

**Limiting Factors on Populations of Oregon Vesper Sparrow:
Understanding Demographic and Associated Habitat Parameters
to Direct Conservation Actions in the Willamette Valley, 2016-2019**

Final Report, 2019



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Background

Oregon Vesper Sparrow is one of the most imperiled birds in North America. Historically, this subspecies was a relatively common breeding bird throughout grassland and savannah habitats from southwestern British Columbia, through western Washington and Oregon, and into northwestern California (Altman 2011). Currently, it has experienced breeding range contraction from British Columbia (S. Beauchesne pers. comm.) and California (B. Altman pers. obs.), and wintering range contraction from Baja (Patten et al. 2003) and southern California (Erickson 2008). In addition, many local breeding populations have been extirpated. Breeding Bird Survey data indicates a statistically significant declining population trend of 5.01%/year (Sauer et al. 2014). A recent range-wide inventory in 2013 (Altman 2015), in conjunction with additional surveys and extensive anecdotal information, suggests that the remaining population is <3,000 birds (2,025-2,900; Altman 2016).

Oregon Vesper Sparrow is considered of high conservation concern by all natural resources entities within its breeding and wintering range. In British Columbia, it was listed as an Endangered Species in April 2006 (COSEWIC 2006). It is a Bird of Conservation Concern for the U.S. Fish and Wildlife Service (USFWS 2008), and a Species of Greatest Conservation Need in both the Oregon and Washington State Wildlife Action Plans (ODFW 2016, WDFW 2015). It is a candidate for listing as Endangered or Threatened in Washington State, and the process for consideration of listing under the State Endangered Species Act has been initiated (H. Anderson pers. comm.). On the ODFW Sensitive Species List, it is considered Sensitive-Critical, a subcategory which indicates “imperiled with extinction.” In California, the wintering population is considered a Bird Species of Special Concern (Erickson 2008). Continentally, Oregon Vesper Sparrow is one of 22 subspecies recognized as a “distinct population of high conservation concern and extremely high vulnerability” in the 2014 State of the Birds Watch List report (Rosenberg et al. 2014). Lastly, a Petition to List it as Threatened or Endangered under the U. S. Endangered Species Act (ESA) was submitted to the Department of Interior by the American Bird Conservancy in November, 2017. On June 27, 2018, the 90-day finding concluded that Oregon Vesper Sparrow *may be warranted* for listing, which initiated a 12-month status review to determine if ESA listing is appropriate (Federal Register 2018).

Need

The population status of Oregon Vesper Sparrow warrants a sense of urgency for all appropriate conservation actions. However, these efforts are precluded without understanding of the cause(s) of the population status. A synthesis of information for a Conservation Assessment (Altman 2016) suggested that demographic vital rates (e.g., survival, productivity, dispersal) and their associated habitat conditions (e.g., land use and management, vegetative composition and structure) are likely primary causative factors in the population declines and extirpations. This was based on 1) observations of many areas of unoccupied suitable habitat, especially at sites where there already is a population, 2) examples of many local extirpations of populations where there were no habitat changes, 3) areas with significant habitat restoration but no establishment of populations, and 4) a preponderance of small and isolated populations that are inherently subject to a high degree of potential demographic issues (Shaffer 1981). Further, determining the vital rates that are the proximate demographic drivers of population change is critical for directing effective conservation actions (DeSante et al. 2001, Saracco and DeSante 2008). With a better understanding of demographic parameters at various scales and contexts, strategies can be developed to counter the causative factors. Land managers and responsible agencies can then begin to implement activities to stabilize and recover populations, potentially precluding regulatory intervention.

The challenges of conservation of Oregon Vesper Sparrow are further exacerbated by its extensive occurrence on private lands. Range-wide, approximately 80% of the population occurs on private lands, but within the Willamette Valley, it is >95% (Altman 2016). Further, the vast majority of those private lands are working lands, primarily pastures and Christmas tree farms. Thus, knowledge of potential impacts on those populations (both negative and positive), and potential opportunities for private land partnerships and land management for suitable habitat and viable populations will be essential for the birds conservation.

History

In response to the need for an understanding of demographic vital rates, American Bird Conservancy initiated this project with a pilot study at one site in 2016 (Bald Hill Farm), and the full study at numerous additional sites in 2017-2019. Initial results through 2017 and 2018 have been reported previously (Altman 2017, Altman 2018). In general, cumulative data summaries suggest relatively high annual survivorship and site fidelity for both older adults and first-year birds, high post-fledging survivorship, low to average measures of productivity with the most concern for nest success and low egg hatch rates, and many examples of both between and within season dispersal among sites.

This project builds upon other research and monitoring conducted by the Project Manager and other cooperators since 2013 including territory-mapping, location and size of populations, and assessment of habitat types and conditions at sightings (Altman 2015, 2016). This project was designed to ramp-up those efforts in intensity and spatial scale to provide sufficient data for statistical analyses on the type, degree, and context of demographic vital rates and associated habitat parameters limiting populations. The project also represents a unique cooperative effort to conduct consistent research simultaneously throughout the birds' range, with similar efforts occurring concurrently in the Klamath Mountains ecoregion in southwest Oregon and the Puget Lowlands ecoregion in southwest Washington. This approach is counter to the more prevalent scenario of multiple entities working independently and often inconsistently in their research and conservation efforts. Thus, we feel our cooperative, range-wide approach is very efficient, and will be most effective in understanding what factors are limiting populations at multiple scales, and how best to address those factors through conservation and management actions.

Objectives

This project seeks to understand the roles of demographic vital rates as potential limiting factors in an Oregon Vesper Sparrow meta-population in the Willamette Valley to effectively and efficiently direct conservation actions. The primary objectives are to:

- 1. Evaluate the role of multiple parameters within three demographic vital rates (i.e., productivity, survivorship, recruitment/dispersal) and associated habitat types and conditions as potential limiting factors in the population status of Oregon Vesper Sparrow.**
- 2. Recommend strategies to address and prioritize actions that ameliorate limiting factors at appropriate scales to stabilize and recover populations of Oregon Vesper Sparrow.**



Sites

The study was conducted at 22 sites, mostly within a 12-mile radius of Corvallis, in the Willamette Valley (two new sites in 2019 extended that out to a 24 mile radius). There is an assessment of population status on all sites, and intensive demographic monitoring (i.e., color-banding and resights, nest searching and monitoring) and habitat sampling on a subset of 10 sites (Table 1). Among the 10 sites, six have relatively large populations (primary sites: 14-30 pairs) and were intensively surveyed, and four have small populations (secondary sites: 1-6 pairs) and were surveyed less frequently. The 12 tertiary sites were visited 1-3 times/season to assess presence of birds.

Table 1. Oregon Vesper Sparrow Willamette Valley study sites in 2018 near Corvallis, Oregon.

Site	Habitat Type	Ownership
Primary		
Soap Creek Ranch	Pasture	Oregon State University
Crestmont Ranch	Pasture	Private - Individual
Bald Hill Farm	Pasture/Prairie	Greenbelt Land Trust
Noble Mountain Sauerkraut	Christmas Tree	Private - Business
Holiday Starr Creek Road	Christmas Tree	Private - Business
Holiday Bellfountain Road	Christmas Tree	Private - Business
Secondary		
Holiday Berry Creek	Christmas Tree	Private - Business
Holiday Cory Road	Christmas Tree	Private - Business

Crisp-Lidell	Prairie	Benton County
Pearcy-Schoner	Prairie	Private – Individual
Tertiary		
Fitton Green	Prairie	Benton County
Cardwell Hill Winery	Winery	Private - Business
Lupine Meadows	Prairie	Greenbelt Land Trust
Viehl Ranch	Pasture/Prairie	Private - Individual
Oak Creek Ranch	Pasture	Oregon State University
Sunrise Tree Farm	Christmas Tree	Private - Business
Lone Star Ranch	Pasture	Private - Individual
Wren Prairie	Prairie	Private - Individual
Wooden Knolls Road	Pasture	Private - Individuals
Consumer's Power	Pasture	Private - Business
Labare Road	Christmas Tree	Private - Individual
Raindance Ranch	Pasture	Private - Individual

Primary Sites – frequent visits (e.g., multiple times a week) to sites with relatively large populations to assess productivity, survival, and dispersal

Secondary Sites – regular visits (e.g., once every 10-14 days) to sites with relatively small populations to primarily assess survival and dispersal

Tertiary Sites - occasional visits (e.g., 1-3 times during breeding season) to sites with suitable habitat and/or small populations to determine presence and dispersal

Progress and Results

Significant results from 2016-2019 for the primary demographic metrics include:

Survivorship

- We have color-banded 447 birds (235 adults and 212 hatch-year) at 11 sites. Among adults, this included 192 males, 26 females, and 17 birds of unknown gender. Among hatch-year birds, this included 162 nestlings and 50 fledglings.
- We have documented 237 birds (179 banded as adults and 58 banded as hatch-year) to have returned in the year after their banding or last resighting.
- Annual survivorship was 64.4% for adults and 37.9% for hatch-year birds. Among adults this included 68.5% (n=159) for males and 54.8% (n=17) for females. Among hatch-year birds, this included 36.8% of the birds banded as nestlings (n=42) and 41.0% of the birds banded as fledglings (n=16).
- Post-fledging survivorship from the one site in which this was assessed (i.e., Soap Creek Ranch; n=60) was 72.5% through three weeks and 64.5% through six weeks.

Productivity

- Apparent nest success (i.e., without corrections for number of observation days) was 52.1% (n=50). The Mayfield estimate of nest success (i.e., corrected for number of observation days) was 24.3%.
- Apparent and Mayfield estimates of nest success were 57.4% and 30.6% respectively in pastures (n=35), 62.5% and 31.7% in Christmas tree farms (n=10), and 26.3% and 7% in restoration prairies (n=5).
- Egg hatch rates were 86.7% (n=113 eggs from 31 nests). This included 84.4% in pastures (n=77 eggs from 21 nests), 93.8% in Christmas tree farms (n=16 eggs from 4 nests), and 87.5% in prairies (n=16 eggs from 5 nests).

- Fledge rates were 3.2 birds/successful nest (n=50) and 1.7 birds/total nest (n=96).

Dispersal

- Site fidelity was 97.5% for adults (n=168) and 83.6% for hatch-year birds (n=45).
- There were 30 examples of dispersal to a new site.
- Among the 15 between-season movements: nine were first-year birds and six were adults; and 10 were males, four were females, and one was unknown. The longest dispersal distance was 16.5 miles. Among females the longest dispersal distance was nine miles. There were seven changes in habitat type with five moving from grassland to Christmas tree and two from Christmas tree to grassland.
- There were 15 examples of within-season movement to a different site (eight adult breeding birds and seven fledglings with natal dispersal). Among the adults, six were within the breeding season and two were post-breeding; and seven were males and there was one female. The longest distance was 8.4 miles for both adults and fledglings. There were two changes in habitat type with one each post-breeding adult and natal dispersal from Christmas tree to grassland.
- Among the six examples of within-season natal dispersal through 2018, three were documented to have survived based on resighting in 2019. All three of these first-year birds established breeding territories in the dispersal site, not their natal site. Two of the three were females and the other was a male.
- All dispersal events have been to occupied sites except one; a between-season return of a first-year male to an unoccupied site in 2018, but a site that had been occupied in 2017. This bird stayed approximately one week but did not find a mate and moved back to its natal site where it found a mate and nested.
- Approximately 10-12% of the population is annually seeking new sites (3-4% of the returning adults, and 7-8% of the returning first-year birds).

Population Size

- Since the inception of the study in 2016, three sites with small populations (2-4 pairs) have been extirpated. Three additional sites with small populations (2-5 pairs) as recent as 6-7 years ago, were extirpated by the time of the initial survey in this study.
- One primary site, Bald Hill Farm, has seen a population decline of approximately 41% from 22-24 pairs to 13-14 pairs. Population size has remained stable at the other five primary sites.



Successes

Post-fledging Survivorship Data

There were numerous successes associated with the amount and types of data collected as described above. The most significant is the ability to collect data on post-fledging survivorship. This data is critical for population and life cycle modeling, but it is often a difficult to document population metric. Typically, this requires placing transmitters on nestlings. However, the fledglings appear to stay on their natal grounds for 1-3 months after fledging. With concerted effort and coverage in July, August, and early September, we have been able to regularly resight these birds and quantify a metric that few studies are able to document.

Access

There was noteworthy success in permitted access to two new private properties in 2019 - Holiday Tree Farms Cory Road and Raindance Ranch. The former is a Christmas tree farm with a population of 8-10 pairs of Oregon Vesper Sparrow. It also extends the study area another 12 miles south from the previous southern-most site. The latter is a private ranch under a conservation easement where cattle are grazed on part of the prairie/savannah. It had 2-3 pairs in previous years, but there were no detections in 2019.

Permitted access to private properties has been one of the major successes in this project with the majority of the 22 sites on private lands including 5 of the 6 primary sites with relatively large populations. Since nearly all of the populations of Oregon Vesper Sparrow in the Willamette Valley are on private working lands (i.e., pastures and Christmas tree farms), our ability to access and collect data on these properties is a major accomplishment, since the results will reflect the reality of population viability within the context of working lands.

Challenges

Finding Nests and Banding Females

Challenges we have faced so far have been inherent ecological challenges of finding nests and the difficulty in capturing females for color-banding. Most ground-nesting bird studies are subject to the labor intensive activity of nest finding because of the ecological adaptation to conceal nests in an environment with easy access for predators. The most practical solution is continued intensive effort.

The low sample sizes of data on all population metrics for females is problematic from a population modeling standpoint. We have been reluctant to try to capture females at nests due to potential for the disturbance causing abandonment, increased predator activity in the area associated with our presence, and overall potential effects on nest success relative to nests where this disturbance does not occur. Most female captures are incidental to capturing males using playbacks. In 2019 we were able to record nestling begging calls which showed some promise for soliciting the interest of females.

Determination of Nest Predators

Two of the primary sites have large and rapidly increasing populations of Wild Turkeys. There is a need to determine if they are significant nest predators. However, this is difficult without the use of cameras. We will be seeking support in 2020 to initiate the use of nest cameras to understand the degree of nest predation by Wild Turkeys.

Lessons Learned

Conservation of a Metapopulation

Although site-fidelity is high, the documentation of many dispersal events between breeding seasons, within a breeding season, and during post-fledging prior to migration indicates that the birds are functionally linked into a single metapopulation. Even though the sites are managed independently under separate land-owners and land uses including multiple habitat types, no individual population appears to be isolated from the others based on the dispersal of birds among all six primary sites.

The determination that the populations at each site are functioning within a metapopulation via dispersal and interchange of individuals provides critical knowledge to direct conservation actions. In particular, actions taken at a subset of the populations to increase the size or persistence of those populations will also benefit the persistence of the metapopulation. This is important when the sites are patchily distributed and mostly on private working lands. Efforts can be focused on sites with ownerships supportive of conservation actions for Oregon Vesper Sparrow with confidence that those also are efficient actions to support the sustainability and recovery of the metapopulation.

Conspecific Attraction for Establishment of Populations on Conservation Lands

There is an urgent need to establish populations on unoccupied conservation lands that provide suitable habitat since almost all of the metapopulation is on private working lands. Even with the high level of site fidelity, there has been significant examples of dispersal to a different breeding site in subsequent years. However, all but one of the examples of dispersal to a new breeding site have been to occupied sites. Even that one example was unsuccessful in finding a mate and after a week went back to its natal site in the previous year.

The documentation of three within-season natal dispersing birds to establish breeding territories at their dispersal site and not their natal site provides another potential avenue for colonization of unoccupied sites. These birds apparently imprinted on their dispersing site and returned there rather than their natal site, even out to documented distances of 8.4 miles.

These factors suggest that the presence of conspecifics may be important for colonization by dispersing birds. Further, Oregon Vesper Sparrows, especially males, respond strongly to playbacks used to capture adults for color-banding. Females arrive after males in the spring and select sites based on the presence of males.

One method that can be used to facilitate colonization is artificial conspecific attraction (i.e., playbacks and decoys). This has been successfully used for a number of bird species, especially colonial nesting birds (Ahlering et al. 2010). It has been much less used for passerine birds, but recent efforts have shown some successes with grassland birds (Ahlering et al. 2006, Nocera et al. 2006).

Thus, there is an opportunity based on the birds' biology, and a method that has been successfully used to address the need to encourage targeted colonization to desired locations (e.g., habitat restoration sites or otherwise suitable habitat on dedicated conservation lands).

The Need to Enhance Productivity

Most productivity metrics indicate comparatively average rates, except for clutch size and egg hatch rates. Both these metrics have a direct bearing on limiting potential productivity, and in combination

can affect overall population size with reductions in both eggs laid and eggs hatched. Thus, the initial reaction is concern about these metrics on productivity. However, nest success and fledge rates/successful nest are average to slightly above average, suggesting these may compensate to some degree the reduced metrics of clutch size and egg hatch rates. However, this is a tenuous balance to maintain a population when some metrics are compensating for other. There is no margin for error, and the balance can be compromised with one poor year of the metric being counted on for countering the low metric.

Management opportunities to enhance of productivity will likely require identification of nest predators, the primary source of nest failures. Additionally, it will be important to determine the reason for low hatch rates. Both of these can be addressed with the expanded project components of nest cameras and candling of eggs.

Extirpations of Small Populations

The extirpations of six small populations either prior to or during the study, and the decline of the population at one primary site, mirrors similar data elsewhere in their range (Altman 2016). Attempts to understand the causes of these extirpations are confounded and overwhelmed by the inherent issues of small populations.

The sustainability of small populations is always tenuous, independent of specific threats or issues about demography or habitat. Valid and even successful efforts to address one or more issues can be negated if another issue, even one resulting from natural fluctuations in some demographic factor, results in extirpation. Thus, prioritizing investment of resources in small populations over large populations comes with a greater risk of failure. For this and other reasons, the highest priority should be maintaining or enhancing larger populations, which although still subject to the same natural and anthropogenic factors, are more resilient than small populations to withstand a population decline and recover in future years. Large populations also provide the potential for more surplus birds for dispersal and population establishment or enhancement elsewhere following years of high productivity. This is critical for birds with high site-fidelity and limited likelihood of dispersal unless forced by exceeding carrying capacity of a site.

Additional Information

OWF funding in 2019 was used to support habitat assessment at nests and random plots, and acquire some equipment (mp3 player, speaker, color-bands). Other funding sources included Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service, Greenbelt Land Trust, Wildlife Forever Fund, and American Bird Conservancy.

Literature Cited

- Altman, B. 2011. Historical and current distribution and populations of bird species in prairie-oak habitats in the Pacific Northwest. *Northwest Science* 85:194-222.
- Altman, B. 2015. Oregon Vesper Sparrow range-wide inventory and habitat assessment: final report. Unpublished report American Bird Conservancy. Center for Natural Lands Management, State Wildlife Grant G1024-06.
- Altman, B. 2016. Conservation Assessment for Oregon Vesper Sparrow. Prepared for USDA Forest Service and USDI Bureau of Land Management Interagency Special Status Species Program. www.fs.fed.us/r6/sfpnw/issssp/planning-documents/assessments.shtml.

- COSEWIC 2006. COSEWIC assessment and status report on the Vesper Sparrow *affinis* subspecies *Poocetes gramineus affinis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 22 pp.
- DeSante, D. F., D. R. O'Grady, and M. P. Nott. 2001. Identifying the proximate demographic cause(s) of population change by modeling spatial variation in productivity, survivorship, and population trends. *Ardea* 89:185-208.
- Erickson, R. A. 2008. Oregon Vesper Sparrow. Pages 377-381 in W.D. Shuford and T Gardali (editors), *California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California*. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento.
- Federal Register, 2018. Volume 83, Number 124, Wednesday June 27, 2018. U.S. Fish and Wildlife Service Proposed Rule. Pages 30091-30094
- Oregon Department of Fish and Wildlife. 2016. Oregon Conservation Strategy. Oregon Department of Fish and Wildlife, Salem, Oregon.
- Patten, M. A., G. McCaskie, and P. Unitt. 2003. *Birds of the Salton Sea: Status, Biogeography, and Ecology*. University of California Press, Berkeley.
- Rosenberg, K. V., D. Pashley, B. Andres, P. J. Blancher, G. S. Butcher, W. C. Hunter, D. Mehlman, A. O. Panjabi, M. Parr, G. Wallace, and D. Wiedenfeld. 2014. The State of the Birds 2014 Watch List. North American Bird Conservation Initiative, U.S. Committee. Washington, DC. 4 pages. www.stateofthebirds.org/extinctions/watchlist.pdf.
- Saracco, J. F. and D. F. DeSante. 2008. Assessing landbird monitoring programs and demographic causes of population trends. *Journal of Wildlife Management* 72:1665-1673.
- Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2014. The North American Breeding Bird Survey, Results and Analysis 1966-2012. Version 02.19.2014. USGS Patuxent Wildlife Research Center, Laurel, MD.
- Shaffer, M. L. 1981. Minimum population sizes for species conservation. *Bioscience* 31:131-134.
- U.S. Fish and Wildlife Service. 2008. *Birds of Conservation Concern 2008*. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. [Online version available at <<http://www.fws.gov/migratorybirds/>>].
- Washington Department of Fish and Wildlife. 2015. Washington's State Wildlife Action Plan. Washington Department of Fish and Wildlife, Olympia. <http://wdfw.wa.gov/publications/01742/wdfw01742.pdf>.

