Declining and State Sensitive Bird Species Breeding in Willamette Valley Grasslands: 2008/09 Status Update

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Preface

This report was made possible through the efforts of the ODFW Grassland Program, funded by a special allocation by the Oregon Legislature in support of implementing The Oregon Conservation Strategy, and financially supported through the Oregon Zoo Foundation's Future for Wildlife Conservation Fund (Oregon Zoo) and contributing funds from the U.S. Fish and Wildlife Service State Wildlife Grant Program (SWG Program). The Oregon Zoo supports field conservation actions that contribute to the conservation of native animals and their ecosystems in the Pacific Northwest and abroad. The SWG Program provides matching federal grant funds for developing and implementing projects that benefit species of greatest conservation concern.

Technical and/or logistical assistance was provided by Bob Altman, American Bird Conservancy and Randy Moore, Oregon State University. We are indebted to Andrew Wallace, the primary field assistant for the effort. His attention to detail, skilled data collection, and motivation to begin working in the wee hours of the morning were invaluable. Valuable field assistance was also provided by two skilled and motivated volunteers: Joel Geier and David Irons. Special thanks to Andrea Hanson, ODFW, Edie S. Lee, ODFW volunteer, and James Noyes, ODFW, for their editorial contributions.

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Recommended Citation

Oregon Department of Fish and Wildlife. 2010. Declining and State Sensitive Bird Species Breeding in Willamette Valley Grasslands: 2008/09 Status Update.

Photographs

All photographs except where noted by Andrew Wallace.

Cover: Finley National Wildlife Refuge, North Prairie, May 2010, A. Kreager

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INTRODUCTION

Background and Context: No other behavioral or ecological guild of North American avian species has shown more consistent, steeper and more geographically widespread declines than those of grassland birds (Knopf 1996). In Oregon's Willamette Valley, many grassland species have exhibited steady downward trends in distribution and abundance, with some likely having been extirpated as a breeding species (e.g., lark sparrow, *Chondestes grammacus* (Shelmerdine). Data documenting these changes are limited; consequently surveys were conducted in 1996 by the Oregon Department of Fish and Wildlife (ODFW) and Avifauna Northwest in the Willamette Valley to determine the status of grassland community bird species (Altman 1997). Particular focus was given to five species identified as representative of the community: western meadowlark (meadowlark) (*Sturnella neglecta*), Oregon vesper sparrow (vesper sparrow) (*Pooecetes gramineus affinis*), streaked horned lark (horned lark), (*Eremophila alpestris strigata*), common nighthawk (*Chordeilies minor*) and grasshopper sparrow (*Ammodramus savannarum*) (Altman 1997). Recognized as State Sensitive Species in Oregon (Oregon Sensitive Species Rule, OAR 635-100-040, 2008) and Strategy Species identified in the Oregon Conservation Strategy (ODFW 2006), these species were chosen for study because declines in their distribution and abundance seem to be correlated with the rapid loss of the grassland habitat type. The horned lark is a migratory subspecies which was designated in 2001 as a Candidate for listing under the Federal Endangered Species Act.

The original 1996 study involved the establishment of 544 roadside point count stations which were visited once each in May and June. Surveys characterized the grassland breeding bird community and quantified target species abundance and habitat associations. Baseline conditions were established at each of these permanent monitoring stations for long-term monitoring of grassland bird population trends and associated habitat features. This current study involved repeating the point count surveys at each station.

2008 Project Objectives: The 1996 surveys provided the initial focused grassland bird survey data in the Willamette Valley and identified important habitat types and sites to help focus conservation efforts where they could be most effective. In relation to the previous work, the 2008 surveys provided current distribution and relative abundance information for grassland birds and general habitat features of current habitats used by grassland birds.

The primary objectives of the 2008 survey effort were to:

- Update 1996 information on distribution and abundance of populations of target grassland bird species at particular sites within the Willamette Valley;
- Characterize habitat features associated with target species occurrence and document changes from 1996 to 2008.
- Characterize the breeding bird composition of Willamette Valley grasslands and population trend differences between 1996 and 2008;
- Identify key conservation areas to guide landowner outreach and habitat enhancement efforts through the Willamette Valley Grassland Bird Conservation Initiative and other complimentary programs.

METHODS

Bird Censusing: As in 1996, grassland bird presence and habitat were characterized at the 544 established Willamette Valley point count stations. In addition, density transects for meadowlarks and horned larks on routes previously surveyed in 1996 were conducted. No focused surveys were conducted for the common nighthawk. Documentation of grassland bird activity included opportunistic observations of other avian species to provide additional data on grassland bird/habitat relationships. Habitat types as defined by Altman (1997) were utilized in this study to maintain consistency with characterization (Appendix C). This included the terminology for "grassland" habitat, which referred to agricultural fields (e.g., pasture, hayfields and cultivated croplands) and nonagricultural fields (e.g., native prairies and fallow fields). This continuum represents the majority of grassland habitat types remaining in the Willamette Valley that are utilized by most grassland birds.

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

Point count censusing was conducted primarily by two individuals with three others assisting incidentally during the period between May 5 and June 30, 2008. Censusing occurred between official sunrise and 10 a.m. under

favorable weather conditions. Consistent with 1996 surveys, one census was conducted at each point count station in May (primarily for the resident target species meadowlark and horned lark) and one in June (primarily for the long distance migrants vesper sparrow and grasshopper sparrow).

Several roadside walking transects were surveyed June 12th-14th, 2008 to estimate relative densities of meadowlarks and horned larks. These occurred in areas previously surveyed in 1996 (Appendix A), and were known to have relatively large populations of these species. The results of these surveys were kept separate from the point count and habitat analysis.

Site Selection: Point count stations were identical to those selected in 1996 which were chosen primarily from historically known locations of target species and locations of potentially suitable habitat (Appendix B). Additional considerations for selection 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); 5) maintaining a straight-line distance of at least ¼ mile between point count stations to maximize statistical independence among data; 6) avoiding highways and heavily traveled roads for personal safety and species detectability concerns; and 7) avoiding BBS routes to minimize any data dependence during statistical comparisons with BBS data.

Habitat Characterization: Habitats within a 100 meter radius of the survey point were qualitatively characterized at each point count station during the early survey period in May using type codes developed by Altman (1997) (Appendix C). Habitat types were characteristic of one or more of the types described by Altman. Parcel sizes and contiguity varied between sites.

Percent cover and average height class was estimated for each cover type (Altman 1997, Appendix D), and presence of non-vegetative structures noted (e.g., fences, power lines). Habitat characterization was generally conducted during the same day or within one week after the first survey was finished.

Only 185 (25%) of the point count stations were characterized in the 1996 surveys as opposed to all 544 of the stations in the 2008 surveys, resulting in disproportionate comparison. Habitat was assessed for only those sites that had target species detected within 100 meters .

Site Location and Documentation: GPS coordinates were recorded to accurately document survey locations. Digital photos were taken at each survey point in each of four cardinal directions to visually document habitats.

DATA ANALYSIS AND INTERPRETATION

Consistent with the 1996 dataset, point count census data were pooled into regional data sets for analysis and interpretation, resulting in the establishment of forty distinct regions [as determined 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) (Appendix B)]. Additionally, the valley was roughly subdivided into thirds: North, Central and South. Comparisons of indices of target species abundance were made between regions to discern patterns throughout the valley.

Most point count data are presented as relative abundance, the mean number of individuals per point count within a 100 meter fixed radius. All detections during point count censusing were included for analysis of target species occurrence by habitat type. Transect density estimates were based on detections of singing males converted to pairs per mile, or detections of individuals converted to detections per mile.

As in the original study conducted by Altman (1997), some limitations in study design affected the analysis and interpretation of the data. There were no changes made to the methods or sampling sites in order to be able to compare results between years. Point count stations in the original survey were not randomized or systematically located since the principal objective was to locate individuals and populations of target species. In addition, the vast majority of land in the Willamette Valley is privately owned, making access problematic. Statistical constraints and potential biases result since habitat types were not equally sampled, nor were all populations surveyed. The lack of statistical design therefore required representation of the data in a descriptive form and is not necessarily representative of target species' occurrence or population numbers throughout the Willamette Valley. However, reasonable inferences were made whenever the data clearly indicated patterns of abundance, distribution, or habitat associations of target species.

Most of the population data on target species is based on point count censusing for meadowlark, vesper sparrow and horned lark. Grasshopper sparrow was only recorded at four locations, with a total of five detections. The low number of detections for grasshopper sparrow limits the ability to infer trends and subsequently discussion is limited for this species.

RESULTS AND DISCUSSION

Point Counts

Habitat Characterization:

The limitations associated with roadside surveys (e.g., edge effects, public access, inability to ensure adequate representation of all suitable habitat types) potentially bias the representation of habitat types, . The majority of point counts for this study were located in landscapes that have been highly modified through agricultural practices. It is estimated that native prairie habitat (upland and wet) occurs in less than one percent of its historic range in the Willamette Valley (Habeck 1961, Johannessen *et al.* 1971, Towle 1982). Many of the prior wetland landscapes used for farming have undergone conversions to dry landscapes as a result of tile draining or ditching. Intensive agriculture in conjunction with the loss of native ecosystems throughout the Willamette Valley has greatly restricted the native habitat available to the target species and our ability to predict native habitat associations.

Forty-five grassland habitat types were categorized and described (Appendix C) at the point count stations throughout the Willamette Valley. As in the 1996 surveys, cultivated grass fields dominated the landscapes in which surveys were conducted and target species were detected (Figure 1). Habitat types grouped by structural components were characterized as: cultivated grasses, pasture, no vegetation, vertical structure, and unmanaged fields (Figure 2).

Height classes ranged from 0 to 6 inches up to 30 to 36 inches. Height classes were not assigned to trees (Figure 3) in Christmas tree farms, orchards, or non-grassland habitat types; these trees were lumped in a category greater than 36 inches.

Bird Community Abundance:

A total of 95 species was recorded during censusing at 544 point count stations (Appendix E). Most of the species detected within 100 meters of a point count station were associated with grassland habitat, although forest and other non-grassland habitats accounted for a small percentage of associations. Eighty-three of the species were recorded within 100 meters of point count stations, eight species were recorded beyond 100 meters and four species occurred as flyovers.

Savannah sparrow was the most abundant species (n = 1,994; relative abundance = 1.83 birds per point count) followed by European starling (n =

1693), barn swallow (n = 577), American goldfinch (n = 553), American robin (n = 524) and Brewer's blackbird (n = 496) (Table 1). These six species accounted for 71 percent of all detections within 100 meters of point count stations.

Among the 12 most abundant species, only savannah sparrow could be considered a species characteristic of native grasslands (Knopf 1988). The next most abundant species, European starling and Brewer's blackbird, red-winged blackbird and killdeer, are species characteristic of agricultural lands. Barn swallow is an open-country aerial forager. American robin, American goldfinch, song sparrow and common yellowthroat are relatively common generalist or edge species. White-crowned sparrow utilizes hedgerows and semi-open farmland in the Willamette Valley. Spotted towhee favors brushy habitats. The European starling is an aggressive, introduced species that has spread rapidly across North America and causes damage to native bird populations through competition for resources. Survey methods may have caused a bias toward presence of generalist species given the majority of habitat types surveyed were subject to edge effects and alteration in some form.

Target Species Abundance and Distribution:
Target species detections within 100 meters of point count stations are listed for the 2008 and 1996 study respectively: vesper sparrow 14, 62; horned lark 168, 154; and meadowlark, 70, 165. Beyond 100 meters, there were an additional 12, 38 detections of vesper sparrow, 48, 154 of horned lark and 179, 196 of meadowlark, in 2008 and 1996 respectively. 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.

The relatively high number of target species detected beyond the 100 meter radius suggests this may not be the optimal survey area for the point counts. Species detectability may vary with roadway distances, fence lines, habitat matrices, and patch size.

We made the assumption that the various habitat types were equally represented throughout the survey area and thus detectability of species was evenly distributed. Excluding grasshopper sparrow, whose numbers were excluded from this analysis due to the extremely low numbers of observations, **vesper sparrow** was lowest among the three target species in all measures of abundance and distribution in 2008 as it was in 1996 (Table 2). Vesper sparrow had the lowest relative abundance (0.01 birds per point, down from 0.06 in 1996), occurred at the fewest number of point count stations (2.3 percent of 544 point count stations, down from 7.3 percent in

1996) and occurred in the fewest number of regions (8 of 40 regions, down by half from 1996 when vesper sparrow occurred in 16 of 40 regions). **Meadowlark** slipped from highest in measures of relative abundance and distribution of the three target species in 1996 to second highest in 2008 (Table 2). Relative abundance was down to 0.06 birds per point in 2008 from 0.15 birds per point in 1996 as was occurrence at point count stations (6.0 percent compared with 14.5 percent in 1996). Number of regions in which meadowlarks were detected was 14 of 40 in 2008, down from 20 of 40 in 1996. Differences in occurrence could be associated with sampling effort and/or changes in habitat types between years.

In 2008, **horned lark** were highest in all measures of abundance and distribution of the three target species, whereas meadowlark was highest of the three target species in 1996 (Table 2). Horned lark retained similar and in some cases higher measures of relative abundance and distribution in 2008 compared with 1996. In 2008, relative abundance was roughly the same (0.15 and 0.14 birds per point, respectively), occurrence at point count stations was slightly higher (15.2 percent vs. 12.5 percent) and the number of regions where it was detected increased (23 of 40 compared with 21 of 40).

Different patterns of distribution were evident for the three target species throughout the Willamette Valley. **Horned lark** occurred primarily within the central Willamette Valley (Table 3, Figure 4) with the highest abundance in areas around the Basket Slough National Wildlife Refuge (NWR). 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. Relative abundance of horned larks decreased in the northern Willamette Valley, increased slightly in the mid Willamette Valley and increased slightly in the southern Willamette Valley at points surveyed (Figure 5). It should be noted that the area with the largest known breeding population of horned larks, the Corvallis Airport, and another area known to support a large breeding population of horned larks in SE Linn Co. (Randy Moore, pers. comm.) were not surveyed in this effort.

Meadowlarks were nearly absent in the northern Willamette Valley, occurred in relatively low abundance in the central Willamette Valley and were most abundant in the southern Willamette Valley (Table 3, Figure 6). Meadowlark abundance remained highest around Indian Head Hills (0.625 birds per point in 2008, 1.43 birds per point in 1996) between Brownsville and Coburg along the east side of the valley. Another area of high abundance in the southern Willamette Valley included the Camas Swale area surrounding Creswell and southeast of Tangent. There were areas in the southern Willamette Valley with historically higher abundances of meadowlarks which experienced much diminished relative abundances

between 1996 and 2008 (Figure 7), e.g., Cheshire (0.882 vs. 0.118 birds per point count) and Coburg (0.375 vs. 0.125 birds per point count) in 1996 and 2008 respectively. Overall, relative abundance of meadowlarks decreased in the northern, mid and southern Willamette Valley at points surveyed (Table 3). Habitat availability likely influences the changes between survey years.

Vesper sparrows occurred in relatively low abundance in the northern, mid and southern Willamette Valley, and were most abundant in the southern valley. (Table 3). The area where vesper sparrows were most abundant was around Ward Butte (0.313 birds per point), an area east of Interstate 5 in the southern valley. Relative abundance of vesper sparrow decreased in the northern Willamette Valley, remained stable in the mid valley and decreased in the southern valley.

Target Species Habitat Associations:

Target species detections within 100 meters of survey sites occurred most frequently in perennial grass crops (21.7 percent) followed by annual grass crops (14.6 percent) (Figure 1). Cumulatively, cultivated grasses made up the largest proportion of occupied habitat (39 percent). Pasture habitat types were associated with 20 percent of all target species detections; fallow fields and habitat types with little or no vegetation at 19 percent, and vertical crops followed at 16 percent (Figure 2). The remaining habitat types comprised 10 percent or less of the occupied habitat (Figure 1), and only one detection of a target species (meadowlark) was made in wet prairie. The majority of target species detections occurred in the 0 to 6 inch and 12 to 24 inch height classes (Figure 3).

Results for primary habitat types along the transect surveys are detailed in Tables 4 and 5. As with point count associations, cultivated grass fields dominated the habitat types surveyed and were representative of the highest densities of meadowlark and horned lark.

As in 1996, **meadowlarks** that were detected within 100 meters of the point count center (n=70) continued to occur predominantly in cultivated grass fields (25 percent perennial and 6 percent annual) and pastures with fewer than 10 percent trees (46 percent) (Figure 8). The remaining habitat types accounted for less than 10 percent of those in which detections occurred: pastures with between 10 percent and 25 percent tree cover were associated with approximately eight percent of the meadowlarks detected, and fallow fields accounted for roughly 12 percent.

Vesper sparrows (n=13) also showed a preference for pastures with fewer than 10 percent trees (31 percent) (Figure 9) and showed equal preference between Christmas tree farms and non-grassland habitat (15 percent

respectively). Orchards, fallow fields with no trees, and fallow fields with between 1 to 10 percent tree cover each accounted for 8 percent of the remaining habitat types occupied by this species.

Horned larks (n=167), like meadowlarks, showed affinities to cultivated grass fields (20 percent perennial and 19 percent annual) (Figure 10). Plowed fields (20 percent) and short-statured herbaceous crops (15 percent) were nearly equally occupied. Detections were also made at Christmas tree farms (four percent) and corn crop fields (2 percent), but vegetation at these sites were less than 6 inches in height. Nearly all the remaining habitat types accounted for less than 5 percent of habitat types occupied by larks.

Little can be inferred for **grasshopper sparrows**, of which only five detections were made. However, each detection occurred only in pasture habitats (n=5), predominantly those with 1 to 10 percent tree cover (Figure 11). Definitive habitat type associations for this species remains difficult given the extremely low relative abundance.

Target Species Associations with Vegetation Structure:
Structure in the form of variable grass heights, trees, hedgerows and man-made structures such as telephone poles occurred in occupied habitat types for all species, with the exception of horned lark which showed definite preference for habitats without obstruction (Figure 3). With the exception of percent tree cover, structure was not quantitatively defined in this study but noted when observed.

Approximately 38 percent of the habitats in which **meadowlarks** were detected (Figure 8) had between 1 and 25 percent tree cover. Vertical structure appeared to play an important role in these habitat types, particularly for males advertising or defending territories. Trees, posts, fences, hedgerows and telephone poles were all components of meadowlark habitat regardless of vegetation height.

Nearly half (46 percent) of habitat types occupied by **vesper sparrows** contained tree cover up to 25 percent, including habitat that was predominantly vertical (Christmas tree farms) (Figure 9). Hedges, fence rows and blackberry brambles were frequently utilized for singing structures and were evident at every site where this species was detected.

Horned larks were rarely associated with tree cover (less than 1 percent) (Figure 10) although some detections were made in association with very young Christmas tree and corn crops, both of which were less than 6 inches in height. Twenty-eight percent of the detections occurred in habitat with little-to-no ground cover, such as plowed fields or gravel and dirt roads

Eighty percent of the habitat associated with **grasshopper sparrow** detections had vertical components of up to 10 percent tree cover (Figure 11). No other structural components such as fences or power lines were observed being utilized.

Target Species Associations with Grass Height:
Grass height observations (Figure 3) varied somewhat from Altman (1997) with the exception of horned lark, where the majority of detections occurred in short grass (zero to 6 inches) (Figure 12). Altman found vesper sparrows predominantly in grass one to 12 inches but in this study they were not detected at that class height at all, instead preferring grasses 12 to 18 inches (33 percent) and 18 to 24 inches (25 percent) (Figure 13). Grasshopper sparrows showed equal preference for grasses ranging from 12 to18 inches and 18 to 24 inches (40 percent each) (Figure 3), but as with Altman's study, the paucity of detections for this species precludes any sound conclusion toward preferences. Approximately 40 percent of meadowlark detections occurred in vegetation ranging from 12 to 24 inches in height. Less than five percent of the observations occurred in vegetation greater than 30 inches in height (Figure 14).

Height associations can be further described by their association with habitat types for each target species. While the majority of horned lark observations occurred in the 0-6 inch class (some exclusively) for nearly every habitat category, each of the other height classes were represented in varying degrees within other habitat types (Figure 15). Habitat types were distributed fairly equally (Figure 16) with the exception of herbaceous crops and plowed fields in which heights were predominantly less than 6 inches, and fallow fields and wet prairie averaged 12 and 18 inches.

Transects
Fifteen walking transects were conducted along selected roads on June 12 through June 14 to estimate densities of meadowlark (seven transects) (Table 4), and horned lark (eight transects) (Table 5). Densities were somewhat similar for both species.

Meadowlark densities ranged from zero to 10 detections per mile in 2008 compared with two to 12.8 detections per mile in 1996 (Table 4). Transect routes with no detections of meadowlark in 2008 included Sandner Road and Buyserie Road, both of which had two or more detections per mile in 1996 (Table 4). Densities of meadowlark decreased from 12.86 detections per mile at Belts Road in 1996 to 7.14 detections per mile in 2008. Meadowlark densities appear to have increased at Rodgers Mt. Loop Road from five detections per mile in 1996 to ten detections per mile in 2008.

Horned lark densities ranged from zero to 11.79 detections per mile in 2008 compared with 1.54 to 25 detections per mile in 1996 (Table 5). Horned lark detections were absent along the 117th/Kuenzi Way SE transect in 2008; comparatively there were 5.71 detections per mile in 1996 (Table 5). A marked increase in horned lark density was detected along Livermore Road in 2008 (11.79 detections per mile) compared with 1996 (2.82 detections per mile). The previously large 25 detections per mile at Harmony Road in 1996 declined to 10 detections per mile in 2008. This could be a result of natural movement or dispersal related to their association with ephemeral habitats.

Species Distribution Summaries

In general, measurable declines were evident for meadowlark and vesper sparrow populations with the horned lark showing minimal stability. Grasshopper sparrow detections were so few that a reasonable analysis could not be made. Numerous other grassland-dependent species such as western bluebird (*Sialia mexicana*), northern harrier (*Circus cyaneus*) and short-eared owl (*Asio flammeus*) lacked sufficient incidental sightings to be measurable (Table 6).

Despite the limiting parameters within this study, we conclude that target species identified with grassland habitats continue to exhibit downward population trends within the Willamette Valley and a reasonable inference can be made that other highly associated species would likely depict similar trends. Habitat loss and conversion, disturbances, low reproductive output and population isolation continue to exert serious pressure on existing populations, leading to further fragmentation of existing populations and vulnerability to extirpation should conditions continue on a similar trajectory.

The following brief accounts summarize the abundance, distribution and habitat associations of target species on the basis of data collected in 2008.

Horned Lark: Measures of relative abundance increased slightly from 1996. Both detections at point count stations and within regions showed moderate increases (3 percent and 6 percent, respectively). Primary populations occurred within the central Willamette Valley with highest abundance in areas around the Basket Slough NWR. Population numbers decreased in the northern Willamette Valley but were shown to increase slightly in the mid and southern Willamette Valley (Table 3, Figure 4).

Horned larks appeared highly associated with habitats that were sparsely vegetated and generally short-statured (Figure 15). These associations

included habitats typically considered “poor quality”, such as gravel and dirt roads, heavily used pastures and row crops. Horned larks were seldom associated with vegetation height exceeding 6 inches.

Vesper Sparrow: Vesper sparrow depicts the greatest decline in all measures: the number of total detections made (all visits) dropped from 100 in 1996 to 26 in 2008. Relative abundance decreased dramatically from 0.06 in 1996 to 0.01 in 2008, with a similar decline in areas detected: point count stations down from 7.3 percent to 2.3 percent and regions down from 16 percent to 8 percent. What few individuals were detected were located primarily in the southern Willamette Valley in the Ward Butte area. Greatest declines were shown in the northern Willamette Valley, followed by the southern valley. Detections remained relatively stable in the mid-valley areas.

Vegetation height associations were greatest at 12-18 inches, favoring pastures with fewer than 10 percent tree cover. Detections (23 percent) were also made in habitats with vertical structure such as Christmas tree farms and orchards when the understory was left relatively unmanaged. As identified in Altman (1997), associations were greatest with short grass habitat with scattered shrubs and small trees.

Western Meadowlark: The number of detections decreased from 361 to 249 from 1996 to 2008, respectively. Meadowlark showed the highest measures of relative abundance and distribution in 1996 but ceded that position to horned lark in 2008. Relative abundance declined from 0.15 to 0.06 and regional occurrence fell sharply from 14.5 percent to 6.0 percent. Abundance was greatest in the southern Willamette Valley and nearly absent from the northern portion. Indian Head Hills between Brownsville and Coburg and Camas Swale depicted areas of highest abundance.

Cultivated grass fields and pastures with fewer than 10 percent trees were favored habitats. Variability in selection of grassland habitat types by meadowlarks was high, ranging from fallow fields to plowed fields and herbaceous crops. Regardless of habitat type, meadowlarks were located most often in habitats with vegetation height less than 30 inches (Figure 16).

Grassland Bird Conservation Areas

In 2000, Partners in Flight identified Grassland Bird Conservation Areas (GBCAs) in the Willamette Valley Ecoregion in their conservation strategy for landbirds (Altman 2000) based on the 1996 grassland bird survey effort (Altman 1997). The 2008 survey effort confirmed that areas identified as GBCAs represent areas where grassland birds would currently benefit from

immediate habitat conservation actions. Existing bird populations in these identified areas could serve as sources for bird expansion into nearby habitats when and if conservation and restoration efforts are undertaken.

Grassland Bird Conservation Areas (GBCA's) (Altman, 2000)

1. Basket Slough NWR and areas to the north and west
2. Waldo Hills, east of Salem between Sunnyside Road and Sublimity
3. Indian Head Hills between Brownsville, Coburg, and Interstate 5
4. Ward, Peterson, and Washburn Butte Complex southwest of Lebanon
5. Kingston Prairie and area south of Stayton
6. William Finley NWR north to Llewellyn Road.
7. Cheshire, west and north to Ferguson Road
8. Camas Swale, south of Eugene and north and west of Creswell
9. Harrisburg, Tulsa area
10. Richardson Gap, southeast of Scio between Thomas and Crabtree Creeks
11. Fern Ridge area, especially the lands northeast, east, southeast, and south of the reservoir
12. *Carlton Southeast (new) see below*

Figures 17 through 19 illustrate the locations of point count stations and all target species detections made throughout the Willamette Valley regions. Many of the detections were made in areas identified as Conservation Opportunity Areas (COA) within the Oregon Conservation Strategy. Data on grassland bird detections recorded in this study were provided to staff of The Nature Conservancy to be included in analysis of strategic conservation areas for the Willamette Synthesis Effort (Synthesis). Because numerous locations in which target species were detected do not fall within the boundaries of either the COAs or the current Synthesis boundaries it would be important to consider whether inclusion of these locations in future revisions is warranted.

North Willamette Valley Region

We believe that retention and expansion of populations of target species in the Northern Valley is an essential component to the conservation of these sensitive grassland birds. Populations of meadowlark, horned lark, and vesper sparrow occur west of the Cascade mountain range in Washington State where these species are also recognized as sensitive and declining. Ensuring continuity between state populations should be a core priority. The Portland, Oregon, metropolitan area poses a significant obstacle and potential barrier for expansion and connectivity of these populations, emphasizing the need to capitalize on areas currently occupied as well as identify and secure areas considered potential conservation opportunities suitable for colonization and/or linkage. East/West linkages should not be

ignored either, particularly in the areas most heavily occupied from Airlie east to Scio and northward.

One area illustrating the importance of maintaining East/West connectivity is the area southeast of Carlton, where there were higher numbers of detections of meadowlarks, horned larks, and vesper sparrows at survey points in 2008 compared with the number of detections in 1996 (Figure 17). . Habitat in this area was generally comprised of fallow fields, grazed pastures, and agricultural use with relatively small lot sizes.

Observing increases of key species of grassland birds in the area southeast of Carlton, in the northern valley, is encouraging, since populations of grassland birds in the northern Willamette Valley have been historically small and declining over recent years.

Additional areas for conservation of horned lark have been identified through independent surveys in the southwest quad of Portland International Airport and Rivergate Industrial park, and St. John's landfill in Multnomah County. Yamhill and Marion counties support meadowlark populations that are not located within currently identified conservation areas, as does Clackamas County where vesper sparrow also occurs. The alarming decline of vesper sparrow range-wide suggests that particular attention should be focused on the retention of any sites where occupation has been documented.

Central Willamette Valley Region
Again, the distribution of target species in this region (Figure 18) lies largely outside areas identified for priority conservation in the COAs and Synthesis. Federal refuges including Ankeny, Baskett Slough, and Finley currently sustain viable grassland bird populations and provide excellent opportunities for retention and expansion of target species. Note these populations are using grasslands with diverse flora and structure, rather than agricultural habitat types with low diversity.

The Wetland Reserve Program, a cost-share program offered through the Natural Resources Conservation Service, has restored hundreds of acres of habitat throughout the Central Willamette Valley that successfully support target species populations. One example is the M-DAC Farms reserve which spans nearly 600-acres of restored wetland habitat and was documented to support approximately 75 horned lark pairs in its first year post-restoration (pers. comm., R. Moore). These population numbers are anticipated to vary yearly and possibly decline as vegetation in these restored areas matures, thus limiting the low height breeding habitat preferable to this species. Consideration for the different habitat needs of grassland birds must be taken when designing effective management plans.

South Willamette Valley Region
Several of the individuals detected in this region were located within COA and Willamette Synthesis boundaries (Figure 19). Consequently, these species could benefit from targeted conservation and restoration efforts aimed at sites within those areas. Significant populations outside of those boundaries include the area southeast of Tangent and north of Brownsville, located within the Calapooia watershed; near tributaries of Spoon and Little Muddy creeks, south of Halsey; the Muddy creek, its tributaries, and Camous creek; and areas around Belknap and Shafer creeks in the Long Tom watershed, southwest of Monroe. Emphasis on retaining and increasing vesper sparrow populations is essential in these areas.

Additional Recommendations

- Conservation Opportunity Areas and Willamette Synthesis maps should be updated to reflect the findings of target grassland bird populations;
- Secure in perpetuity existing populations of target species;
- Conduct fine-scale landscape analysis to identify the most advantageous and biologically-appropriate corridors to support viability of breeding populations;
- Conduct additional research on local and landscape habitat requirements, and limiting factors (e.g., nest success, predation rates, etc.) of target grassland birds;
- Conduct addition surveys to determine grassland bird populations throughout the Willamette Valley;
- Conduct research into wintering habitat needs and locations of target species;
- Manage parcels where appropriate for multiple species uses, allowing for various vegetation heights and parameters where possible. Target large tracts of habitat for long-term preservation without neglecting retention of smaller parcels to provide continuity between sites;
- Optimize conservation efforts conducted through regulatory agencies such as the Department of State Lands wetland mitigation bank preserves;
- Work with the Watershed Councils and supporting partners to conduct landowner outreach to those areas of known target species occupation, particularly those watersheds containing populations not previously identified for conservation through COAs or the Synthesis, including but not limited to:

Yamhill
Pudding
Luckiamute
Mill Creek
North Santiam
South Santiam
Calapooia
Long Tom
Marys River
Coast Fork Willamette

Potential variables that may have influenced species presence and abundance in this study included site variability, species detectability, edge effects, patch size and distribution, and limited point count coverage. Additional research designed to address these factors could provide further insight into the conservation needs of declining grassland birds in the Willamette Valley.

REFERENCES

Altman B. 1997. Distribution, Abundance and Habitat Associations of Declining and State Sensitive Bird Species Breeding in Willamette Valley Grasslands. Report prepared for Oregon Dept of Fish and Wildlife,. p 64.

Altman B. 2000. Conservation Strategy for Landbirds in Lowlands and Valleys of Western Oregon and Washington Version 1.0. American Bird Conservancy and Oregon-Washington Partners in Flight p138.

Alverson ER. 1990. A survey for native grassland remnants in the mid-Willamette Valley, Oregon. Eugene: The Nature Conservancy. p 35.

Bonney R, and Pashley D. 1994. Developing management objectives for neotropical migratory birds. Cornell Lab of Ornithology and The Nature Conservancy. p 7.

Cyr A, Lepage D, and Freemark K. 1995. Evaluating point count efficiency relative to territory-mapping in cropland birds. In: Ralph CJ, Sauer JR, and Droege S, editors. Monitoring bird populations by point counts USDA Forest Service Gen Tech Rep PSW-GTR-149. Albany, CA: U.S. Dept of Agriculture,. p 63-68.

Habeck JR. 1961. The original vegetation of the mid-Willamette Valley. Northwest Science 35:65-77.

Johannessen CL, Davenport WA, Millet A, and McWilliams S. 1971. The vegetation of the Willamette Valley. Annals of the Association of American Geographers 61:286-302.

Knopf FL. 1988. Conservation of steppe birds in North America. In: Goriup PD, editor. Ecology and conservation of grassland birds: Inter. Council for Bird Preservation. p 27-42.

Knopf FL. 1994. Avian assemblages on altered grasslands. Studies in Avian Biol. 15:247-257.

Knopf FL. 1996. Prairie legacies-birds. In: Samson FB, and Knopf FL, editors. Prairie Conservation. Washington, D.C.: Island Press. p 135-148.

Marshall DB, Chilcote M, and Weeks H. 1996. Species at Risk: sensitive, threatened, and endangered vertebrates of Oregon Portland: Oregon Dept. of Fish and Wildlife.

Marshall DB, MG Hunter, and AL Contreras, Eds. 2003. Birds of Oregon: A General Reference. Oregon State University Press, Corvallis, OR. 768 Pp.

Mueller AJ. 1993. Bottomland hardwood forest habitat goals and objectives for neotropical migratory birds in the east Gulf Coast Plain physiographic area. U.S. Fish and Wildl. Serv. p 14.

Ralph CJ, Droege S, and Sauer JR. 1995. Managing and Monitoring Birds Using Point Counts: Standards and Applications. USDA Forest Service Gen Tech Rep PSW-GTR. p 161-169.

Savard JL, and Hooper TD. 1995. Influence of Survey Length and Radius Size on Grassland Bird Surveys by Point Counts at Williams Lake, British Columbia. In: Ralph CJ, Sauer JR, and Droege S, editors. Monitoring bird populations by point counts. Albany, CA: U.S. Dept of Agriculture. p 57-62.

Shelmerdine, T.A. Lark Sparrow. Pp. 545-547 *in* Birds of Oregon: A General Reference. D.B. Marshall, M.G. Hunter, and A.L. Contreras, Eds. Oregon State University Press, Corvallis, OR.

Towle JC. 1982. Changing geography of Willamette Valley woodlands. Oregon Historical Quarterly 83:66-87.

Table 1. The 12 most abundant species during point count censusing in Willamette Valley grasslands, May-June 2008 with comparisons from 1996 surveys.[a]

	Detections		Birds/Point Count	
	1996	2008	1996	2008
Savannah sparrow	1764	1994	1.62	1.83
European starling	1205	1693	1.11	1.56
Barn swallow	574	577	0.53	0.53
American goldfinch	551	553	0.51	0.51
American robin	499	524	0.46	0.48
Brewer's blackbird	865	496	0.80	0.46
Red-winged blackbird	586	445	0.54	0.41
Song sparrow	509	400	0.47	0.37
Common yellowthroat	429	275	0.39	0.25
White-crowned sparrow	134	201	0.12	0.18
Spotted towhee	162	194	0.15	0.18
Killdeer	192	167	0.18	0.15

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

Table 2. Target species measures of abundance and distribution in Willamette Valley grasslands 1996 and 2008.[a]

	Relative Abundance[b]		Percent Occurrence[c]		Region Occurrence[d]	
Species	1996	2008	1996	2008	1996	2008
Vesper sparrow	0.06	0.01	7.3	2.3	16	8
Horned lark	0.14	0.15	12.5	15.2	21	23
Western meadowlark	0.15	0.06	14.5	6.0	20	14

[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 per point count.
[c]Percent of point count stations where species were detected.
[d]Number of regions (out of 40) in which species were detected.

Table 3. Summary of distribution target species detections and relative abundance by general area of the Willamette Valley, Oregon.

	Detections		Relative Abundance[b]	
Vesper Sparrow	1996	2008	1996	2008
NORTHERN WV	8	3	0.036	0.014
CENTRAL WV	4	4	0.008	0.008
SOUTHERN WV	53	7	0.135	0.018
Totals	65	14	0.060	0.013

	Detections		Relative Abundance[b]	
Western Meadowlark	1996	2008	1996	2008
NORTHERN WV	5	1	0.023	0.005
CENTRAL WV	28	17	0.059	0.036
SOUTHERN WV	138	52	0.350	0.132
Totals	171	70	0.157	0.064

	Detections		Relative Abundance[b]	
Horned Lark	1996	2008	1996	2008
NORTHERN WV	11	8	0.050	0.036
CENTRAL WV	64	82	0.136	0.174
SOUTHERN WV	71	78	0.180	0.198
Totals	146	168	0.134	0.154

[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 per point count.

Table 4. Western meadowlark density estimates along selected road transects in Willamette Valley grasslands, June 11, 1996 and June 12-14, 2008.

SPECIES	SITE	1996 HABITAT	2008 HABITAT	TRANSECT DISTANCE (miles)	1996 DETECTIONS (males)	2008 DETECTIONS (individuals)	1996 DENSITY (Detections/Mile)	2008 DENSITY (Detections/Mile)
Western meadowlark	Duckflat Road	cultivated grass	35% cult [1] grass; 20% plowed field; 20% fallow; 25% non-field	1.2	3	1	2.50	0.83
Western meadowlark	Rodgers Mt. Loop Road	60% pasture; 40% cult grass	40% pasture; 40% cult grass; 20% non-field	0.8	4	8	5.00	10.00
Western meadowlark	Sandner Road	85% cult grass; 15% herb row crop	60% cult grass; 30% non-field; 10% pasture	1	2	0	2.00	0.00
Western meadowlark	Morris Road	50% fallow field; 30% cult grass; 20% pasture	45% cult grass; 25% non-field; 20% pasture; 10% plowed field	1.2	4	9	3.33	7.50

Table 4 (cont.). Western meadowlark density estimates along selected road transects in Willamette Valley grasslands, June 11, 1996 and June 12, 2008

SPECIES	SITE	1996 HABITAT	2008 HABITAT	TRANSECT DISTANCE (miles)	1996 DETECTIONS (males)	2008 DETECTIONS (individuals)	1996 DENSITY (Detections/Mile)	2008 DENSITY (Detections/Mile)
Western meadowlark	Buyserie Road	30% cult grass; 45% herb row crop; 25% orchard	55% cult grass; 35% orchard; 10% Xmas trees	0.9	2	0	2.22	0.00
Western meadowlark	Riches Road	80% cult grass; 20% pasture	50% cult grass; 30% pasture; 20% bare ground	1.4	4	5	2.86	3.57
Western meadowlark	Belts Road	65% pasture; 35% cult grass	50% pasture; 40% cult grass; 6% non-field; 2% gravel/dirt road; 2% roadside ROW	0.7	9	5	12.86	7.14

[1] cultivated grass

Table 5. Horned lark density estimates along selected road transects in Willamette Valley grasslands, June 11, 1996 and June 12, 2008.

SPECIES	SITE	1996 HABITAT	2008 HABITAT	TRANSECT DISTANCE (miles)	1996 DETECTIONS (individuals)	2008 DETECTIONS (individuals)	1996 DENSITY (Detections/ Mile)	2008 DENSITY (Detections/ Mile)
Horned lark	Beck Road	cultivated grass	cult grass	0.8	4	5	5.00	6.25
Horned lark	Harmony Road (Smith Rd.)	cultivated grass	cult grass	0.6	15	6	25.00	10.00
Horned lark	Kirk Road	cultivated grass	85% cult grass; 15% non-field	1.2	5	2	4.17	1.67
Horned lark	Bond Butte Road	75% cult grass; 25% herb row crop;	cult grass	1.3	2	9	1.54	6.92
Horned lark	Center School Road	95% cult grass; 5% herb row crop	cult grass	1.7	7	7	4.12	4.12
Horned lark	Livermore Road	90% cult grass; 10% plowed field	65% cult grass; 15% bare ground; 20% fallow	3.9	11	46	2.82	11.79

Table 5 (cont.). Horned lark density estimates along selected road transects in Willamette Valley grasslands, June 11, 1996 and June 12-14, 2008.

SPECIES	SITE	1996 HABITAT	2008 HABITAT	TRANSECT DISTANCE (miles)	1996 DETECTIONS (individuals)	2008 DETECTIONS (individuals)	1996 DENSITY (Detections/ Mile)	2008 DENSITY (Detections/ Mile)
Horned lark	117th/ Kuenzi Way SE	20% plowed field; 60% cult grass; 20% burned field	80% cult grass; 20% Xmas trees	0.7	4	0	5.71	0.00
Horned lark	Glasser Road	cult grass 70%; 30% herb row crop	98% roadside/ ROW; 2% gravel/dirt road	1.4	4	3	2.86	2.14

Table 6. All Grassland bird detections at point count stations in the Willamette Valley, 1996 and 2008

	Detections		Birds/Point Count 2008	
	1996	2008	1996	2008
Savannah sparrow	1764	1994	1.62	1.83
European starling	1205	1693	1.11	1.56
Barn swallow	574	577	0.53	0.53
American goldfinch	551	553	0.51	0.51
American robin	499	524	0.46	0.48
Brewer's blackbird	865	496	0.80	0.46
Red-winged blackbird	586	445	0.54	0.41
Song sparrow	509	400	0.47	0.37
Common yellowthroat	429	275	0.39	0.25
White-crowned sparrow	134	201	0.12	0.18
Spotted towhee	162	194	0.15	0.18
Killdeer	192	167	0.18	0.15
Horned lark		167		0.15
House finch		124		0.11
Western scrub jay		116		0.11
Violet-green swallow		109		0.10
Mourning dove		104		0.10
Cliff swallow		100		0.09
Western wood pewee		88		0.08
Chipping sparrow		79		0.07
Black-capped chickadee		73		0.07
Brown-headed cowbird		71		0.07
Western meadowlark		70		0.06
Lazuli bunting		66		0.06
Tree swallow		59		0.05
Cedar waxwing		54		0.05
Dark-eyed junco		47		0.04
American crow		47		0.04
Bewick's wren		41		0.04
Band-tailed pigeon		35		0.03
Black-headed grosbeak		33		0.03
House sparrow		31		0.03
American kestrel		31		0.03
California quail		27		0.02
Northern flicker		21		0.02
Canada goose		19		0.02
Red-tailed hawk		17		0.02
Wild turkey		15		0.01
Lesser goldfinch		15		0.01

Table 6 (cont). Grassland bird detections at point count stations in the Willamette Valley, 1996 and 2008

	Detections		Birds/Point Count 2008	
	1996	2008	1996	2008
Vesper sparrow		13		0.01
Ring-necked pheasant		13		0.01
Mallard		12		0.01
Western kingbird		11		0.01
Western tanager		10		0.01
Rufous hummingbird		10		0.01
Bullock's oriole		10		0.01
Acorn woodpecker		10		0.01
Wilson's warbler		9		0.01
Western bluebird		9		0.01
Turkey vulture		9		0.01
Marsh wren		9		0.01
Yellow warbler		8		0.01
Willow flycatcher		8		0.01
Purple finch		7		0.01
Northern harrier		7		0.01
Golden-crowned sparrow		7		0.01
Great-blue heron		7		0.01
Chestnut-backed chickadee		7		0.01
Swainson's thrush		6		0.01
Red-breasted sapsucker		6		0.01
Red-breasted nuthatch		6		0.01
Grasshopper sparrow		5		0.00
Yellow-headed blackbird		4		0.00
House wren		4		0.00
American coot		4		0.00
Vaux's swift		3		0.00
Orange-crowned warbler		3		0.00
White-breasted nuthatch		2		0.00
Warbling vireo		2		0.00
Hairy woodpecker		2		0.00
Common raven		2		0.00
Yellow-breasted chat		1		0.00
Wood duck		1		0.00
Short-eared owl		1		0.00
Pacific slope flycatcher		1		0.00
Pileated woodpecker		1		0.00

Table 6 (cont). Grassland bird detections at point count stations in the Willamette Valley, 1996 and 2008

	Detections		Birds/Point Count 2008	
	1996	2008	1996	2008
Osprey		1		0.00
MacGillivray's warbler		1		0.00
Hutton's vireo		1		0.00
Downy woodpecker		1		0.00
Cinnamon teal		1		0.00
Ash-throated flycatcher		1		0.00
American bittern		1		0.00

Figure 1

Habitat Types Associated with Target Species Detections at Roadside Point Count Stations in the Willamette Valley

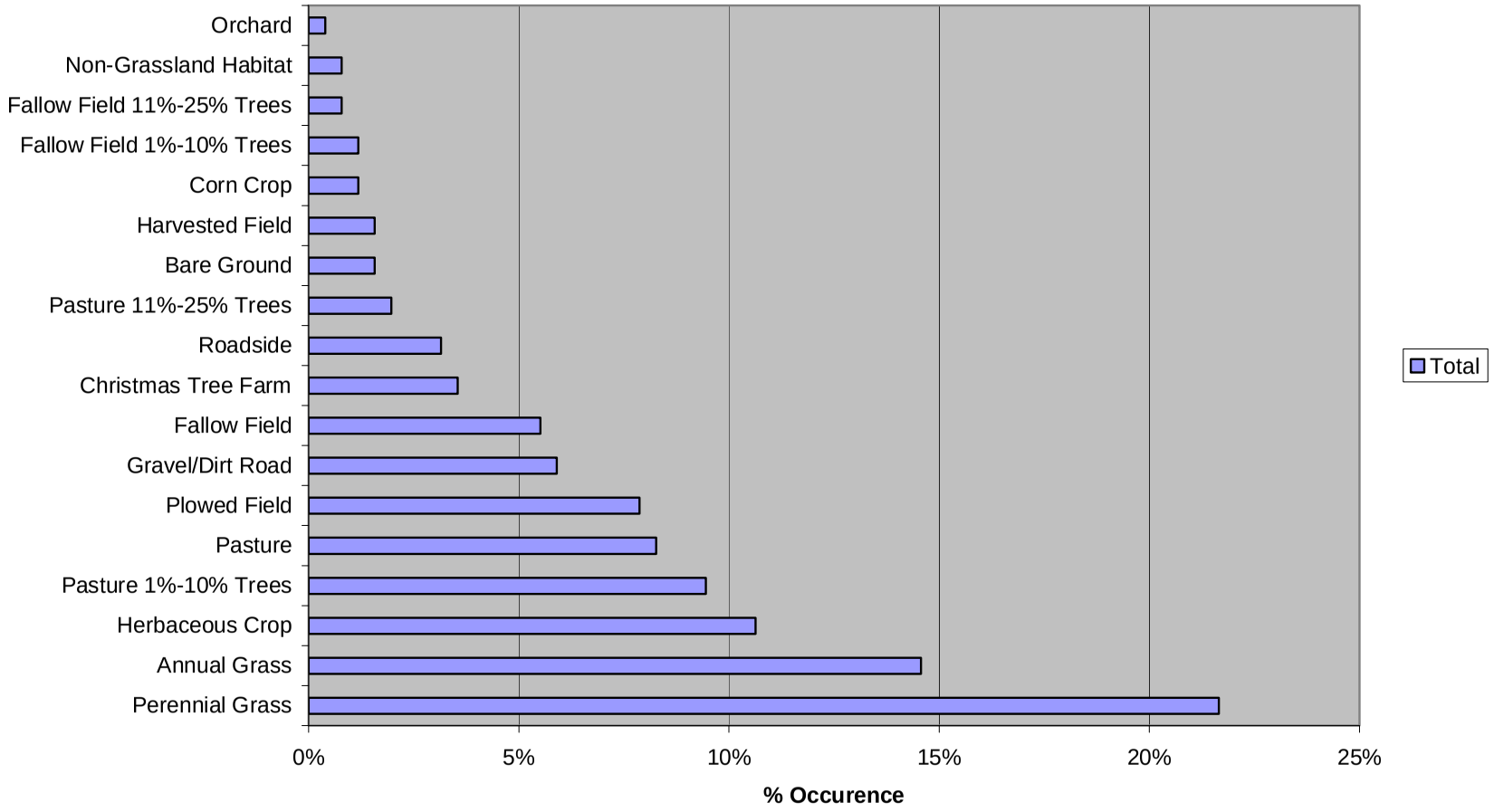


Figure 2

Habitat Types Associated with Target Species Detections at Roadside Point Count Stations in the Willamette Valley

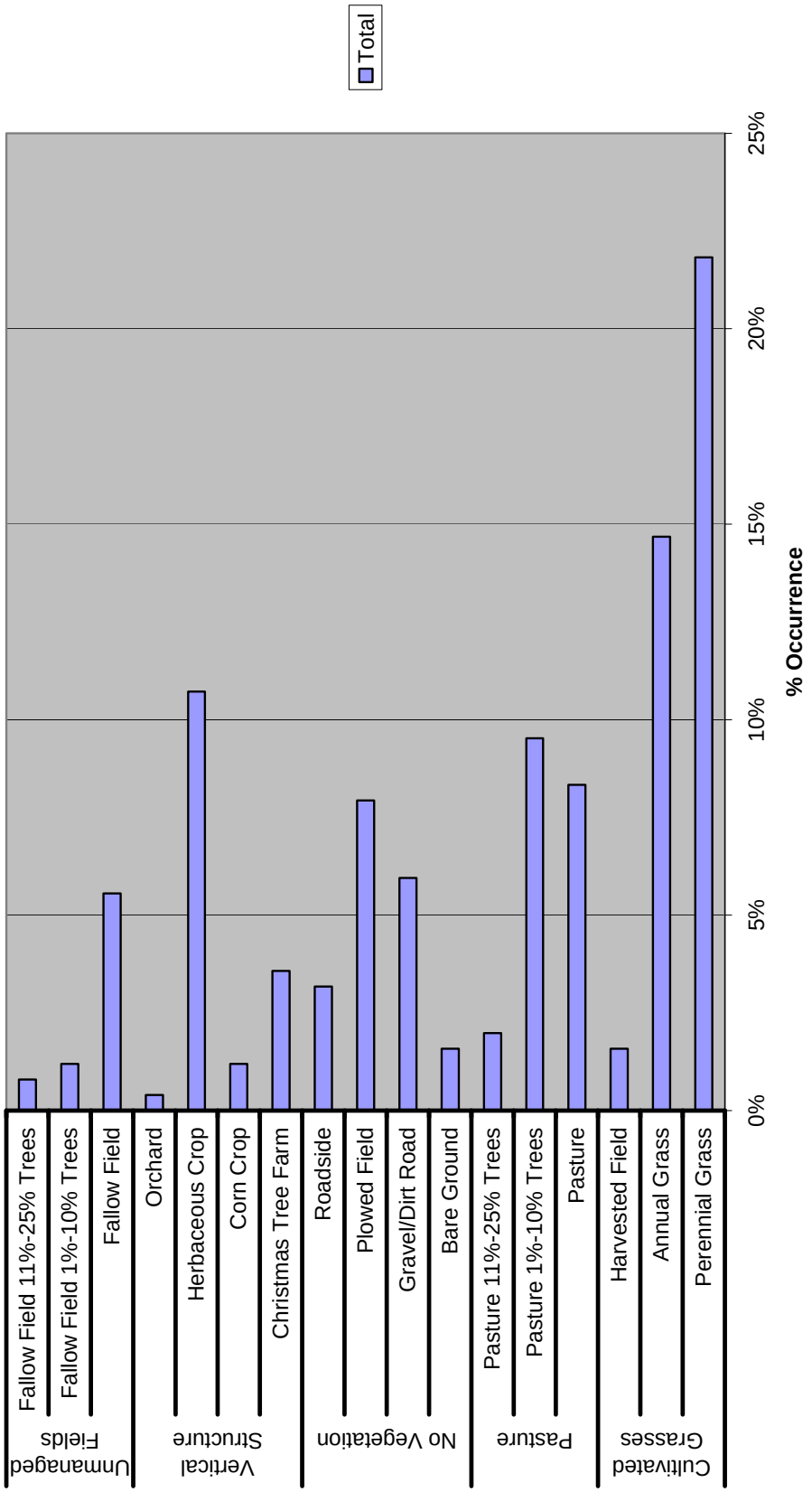


Figure 3

Target Species Associations with Height Classes
at Roadside Point Count Stations within the Willamette Valley

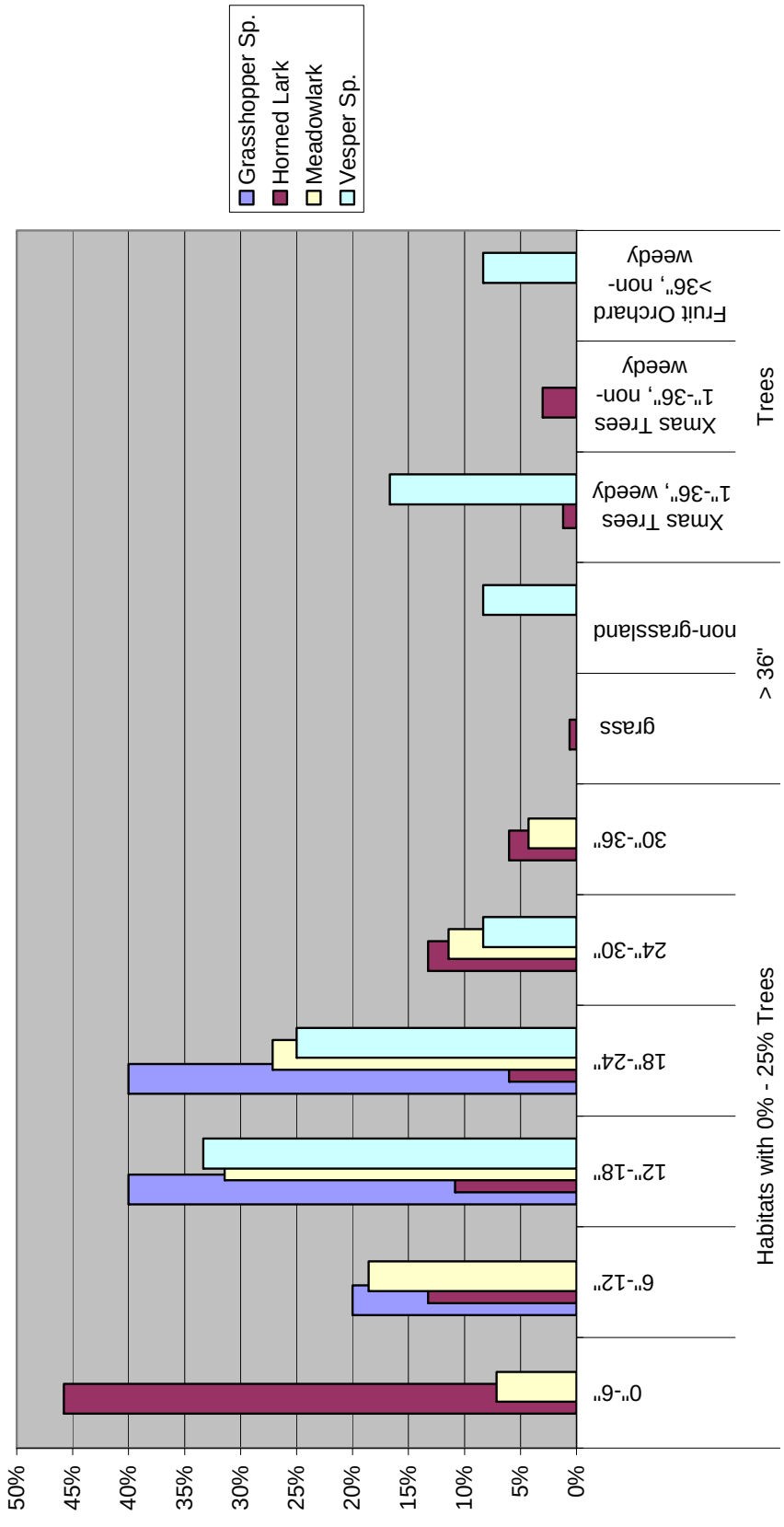


Figure 4

Horned Lark Relative Abundance by Region
Based on Point Count Censusing in Willamette Valley Grasslands
May-June 1996

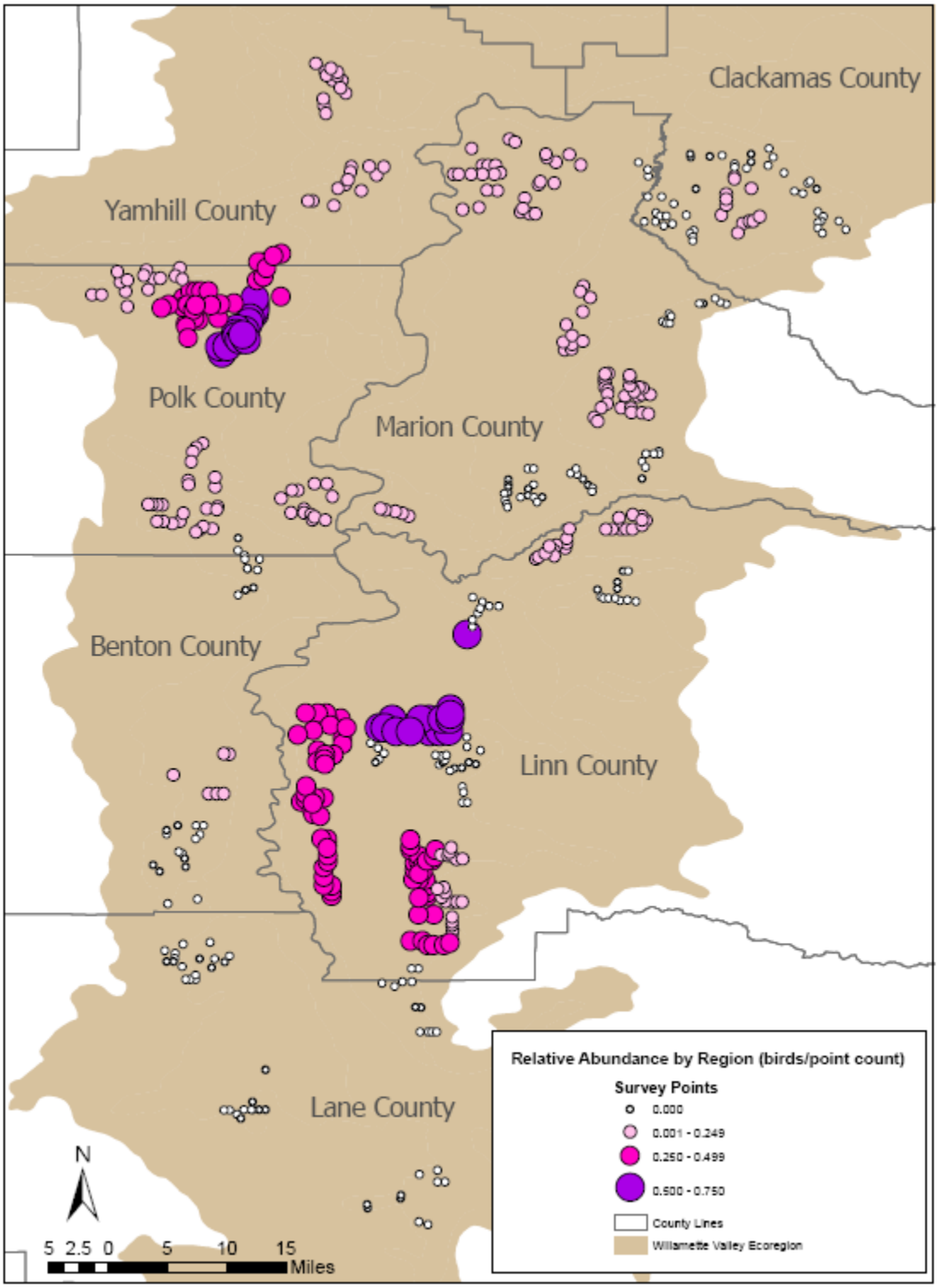


Figure 5

Horned Lark Relative Abundance by Region
Based on Point Count Censusing in Willamette Valley Grasslands
May-June 2008

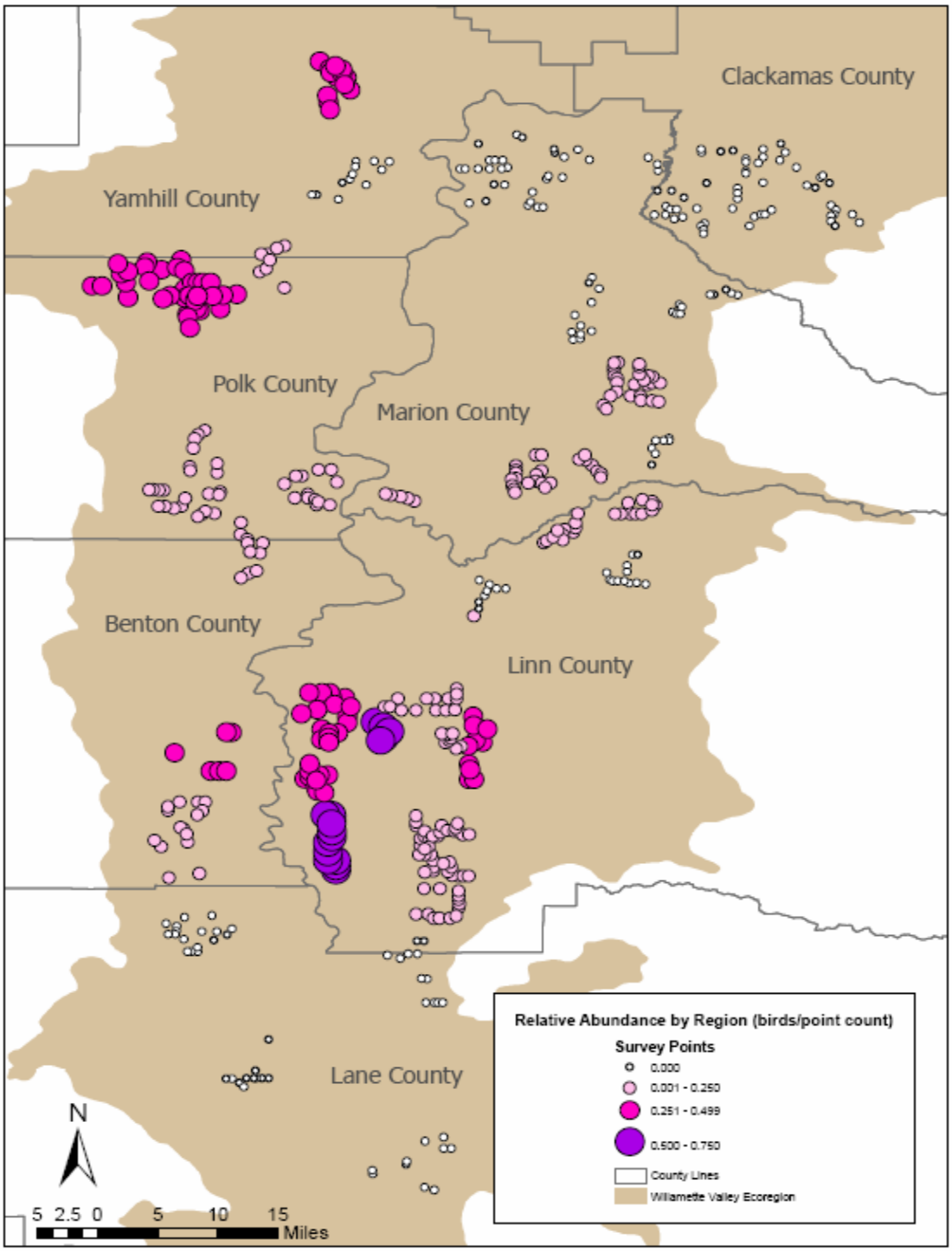


Figure 6

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

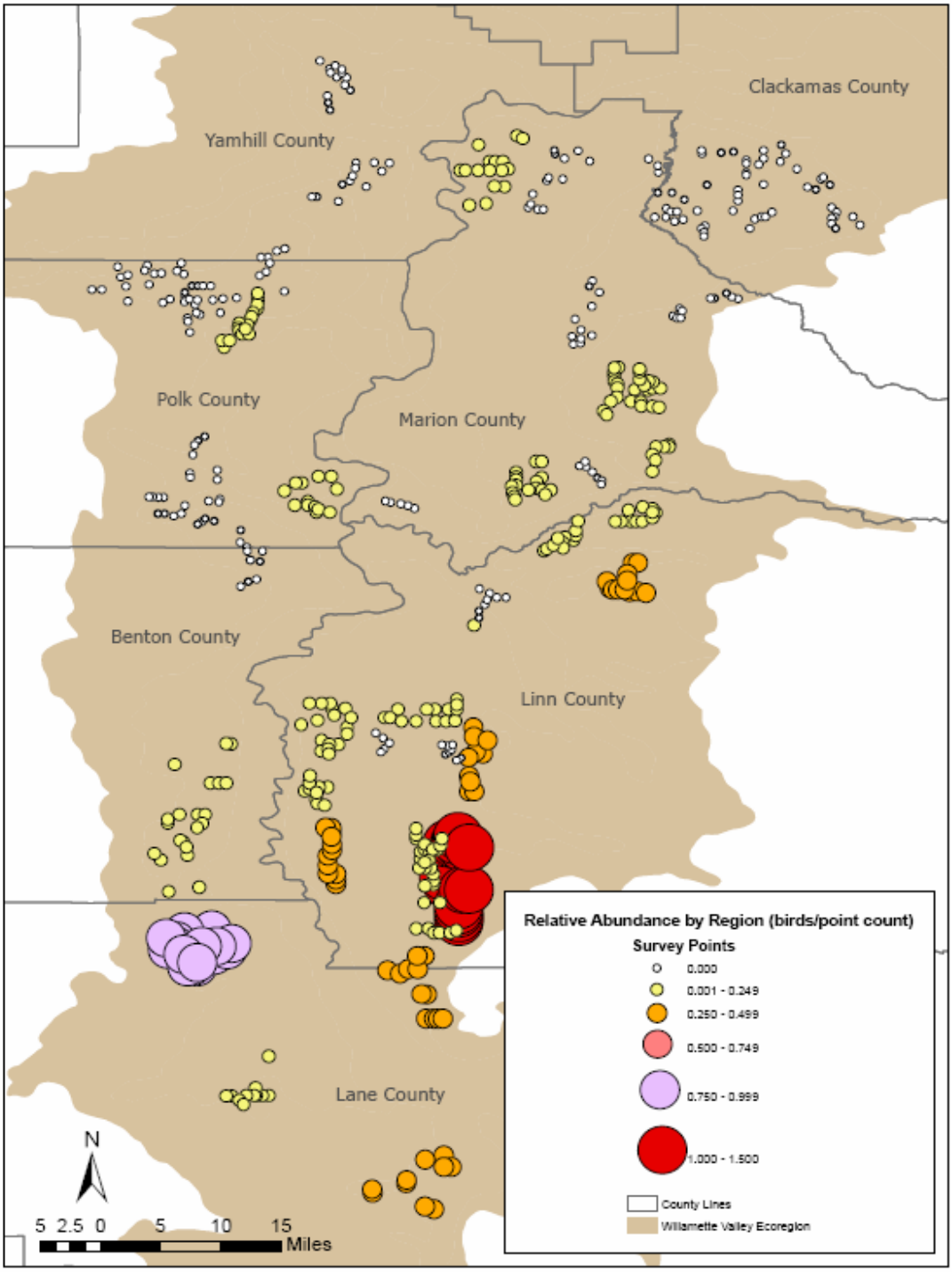


Figure 7

Western Meadowlark Relative Abundance by Region
Based on Point Count Censusing in Willamette Valley Grasslands
May-June 2008.

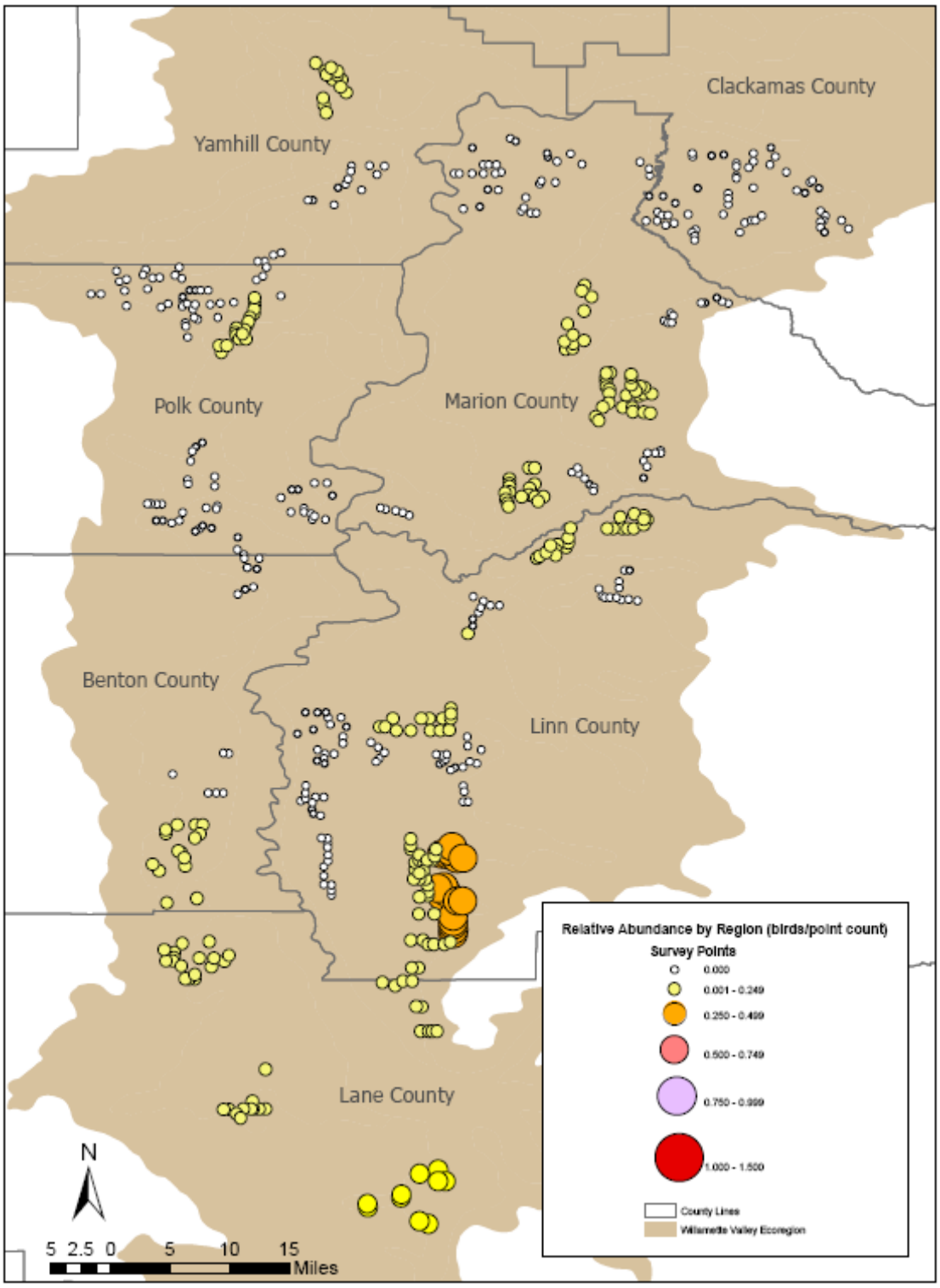


Figure 8

Primary Habitat Types Associated with Western Meadowlark Detections at Roadside Point Count Stations within the Willamette Valley

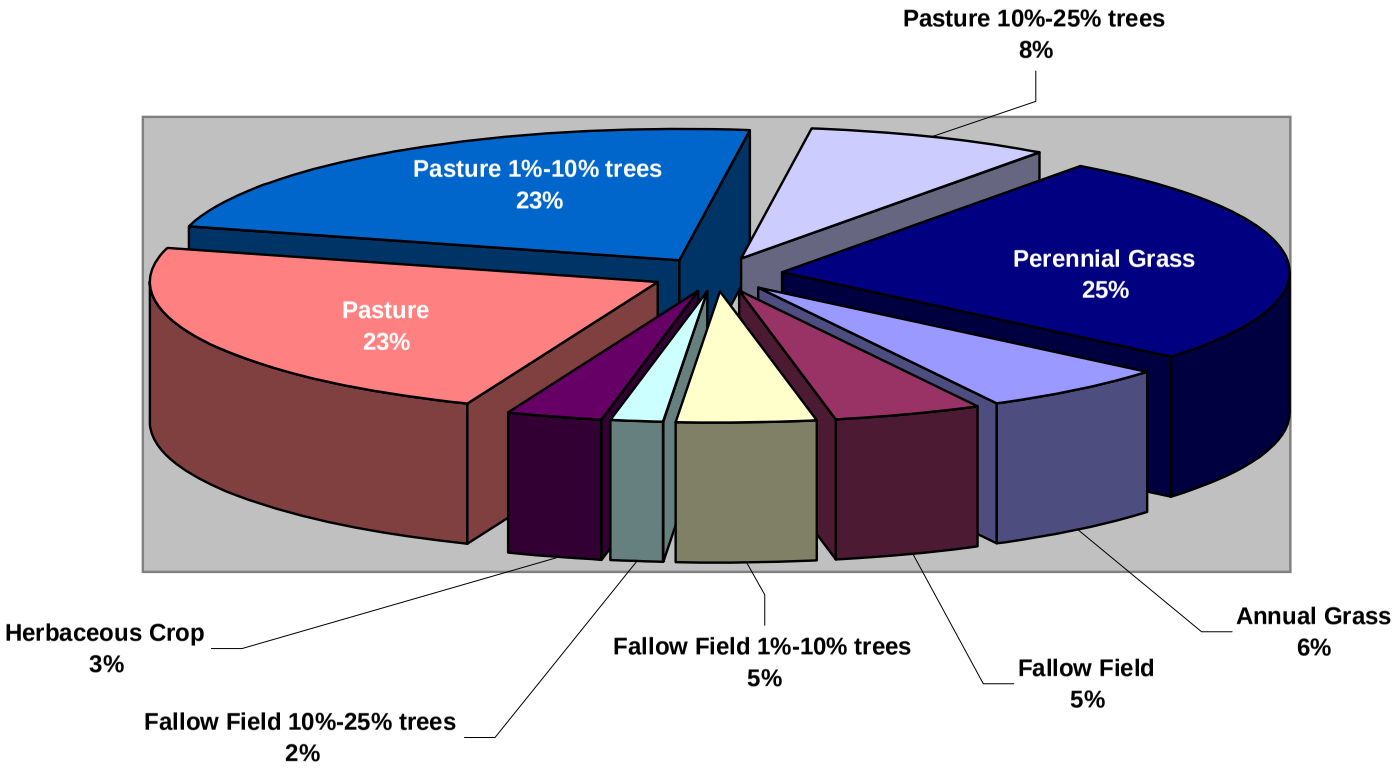


Figure 9

Primary Habitat Types Associated with Vesper Sparrow Detections at Roadside Point Count Stations within the Willamette Valley

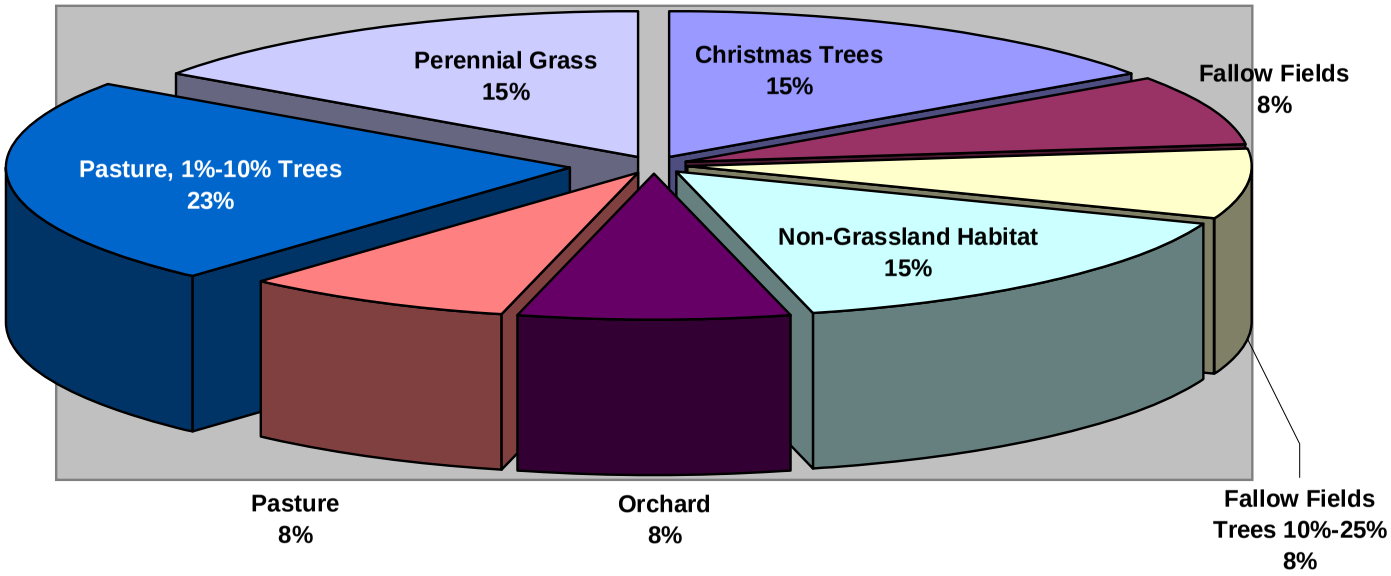


Figure 10

Primary Habitat Types Associated with Streaked Horned Lark Detections at Roadside Point Count Stations within the Willamette Valley

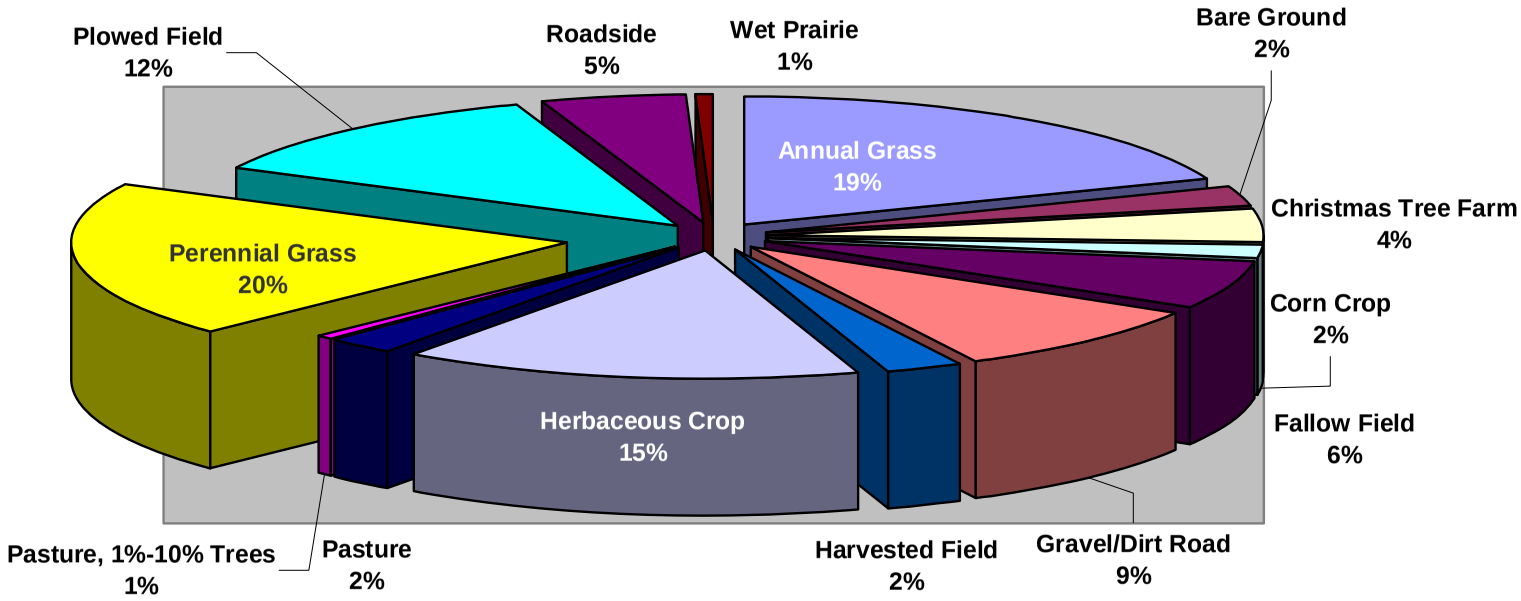


Figure 11

Primary Habitat Types Associated with Grasshopper Sparrow Detections at Roadside Point Count Stations within the Willamette Valley

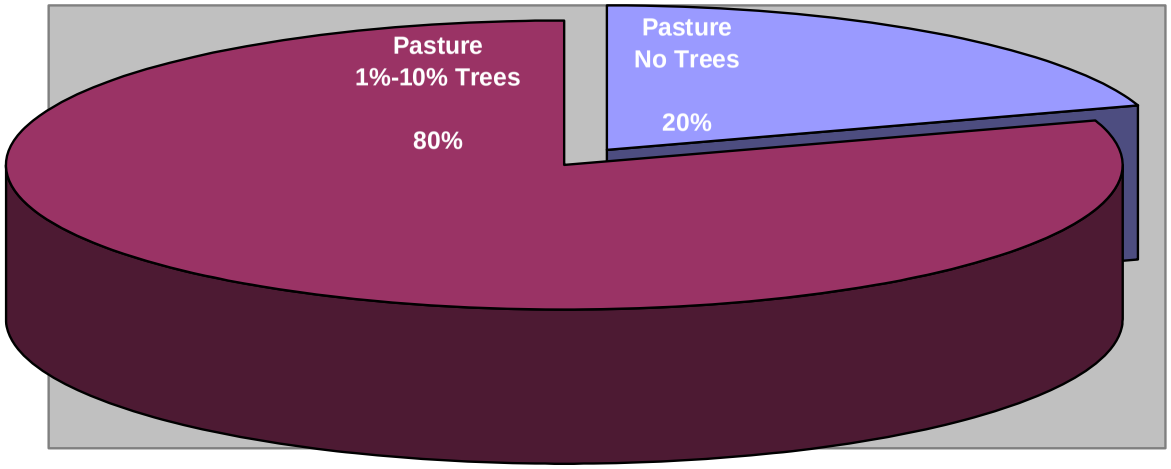


Figure 12

Height Associations for Streaked Horned Lark at Roadside Point Count Stations in the Willamette Valley

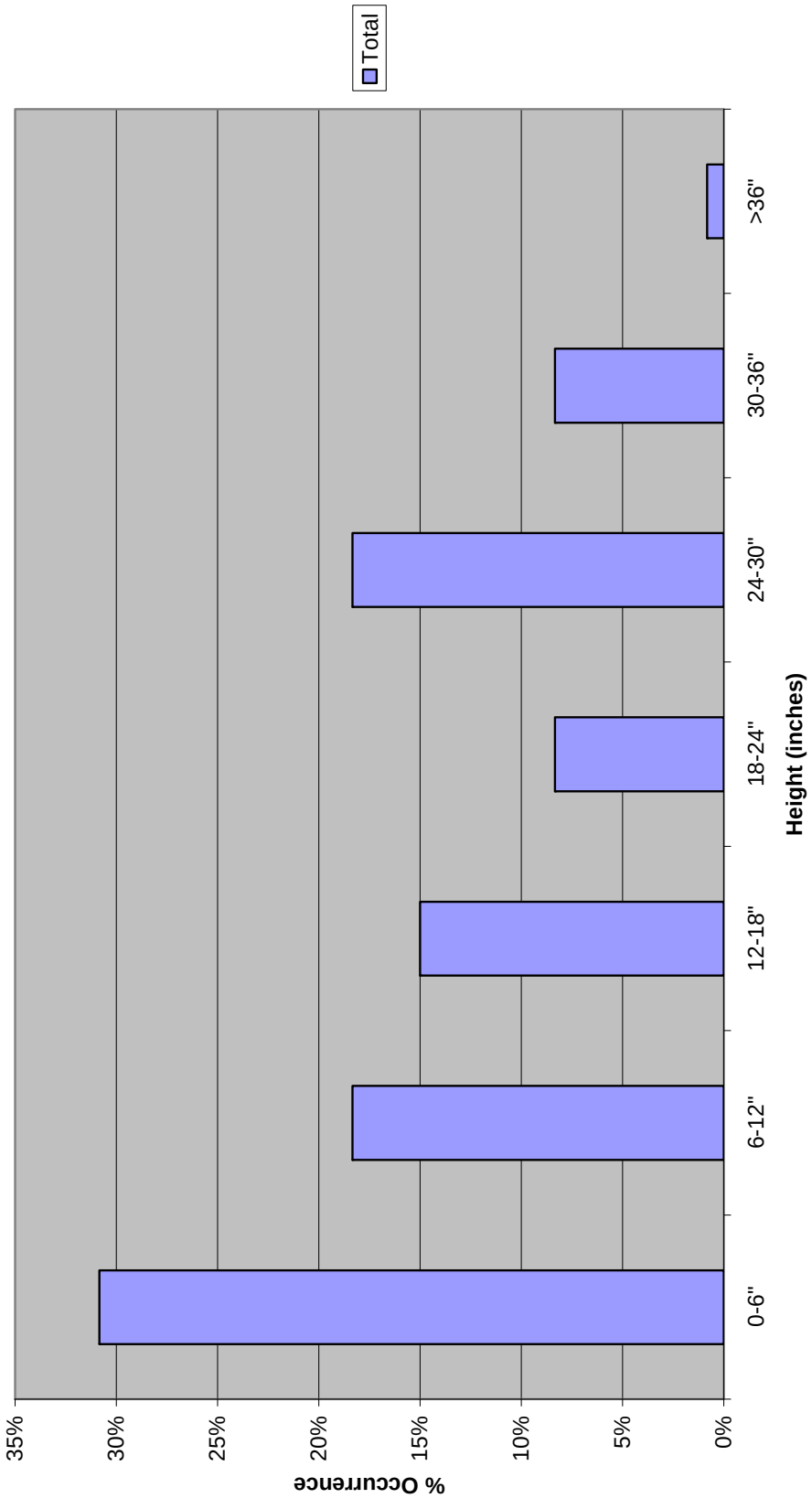


Figure 13

Height Associations for Vesper Sparrow
at Roadside Point Count Stations in the Willamette Valley

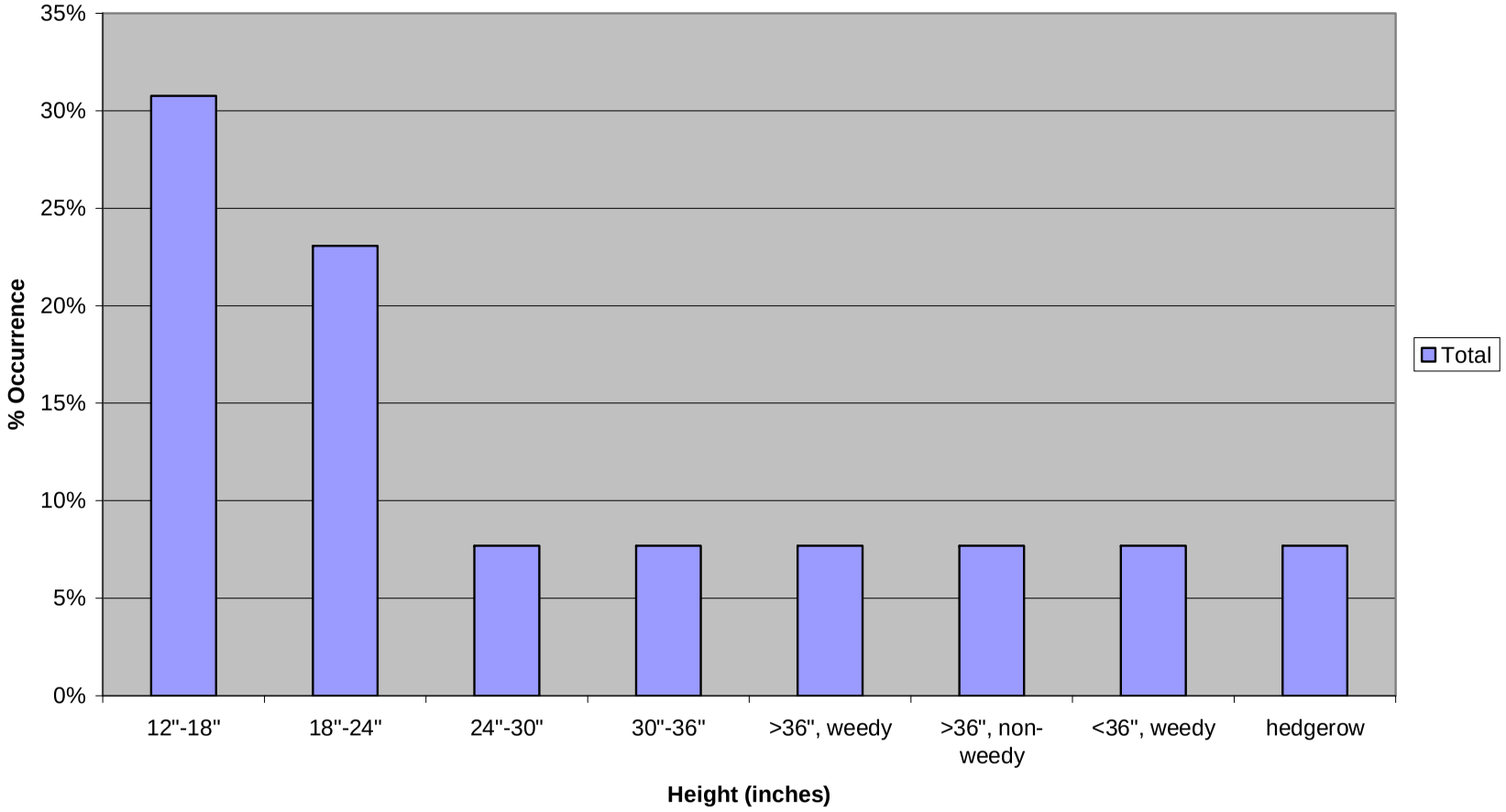


Figure 14

Height Associations for Western Meadowlark at Roadside Point Count Stations in the Willamette Valley

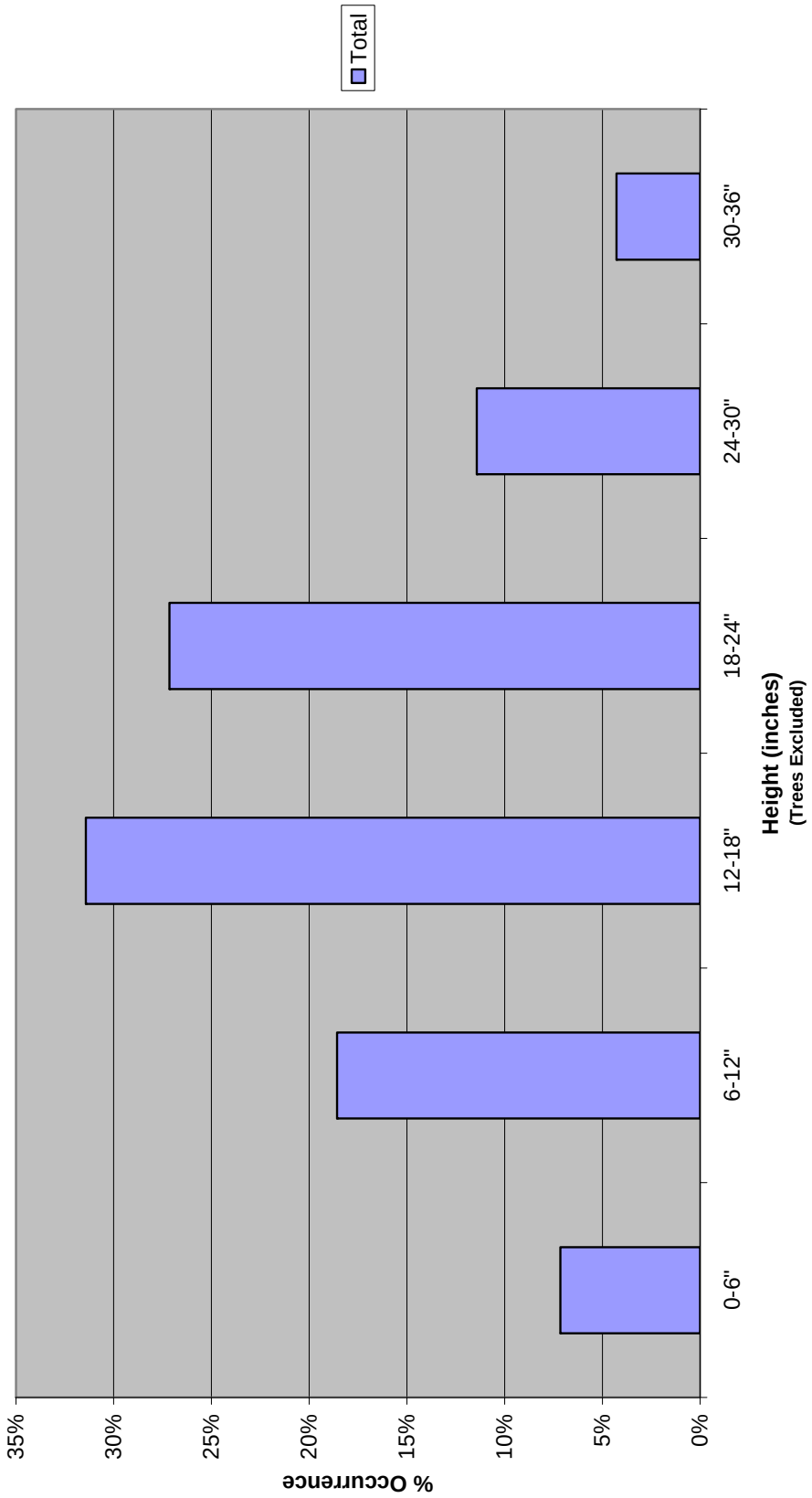


Figure 15

Habitat and Height Associations for Streaked Horned Larks Detected at Roadside Count Stations within the Willamette Valley

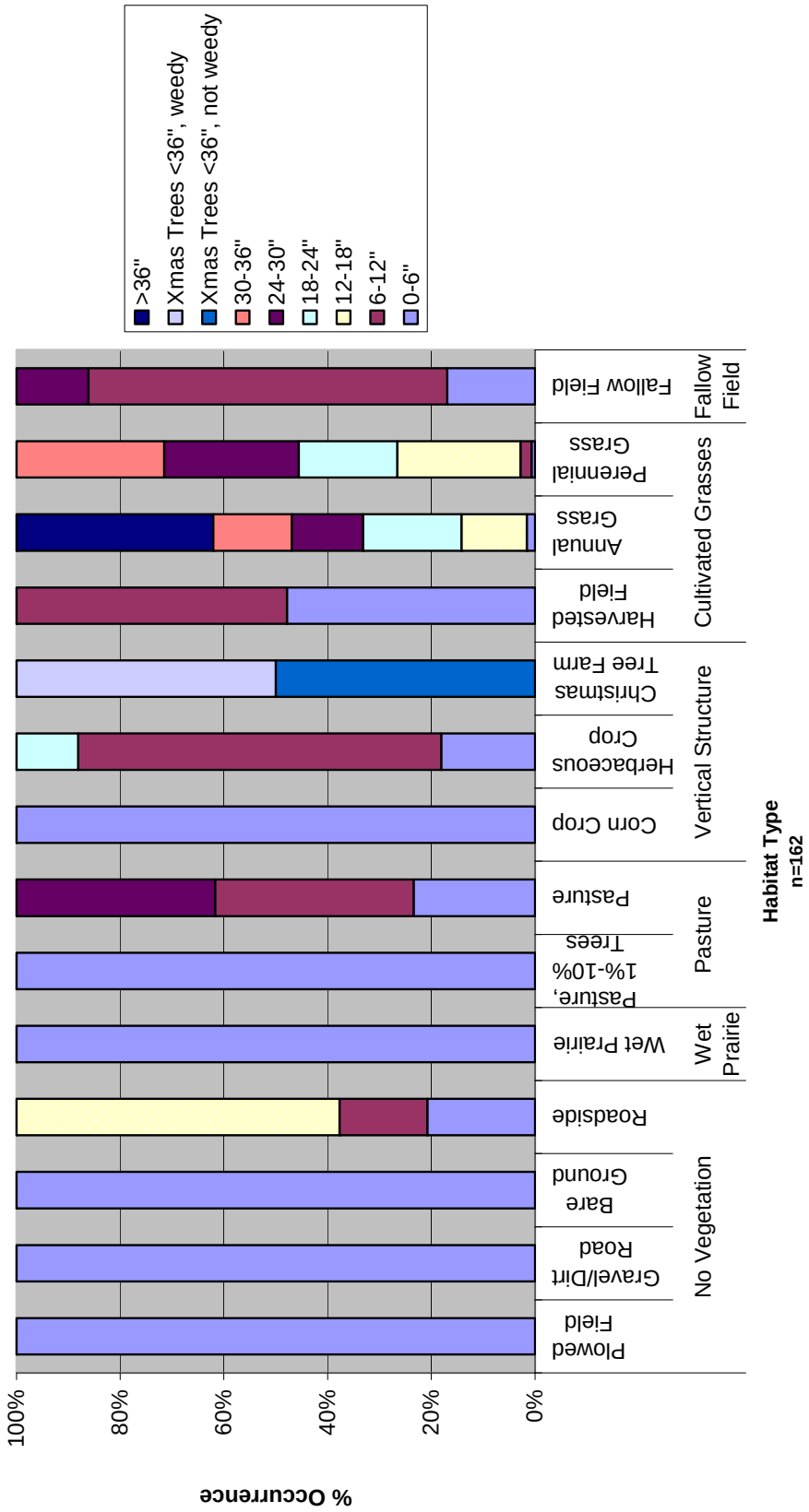


Figure 16

Habitat and Height Associations for Western Meadowlarks Detected at Roadside Point Count Stations in the Willamette Valley

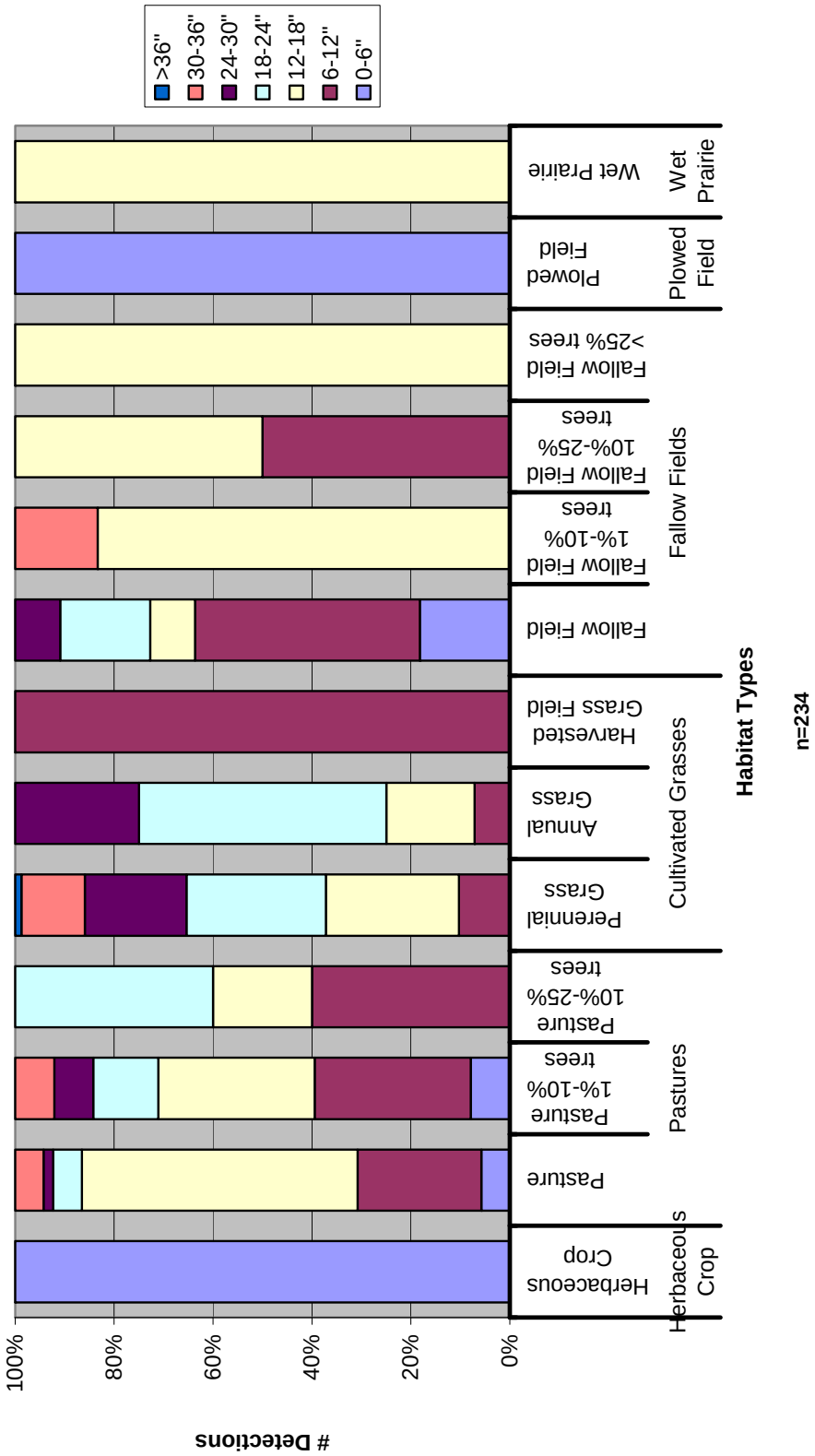


Figure 17 2008 North Willamette Valley Point Count Locations and Target Species Detections

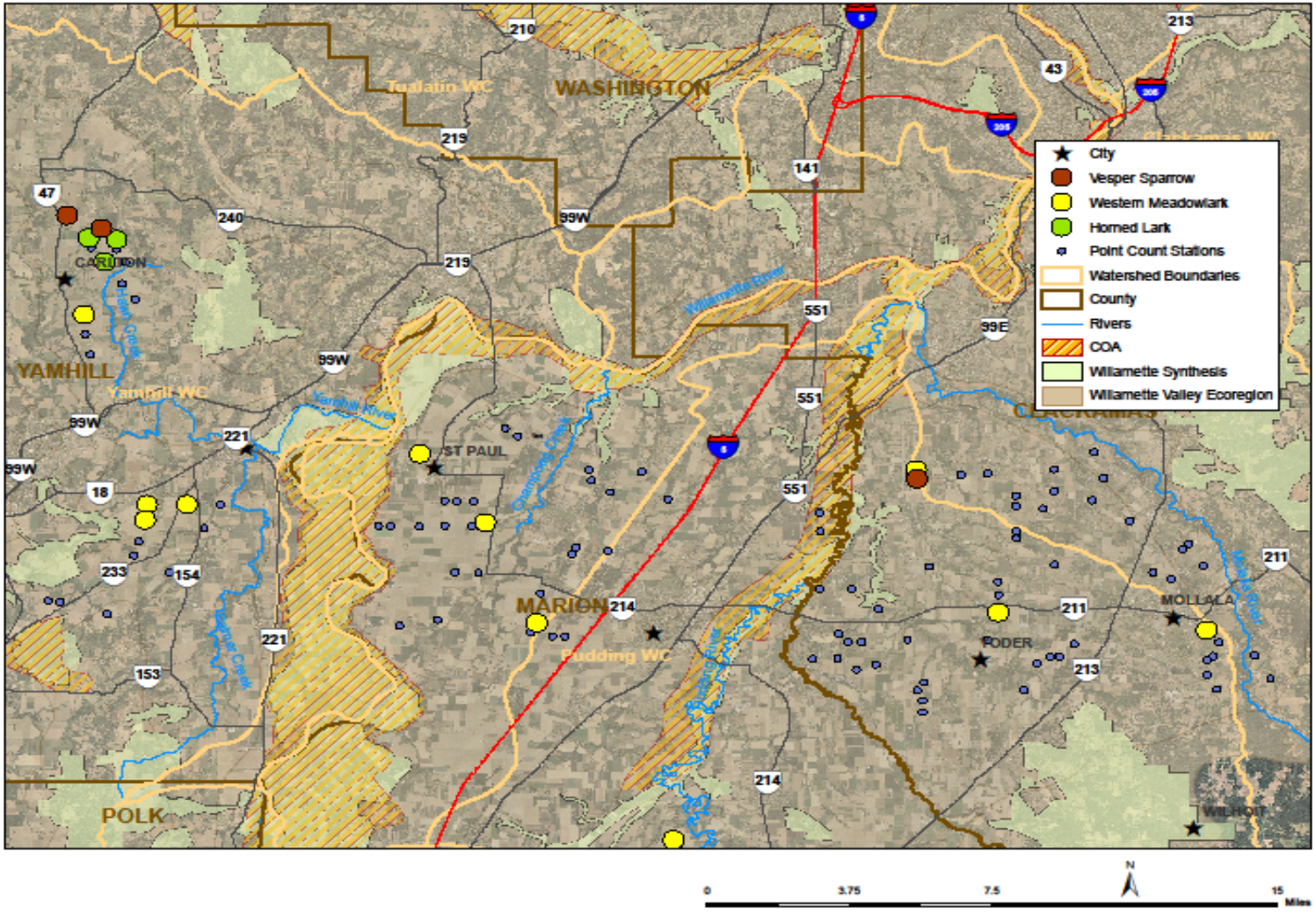


Figure 18 2008 Central Willamette Valley Point Count Locations and Target Species Detections

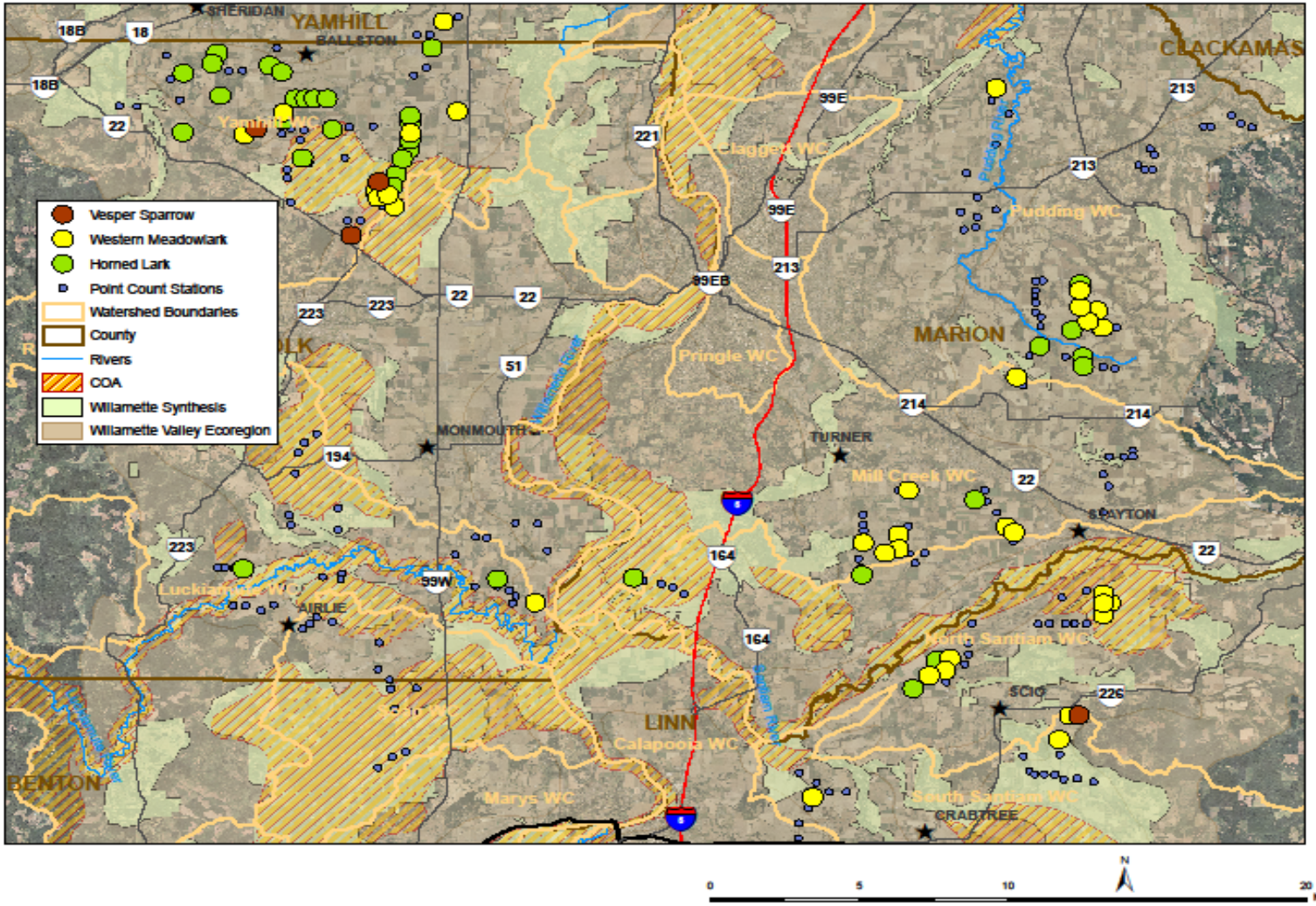
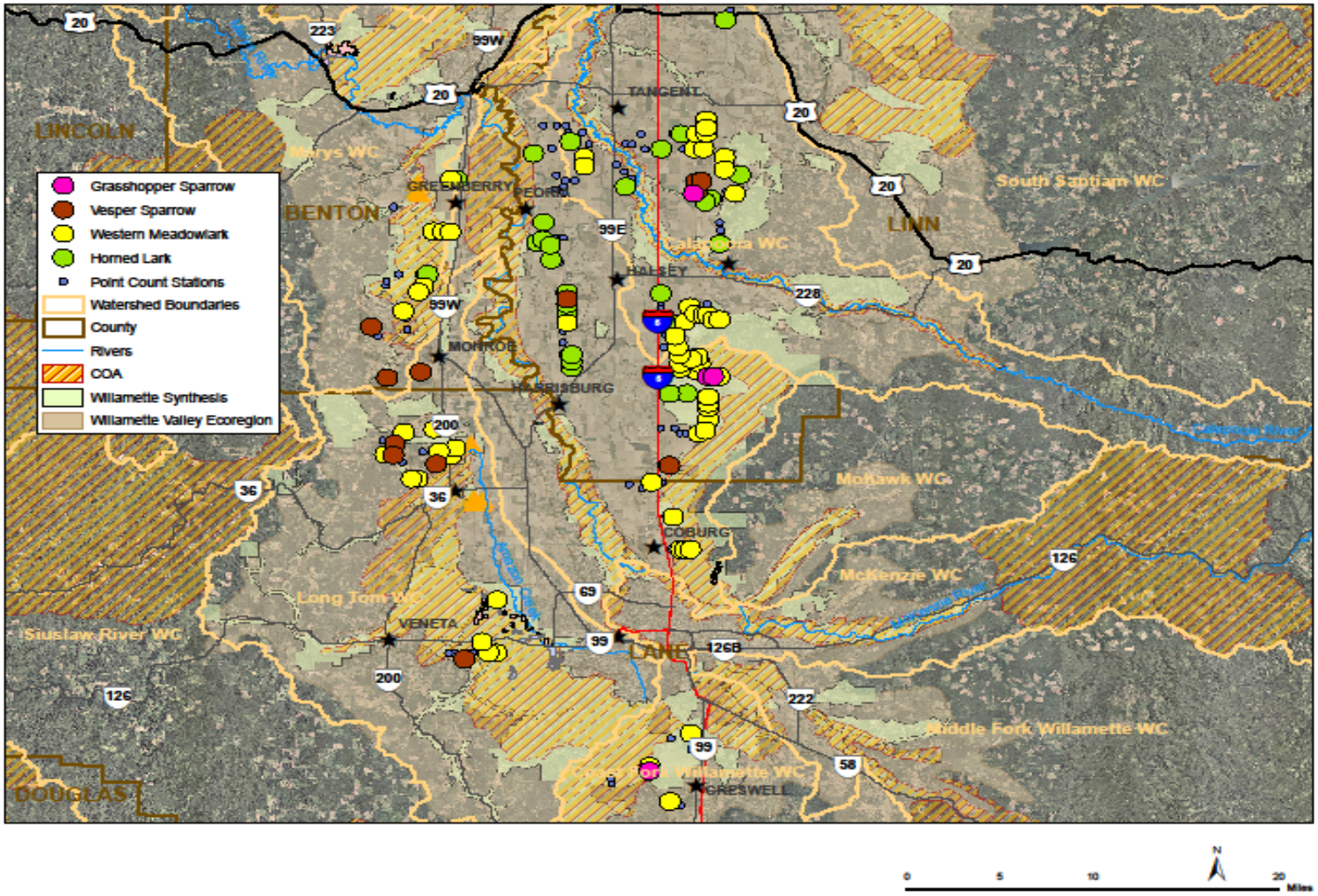


Figure 19 2008 South Willamette Valley Point Count Locations and Target Species Detections



Appendix A. Road transects in Willamette Valley grasslands previously surveyed for western meadowlark and (streaked) horned lark density estimates June 11, 1996.

Western Meadowlark
Belts Road
Duckflat Road
Riches Road
Rodgers Mt. Loop Road
Sandner Road
Buyserie Road
Morris Road

(Streaked) Horned Lark
Glasser Road
117th/Kuenzi Road
Bond Butte Road
Center School Road
Harmony Road (now Smith Rd.)
Kirk Road
Beck Road
Livermore Road

Appendix B. Region names and codes used for point count censusing in Willamette Valley grasslands, May-June 1996 and 2008.

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)	
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
Basket Slough North (BASLNO)	18	Dallas (DALL)	1-10

Appendix B. (cont.) Region names and codes used for point count censusing in Willamette Valley grasslands, May-June 1996 and 2008.

		CENTRAL VALLEY	
		Ballston (BALL)	3,6,18
		Amity (AMIT)	2,3,7,12,13
Adair East (ADAIEA)	10	Lewisburg (LEWS)	1-3
Ankeny 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
Cheshire North (CHESNO)	17	Cheshire (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 C. Habitat codes and descriptions used for point count station habitat typing and target species habitat use in Willamette Valley grasslands, 1996 and 2008

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 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
- 1350 meadowfoam

1400 **tall, non-herbaceous row crops**
- 1410 nursery/Xmas trees
  - 1411 > 3 feet tall (1996 code only)
  - 1412 < 3 feet tall (1996 code only)
  - 1413 > 3 feet tall (weedy between rows)
  - 1414 > 3 feet tall (<u>not</u> weedy between rows)
  - 1415 < 3 feet tall (weedy between rows)
  - 1416 < 3 feet tall (<u>not</u> weedy between rows)
- 1420 orchards – fruit and nut
- 1430 vineyards (including 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 on roadside right of way)

1600 **recently plowed fields** – 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

APPENDIX C. (cont.) Habitat codes and descriptions used for point count station habitat typing and target species habitat use in Willamette Valley grasslands, 1996 and 2008

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 a 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 definitely 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 traveled 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 the above)

APPENDIX C. (cont.) Habitat codes and descriptions used for point count station habitat typing and target species habitat use in Willamette Valley grasslands, 1996 and 2008

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 fence line 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 and deciduous)
Riparian forest – includes shrub and tree within riparian zone of pond, creek, stream, ditch
Ditch
Residential – includes buildings, yard, and maintained area associated with residence
Open water – ponds, creeks, ditches, etc.

APPENDIX D. 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 Height

* Height classes–ocular estimate of 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

Appendix E. Species recorded during Willamette Valley grassland breeding bird surveys, 2008.

Acorn woodpecker
American bittern
American coot
American crow
American goldfinch
American kestrel
American robin
Ash-throated flycatcher
American white pelican
Bald eagle
Barn swallow
Black-capped chickadee
Bewick's wren
Brown-headed cowbird
Black-headed grosbeak
Brewer's blackbird
Brown creeper
Black-throated gray warbler
Band-tailed pigeon
Bullock's oriole
Canada goose
California quail
Cassin's vireo
Chestnut-backed chickadee
Cedar waxwing
Chipping sparrow
Cassin's vireo
Cliff swallow
Coopers hawk
Common raven
Common yellowthroat
Dark-eyed junco
Downy woodpecker
European starling
Evening grosbeak
Great-blue heron
Golden-crowned sparrow
Grasshopper sparrow
Hairy woodpecker
House finch
Horned lark
House sparrow
House wren
Hutton's vireo
Killdeer
Lazuli bunting
Lesser goldfinch
Mallard
MacGillivray's warbler
Marsh wren
Mourning dove
Northern flicker
Northern harrier
Orange-crowned warbler
Osprey
Pileated woodpecker
Pacific slope flycatcher
Purple finch
Red-breasted nuthatch
Red-breasted sapsucker
Ring-necked pheasant
Rock dove
Red-shouldered hawk
Red-tailed hawk
Rufous hummingbird
Red-winged blackbird
Savannah sparrow
Short-eared owl
Song sparrow
Spotted towhee
Steller's jay
Swainson's thrush
Tree swallow
Turkey vulture
Vaux's swift
Vesper sparrow
Violet-green swallow
Warbling vireo
White-breasted nuthatch
White-crowned sparrow
Western bluebird
Western kingbird
Western meadowlark
Western tanager
Willow flycatcher
Wild turkey
Wilson's warbler
Winter wren
Wood duck
Wrentit
Western scrub jay
Western wood pewee
Yellow-breasted chat
Yellow warbler
Yellow-headed blackbird

Appendix F. Photographs of representative habitat types taken at point count stations within the Willamette Valley.

Northern Valley, Yoder Quad, Point 16 (north). Annual and Perennial Cultivated Grass fields. No target species detected. Photo taken May 28, 2008.

Northern Valley, Yoder Quad, Point 5 (south). Christmas Tree Farm (<36", weedy between rows). No target species detected. Photo taken May 20, 2008.

Appendix F (cont.). Photographs of representative habitat types taken at point count stations within the Willamette Valley.

Northern Valley, St. Paul Quad, Point 13 (south). Perennial Grass/Non-fields. Meadowlark singing on the fence beyond 100 meter radius. Photo June 11, 2008.

Northern Valley, Yoder Quad, Point 11 (north). Fallow fields with 10%-25% trees/shrubs. A vesper sparrow was detected within 100 meter radius of point center. Photo May 14, 2008.

Appendix F (cont.). Photographs of representative habitat types taken at point count stations within the Willamette Valley.

Central Valley, Amity Quad, Poin 7 (north). Horned lark pair detected beyond 100 meters in the cornfield. Photo taken May 15, 2008.

Central Valley, Dallas Quad, Point 4 (east). Detections of vesper sparrow and meadowlark were made in this recently mowed field. Photo taken May 29, 2008.

Appendix F (cont.). Photographs of representative habitat types taken at point count stations within the Willamette Valley.

Central Valley, Lewisburg Quad, Point 2 (east). No target species were detected in this pasture before or after mowing. Photo June 24, 2008

Central Valley, Stayton Quad, Point 17 (south). A male horned larked was observed using the area between the roadway and low crop field. Photo taken June 26, 2008.

Appendix F (cont.). Photographs of representative habitat types taken at point count stations within the Willamette Valley.

South Valley, Cresswell Quad, Point 1 (north). A grasshopper sparrow was detected in this herbaceous pasture with grass heights ranging from 12" – 18". Photo taken June 23, 2008.

South Valley, Halsey Quad, Point 4 (west). Herbaceous pasture with 1% - 10% shrub/tree cover occupied by vesper sparrow. Photo taken June 3, 2008

Appendix F (cont.). Photographs of representative habitat types taken at point count stations within the Willamette Valley.

South Valley, Indian Head Hills Quad, Point 14 (west). This annual cultivated grassland had meadowlark detected in the 1996 surveys as well as the 2008 surveys. Photo taken May 8, 2008.

South Valley, Indian Head Hills Quad, Point 10 (west). Meadowlark and grasshopper sparrow utilized pasture with fewer than 10% tree cover. Photo taken May 8, 2008.