Landbird Monitoring

2017 Results from Oregon Caves National Monument and Preserve, Lava Beds National Monument, and Redwood National and State Parks

Natural Resource Data Series NPS/KLMN/NRDS—2018/1180
ON THE COVER
Bewick’s Wren
Photograph by: James Livaudais ©2018
Landbird Monitoring

2017 Results from Oregon Caves National Monument and Preserve, Lava Beds National Monument, and Redwood National and State Parks

Natural Resource Data Series NPS/KLMN/NRDS—2018/1180

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National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado
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All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

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Abstract

In 2017, the Klamath Inventory and Monitoring Network (KLMN) of the National Park Service implemented the tenth year of a long-term landbird monitoring protocol. Klamath Bird Observatory, in partnership with the KLMN, developed the protocol and completed this tenth year effort. Multiple standard avian sampling methods were implemented, including variable circular plot point counts, area search surveys, mist netting, species checklists, and habitat surveys. In 2017, a fourth year of point counts were completed, along with corresponding species checklists and habitat surveys, at 25 locations within Lava Beds National Monument, and 30 locations within Redwood National and State Parks. The operation of an ongoing constant effort monitoring station, which included mist netting, point counts, area searches, species checklists, and habitat surveys, continued at Oregon Caves National Monument and Preserve during the breeding and fall migration seasons. Relative abundance (birds/station), as measured by point count and area search methods, was calculated for all survey sites combined within each park. Total captures, by season, were calculated using constant effort mist netting data. Species of conservation importance were among the most abundant species at each park. Results are presented along with conservation status of individual species based on Partners in Flight state and continental plans and Oregon and California Wildlife Conservation Strategies. This tenth year of implementation of the KLMN landbird monitoring program continued to lay the groundwork for improved understanding of landbird status and long-term trends in each park. When analyzed in the framework of the Klamath Bird Monitoring Network, the contribution of KLMN parks to bird conservation in this region will help inform landbird conservation in the West.

Acknowledgments

We would like to thank John Alexander, Kathryn Irvine, Sean Mohren, and Daniel Sarr for their contributions to the landbird monitoring protocol. Implementation of the monitoring program would not have been possible without the help of both network and park staff. Special thanks to Alice Chung-MacCoubrey, Eric Dinger, Jay Harris, Jessica Middleton, Randy Paylor, John Roth, Kristin Schmidt, Katrina Smith, and Amber Transou for their logistical support in 2017. We appreciate Allison Snyder’s support for data management. We would like to acknowledge Caitlyn Gillespie who oversaw the point count field season. The dedication of the field crews made this season successful. Point count surveys were completed by Jim DeStaebler, Frank Lospalluto, and Claudia Strijek. The constant effort monitoring station was run by Robert Frey with assistance from Luiza Figueira Rodrigues and Pedro Martins with Klamath Bird Observatory student volunteer interns Eric Cannizzaro, Gemma Green, Aranya Iyer, Martin Lopez, Claire Nemes, Christine Rholl and Nathan Trimble.
Introduction

In 2017, the Klamath Inventory and Monitoring Network (KLMN) of the National Park Service (NPS) implemented the tenth year of their long-term landbird monitoring protocol (Stephens, Mohren et al. 2010). Klamath Bird Observatory, in partnership with the KLMN, developed the protocol and has completed the monitoring since 2008. This annual report provides a summary of 2017 efforts, including (1) a summary of the monitoring protocol, (2) a summary of point count and area search surveys and constant effort monitoring efforts, and (3) a summary of birds detected at each of the park units where monitoring occurred.

The KLMN monitors natural resources in parks of southern Oregon and northern California, including Crater Lake National Park (CRLA), Lassen Volcanic National Park (LAVO), Lava Beds National Monument (LABE), Oregon Caves National Monument and Preserve (ORCA), Redwood National and State Parks (REDW, and Whiskeytown National Recreation Area (WHIS). These park units fall within the Klamath Region. This region includes a broad range of topography, elevation, and corresponding climate and vegetation. The region is recognized for its rich biodiversity, which is represented by diverse avifauna (Trail et al. 1997, Della Sala et al. 1999, Stephens et al. 2016).

Landbird monitoring contributes to the vital signs monitoring program that has been developed by the KLMN (Sarr et al. 2007). A landbird monitoring protocol was designed to yield important information about avian community composition, status of landbirds in a given year, and long-term population trends of specific species for each KLMN park unit (Stephens, Mohren et al. 2010). The avian sampling methods incorporated in this protocol include point count surveys, constant effort mist netting, area search surveys, and a compilation of species checklists at specific sites. The methodology selected for each park was based on park unit size, habitat composition, and historical bird monitoring efforts (Stephens, Mohren et al. 2010).

KLMN landbird monitoring contributes to regional and continental bird monitoring programs and aligns with the U.S. North American Bird Conservation Initiative Monitoring Subcommittee recommendations for improving avian monitoring (US NABCI 2007). In addition, KLMN landbird monitoring is integrated with an extensive regional bird monitoring network. The Klamath Bird Monitoring Network is a bird monitoring partnership that extends across the Klamath-Siskiyou Bioregion (Alexander et al. 2004). It has been coordinated by the Klamath Bird Observatory and U.S. Forest Service Redwood Sciences Laboratory for over 20 years. This effort has yielded a substantial regional dataset with information about landbird distribution, population trends, and population demographics (Alexander et al. 2004). Additionally, data are contributed to Avian Knowledge Northwest, a regional node of the Avian Knowledge Network. The KLMN landbird monitoring program also fits within continental monitoring programs, including the Landbird Monitoring Network of the Americas (Alexander and Ralph 2005) and the Monitoring Avian Productivity and Survivorship Program (DeSante et al. 2004).

The KLMN landbird monitoring effort is informed by and contributes to the Partners in Flight (PIF) landbird conservation initiative. Regional and continental PIF habitat-based bird conservation objectives are met through the implementation of the NPS mission to preserve natural resources
unimpaired for future generations. Partners in Flight conservation plans and state wildlife conservation strategies provide a framework for understanding landbird status in the parks. We therefore use these resources to frame the results of the KLMN landbird monitoring efforts.

The objectives of the Klamath Network Landbird Monitoring Protocol are to:

1) Monitor breeding landbird richness, relative abundance, and density.

2) Co-sample habitat parameters and integrate bird and vegetation monitoring to aid in interpretation of landbird status and trends.

3) Determine status and trends in demographic parameters (productivity, adult survival, and recruitment) for selected landbird species in a mixed-conifer and riparian habitat at Oregon Caves National Monument and Preserve.

This annual report provides an overview of methodology and implementation of yearly field surveys. Results presented in this report are limited to general information about bird presence and abundance. Additional analysis and synthesis reports are completed every third year, to include results of species detectability and density, community and habitat structure, and landbird status and trends (Rockwell et al. 2016, Stephens et al. 2016, Stephens, Mohren, Barton et al. 2013, Stephens, Mohren, Newell et al. 2013).
Methods

Sampling Design
The KLMN landbird monitoring protocol incorporates multiple standard avian sampling methods (Ralph et al. 1993, Stephens, Mohren et al. 2010), including variable circular plot point counts, area search surveys, mist netting, species checklists, and habitat surveys. The use of these complementary methods, which gather information about multiple bird species, optimizes the amount of information gathered about birds in each park. Twenty-five to 35 point count routes were established at each park unit corresponding to park unit size, with the exception of Oregon Caves National Monument and Preserve. Due to the relatively small size of the Monument, monitoring includes a constant effort mist net station and four point count routes.

The sampling frames for Crater Lake National Park, Lassen Volcanic National Park, Lava Beds National Monument, and Redwood National and State Parks include locations between 100 m and 1000 m from a road or trail. The roads and trails within KLMN park units cross most environmental gradients. Further refinement of sampling frames considered three potential elevation and habitat-associated frames (high elevation; riparian; and matrix, which includes all non-high elevation and non-riparian areas) and varied by park (Sarr et al. 2007). At Whiskeytown National Recreation Area, the sampling frame was limited to roads, trails, and power lines for safety reasons. At Oregon Caves National Monument and Preserve we established sampling locations within both the existing Monument and the now expanded area and applied a slightly different sampling frame to each. Within the existing Monument, the sampling frame included locations between 100 m and 1000 m from a road and within 1000 m of a trail (i.e., locations could be established within 100 m of a trail). Because of the high density of trails, this sampling frame was necessary in order to place a point count route within the existing Monument. The sampling frame within the expansion included locations between 100 m and 1000 m from a road or trail.

The number of point count sites varied by park and was based on park size: Crater Lake National Park (n=35), Lassen Volcanic National Park (n=25), Lava Beds National Monument (n=25), Oregon Caves National Monument and Preserve (n=4), Redwood National and State Parks (n=30), Whiskeytown National Recreation Area (n=30). We used the Generalized Random Tessellation Stratified (GRTS) method (Stevens and Olsen 2004) to develop spatially balanced sampling locations of point count sites within each sampling frame. At each point count site, a series of stations are surveyed in a single morning, referred to as a point count route. The number of point count stations on a route is typically determined by time constraints; optimally, 12 stations are surveyed within each route, which is the case for all routes in all parks with the exception of Lassen Volcanic National Park and Redwood National and State Parks. At Lassen Volcanic National Park three points were dropped during the initial year of protocol implementation due to safety and time constraints. Because of the rugged terrain at Redwood National and State Parks, the number of established point count stations varied from six to eight for each route. Stations were placed 250 m apart, which nearly eliminates the likelihood of double counting birds (Scott et al. 1981). Point count stations were sampled during the breeding season (early May through early July) using 5-minute count periods following the variable circular plot (VCP) methodology that incorporates distance sampling.
(Reynolds et al. 1980, Fancy 1997, Nelson and Fancy 1999). At Oregon Caves National Monument and Preserve, an ongoing constant effort monitoring station is operated following standard protocols (Ralph et al. 2004, Stephens, Mohren et al. 2010) during the breeding season (early May through late August) as well as during the fall dispersal and migration seasons (late August through mid-October). This is a sentinel site, which was selected subjectively as a location of special interest due to habitat characteristics. Specifically, this site was selected because of riparian habitat and accessibility by trail.

Field Surveys

Monitoring Schedule
In accord with the KLMN landbird monitoring protocol, each of the six park units is to be monitored every third year using point counts and associated methodologies. The first round of visits was completed from 2008 to 2010, the second round from 2011 to 2013, the third round from 2014 to 2016, and the fourth round of visits beginning in 2017. The parks are paired in a given survey year such that Redwood National and State Parks and Lava Beds National Monument are surveyed in year one, Lassen Volcanic National Monument and Whiskeytown National Recreation Area in year two, and Crater Lake National Park and Oregon Caves National Monument and Preserve in year three. However, during the first round of surveys Lassen Volcanic National Monument was completed in 2010 (year 3) rather than 2009 (year 2) due to logistical challenges with site establishment in 2009. In 2017, we completed the fourth round of visits at Lava Beds National Monument and Redwood National and State Parks (Figure 1 and Figure 2). In addition, the constant effort monitoring station at Oregon Caves National Monument and Preserve was operated in 2017, and is operated annually.
Figure 1. Lava Beds National Monument is located in northern California.
Figure 2. Redwood National and State Parks are located in northern California.

**Training**

Point count surveyors all had previous experience with point count methodology and were proficient with western bird species identification by sight and sound. At the onset of the field season point count surveyors participated in a three-day to two-week long training session, depending on
experience. Training exercises included group calibration for distance estimation and simultaneous point count and vegetation surveys in the field. A certification test for bird species identification, which included various written and audio exercises, was completed by all point count surveyors. Interns that operated the constant effort monitoring station underwent ongoing training throughout the season. Benchmarks were noted for proficiency with bird extraction and handling, bird identification, and data collection. A primary bander who had undergone certification operated the station, with the assistance of interns who were at varying levels within the training program.

**Variable Circular Plot Point Count**
Point count surveys began within 15 minutes of sunrise. The observer used a digital rangefinder to establish distance reference points at each station prior to conducting the survey. During a 5-minute count period, all birds detected by sight or sound were identified to species and recorded on data forms, along with the horizontal distance to each bird, estimated as accurately as possible and rounded to the nearest meter. In addition, for each individual, the time of detection (rounded to the previous minute), detection type (e.g., visual, song, call), and breeding status were also recorded. All point count stations along a given route (or as many stations as possible) were completed by a single surveyor within 4 hours of sunrise.

**Constant Effort Monitoring Station**
The constant effort monitoring station incorporated a variety of survey methods to sample avian species, including mist netting, area searches, point counts, species checklists, and habitat surveys. The mist netting station at Oregon Caves National Monument and Preserve had 10 nets set in an array. This arrangement optimized bird capture and met logistical constraints. Mist nets were opened within 15 minutes of sunrise and operated for 5 hours. Nets were not operated during inclement weather conditions that might affect capture rates or bird safety. All birds that were captured were identified to species, aged and sexed according to Pyle (1997), and checked for signs of breeding condition (e.g., cloacal protuberances and brood patches); additional biometrics were collected. All captured birds, excluding hummingbirds and game birds, were banded with a U.S. Geological Survey Bird Banding Laboratory aluminum butt-end leg band.

Two area search surveys were completed at the mist net site on each day the site is operated. This method provided additional information, such as presence and breeding status of most of the birds occurring at the site, including those not often captured in the nets (e.g., canopy dwelling warblers). During an area search, the surveyor moved around the designated area for a 20-minute period, recording all birds seen or heard. The two area search plots at Oregon Caves National Monument and Preserve were approximately 0.4 and 0.6 hectares in size.

**Species Checklists**
Species checklists were completed in conjunction with all bird monitoring efforts, including point count, habitat, and area search surveys and mist netting. Species checklists added value to survey data by documenting encounters of all species during an effort. Checklists enabled surveyors to record information on common and rare species that may or may not have been detected using the other survey techniques.
**Habitat Surveys**
In addition to avian surveys, habitat surveys were completed at each point count station and at the constant effort monitoring station following a standard methodology (Ralph et al. 1993). The surveys were designed specifically to account for habitat aspects associated with the feeding and nesting requirement of birds. The habitat sampling was conducted using a vegetation relevé method that was suitable for any vegetation type and provided an efficient assessment of vegetation composition and structure. Ocular estimates of cover and height for all vegetation layers, tree and shrub species, and other plant forms were recorded, along with snag counts, presence of water, evidence of burns, and tree size and height. Habitat data will be used as part of several larger analyses as described in the KLMN landbird monitoring protocol (Stephens, Mohren et al. 2010).

**Data**

**Data Delivery**
Data were entered into relational databases to store the variety of information collected in the field. Six databases were used, each one associated with a survey methodology (Point Count, Mist Net, Mist Net Hours, Vegetation, Area Search, and Checklist), and an additional database was used to store location information for each site. The verified, validated, and certified data were submitted to the KLMN, where they were uploaded into one relational database designed using the NPS natural resource database template.

**Data Analysis**
Relative abundance (birds/station), as measured by point counts and area search surveys, was calculated for all survey points combined within each park. Only species detected within 50 m of point count survey stations and within the established area search plot were included in abundance calculations. We also calculated the proportion of point count routes on which a given species was detected, out of the total number of routes surveyed in each park. Total captures, by season, were calculated using constant effort mist net data. Partners in Flight focal species, which are indicative of a variety of ecosystem components (Altman and Alexander 2012, CalPIF 2002a, 2002b, 2004, 2005, RHJV 2004, Rosenberg. 2016), and conservation status from the Oregon and California State Wildlife Conservation Strategies (CDFW 2015, ODFW 2016) are highlighted in the results where applicable.
Results

Lava Beds National Monument
In 2017 we surveyed 25 permanent point count survey routes at Lava Beds National Monument, each consisting of 12 survey stations (Figure 3). Surveys were completed from May 17th to June 1st by Frank Lospalluto and Claudia Strijek. Lava Beds National Monument does not contain any high elevation or riparian areas, so the sampling frame for this park unit included matrix lands, which encompass the entire park except for lava flow areas. The 2017 point count surveys recorded 54 species within 50 m of the stations (Table 1). Of those species, Anna’s Hummingbird, Lewis’s Woodpecker, Northern Harrier, and Red-tailed Hawk were not detected on point count surveys in 2008, 2011 or 2014 but have been previously detected outside of point count surveys (Table 1). An additional 31 species were recorded outside of 50 m during point count surveys or encountered between bird surveys or during vegetation surveys and accounted for on species checklists (Table 2).
Figure 3. Point count routes at long-term landbird monitoring sites in Lava Beds National Monument.
Table 1. Mean relative abundance (birds within 50 m/point) for species detected during 2008, 2011, 2014 and 2017 point count surveys at Lava Beds National Monument, and proportion of routes with detections for each species in 2017. Species ordered in decreasing order of abundance for 2017 at the park unit; those detected in previous years, but not in 2017, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns.

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<th>Scientific Name</th>
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<th>Cont PIF&lt;sup&gt;3,4,5&lt;/sup&gt;</th>
<th>CDFW&lt;sup&gt;6&lt;/sup&gt;</th>
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<td>0.023</td>
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1 CalPIF 2002a, 2 CalPIF 2005, 3 Rosenberg et al. 2016, 4 D are ‘Common Birds in Decline’ for the Intermountain West Joint Venture region in Rosenberg et al. (2016), 5 W are ‘Watch List Species’ (Rosenberg et al. 2016), 6 CDFW 2015.
Table 1 (continued). Mean relative abundance (birds within 50 m/point) for species detected during 2008, 2011, 2014 and 2017 point count surveys at Lava Beds National Monument, and proportion of routes with detections for each species in 2017. Species ordered in decreasing order of abundance for 2017 at the park unit; those detected in previous years, but not in 2017, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns.

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<td>Sagebrush&lt;sup&gt;2&lt;/sup&gt;</td>
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<td>0.008</td>
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<sup>1</sup> CalPIF 2002a, <sup>2</sup> CalPIF 2005, <sup>3</sup> Rosenberg et al. 2016, <sup>4</sup> D are ‘Common Birds in Decline’ for the Intermountain West Joint Venture region in Rosenberg et al. (2016), <sup>5</sup> W are ‘Watch List Species’ (Rosenberg et al. 2016), <sup>6</sup> CDFW 2015.
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<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Relative Abundance</th>
<th>Proportion of Routes</th>
<th>CalPIF</th>
<th>Cont PIF&lt;sup&gt;3,4,5&lt;/sup&gt;</th>
<th>CDFW&lt;sup&gt;6&lt;/sup&gt;</th>
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<td>2008</td>
<td>2011</td>
<td>2014</td>
<td>2017</td>
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<td>0.007</td>
<td>0.003</td>
<td>0.004</td>
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<sup>1</sup> CalPIF 2002a, <sup>2</sup> CalPIF 2005, <sup>3</sup> Rosenberg et al. 2016, <sup>4</sup> D are ‘Common Birds in Decline’ for the Intermountain West Joint Venture region in Rosenberg et al. (2016), <sup>5</sup> W are ‘Watch List Species’ (Rosenberg et al. 2016), <sup>6</sup> CDFW 2015.
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<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Relative Abundance</th>
<th>Proportion of Routes</th>
<th>CalPIF</th>
<th>Cont PIF&lt;sup&gt;3,4,5&lt;/sup&gt;</th>
<th>CDFW&lt;sup&gt;6&lt;/sup&gt;</th>
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<td>2011</td>
<td>2014</td>
<td>2017</td>
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<td>Bullock's Oriole</td>
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<td>0</td>
<td>0.017</td>
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<tr>
<td>Red-breasted Nuthatch</td>
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<td>0.01</td>
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<tr>
<td>Clark's Nutcracker</td>
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<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Relative Abundance</th>
<th>Proportion of Routes</th>
<th>CalPIF</th>
<th>Cont PIF$^{3,4,5}$</th>
<th>CDFW$^6$</th>
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<td>Dendroica nigrescens</td>
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<td>0.003</td>
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<tr>
<td>Prairie Falcon</td>
<td>Falco mexicanus</td>
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<td>0.003</td>
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<tr>
<td>White-breasted Nuthatch</td>
<td>Sitta carolinensis</td>
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<td>0.003</td>
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<td>Vesper Sparrow</td>
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<td>0.003</td>
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</table>

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Table 2. List of additional species detected at Lava Beds National Monument in 2017 (not counted within 50 m during VCP point count surveys), and conservation status. Detected species are noted with an “X”.

<table>
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<tr>
<th>Common Name</th>
<th>Scientific Name</th>
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<th>CDFW</th>
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<td>American White Pelican</td>
<td>Pelecanus erythrorhynchos</td>
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<tr>
<td>Bald Eagle</td>
<td>Haliaeetus leucocephalus</td>
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<tr>
<td>Barn Swallow</td>
<td>Hirundo rustica</td>
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<tr>
<td>Bullock’s Oriole</td>
<td>Icterus bullockii</td>
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<tr>
<td>California Gull</td>
<td>Larus californicus</td>
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<td>Canada Goose</td>
<td>Branta canadensis</td>
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<tr>
<td>Cassin’s Finch</td>
<td>Haemorhous cassinii</td>
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<tr>
<td>Cassin’s Vireo</td>
<td>Vireo cassinii</td>
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<tr>
<td>Clark’s Nutcracker</td>
<td>Nucifraga columbiana</td>
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<tr>
<td>Common Nighthawk</td>
<td>Chordeiles minor</td>
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<td>Common Poorwill</td>
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<td>Streptopelia decaocto</td>
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<td>Great Horned Owl</td>
<td>Bubo virginianus</td>
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<tr>
<td>Hairy Woodpecker</td>
<td>Leuconotopicus villosus</td>
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<tr>
<td>Lesser Goldfinch</td>
<td>Spinus psaltria</td>
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<tr>
<td>Olive-sided Flycatcher</td>
<td>Contopus cooperi</td>
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<td>Pine Siskin</td>
<td>Spinus pinus</td>
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<td>–</td>
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<tr>
<td>Pinyon Jay</td>
<td>Gymnorhinus cyanoccephalus</td>
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<td>Prairie Falcon</td>
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<td>Purple Finch</td>
<td>Haemorhous purpureus</td>
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<td>Red-breasted Nuthatch</td>
<td>Sitta canadensis</td>
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<td>Red-winged Blackbird</td>
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<td>Ring-billed Gull</td>
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<td>Ring-necked Pheasant</td>
<td>Phasianus colchicus</td>
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<td>Turkey Vulture</td>
<td>Cathartes aura</td>
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<tr>
<td>Western Grebe</td>
<td>Aechmophorus occidentalis</td>
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<td>White-breasted Nuthatch</td>
<td>Sitta carolinensis</td>
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<td>Yellow-headed Blackbird</td>
<td>Xanthocephalus xanthocephalus</td>
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\(^1\) CalPIF 2005, \(^2\) CDFW 2015, \(^2\) X are detected species.
Redwood National and State Parks

In 2017, we surveyed all of the 30 permanent point count survey routes at Redwood National and State Parks (Figure 4 and Figure 5). Because of the rugged terrain in this park, the number of established point count stations varied from six to eight for each route; all points were surveyed in 2017. Surveys were completed from June 7th to June 30th by Jim DeStaebler and Frank Lospalluto. At Redwood National and State Parks, the matrix areas were sampled. The park does not contain high elevation areas but does contain riparian areas that were excluded from sampling. The 2017 point count surveys recorded 31 species within 50 m of the station (Table 3). An additional 36 species were detected outside of 50 m during point count surveys or encountered between bird surveys or during vegetation surveys and accounted for on species checklists (Table 4).
Figure 4. Point count routes at long-term landbird monitoring sites in the northern area of Redwood National and State Parks.
Figure 5. Point count routes at long-term landbird monitoring sites in the southern area of Redwood National and State Parks.
Table 3. Mean relative abundance (birds within 50 m/point) for species detected during 2008, 2011, 2014 and 2017 point count surveys at Redwood National and State Parks, and proportion of routes with detections for each species in 2017. Species ordered in decreasing order of abundance for 2017 at the park; those detected in previous years, but not in 2017, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns.

<table>
<thead>
<tr>
<th>Tree Swallow</th>
<th>Scientific Name</th>
<th>Relative Abundance</th>
<th>Proportion of Routes</th>
<th>CalPIF&lt;sup&gt;10&lt;/sup&gt;</th>
<th>Cont PIF&lt;sup&gt;5,6,7,10&lt;/sup&gt;</th>
<th>Coastal Scrub&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Northern Pacific Rainforest</th>
<th>CDFW&lt;sup&gt;8,10&lt;/sup&gt;</th>
<th>N. Coast and Klamath Province</th>
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<td>Troglodytes pacificus</td>
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<td>0.287</td>
<td>0.338</td>
<td>0.391</td>
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<td>Poecile rufescens</td>
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<td>Regulus satrapa</td>
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<td>0.255</td>
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<td>0.159</td>
<td>0.097</td>
<td>0.211</td>
<td>0.600</td>
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<td>Vireo huttoni</td>
<td>0.115</td>
<td>0.144</td>
<td>0.046</td>
<td>0.155</td>
<td>0.400</td>
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<td>0.123</td>
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<td>0.149</td>
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<td>0.267</td>
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<td>–</td>
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<td>0.056</td>
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<td>0.087</td>
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<td>0.037</td>
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</tbody>
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1 RHJV 2004, 2 CalPIF 2002b, 3 CalPIF 2002a, 4 CalPIF 2004, 5 Rosenberg et al. 2016, 6 D are ‘Common Birds in Decline’ for the Pacific Birds Habitat Joint Venture region in Rosenberg et al. (2016), 7 W are ‘Watch List Species’ (Rosenberg et al. 2016), 8 CDFW 2015, 9 Previously grouped with eastern North American and Eurasian species as the Winter Wren, Troglodytes troglodytes (Chesser et al. 2011), 10 X are detected species
Table 3 (continued). Mean relative abundance (birds within 50 m/point) for species detected during 2008, 2011, 2014 and 2017 point count surveys at Redwood National and State Parks, and proportion of routes with detections for each species in 2017. Species ordered in decreasing order of abundance for 2017 at the park; those detected in previous years, but not in 2017, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns.

<table>
<thead>
<tr>
<th>Species</th>
<th>Scientific Name</th>
<th>2008</th>
<th>2011</th>
<th>2014</th>
<th>2017</th>
<th>Riparian</th>
<th>Oak</th>
<th>Conifer</th>
<th>Coastal Scrub</th>
<th>Northern Pacific Rainforest</th>
<th>N. Coast and Klamath Province</th>
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<tr>
<td>Tree Swallow</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>Allen's Hummingbird</td>
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<td>0.021</td>
<td>0.015</td>
<td>0.031</td>
<td>0.133</td>
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<td>-</td>
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<td>0.01</td>
<td>0.005</td>
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<td>-</td>
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<td>Lesser Goldfinch</td>
<td>Spinus psaltria</td>
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<td>0</td>
<td>0</td>
<td>0.006</td>
<td>0.033</td>
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<td>-</td>
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<td>Dark-eyed Junco</td>
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<td>0.031</td>
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<td>-</td>
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1 RHJV 2004, 2 CalPIF 2002b, 3 CalPIF 2002a, 4 CalPIF 2004, 5 Rosenberg et al. 2016, 6 D are ‘Common Birds in Decline’ for the Pacific Birds Habitat Joint Venture region in Rosenberg et al. (2016), 7 W are ‘Watch List Species’ (Rosenberg et al. 2016), 8 CDFW 2015, 9 Previously grouped with eastern North American and Eurasian species as the Winter Wren, Troglodytes troglodytes (Chesser et al. 2011), 10 X are detected species
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<table>
<thead>
<tr>
<th>Tree Swallow</th>
<th>Scientific Name</th>
<th>Relative Abundance</th>
<th>Proportion of Routes</th>
<th>CalPIF&lt;sup&gt;10&lt;/sup&gt;</th>
<th>Cont PIF&lt;sup&gt;5,6,7,10&lt;/sup&gt;</th>
<th>Coastal Scrub&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Northern Pacific Rainforest</th>
<th>CDFW&lt;sup&gt;8,10&lt;/sup&gt; N. Coast and Klamath Province</th>
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<td>Pine Siskin</td>
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<td>0</td>
<td>D</td>
</tr>
</tbody>
</table>

<sup>1</sup> RHJV 2004, <sup>2</sup> CalPIF 2002b, <sup>3</sup> CalPIF 2002a, <sup>4</sup> CalPIF 2004, <sup>5</sup> Rosenberg et al. 2016, <sup>6</sup> D are ‘Common Birds in Decline’ for the Pacific Birds Habitat Joint Venture region in Rosenberg et al. (2016), <sup>7</sup> W are ‘Watch List Species’ (Rosenberg et al. 2016), <sup>8</sup> CDFW 2015, <sup>9</sup> Previously grouped with eastern North American and Eurasian species as the Winter Wren, <i>Trogodytes troglodytes</i> (Chesser et al. 2011). <sup>10</sup> X are detected species
Table 3 (continued). Mean relative abundance (birds within 50 m/point) for species detected during 2008, 2011, 2014 and 2017 point count surveys at Redwood National and State Parks, and proportion of routes with detections for each species in 2017. Species ordered in decreasing order of abundance for 2017 at the park; those detected in previous years, but not in 2017, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Relative Abundance</th>
<th>Proportion of Routes</th>
<th>CalPIF¹⁰</th>
<th>Cont PIF⁵,⁶,⁷,¹⁰</th>
<th>Coastal Scrub⁴</th>
<th>Northern Pacific Rainforest</th>
<th>N. Coast and Klamath Province</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spotted Towhee</td>
<td>0</td>
<td>0.015</td>
<td>0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>X</td>
</tr>
<tr>
<td>White-crowned Sparrow</td>
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<td>0.015</td>
<td>0</td>
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<td>–</td>
</tr>
<tr>
<td>Cassin's Vireo</td>
<td>0</td>
<td>0.005</td>
<td>0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Chipping Sparrow</td>
<td>0</td>
<td>0.005</td>
<td>0</td>
<td>–</td>
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<td>–</td>
<td>–</td>
</tr>
<tr>
<td>MacGillivray's Warbler</td>
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<td>0.005</td>
<td>0</td>
<td>0</td>
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<tr>
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<td>Grasshopper Sparrow</td>
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<td>Purple Finch</td>
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<td>–</td>
<td>–</td>
<td>–</td>
<td>W</td>
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</table>

¹ RHJV 2004, ² CalPIF 2002b, ³ CalPIF 2002a, ⁴ CalPIF 2004, ⁵ Rosenberg et al. 2016, ⁶ D are ‘Common Birds in Decline’ for the Pacific Birds Habitat Joint Venture region in Rosenberg et al. (2016), ⁷ W are ‘Watch List Species’ (Rosenberg et al. 2016), ⁸ CDFW 2015, ⁹ Previously grouped with eastern North American and Eurasian species as the Winter Wren, Troglodytes troglodytes (Chesser et al. 2011), ¹⁰ X are detected species
<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Riparian</th>
<th>Oak</th>
<th>Conifer</th>
<th>Northern Pacific Rainforest</th>
<th>CalPIF</th>
<th>Cont PIF</th>
<th>CDFW</th>
<th>N. Coast and Klamath Province</th>
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<td>–</td>
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<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Barn Swallow</td>
<td>Hirundo rustica</td>
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<td>–</td>
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<td>Barred Owl</td>
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</tr>
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<td>Black-throated Gray Warbler</td>
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<td>–</td>
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<td>–</td>
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<td>Brown-headed Cowbird</td>
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<td>–</td>
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<td>California Scrub-Jay</td>
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<td>Cedar Waxwing</td>
<td>Bombycilla cedrorum</td>
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<td>Dark-eyed Junco</td>
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<td>Downy Woodpecker</td>
<td>Picoides pubescens</td>
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<td>W</td>
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<td>Marbled Murrelet</td>
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<tr>
<td>Mountain Quail</td>
<td>Oreortyx pictus</td>
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<tr>
<td>Northern Flicker</td>
<td>Colaptes auratus</td>
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<td>–</td>
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<td>–</td>
<td>–</td>
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<tr>
<td>Northern Pygmy-Owl</td>
<td>Glaucidium gnoma</td>
<td>–</td>
<td>–</td>
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<td>–</td>
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<tr>
<td>Osprey</td>
<td>Pandion haliaetus</td>
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<td>–</td>
<td>X</td>
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<tr>
<td>Red-shouldered Hawk</td>
<td>Buteo lineatus</td>
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<tr>
<td>Red-tailed Hawk</td>
<td>Buteo jamaicensis</td>
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</tr>
<tr>
<td>Ruby-crowned Kinglet</td>
<td>Regulus calendula</td>
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<tr>
<td>Ruffed Grouse</td>
<td>Bonasa umbellus</td>
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<tr>
<td>Sooty Grouse</td>
<td>Dendragapus fuliginosus</td>
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<td>–</td>
<td>–</td>
<td>–</td>
<td>W</td>
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<td>X</td>
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<tr>
<td>Spotted Sandpiper</td>
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</tr>
<tr>
<td>Spotted Towhee</td>
<td>Pipilo maculatus</td>
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<td>–</td>
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<td>–</td>
<td>–</td>
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<td>–</td>
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</tr>
</tbody>
</table>

1 RHJV 2004, 2 CalPIF 2002b, 3 CalPIF 2002a, 4 Rosenberg et al. 2016, 5 D are 'Common Birds in Decline' for the Pacific Birds Habitat Joint Venture region in Rosenberg et al. (2016), 6 W are 'Watch List Species' (Rosenberg et al. 2016), 7 CDFW 2015, 8 X are detected species
Table 4 (continued). List of additional species detected at Redwood National and State Parks 2017 (not counted within 50 m during VCP point count surveys) and conservation status.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>CalPIF 8</th>
<th>Cont PIF 4,5,6,8</th>
<th>CDFW 7,8</th>
<th>Northern Pacific Rainforest</th>
<th>N. Coast and Klamath Province</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turkey Vulture</td>
<td>Cathartes aura</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Violet-green Swallow</td>
<td>Tachycineta thalassina</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Warbling Vireo</td>
<td>Vireo gilvus</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Western Bluebird</td>
<td>Sialia mexicana</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Western Meadowlark</td>
<td>Sturnella neglecta</td>
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<tr>
<td>Western Tanager</td>
<td>Piranga ludoviciana</td>
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</tr>
<tr>
<td>Western Wood-Pewee</td>
<td>Contopus sordidulus</td>
<td></td>
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<tr>
<td>White-breasted Nuthatch</td>
<td>Sitta carolinensis</td>
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<tr>
<td>White-crowned Sparrow</td>
<td>Zonotrichia leucophrys</td>
<td></td>
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</tbody>
</table>

1 RHJV 2004, 2 CalPIF 2002b, 3 CalPIF 2002a, 4 Rosenberg et al. 2016, 5 D are ‘Common Birds in Decline’ for the Pacific Birds Habitat Joint Venture region in Rosenberg et al. (2016), 6 W are ‘Watch List Species’ (Rosenberg et al. 2016), 7 CDFW 2015, 8 X are detected species

Oregon Caves National Monument and Preserve Ecological Monitoring Station

The ecological monitoring station at Oregon Caves National Monument and Preserve was run 14 times during 2017. Eight visits occurred during the breeding season (June 16th to August 11th) and six visits during the fall dispersal and migration season (September 15th to October 12th). On all visits, two area searches were completed, except on July 20th when none were completed due to field crew miscommunications. Monitoring was completed by Robert Frey, Luiza Figueira Rodrigues, Pedro Martine, Eric Cannizzaro, Gemma Green, Aranya Iyer, Martin Lopez, Claire Nemes, Christine Rholl, and Nathan Trimble.

In 2017, 50 species were detected at Oregon Caves National Monument and Preserve at the ecological monitoring station (Table 5). Thirty species were captured during mist-netting, 21 during the breeding season and 19 during the migration season. During area searches 26 species were detected, 17 during the breeding season and 20 during the migration season. Fifteen additional species were recorded on species checklists only. Overall, the number of species surveyed aligns with past efforts. From 2008 through 2016, 38–59 total species were detected, 27–34 species were captured during mist-netting, and 17–31 species were detected during area search surveys annually (Stephens et al. 2009, Stephens, Alexander et al. 2010, Stephens et al. 2011, Stephens and Mohren 2012, Stephens and Mohren 2013, Stephens 2014, Stephens 2015, Stephens 2016, Stephens 2017).
Table 5. Results from the constant effort monitoring station at Oregon Caves National Monument and Preserve in 2017, showing total mist net captures and relative abundance (birds/area search plot) during breeding (16 June to 11 August) and migration (8 September to 12 October), and conservation status. Species ordered in alphabetical order by common name. Species included in this table with no capture or abundance values were detected at the site, but not during an area search or from mist-net captures.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Total Captures (breeding)</th>
<th>Total Captures (migration)</th>
<th>Rel. Abund. (breeding)</th>
<th>Rel. Abund. (migration)</th>
<th>OR/WA PIF&lt;sup&gt;1,6&lt;/sup&gt;</th>
<th>Cont PIF&lt;sup&gt;2,3,4,6&lt;/sup&gt;</th>
<th>Conifer</th>
<th>Pacific</th>
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</thead>
<tbody>
<tr>
<td>American Robin</td>
<td>Turdus migratorius</td>
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<td>–</td>
<td>0.071</td>
<td>–</td>
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<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Band-tailed Pigeon</td>
<td>Patagioenas fasciata</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Black-headed Grosbeak</td>
<td>Patagioenas fasciata</td>
<td>–</td>
<td>–</td>
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<td>Brown Creeper</td>
<td>Certhia americana</td>
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<td>1</td>
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<td>0.333</td>
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<td>Cassin's Vireo</td>
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<td>9</td>
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<td>–</td>
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<tr>
<td>Clark's Nutcracker</td>
<td>Nucifraga columbiana</td>
<td>–</td>
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<td>–</td>
<td>–</td>
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<tr>
<td>Common Raven</td>
<td>Corvus corax</td>
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<td>–</td>
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</tr>
<tr>
<td>Evening Grosbeak</td>
<td>Coccothraustes vespertinus</td>
<td>–</td>
<td>–</td>
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<td>–</td>
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<tr>
<td>Fox Sparrow</td>
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<td>Golden-crowned Kinglet</td>
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<td>1</td>
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<td>Hairy Woodpecker</td>
<td>Leuconotopicus villosus</td>
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<td>–</td>
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<td>0.083</td>
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<tr>
<td>Hammond's Flycatcher</td>
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<td>X</td>
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<td>Hermit Thrush</td>
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</tr>
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<td>Hermit Warbler</td>
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<tr>
<td>House Wren</td>
<td>Troglodytes aedon</td>
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<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
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</tr>
<tr>
<td>Lesser Goldfinch</td>
<td>Spinus psaltria</td>
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<td>–</td>
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<td>MacGillivray's Warbler</td>
<td>Geothlypis tolmiei</td>
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</table>

<sup>1</sup> Altman and Alexander 2012, <sup>2</sup> Rosenberg et al 2016, <sup>3</sup> D are ‘Common Birds in Decline’ for the Pacific Birds Habitat Joint Venture region in Rosenberg et al. (2016), <sup>4</sup> W are ‘Watch List Species’ (Rosenberg et al. 2016), <sup>5</sup> Previously grouped with eastern North American and Eurasian species as the Winter Wren, Troglodytes troglodytes (Chesser et al. 2011), <sup>6</sup> X are detected species
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<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Total Captures (breeding)</th>
<th>Total Captures (migration)</th>
<th>Rel. Abund. (breeding)</th>
<th>Rel. Abund. (migration)</th>
<th>OR/WA PIF(^*)(^1)(^6)</th>
<th>Cont PIF(^2)(^3)(^4)(^6)</th>
<th>Conifer</th>
<th>Pacific</th>
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<tbody>
<tr>
<td>Mountain Chickadee</td>
<td>Poecile gambeli</td>
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<td>0.417</td>
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<td>Nashville Warbler</td>
<td>Oreothlypis ruficapilla</td>
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<td>0.571</td>
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<tr>
<td>Northern Flicker</td>
<td>Colaptes auratus</td>
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<td>–</td>
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<td>0.083</td>
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<tr>
<td>Northern Pygmy-Owl</td>
<td>Glaucidium gnoma</td>
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<td>Olive-sided Flycatcher</td>
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<tr>
<td>Orange-crowned Warbler</td>
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<td>8</td>
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<td>0.167</td>
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<tr>
<td>Oregon Junco</td>
<td>Junco hyemalis oregonus</td>
<td>50</td>
<td>25</td>
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<td>3.083</td>
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<tr>
<td>Pacific Wren(^5)</td>
<td>Trogodytes pacificus</td>
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<td>2</td>
<td>0.071</td>
<td>0.167</td>
<td>X</td>
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<tr>
<td>Pacific-slope Flycatcher</td>
<td>Epidonax difficilis</td>
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<td>–</td>
<td>0.071</td>
<td>–</td>
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<tr>
<td>Pileated Woodpecker</td>
<td>Hylatomus pileatus</td>
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<td>0.250</td>
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<tr>
<td>Pine Siskin</td>
<td>Spinus pinus</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>D</td>
<td>–</td>
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</tr>
<tr>
<td>Red Crossbill</td>
<td>Loxia curvirostra</td>
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<td>–</td>
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<td>Red-breasted Nuthatch</td>
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<td>Red-breasted Sapsucker</td>
<td>Sphyrapicus ruber</td>
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<td>0.083</td>
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<tr>
<td>Red-tailed Hawk</td>
<td>Buteo jamaicensis</td>
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<tr>
<td>Ruby-crowned Kinglet</td>
<td>Regulus calendula</td>
<td>1</td>
<td>4</td>
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<td>0.083</td>
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<tr>
<td>Rufous Hummingbird</td>
<td>Selasphorus rufus</td>
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<td>–</td>
<td>–</td>
<td>X</td>
<td>W</td>
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<tr>
<td>Sooty Grouse</td>
<td>Dendragapus fuliginosus</td>
<td>–</td>
<td>–</td>
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<td>–</td>
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<td>–</td>
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<tr>
<td>Steller's Jay</td>
<td>Cyanocitta stelleri</td>
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<td>0.429</td>
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<tr>
<td>Swainson's Thrush</td>
<td>Catharus ustulatus</td>
<td>5</td>
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</tbody>
</table>

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<th>Rel. Abund. (migration)</th>
<th>OR/WA PIF</th>
<th>Cont PIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Townsend's Solitaire</td>
<td><em>Myadestes townsendi</em></td>
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<tr>
<td>Townsend's Warbler</td>
<td><em>Dendroica townsendi</em></td>
<td>0</td>
<td>1</td>
<td>--</td>
<td>--</td>
<td></td>
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<tr>
<td>Turkey Vulture</td>
<td><em>Cathartes aura</em></td>
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<tr>
<td>Varied Thrush</td>
<td><em>Ixoreus naevius</em></td>
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<td>2</td>
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<td>0.250</td>
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<td>Warbling Vireo</td>
<td><em>Vireo gilvus</em></td>
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<tr>
<td>Western Flycatcher</td>
<td><em>Empidonax difficilis/occidentalis</em></td>
<td>5</td>
<td>0</td>
<td>0.143</td>
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<td>--</td>
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<tr>
<td>Western Wood-Pewee</td>
<td><em>Contopus sordidulus</em></td>
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<tr>
<td>Wilson's Warbler</td>
<td><em>Cardellina pusilla</em></td>
<td>5</td>
<td>1</td>
<td>--</td>
<td>--</td>
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<tr>
<td>Yellow Warbler</td>
<td><em>Setophaga petechia</em></td>
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<tr>
<td>Yellow-rumped Warbler</td>
<td><em>Dendroica coronata</em></td>
<td>1</td>
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</tr>
</tbody>
</table>

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Summary

This tenth year of the KLMN landbird monitoring provided information on avian community composition and the status of landbirds at Lava Beds National Monument and Redwood National and State Parks. In addition, the monitoring at Oregon Caves National Monument and Preserve contributed to the long-term demographic information that has been gathered at this park unit since 2002. Over time, the KLMN landbird monitoring program will yield important information about avian community composition shifts and long-term population trends of specific species for each KLMN park. These monitoring efforts contribute to both Oregon-Washington and California Partners in Flight long-term monitoring programs and align with both Oregon and California State Wildlife Conservation Strategies.

At Lava Beds National Monument, Spotted Towhee was the most abundant species at the Park in all survey years (2008, 2011, 2014 and 2017) (Table 1). In 2017, of the 10 most abundant species, two are Partners in Flight focal species for sagebrush habitat and California Wildlife Conservation Strategy focal species for the Modoc Plateau region (Lark Sparrow, Western Meadowlark) (CalPIF 2005, CDFW 2015). Relative abundance appeared to be higher in 2017 compared with 2014 for many of the common species. Long-term monitoring will add to our understanding of relative abundance estimates in these first four years.

At Redwood National and State Parks, Pacific-slope Flycatcher was the most abundant species in the Park in 2017 (Table 3). Of the ten most abundant species detected during point count survey, six (Wilson’s Warbler, Golden-crowned Kinglet, Brown Creeper, Hutton’s Vireo, Swainson’s Thrush and Vaux’s Swift) are Partners in Flight focal species for riparian, oak, or conifer habitat (RHJV 2004, CalPIF 2002b, CalPIF 2002a). Two of those (Hutton’s Vireo and Vaux’s Swift) are California Wildlife Conservation Strategy focal species (CDFW 2015) and two are common birds in steep decline (Wilson’s Warbler and Varied Thrush) (Rosenberg et al. 2016).

Oregon Junco was the most frequently captured species at Oregon Caves National Monument and Preserve ecological monitoring station during the combined breeding and migration seasons in 2017. Of the ten most frequently captured species, Nashville Warbler, Fox Sparrow, and Orange-crowned Warbler are PIF focal species in coniferous forest (Altman and Alexander 2012). The Chestnut-backed Chickadee, a Continental Partners in Flight Watch List species, and Wilson’s Warbler, a common bird in steep decline, were also among the top ten species captured (Rosenberg et al. 2016).

Implementation of the KLMN landbird monitoring protocol began in 2008. Landbird status and community composition results from this tenth year of monitoring will provide information to park managers at Lava Beds National Monument and Redwood National and State Parks, and will contribute to avian trend monitoring in the parks. In addition, continuation of the constant effort monitoring station at Oregon Caves National Monument and Preserve contributes to long-term avian demographic information for that park. This information will inform management decisions at the parks and over time will yield important information on the status and trends of birds in the KLMN.
Literature Cited


The Department of the Interior protects and manages the nation’s natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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