have fun, enjoy the evening, and DRIVE SAFELY!

Data Form

Name(s)_____Phone_____

Address_____

Date_____Miles driven_____Start time_____Stop time_____

Time	# Birds	Location (include road name and approx. distance from another road or landmark)	Comments/Behavior (flying, perching)

Time	# Birds	Location (include road name and approx. distance from another road or landmark)	Comments/Behavior (flying, perching)

NIGHTHAWK NITE-OUT DATA SUMMARY - FIRST NIGHT					
Surveyor name(s)	Survey area	Survey date	Survey miles	Survey minutes	Bird detections
W & T Logan	Waldo Hills	6/26/96	61	195	3
K Weil	Dayton south	6/26/96	40	102	7
S & K Viste-Sparkman	Sublimity	6/26/96	59	115	6
M Platt & B Schreiber	Greenberry	6/26/96	19	90	5
B Bales & D Budeau	EE Wilson	6/26/96	35	65	4
S Sahnow	Riverside Dr	6/26/96	35*	75	4
M & T Sekora	Fern Ridge west	6/26/96	39	75	2
R Gerig	Monmouth east	6/26/96	50	120	2
D Cottam	Ingram Island	6/26/96	22	61	1
Eric & Jessyca Burke	Philomath east	6/26/96	25	115	1
W & C Hlebechuk	Pleasant Hill	6/26/96	32	69	1
J Reams & L Newton	Tangent	6/26/96	28	75	1
N & R Wogen, M Southard	Brownsville	6/26/96	35	120	5
H Nehls	French Prairie	6/26/96	51	105	1
R & D Titus	Peoria east	6/26/96	34	78	1
B Shoffner & J Becker	Molalla	6/26/96	25	70	1
C Klock	Rickreall	6/26/96	38	100	3
T & A Mickel	Fisher Butte	6/26/96	15	85	1
M A Sohlstrom& S Wagner	Carlton west	6/26/96	29	96	0
Richard Green	Freeway Lks east	6/26/96	30	101	0
D Felber	Monroe west	6/26/96	19	85	0
B Bellin & D Pederson	Stayton west	6/26/96	26	70	0
H & C Heinkel	Turner	6/26/96	32	90	0
K Merrifield	Finley NWR	6/26/96	21	80	0
D Philpott, J Fukuda,C Rim & K Higgins	Molalla west	6/26/96	30	75	0
K & S Freemark	Scio	6/26/96	35	87	0
K Larsen	Creswell	6/26/96	14	90	0
F Schrock	Amity south	6/26/96	33	75	0
S Dowlan	Labish	6/26/96	72	105	0
B Leaf & K Finley	Halsey east	6/26/96	26	98	0
C & E McCloskey	Irish Bend	6/26/96	35*	105	0
W High	Salem east	6/26/96	34	80	0
A Cornwell & D Gutcher	Stayton south	6/26/96	40	105	0
T Murtagh	Marquam	6/26/96	20	100	0
A Smith, R & K Raymond	Lebanon east	6/26/96	40	81	0
A Contreras	Wheatland	6/26/96	23	65	0
K Islam	Millersburg	6/26/96	24	75	0
S Page	Priceboro Rd	6/26/96	25	70	0
R Wise	Cox Butte	6/26/96	30	93	0
B Castillo & M Bishop	Alvadore	6/26/96	29	75	0
B Campbell	Coburg	6/26/96	24	80	0
D Irish & J Sylvestre	Harrisburg west	6/26/96	31	79	0
J Dillon & J Fulkerson	Amity Hills	6/26/96	26	90	0
R Keister	Ward Butte	6/26/96	70	90	0
G & A Ansell	Smith Loop	6/26/96	33	120	0
M Nebeker & B Lee	Airlie	6/26/96	30	104	0
D Wheeler & K Korn	Peterson Butte	6/26/96	26	95	0
D Lay & S Sears	Fern Ridge south	6/26/96	42	80	0
S Kohlman	American Bottom	6/26/96	32	135	0
J & Y Faulkner	Lebanon north	6/26/96	69	90	0
Aaron Bengtson	Lebanon northwest	6/26/96	17	105	0
S Bielke & L Allen	Silverton west	6/26/96	27	132	0
M Naughton & R Goggans	Baskett Slough NWR	6/26/96	25	120	0
G & N Hostick	Oakville	6/26/96	20	90	0
Paul Adamus	Albany east	6/26/96	32	90	0
Bob Altman	I-5 Pdx-Salem	6/26/96	82	60	0
B & D Gleason	Junction City south	6/27/96	58	105	0
N Ten Eyck & C Files	Dallas east	6/27/96	29	60	0
M McLaughlin	Harrisburg east	6/27/69	31	82	0
B & D Gleason	Cloverdale	6/25/96	62	95	0
Total			2006	5518	49
Average			34.6	92.0	
			* mileage not available so average used		

NIGHTHAWK NITE-OUT DATA SUMMARY - SECOND NIGHT					
Surveyor name(s)	Survey area	Survey date	Survey miles	Survey minutes	Bird detections
W & T Logan	Waldo Hills	7/10/96	30	120	9
T Buerger	Dayton south	7/10/96	27	110	5
K Viste-Sparkman	Sublimity	7/10/96	50	120	7
B Schreiber	Greenberry	7/10/96	20	85	5
B Bales & D Budeau	EE Wilson	7/10/96	13	59	4
C & G Woosley	Riverside Dr	7/10/96	21	79	1
W & C Morrow	Fern Ridge west	7/9/96	34	85	1
R Gerig	Monmouth east	7/10/96	46	105	3
D Cottam	Ingram Island	7/10/96	30	82	3
Eric & Jessyca Burke	Philomath east	7/10/96	39	100	1
S Kohlman	American Bottom	7/10/96	26	120	4
R Keister	Ward Butte	7/10/96	70	95	3
A Smith & K Farris, R & K Raymond	Lebanon east	7/10/96	45	138	2
M Nebeker	Airlie	7/10/96	31	120	1
Joan Hagar	Albany north	7/10/96	33*	65	1
K Maurice	Carlton east	7/10/96	32	90	1
M A Sohlstrom& S Wagner	Carlton west	7/10/96	37	90	0
Richard Green	Freeway Lks east	7/10/96	16	86	0
J Reams & L Newton	Tangent	7/10/96	42	65	0
D Felber	Monroe west	7/10/96	19	65	0
B Bellin & D Pederson	Stayton west	7/10/96	27	70	0
H & C Heinkel	Turner	7/10/96	46	95	0
K Merrifield	Finley NWR	7/10/96	27	90	0
D Philpott, J Fukuda,C Rim & K Higgins	Molalla west	7/10/96	35	105	0
K & S Freemark	Scio	7/10/96	30	85	0
K Larsen	Creswell	7/10/96	15	120	0
F Schrock	Amity south	7/10/96	28	70	0
B & D Gleason	Junction City south	7/10/96	58	120	0
B Shoffner & J Becker	Molalla	7/10/96	27	65	0
S Dowlan	Labish	7/10/96	69	105	0
K Finley & T Seager	Halsey east	7/10/96	28	80	0
N & G Sieglitz	Irish Bend	7/10/96	33*	105	0
W High	Salem east	7/10/96	24	75	0
N Ten Eyck & J & C Files	Dallas east	7/10/96	32	65	0
R & D Titus	Peoria east	7/10/96	22	60	0
A Cornwell	Stayton south	7/10/96	40	90	0
T Murtagh	Marquam	7/10/96	20	90	0
S Page	Priceboro Rd	7/10/96	30	70	0
R Wise	Cox Butte	7/10/96	29	83	0
B Castillo & M Bishop	Alvadore	7/10/96	29	80	0
B Campbell	Coburg	7/10/96	32	65	0
D Irish & J Sylvestre	Harrisburg west	7/10/96	31	75	0
J Dillon & J Fulkerson	Amity Hills	7/10/96	26	100	0
T & A Mickel	Fisher Butte	7/10/96	26	105	0
G & A Ansell	Smith Loop	7/10/96	33	120	0
H Nehls	French Prairie	7/10/96	54	95	0
C Klock & J Yeager	Rickreall	7/10/96	38	105	0
D & D Wheeler	Peterson Butte	7/10/96	26	90	0
W Morrow	Fern Ridge south	7/10/96	36	90	0
J & Y Faulkner	Lebanon north	7/10/96	63	80	0
Aaron Bengtson	Lebanon northwest	7/10/96	14	120	0
S Bielke & L Allen	Silverton west	7/10/96	25	125	0
M Naughton & R Goggans	Baskett Slough NWR	7/10/96	20	80	0
Paul Adamus	Albany east	7/10/96	36	95	0
Bob Altman & Carol Schuler	Willamte R. Falls-Canby	7/10/96	47	60	0
M McLaughlin	Harrisburg east	7/11/96	32	74	0
R & N Miller	Woodburn east	7/3/96	35	90	0
O Thomsen & S Sears	Cloverdale	7/8/96	28	82	0
Total			1846	5081	51
Average			33.0	90.7	
			* mileage not available so average used		

APPENDIX B. Habitat codes and descriptions used for point count station habitat typing and target species habitat use in Willamette Valley grasslands, 1996.

Agricultural

1100 **recently harvested (mowed) grass field**
- 1110 cut grass removed, stubble, short-grass remains
- 1120 cut grass laying in field (e.g., hayed field)

1200 **cultivated grasses** - in general, there is a uniformity in terms of vegetation height, structure, and species composition (e.g, rye, fescue, wheat, oats)
- 1210 annual - has the appearance of a row crop
- 1220 perennial - a clumped, bunch grass appearance, often less uniform in appearance than annual grass field (e.g., hayfield)

1300 **low-growing herbaceous row crops**
- 1310 vegetable (e.g., cabbage, cauliflower, onion)
- 1320 mint/strawberry
- 1330 clover
- 1340 bulbs/flowers

1400 **tall, non-herbaceous row crops**
- 1410 nursery/Xmas trees
  - 1411 > 3 feet tall
  - 1412 < 3 feet tall
- 1420 orchards - fruit and nut
- 1430 vineyards (includes berries on vines and supports)
- 1440 corn
- 1450 hops

1500 **bare ground** - areas within fields where vegetation hasn't taken, at edge of fields, or between fields (note difference from plowed fields and difference from bare ground in roadside right of way)

1600 **recently plowed field** - most or all of field is exposed dirt; if planted, vegetation is not dominant

1700 **pasture** - fields that are fenced and are being grazed or have recently been grazed by livestock; generally there is some irregularity in terms of vegetation height, structure, and species composition (i.e., some areas may be heavily grazed and others lightly grazed); some cultivated grass fields will have livestock, usually sheep, grazing them; but these are not regular pastures; they should be called grass fields - 1200
- 1710 herbaceous
- 1720 shrubs/trees < 10 %
- 1730 shrubs/trees 10-25 %
- 1740 shrubs/trees > 25 %

Non-Agricultural

2100 **wet prairie** - herbaceous dominated wetlands should include some wetland herb vegetation such as rushes and sedges (e.g., marshes, floodplain of creeks/rivers)

2200 **fallow (unmanaged) fields** - includes fields fallow for several years such as CRP land or fields only not in use at this time(e.g., a field that has yet to be planted this year and is a mixture of weeds, grasses, bare ground etc.); also includes "native" grassland remnants; like pasture there may be a great deal of irregularity in terms of vegetation, height, structure, and species composition, but these fields have no sign of recent grazing and may or may not be fenced (an unfenced field like this is definetly a fallow field and not a pasture)

- 2210 herbaceous
- 2220 shrubs/trees <10 %
- 2230 shrubs/trees 10-25 %
- 2240 old field - early successional abandoned fields with mixture of forbs, grasses, scattered shrubs and/or small saplings; woody component > 25 of area

2400 **maintained fields** - includes recreational parks, cemeteries

2600 **gravel and dirt roads** - does not include field roads, must be a regularly travel road leading to other roads, homes, barns, etc. (for percentage purposes do not include shoulder)

2700 **roadside/railroad right of way** - area adjacent to road or railroad, including ditch, that is distinct from adjacent field or non-field habitat and dominated by:

- 2710 herbaceous vegetation (if shrub or tree dominated then non-field riparian or hedgerow)
- 2720 gravel
- 2730 dirt
- 2740 mixed (any relatively equal combination of above)

3000 **Non-Field Habitats** - lump all together for percent coverage at point counts

paved roads

fence row - a fence does not need to be present (e.g., hedgerow); codes:

1) unvegetated - "clean" fence (< 10 % of fenceline is vegetated)
2) herbaceous - grasses and forbs within fence (< 10 % of vegetation is woody)
3) mixed - herbaceous vegetation with scattered individual or clumps of woody (tree or shrub) vegetation
4) woody - relatively continuous trees and shrubs

upland forest/woodland (conifer or deciduous)

riparian forest - includes shrub and tree within riparian zone of pond, creek, stream, ditch

residential - includes buildings, yard, and maintained area associated with residence

open water - ponds, creeks, ditches, etc.

APPENDIX C. Habitat variables and methodology used at point count stations and target species nest sites in Willamette Valley grasslands, 1996.

Percent Habitat Type

* ocular estimate of the percent of each habitat type within a 100 meter fixed radius of all point count stations. Road types 1) paved, 2) gravel, 3) dirt.

Vegetation Cover

* herbaceous layer - ocular estimate of percent cover of grasses/forbs, litter/residue, bare ground, and rock within 1 m square frame placed at nest and at non-use plot - meter square plot centered on nest with corners in each of 4 cardinal directions
* tree layer - percent cover, stem densities, height, and size class (dbh) by species in 11.3 meter square
* shrub layer - percent cover, stem densities, and height by species in 5 meter square
* litter/residue depth measured at a point adjacent to 3 inches to the N side of the wall of the nest cup and at each of 4 corners of 1 m plot

Vegetation Density

* measured at each nest and non-use plot with density board (Basore et al. 1986) - 15 cm wide, 180 cm tall graduated at 10 cm intervals - ocular estimate of the percentage of the board obscured by vegetation (herbaceous and non-herbaceous) in each 10 cm interval using percentage categories of 0-20, 21-40, 41-60, 61-80, 81-100 - estimated from distances of 1.5 and 3 m and at a height of 1 m - also record type of vegetation making hit

Vegetation Height

* effective height - measured height of tallest herbaceous vegetation (alive or dead) in 1 m plot, shrub vegetation in 5 m plot , and tree vegetation in 11.3 m plot
* nest - measured height of tallest herbaceous vegetation within 6 inches of nest
* diversity of vegetation heights - intensive and extensive sites
    - uniform - height of more than 50 percent of non-woody vegetation within 5 cm of average height (ocular)
    - non-uniform - height of less than 50 percent of non-woody vegetation within 5 cm of average height (ocular estimate)
* height classes - ocular estimate of the median height of herbaceous vegetation only
    1 - 0-6 inches
    2 - 6-12 inches
    3 - 12-18 inches
    4 - 18-24 inches
    5 - 24-30 inches
    6 - 30-36 inches
    7 - >36 inches

Other Nest Site Variables

* distance to nearest woody vegetation (tree or shrub)
* distance to road (field road and public Road)
* distance to edge (habitat type change or intra-habitat type change)
* distance to fenceline
* nest concealment - subjective estimate (excellent, good, fair, poor) from above and at 1 m away (1 m height) in each of the 4 cardinal directions

  excellent (4) - nest completely obscured by vegetation (herb or woody) or less than 10 percent visible

  good (3) - most (60-90 %) of the nest is obscured by vegetation

  fair (2) - some (20-60 %) of the nest is obscured by vegetation

  poor (1) - little (< 20%) of the nest is obscured by vegetation

APPENDIX D. Region names and codes used for point count censusing in Willamette Valley grasslands, May-June, 1996.

REGION (CODE)	TOTAL POINTS	QUAD (CODE)	POINT COUNTS
	NORTHERN VALLEY		
Carlton East (CARLEA)	13	Carlton (CARL)	1-13
Dayton Prairie (DAYTPR)	12	McMinnville (MINN)	1-8
		Dayton (DAYT)	2,4-6
French Prairie West (FRPRWE)	16	Dayton (DAYT)	1
		St Paul (STPL)	9,11-22,24,26
French Prairie East (FRPREA)	13	St Paul (STPL)	1-8,10,23,25
		Woodburn (WOOD)	1,2
Elliot Prairie (ELLIPR)	19	Woodburn (WOOD)	3-11
		Yoder (YODE)	2,5,8,15,17
		Scotts Mills (SCOT)	1-5
Marks/Gribble Prairie (MAGRPR)	9	Yoder (YODE)	3,10-12,19-23
Yoder East (YODEEA)	12	Yoder (YODE)	1,4,6,7,9,13,14,16,18,24
		Scotts Mills (SCOT)	13,14
Molalla River Lowlands (MORILO)	9	Molalla (MOLA)	1-9
Dickey Prairie (DICKPR)	8	Molalla (MOLA)	10-14
		Wilhoit (WILH)	1-3
TOTAL POINTS	111		
	CENTRAL VALLEY		
Silverton East (SILVEA)	10	Scotts Mills (SCOT)	6-12,15-17
Richardson Gap (RICHGA)	12	Scio (SCIO)	1-12
Stayton Southwest (STAYSW)	22	Stayton (STAY)	8-13,19,22-26
		Scio (SCIO)	13-15
		Crabtree (CRAB)	6-12
Crabtree West (CRABWE)	8	Crabtree (CRAB)	1-5,13-15
Aumsville South (AUMSSO)	7	Stayton (STAY)	14-18,20,21
Turner South (TURNSO)	17	Turner (TURN)	1-17
Sublimity East (SUBLEA)	7	Stayton (STAY)	1-7
Waldo Hills (WALDHI)	28	Stayton Northeast (STYN)	7-34
Howell Prairie (HOWEPR)	11	Stayton Northeast (STYN)	1-6
		Silverton (SILV)	1-5
Red Prairie (REDPRA)	15	Sheridan (SHER)	1-10
		Ballston (BALL)	17,19-22
Baskett Slough North (BASLNO)	18	Dallas (DALL)	1-10
		Ballston (BALL)	3,6,18
		Amity (AMIT)	2,3,7,12,13

Adair East (ADAIEA)	10	Lewisburg (LEWS)	1-3
		Airlie South (ARSO)	2-8
Luckiamute River Hills (LURIHI)	24	Airlie North (ARNO)	1-23
		Airlie South (ARSO)	1
Ankney Bottom (ANKNBO)	5	Sydney (SYND)	1-5
Monmouth South (MONMSO)	13	Monmouth (MONM)	1-13
Amity South (AMITSO)	8	Amity (AMIT)	1,4-6,8-11
Ballston South (BALLSO)	21	Ballston (BALL)	1-2,4-5,7-16,23-27
		Dallas (DALL)	11,12
TOTAL POINTS	236		

SOUTHERN VALLEY

Coburg Northeast (COBUNE)	12	Coburg (COBU)	1-10,17,18
Chesire North (CHESNO)	17	Chesire (CHES)	1-17
Harrisburg North (HARRNO)	12	Harrisburg (HARR)	1-12
Monroe East (MONREA)	15	Monroe (MONR)	2-10
		Greenberry (GREN)	6-11
Ward Butte (WARDBU)	8	Halsey (HALS)	1-8
Peoria East (PEOREA)	27	Peoria (PEOR)	1-18
		Riverside (RIVE)	1-9
Corvallis South (CORVSO)	6	Greenberry (GREN)	1-5,12
Shedd Northeast (SHEDNE)	5	Halsey (HALS)	10-14
Fern Ridge (FERNRI)	11	Veneta (VENE)	1-6
		Eugene West (EUWE)	1-5
Tangent Southeast (TANGSE)	15	Tangent (TANG)	1-14
		Lebanon (LEBN)	1
Camas Swale (CAMASW)	10	Creswell (CRES)	1-10
Brownsville North (BROWNO)	10	Brownsville (BROW)	1-10
Indian Head Hills (INHEHI)	20	Indian Head (INDH)	1-5,9-12,15-17,34-39
		Union Point (UNPT)	1,2
Bond Butte Lowlands (BOBULO)	29	Coburg (COBU)	11-16
		Indian Head (INDH)	6-8,13-14,18-33,40-41
TOTAL POINTS	197		

APPENDIX E. Species recorded during Willamette Valley grassland breeding bird project, 1996.

Species	Species
Acorn woodpecker	Horned lark
American bittern	House finch
American crow	House sparrow
American goldfinch	House wren
American kestrel	Hutton's vireo
American pipit**	Killdeer
American robin	Lesser goldfinch**
Band-tailed pigeon*	Lazuli bunting
Barn swallow	Mallard
Black-capped chickadee	MacGillivray's warbler
Belted kingfisher	Marsh wren*
Bewick's wren	Mountain quail*
Black-throated gray warbler	Mourning dove
Blue-gray gnatcatcher**	Northern bobwhite
Brown-headed cowbird	Northern flicker
Black-headed grosbeak	Northern harrier
Brewer's blackbird	Northern mockingbird
California quail	Northern oriole
Canada goose	Northern shrike
Chestnut-backed chickadee	Northern rough-winged swallow
Cedar waxwing	Olive-sided flycatcher*
Chipping sparrow	Orange-crowned warbler
Cliff swallow	Osprey
Common bushtit	Pacific-slope flycatcher
Common nighthawk**	Pileated woodpecker
Common raven	Pine siskin*
Common snipe*	Prairie falcon*
Common yellowthroat	Purple finch
Coopers hawk*	Red-breasted nuthatch
Dark-eyed junco	Red-breasted sapsucker*
Downy woodpecker	Red-tailed hawk
European starling	Red-winged blackbird
Evening grosbeak	Ring-necked pheasant
Golden-crowned kinglet	Rock dove
Golden-crowned sparrow	Rock wren**
Grasshopper sparrow**	Rufous hummingbird
Gray jay*	Savannah sparrow
Great-blue heron	Scrub jay
Green heron	Sharp-shinned hawk
Short-eared owl**	Western kingbird
Song sparrow	Western meadowlark

Solitary vireo
Spotted towhee
Swainson's thrush
Tree swallow
Turkey vulture
Varied thrush*
Vaux's swift*
Vesper sparrow
Violet-green swallow
Virginia rail
Warbling vireo
Western bluebird
Western sandpiper*
Western tanager
Western wood-pewee
White-breasted nuthatch
White-crowned sparrow
Willow flycatcher
Wild turkey
Wilson's warbler
Wood duck*
Yellow-breasted chat*
Yellow warbler
Yellow-rumped warbler

* recorded during point count censusing, but only beyond 100 meters
** recorded only as an incidental; not during censusing

APPENDIX F. Summary of area search censusing in Willamette Valley grasslands, May-June, 1996.

Location	Champoeg State Park		Rowland CRP	Howard CRP	Elijah Bristow	BLM Royal	BLM Coast	E.E Wilson		Finley NWR Pigeon Butte					Bald Top			Wet Prairie	
Field Type	FF	FF	FF	FF	FF	FF	TF	FF	FF	FF	FF	FF	FF	FF	FF	FF	PT	WP	WP
Date	6/20	6/20	6/4	6/4	5/30	6/13	5/16	6/28	6/28	5/29	5/29	5/29	5/29	5/29	6/3	6/3	6/3	6/21	6/21
Site Number	1	2	1	1	1	1	1	1	2	1	2	3	4	5	1	2	3	1	2
Turkey vulture	9													2					
Great-blue heron	1					3		1											
Mallard						1													
Wood duck						1													
Red-tailed hawk						1													
Northern harrier	1																		
American crow	2				18														1
Ring-necked pheasant						1													
Northern flicker	1						1												
Killdeer	1																		
Scrub jay			1		1												1		
Rufous hummingbird																		2	
Western kingbird															1				
Willow flycatcher																			1
Western wood pewee	1												3						
Lazuli bunting	1		1												5	4			
American robin					3	1	4		1										
Western bluebird	3																		
Cedar waxwing			4			4					3				13	2	2	2	
Tree swallow	2								5										
Violet-green swallow	1																		
Barn swallow			2	1		5													
Cliff swallow									1				1						
Unidentified swallow								1				3							
Bewick's wren				1														1	
Black-capped chickadee			1																
Common yellowthroat		2	2	1		6		1	2		2	1				2	1	4	6
Orange-crowned warbler			1										1						1
Savannah sparrow	3	1																5	11
Song sparrow		1				6		3										2	3
White-crowned sparrow				2			8												
Vesper sparrow				1			1												
Dark-eyed junco							2												
Rufous-sided towhee							2		1										
Brown-headed cowbird			2			4				3						2		1	
Red-winged blackbird						12													
European starling	1														3	1	8		
Western meadowlark						1													
Evening grosbeak										2	2					2			
House finch																1			
American goldfinch	1		1	5		8	27	3		2	2		1	1	2	1	4	2	7
Totals	28	4	15	11	22	54	45	9	10	7	9	4	6	3	24	15	16	19	30

FF = Fallow field
TF = Tree farm
WP = Wet prairie