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Natural Resource Stewardship and Science

Landbird Monitoring

2021 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—2022/1364

ON THE COVER
Pacific-slope Flycatcher
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Natural Resource Data Series NPS/KLMN/NRDS—2022/1364

Jaime L. Stephens[1], Caitlyn R. Gillespie[1], and Claire M. Stuyck[1]

[1]Klamath Bird Observatory
PO Box 758
Ashland, OR 97520

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Abstract

In 2021, the Klamath Inventory and Monitoring Network (KLMN) of the National Park Service implemented the thirteenth year of a long-term landbird monitoring protocol. Klamath Bird Observatory, in partnership with the KLMN, developed the protocol and completed this thirteen 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 2021, a fifth year of point counts were completed, along with corresponding species checklists and habitat surveys, at 25 locations within Lava Beds National Monument, and 15 (out of 30) locations within Redwood National and State Parks. The reduction in survey locations at Redwoods National and State Parks was to allow surveyors to work in pairs for safety reasons and will be a permanent change to the monitoring at the park. 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 thirteenth 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, Keith Benson, David Hayes, Terry Hines, Mark Morrissette, Keith Slauson, Stephen Troy, Jason Walz, and Ivan Yates. for their logistical support in 2021. We appreciate Allison Snyder's support for data management. The dedication of the field crews made this season successful. Point count surveys were completed by Caitlin Bebee, William Harrod, and Avery Young, and Stephanie Loredo provided logistical support for the point count crew. The constant effort monitoring station was run by Claire Stuyck with Klamath Bird Observatory Field Technician, Stephanie Loredo, and student volunteer interns: Nolan Clements, Molly Heal, Victor Sanchez, and Sam Webb.

Introduction

In 2021, the Klamath Inventory and Monitoring Network (KLMN) of the National Park Service (NPS) implemented the thirteenth 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 conducted the monitoring since 2008. This annual report provides a summary of 2021 efforts, including (1) a summary of the monitoring protocol, (2) a summary of point count and area search surveys and constant effort monitoring visits, 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, DellaSala 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. Recently, long-term monitoring data from the six park units were applied to test the PIF focal species approach against site-specific empirical data (Stephens, Dinger, and Alexander 2019). We 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 (Gillespie, Dinger, Loredo et al. In Review, Rockwell et al. 2016; Stephens, Dinger, and Alexander 2019; 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 the Monument and the expanded area (the "Preserve") and applied a slightly different sampling frame to each. Within the 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 Monument. The sampling frame within the Preserve 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 as well as during the fall dispersal and migration seasons. In previous years, we defined the breeding season as early May through late August and the migration season as late August through mid-October. In 2021, we adjusted this framework to redefine breeding as May through August 9th and fall dispersal and migration as August 10th through October. This follows the definition from the Monitoring Avian Productivity and Survivorship (MAPS) program (DeSante et al. 2021) and better aligns with the life history of landbirds in our region. This change does not affect the total number of survey efforts. 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, the fourth round from 2017 to 2019, and the fifth round of visits began in 2021. 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 Park 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 Park was completed in 2010 (year 3) rather than 2009 (year 2) due to logistical challenges with site establishment in 2009. Surveys were not implemented in 2020 due to the Covid-19 pandemic. In 2021, we completed the fifth round of visits at Lava Beds National Monument and Redwood National and State Parks (Figure 1 and Figure 2). Beginning in 2021, surveys at Redwood National and State Parks are completed in pairs for safety reasons (one surveyor completes the point count survey while the second observer simultaneously completes the habitat survey). As a result, only 15 out of 30 established routes will be surveyed moving forward. In addition, in 2021 we continued the annual operation of the constant effort monitoring station at Oregon Caves National Monument and Preserve.

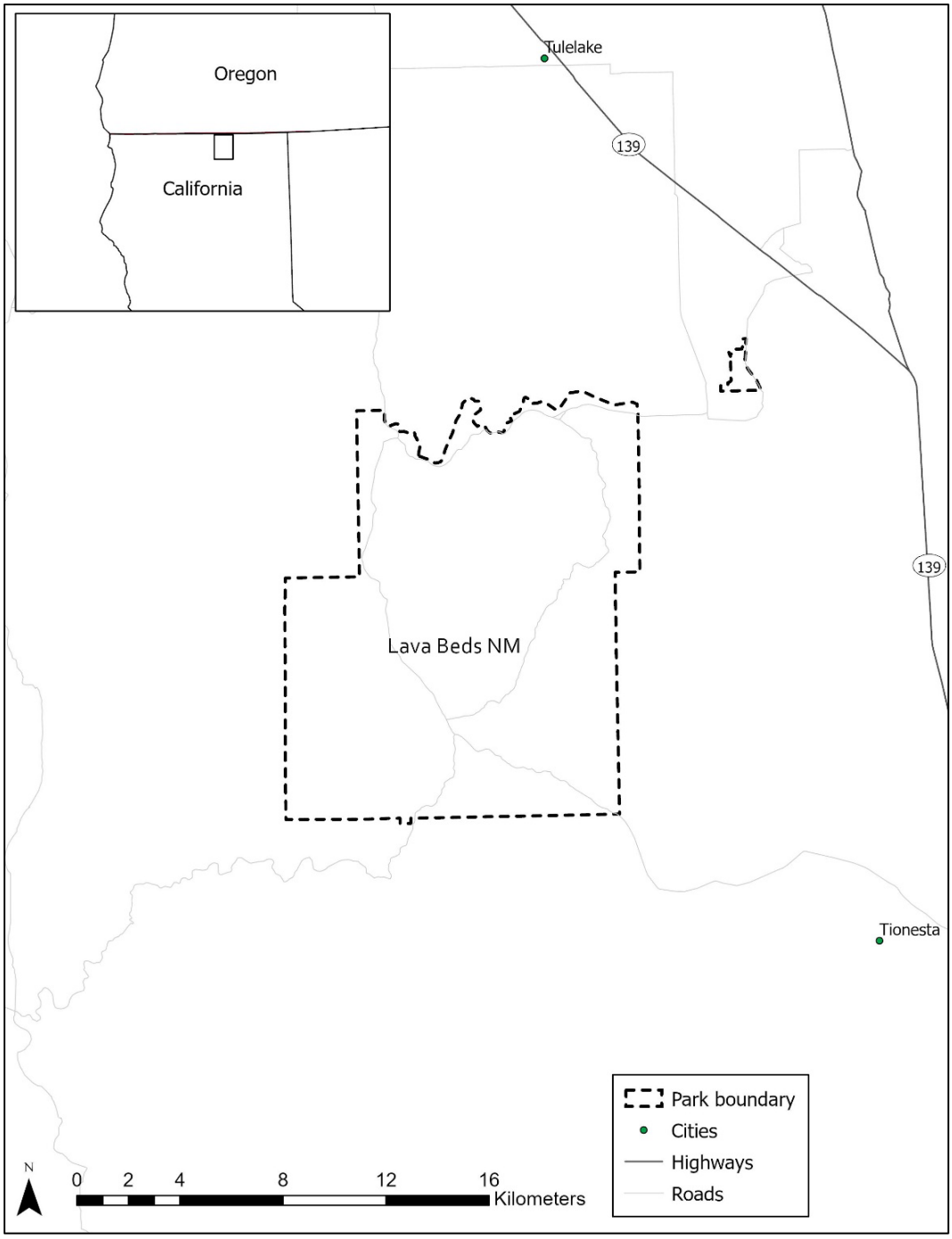

Figure 1. Lava Beds National Monument is located in northern California.

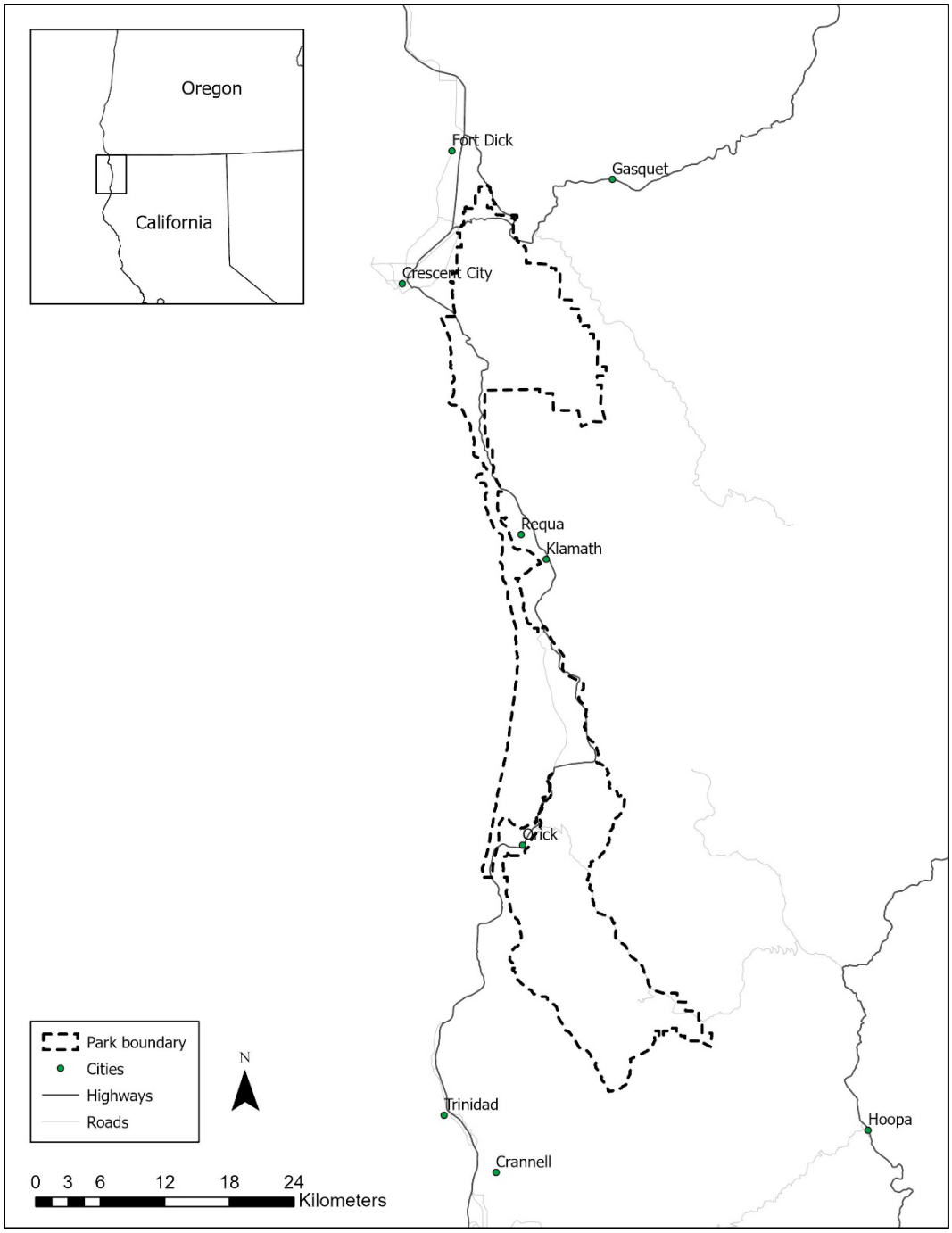

Figure 2. Redwood National and State Parks are located in northern California.

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

Mist Net, Mist Net Hours, Vegetation, and Area Search data were entered into relational Access databases. Point Count and Checklist data were entered directly into Avian Knowledge Network's online interface and were later downloaded and brought into an Access database for delivery to KLMN. 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 2021 we surveyed 25 permanent point count survey routes at Lava Beds National Monument, each consisting of 12 survey stations (Figure 3). 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. Surveys were completed from May 18th–June 5th by Caitlin Bebee and William Harrod. The 2021 point count surveys recorded 46 species within 50 m of the stations (Table 1). An additional 38 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). 85 species have been detected within 50 m of the stations during at least 1 of 5 survey years, and a total of 42 species have been detected within 50 m of the stations throughout all 5 years of surveys. Species detected at Lava Beds for the first time in 2021 include Black-capped Chickadee, Pacific-slope Flycatcher, and Tree Swallow.

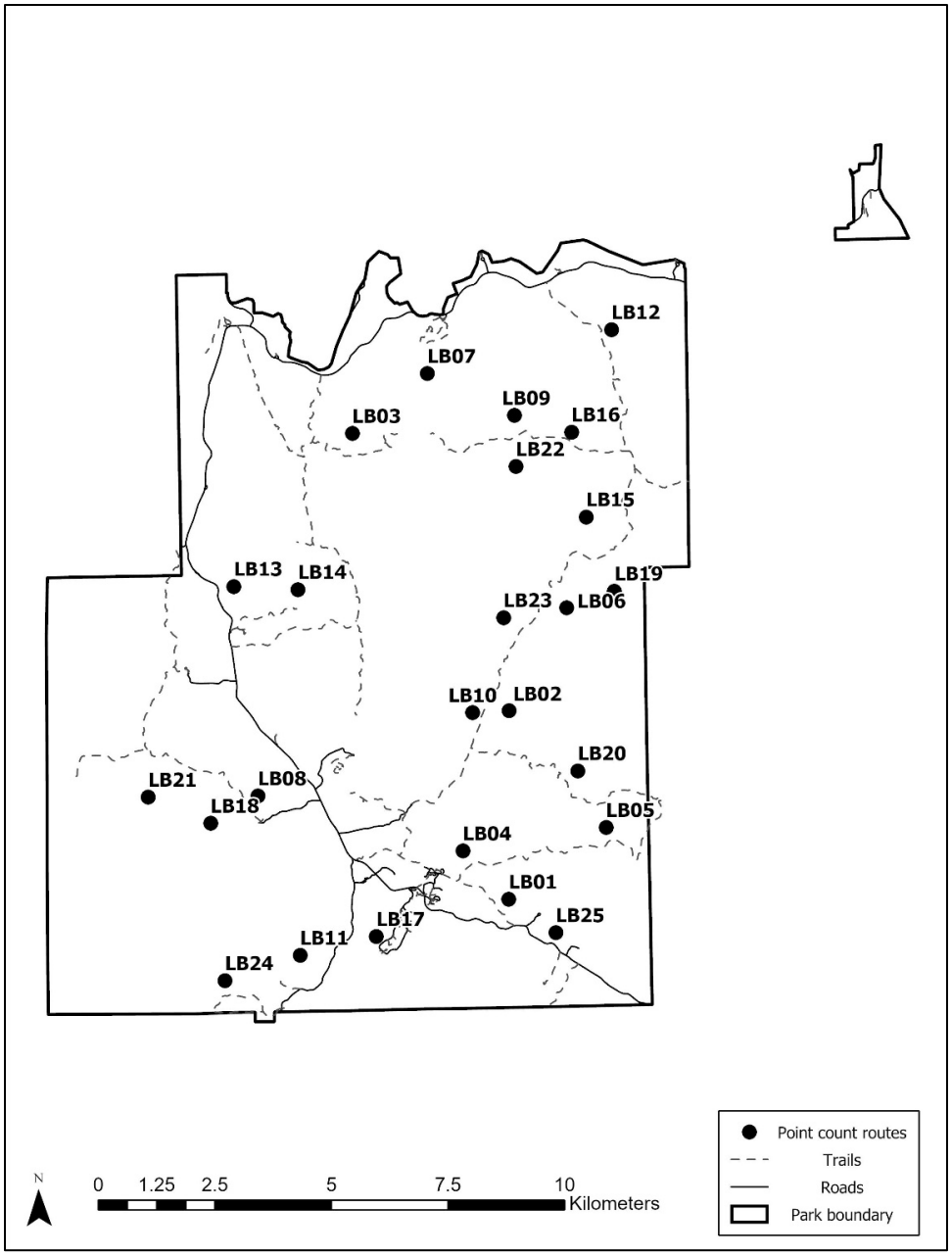

Figure 3. Point count routes at long-term landbird monitoring sites in Lava Beds National Monument.

Table 1. Mean relative abundance (RA, birds within 50 m/point) for species detected during 2008, 2011, 2014, 2017, and 2021 point count surveys at Lava Beds National Monument, and proportion of routes with detections for each species in 2021. Species are ordered in decreasing order of abundance for 2021 at the park unit; those detected in previous years, but not in 2021, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Conifer[1]	CalPIF Sagebrush[2]	ContPIF Northern Pacific Rain-forest[3,4,5]	ContPIF Great Basin[3,4,5]	CDFW Modoc Plateau[6]
California Scrub-Jay	*Aphelocoma californica*	0.06	0.08	0.037	0.079	0.083	0.28	–	–	–	–	–
Oak/Juniper Titmouse sp.	*Baeolophus inornatus/ridgwayi*	0.033	0.02	0.023	0.044	0.083	0.28	–	X	–	–	–
Bewick's Wren	*Thryomanes bewickii*	0.02	0.053	0.127	0.278	0.077	0.36	–	–	–	–	–
Brown-headed Cowbird	*Molothrus ater*	0.15	0.13	0.14	0.139	0.073	0.4	–	–	–	–	–
Spotted Towhee	*Pipilo maculatus*	0.633	0.347	0.28	0.655	0.073	0.44	–	–	–	–	–
Gray Flycatcher	*Empidonax wrightii*	0.067	0.043	0.15	0.075	0.06	0.24	X	X	–	–	X
Western Meadowlark	*Sturnella neglecta*	0.14	0.087	0.023	0.095	0.047	0.2	–	X	–	–	X
Lesser Goldfinch	*Spinus psaltria*	0.023	0.017	0.013	0	0.043	0.16	–	–	–	–	–

[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 (RA, birds within 50 m/point) for species detected during 2008, 2011, 2014, 2017, and 2021 point count surveys at Lava Beds National Monument, and proportion of routes with detections for each species in 2021. Species are ordered in decreasing order of abundance for 2021 at the park unit; those detected in previous years, but not in 2021, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Conifer[1]	CalPIF Sagebrush[2]	ContPIF Northern Pacific Rain-forest[3,4,5]	ContPIF Great Basin[3,4,5]	CDFW Modoc Plateau[6]
Cedar Waxwing	*Bombycilla cedrorum*	0	0.05	0	0	0.037	0.08	–	–	–	–	–
Blue-gray Gnatcatcher	*Polioptila caerulea*	0.16	0.147	0.157	0.206	0.033	0.12	–	–	–	–	–
House Finch	*Carpodacus mexicanus*	0	0.003	0	0.012	0.027	0.24	–	–	–	–	–
Lark Sparrow	*Chondestes grammacus*	0.077	0.09	0.073	0.099	0.027	0.2	–	X	–	–	X
Mountain Chickadee	*Poecile gambeli*	0.03	0.077	0.01	0.024	0.027	0.08	–	–	–	–	–
Rock Wren	*Salpinctes obsoletus*	0.073	0.15	0.097	0.143	0.027	0.2	–	–	–	–	–
Ash-throated Flycatcher	*Myiarchus cinerascens*	0.013	0.027	0.043	0.056	0.023	0.2	–	–	–	–	–

[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)

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[6] CDFW 2015

Table 1 (continued). Mean relative abundance (RA, birds within 50 m/point) for species detected during 2008, 2011, 2014, 2017, and 2021 point count surveys at Lava Beds National Monument, and proportion of routes with detections for each species in 2021. Species are ordered in decreasing order of abundance for 2021 at the park unit; those detected in previous years, but not in 2021, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Conifer[1]	CalPIF Sagebrush[2]	ContPIF Northern Pacific Rain-forest[3,4,5]	ContPIF Great Basin[3,4,5]	CDFW Modoc Plateau[6]
American Robin	*Turdus migratorius*	0.02	0.037	0.013	0.004	0.02	0.04	–	–	–	–	–
Black-headed Grosbeak	*Pheucticus melanocephalus*	0.013	0.013	0.04	0.028	0.017	0.08	–	–	–	–	–
Chipping Sparrow	*Spizella passerina*	0.15	0.093	0.167	0.067	0.017	0.12	X	–	–	–	–
Dark-eyed Junco	*Junco hyemalis*	0.027	0.06	0.03	0.044	0.017	0.12	X	–	–	–	–
Dusky Flycatcher	*Empidonax oberholseri*	0.023	0.007	0.02	0.044	0.017	0.2	–	–	–	–	–
Lazuli Bunting	*Passerina amoena*	0.17	0.12	0.063	0.056	0.017	0.16	–	–	–	–	–
Mountain Bluebird	*Sialia currucoides*	0.013	0.013	0.013	0.004	0.017	0.08	–	–	–	–	–
Mourning Dove	*Zenaida macroura*	0.073	0.073	0.05	0.028	0.013	0.16	–	–	–	–	–

[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 (RA, birds within 50 m/point) for species detected during 2008, 2011, 2014, 2017, and 2021 point count surveys at Lava Beds National Monument, and proportion of routes with detections for each species in 2021. Species are ordered in decreasing order of abundance for 2021 at the park unit; those detected in previous years, but not in 2021, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Conifer[1]	CalPIF Sagebrush[2]	ContPIF Northern Pacific Rain-forest[3,4,5]	ContPIF Great Basin[3,4,5]	CDFW Modoc Plateau[6]
Western Kingbird	*Tyrannus verticalis*	0	0.003	0.027	0.008	0.01	0.08	–	–	–	–	–
California Towhee	*Pipilo crissalis*	0.003	0	0	0.012	0.007	0.08	–	–	–	–	–
Cassin's Vireo	*Vireo cassinii*	0.003	0	0	0	0.007	0.08	–	–	–	–	–
Northern Flicker	*Colaptes auratus*	0.01	0.02	0.013	0.012	0.007	0.08	–	–	–	–	–
Purple Finch	*Carpodacus purpureus*	0	0	0.003	0	0.007	0.04	X	–	–	–	–
Townsend's Solitaire	*Myadestes townsendi*	0	0.003	0	0.016	0.007	0.08	–	–	–	–	–
Tree Swallow	*Tachycineta bicolor*	0	0	0	0	0.007	0.08	–	–	–	–	–
Black-capped Chickadee	*Poecile atricapillus*	0	0	0	0	0.003	0.04	–	–	–	–	–
Bullock's Oriole	*Icterus bullockii*	0.01	0	0.017	0	0.003	0.04	–	–	–	–	–

[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)

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Table 1 (continued). Mean relative abundance (RA, birds within 50 m/point) for species detected during 2008, 2011, 2014, 2017, and 2021 point count surveys at Lava Beds National Monument, and proportion of routes with detections for each species in 2021. Species are ordered in decreasing order of abundance for 2021 at the park unit; those detected in previous years, but not in 2021, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Conifer[1]	CalPIF Sagebrush[2]	ContPIF Northern Pacific Rain-forest[3,4,5]	ContPIF Great Basin[3,4,5]	CDFW Modoc Plateau[6]
Cassin's Finch	*Carpodacus cassinii*	0.007	0.023	0.003	0	0.003	0.04	X	–	–	W	–
Common Raven	*Corvus corax*	0	0.003	0	0.004	0.003	0.04	–	–	–	–	–
Loggerhead Shrike	*Lanius ludovicianus*	0	0.003	0.017	0.028	0.003	0.04	–	X	–	–	X
Olive-sided Flycatcher	*Contopus cooperi*	0.007	0	0	0	0.003	0.04	X	–	W	–	–
Pacific-slope Flycatcher	*Empidonax difficilis*	0	0	0	0	0.003	0.04	–	–	–	–	–
Pinyon Jay	*Gymnorhinus cyanocephalus*	0.003	0	0.023	0	0.003	0.04	–	–	–	–	–
Red Crossbill	*Loxia curvirostra*	0	0	0.007	0	0.003	0.04	–	–	–	–	–
Savannah Sparrow	*Passerculus sandwichensis*	0.007	0.01	0	0	0.003	0.04	–	–	–	–	X
Say's Phoebe	*Sayornis saya*	0	0.003	0.01	0.008	0.003	0.04	–	–	–	–	–

[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)

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[6] CDFW 2015

Table 1 (continued). Mean relative abundance (RA, birds within 50 m/point) for species detected during 2008, 2011, 2014, 2017, and 2021 point count surveys at Lava Beds National Monument, and proportion of routes with detections for each species in 2021. Species are ordered in decreasing order of abundance for 2021 at the park unit; those detected in previous years, but not in 2021, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Conifer[1]	CalPIF Sagebrush[2]	ContPIF Northern Pacific Rain-forest[3,4,5]	ContPIF Great Basin[3,4,5]	CDFW Modoc Plateau[6]
Steller's Jay	*Cyanocitta stelleri*	0.003	0.003	0	0.004	0.003	0.04	X	–	–	–	–
Western Bluebird	*Sialia mexicana*	0	0	0.017	0.016	0.003	0.04	–	–	–	–	–
Western Tanager	*Piranga ludoviciana*	0.037	0.007	0.007	0.012	0.003	0.04	X	–	–	–	–
Western Wood-Pewee	*Contopus sordidulus*	0.007	0	0.003	0.024	0.003	0.04	–	–	–	–	–
American Kestrel	*Falco sparverius*	0	0	0.003	0.004	0	0	–	–	–	–	–
Anna's Hummingbird	*Calypte anna*	0	0	0	0.004	0	0	–	–	–	–	–
Barn Swallow	*Hirundo rustica*	0.003	0.003	0	0	0	0	–	–	–	–	–
Black-throated Gray Warbler	*Dendroica nigrescens*	0.003	0.003	0	0	0	0	X	–	–	–	–

[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)

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[6] CDFW 2015

Table 1 (continued). Mean relative abundance (RA, birds within 50 m/point) for species detected during 2008, 2011, 2014, 2017, and 2021 point count surveys at Lava Beds National Monument, and proportion of routes with detections for each species in 2021. Species are ordered in decreasing order of abundance for 2021 at the park unit; those detected in previous years, but not in 2021, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Conifer[1]	CalPIF Sagebrush[2]	ContPIF Northern Pacific Rain-forest[3,4,5]	ContPIF Great Basin[3,4,5]	CDFW Modoc Plateau[6]
Black-throated Sparrow	*Amphispiza bilineata*	0.007	0.007	0.01	0.012	0	0	–	–	–	–	–
Brewer's Blackbird	*Euphagus cyanocephalus*	0.007	0.07	0.02	0.004	0	0	–	–	–	–	–
Brewer's Sparrow	*Spizella breweri*	0.04	0.08	0.043	0.06	0	0	–	X	–	–	X
Broad-tailed Hummingbird	*Selasphorus platycercus*	0	0	0.003	0	0	0	–	–	–	–	–
Bushtit	*Psaltriparus minimus*	0.06	0.06	0.053	0.083	0	0	–	–	–	–	–
California Quail	*Callipepla californica*	0.013	0.017	0.02	0.052	0	0	–	–	–	–	–
Calliope Hummingbird	*Stellula calliope*	0.007	0.007	0.007	0	0	0	–	–	–	–	–

[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)

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Table 1 (continued). Mean relative abundance (RA, birds within 50 m/point) for species detected during 2008, 2011, 2014, 2017, and 2021 point count surveys at Lava Beds National Monument, and proportion of routes with detections for each species in 2021. Species are ordered in decreasing order of abundance for 2021 at the park unit; those detected in previous years, but not in 2021, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Conifer[1]	CalPIF Sagebrush[2]	ContPIF Northern Pacific Rain-forest[3,4,5]	ContPIF Great Basin[3,4,5]	CDFW Modoc Plateau[6]
Canyon Wren	*Catherpes mexicanus*	0	0.007	0.003	0.024	0	0	–	–	–	–	–
Clark's Nutcracker	*Nucifraga columbiana*	0	0.007	0	0	0	0	X	–	–	–	–
Evening Grosbeak	*Coccothraustes vespertinus*	0	0.007	0	0	0	0	–	–	W	W	–
Green-tailed Towhee	*Pipilo chlorurus*	0.007	0.007	0.02	0.02	0	0	–	X	–	–	X
Hairy Woodpecker	*Picoides villosus*	0.003	0.003	0.01	0	0	0	–	–	–	–	–
Horned Lark	*Eremophila alpestris*	0.08	0.04	0.05	0.095	0	0	–	–	–	–	–
House Wren	*Troglodytes aedon*	0.003	0.007	0.003	0.004	0	0	–	–	–	–	–

[1] CalPIF 2002a

[2] CalPIF 2005

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Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Conifer[1]	CalPIF Sagebrush[2]	ContPIF Northern Pacific Rain-forest[3,4,5]	ContPIF Great Basin[3,4,5]	CDFW Modoc Plateau[6]
Lewis's Woodpecker	*Melanerpes lewis*	0	0	0	0.004	0	0	–	–	–	W	–
Mountain Quail	*Oreortyx pictus*	0.013	0.007	0	0.008	0	0	X	–	–	–	–
Northern Harrier	*Circus cyaneus*	0	0	0	0.004	0	0	–	–	–	–	X
Orange-crowned Warbler	*Vermivora celata*	0	0.037	0	0	0	0	–	–	–	–	–
Pine Siskin	*Spinus pinus*	0	0.023	0.007	0	0	0	–	–	D	D	–
Prairie Falcon	*Falco mexicanus*	0	0.003	0	0	0	0	–	–	–	–	–
Purple Martin	*Progne subis*	0.013	0.003	0	0	0	0	–	–	–	–	–
Pygmy Nuthatch	*Sitta pygmaea*	0.003	0.003	0	0	0	0	–	–	–	–	–
Red-breasted Nuthatch	*Sitta canadensis*	0.003	0.01	0	0	0	0	X	–	–	–	–
Red-breasted Sapsucker	*Sphyrapicus ruber*	0.003	0	0.013	0.008	0	0	–	–	–	–	–

[1] CalPIF 2002a

[2] CalPIF 2005

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Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Conifer[1]	CalPIF Sagebrush[2]	ContPIF Northern Pacific Rain-forest[3,4,5]	ContPIF Great Basin[3,4,5]	CDFW Modoc Plateau[6]
Red-tailed Hawk	*Buteo jamaicensis*	0	0	0	0.004	0	0	–	–	–	–	–
Rufous Hummingbird	*Selasphorus rufus*	0	0.003	0	0.004	0	0	–	–	–	–	–
Sage Thrasher	*Oreoscoptes montanus*	0	0.017	0.003	0.004	0	0	–	X	–	–	–
Townsend's Warbler	*Dendroica townsendi*	0.007	0.017	0.02	0.008	0	0	–	–	–	–	–
Turkey Vulture	*Cathartes aura*	0	0.01	0.007	0	0	0	–	–	–	–	–
Vaux's Swift	*Chaetura vauxi*	0.007	0	0	0	0	0	X	–	–	–	X
Vesper Sparrow	*Pooecetes gramineus*	0.023	0	0	0	0	0	–	X	–	–	–
Violet-green Swallow	*Tachycineta thalassina*	0.003	0.02	0.01	0.008	0	0	–	–	–	–	–

[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)

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Table 1 (continued). Mean relative abundance (RA, birds within 50 m/point) for species detected during 2008, 2011, 2014, 2017, and 2021 point count surveys at Lava Beds National Monument, and proportion of routes with detections for each species in 2021. Species are ordered in decreasing order of abundance for 2021 at the park unit; those detected in previous years, but not in 2021, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Conifer[1]	CalPIF Sagebrush[2]	ContPIF Northern Pacific Rain-forest[3,4,5]	ContPIF Great Basin[3,4,5]	CDFW Modoc Plateau[6]
Warbling Vireo	*Vireo gilvus*	0.017	0	0	0.012	0	0	–	–	–	–	–
White-breasted Nuthatch	*Sitta carolinensis*	0	0.003	0	0	0	0	–	–	–	–	–
Wilson's Warbler	*Wilsonia pusilla*	0.03	0.01	0.023	0.012	0	0	–	–	–	–	–
Yellow-rumped Warbler	*Dendroica coronata*	0.007	0.127	0.03	0	0	0	X	–	–	–	–

[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 2. List of additional species detected at Lava Beds National Monument in 2021 (not counted within 50 m during VCP point count surveys) and conservation status. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	CalPIF Sagebrush[1]	ContPIF Northern Pacific Rainforest[2,3,4]	ContPIF Great Basin[2,3,4]	CDFW Modoc Plateau[5]
American Goldfinch	*Spinus tristis*	–	–	–	–
American Kestrel	*Falco sparverius*	–	–	–	–
Band-tailed Pigeon	*Patagioenas fasciata*	–	W	W	–
Barn Swallow	*Hirundo rustica*	–	–	–	–
Black-throated Sparrow	*Amphispiza bilineata*	–	–	–	–
Brewer's Blackbird	*Euphagus cyanocephalus*	–	D	D	–
Brewer's Sparrow	*Spizella breweri*	X	–	–	X
Brown Creeper	*Certhia americana*	–	–	–	–
Bushtit	*Psaltriparus minimus*	–	–	–	–
California Quail	*Callipepla californica*	–	–	–	–
Calliope Hummingbird	*Stellula calliope*	–	–	–	–
Canada Goose	*Branta canadensis*	–	–	–	–
Canyon Wren	*Catherpes mexicanus*	–	–	–	–
Caspian Tern	*Hydroprogne caspia*	–	–	–	–
Clark's Nutcracker	*Nucifraga columbiana*	–	–	–	–
Common Nighthawk	*Chordeiles minor*	–	D	D	–
Eurasian Collared-Dove	*Streptopelia decaocto*	–	–	–	–
Evening Grosbeak	*Coccothraustes vespertinus*	–	W	W	–
Great Horned Owl	*Bubo virginianus*	–	–	–	–
Green-tailed Towhee	*Pipilo chlorurus*	X	–	–	X
Hammond's Flycatcher	*Empidonax hammondii*	–	–	–	–
Hermit Thrush	*Catharus guttatus*	–	–	–	–
Horned Lark	*Eremophila alpestris*	–	D	D	–
Mallard	*Anas platyrhynchos*	–	–	–	–
Mountain Quail	*Oreortyx pictus*	–	W	W	–
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	–	–	–	–

[1] CalPIF 2005

[2] Rosenberg et al. 2016

[3] D are 'Common Birds in Decline' for the Intermountain West Joint Venture region in Rosenberg et al. (2016)

[4] W are 'Watch List Species' (Rosenberg et al. 2016)

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Table 2 (continued). List of additional species detected at Lava Beds National Monument in 2021 (not counted within 50 m during VCP point count surveys) and conservation status. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	CalPIF Sagebrush[1]	ContPIF Northern Pacific Rainforest[2,3,4]	ContPIF Great Basin[2,3,4]	CDFW Modoc Plateau[5]
Red-breasted Sapsucker	*Sphyrapicus ruber*	–	–	–	–
Red-tailed Hawk	*Buteo jamaicensis*	–	–	–	–
Ring-necked Pheasant	*Phasianus colchicus*	–	–	–	–
Rock Pigeon	*Columba livia*	–	–	–	–
Sagebrush Sparrow	*Artemisiospiza nevadensis*	X	–	–	X
Sage Thrasher	*Oreoscoptes montanus*	X	–	–	–
Swainson's Hawk	*Buteo swainsoni*	–	–	–	–
Turkey Vulture	*Cathartes aura*	–	–	–	–
Violet-green Swallow	*Tachycineta thalassina*	–	–	–	–
Warbling Vireo	*Vireo gilvus*	–	–	–	–
White-breasted Nuthatch	*Sitta carolinensis*	–	–	–	–
Yellow-rumped Warbler	*Dendroica coronata*	–	–	–	–

[1] CalPIF 2005

[2] Rosenberg et al. 2016

[3] D are 'Common Birds in Decline' for the Intermountain West Joint Venture region in Rosenberg et al. (2016)

[4] W are 'Watch List Species' (Rosenberg et al. 2016)

[5] CDFW 2015

Redwood National and State Parks

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. Because of the rugged terrain in this park, the number of established point count stations varied from six to eight for each route. In 2021, it was determined that surveyors at RNSP would work in pairs for safety purposes. For that reason, we surveyed only 15 of the 30 permanent point count survey routes (Figure 4 and Figure 5). We attempted to survey the first 15 routes in the original GRTS design to best achieve spatial balance, but several of the routes were inaccessible (Table 3). All points in each of the 15 routes completed were surveyed in 2021. Surveys were completed from June 9th to June 29th by Caitlin Bebee and Avery Young. The 2021 point count surveys recorded 23 species within 50 m of the station (Table 4). An additional 17 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 5). Sixty-two species have been detected within 50 m of the stations during at least 1 of 5 survey years, and a total of 16 species have been detected within 50 m of the stations throughout all 5 years of surveys. Species detected at Redwoods for the first time in 2021 include Black-capped Chickadee and Western Tanager.

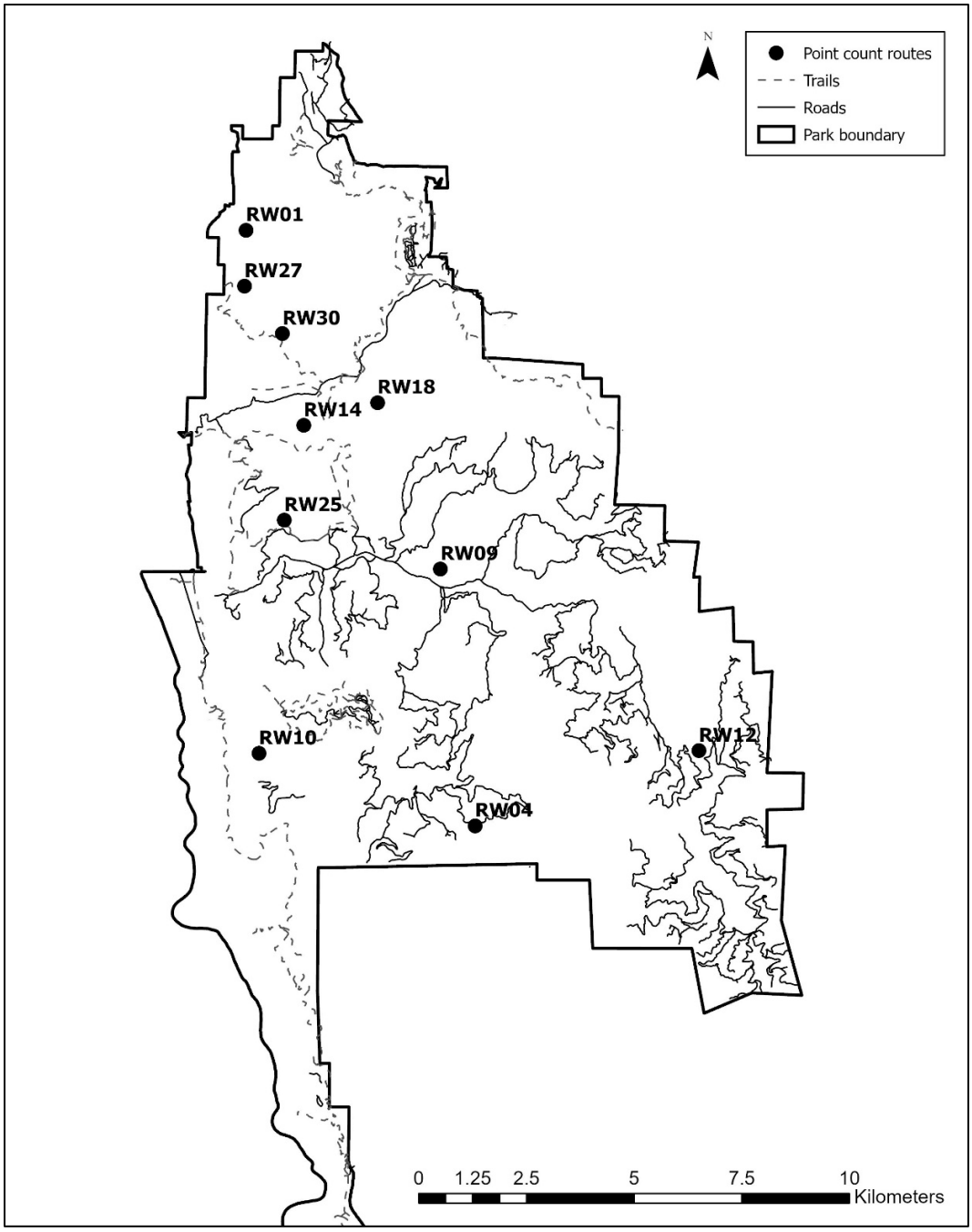

Figure 4. Point count routes at long-term landbird monitoring sites in the northern area of Redwood National and State Parks.

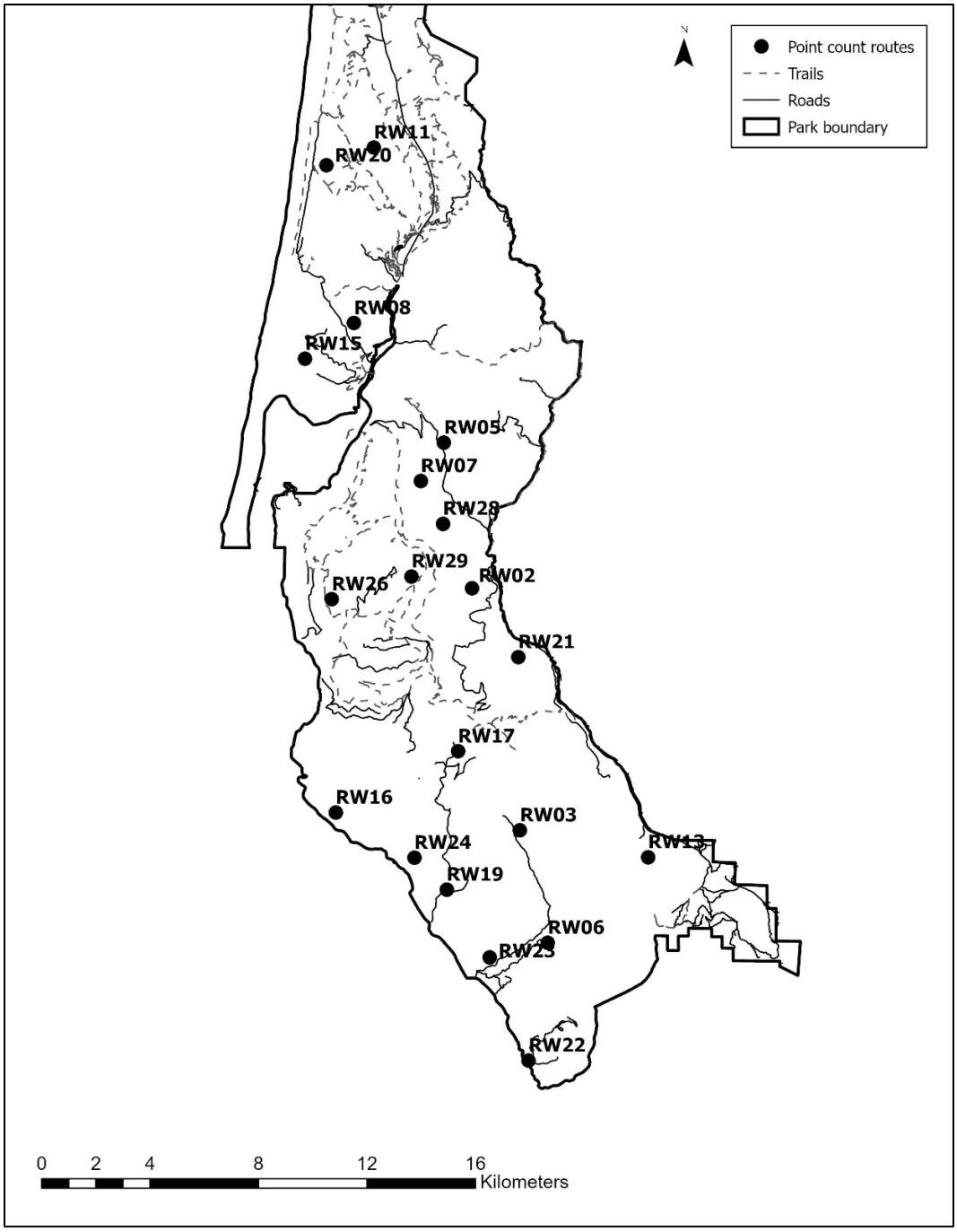

Figure 5. Point count routes at long-term landbird monitoring sites in the southern area of Redwood National and State Parks.

Table 3. Redwood State and National Parks long-term landbird monitoring sites, listed in GRTS order, indicating which 15 out of 30 monitoring sites were sampled in 2021. We attempted to survey the first 15 routes in the original GRTS design to best achieve spatial balance, but several of the routes were inaccessible.

Site Code	Site Name	Sampled in 2021?
RW01	Redwoods 01	Yes
RW02	Redwoods 02	Yes
RW03	Redwoods 03	No
RW04	Redwoods 04	Yes
RW05	Redwoods 05	Yes
RW06	Redwoods 06	No
RW07	Redwoods 07	Yes
RW08	Redwoods 08	Yes
RW09	Redwoods 09	Yes
RW10	Redwoods 10	Yes
RW11	Redwoods 11	Yes
RW12	Redwoods 12	Yes
RW13	Redwoods 13	Yes
RW14	Redwoods 14	Yes
RW15	Redwoods 15	Yes
RW16	Redwoods 16	No
RW17	Redwoods 17	Yes
RW18	Redwoods 18	No
RW19	Redwoods 19	No
RW20	Redwoods 20	No
RW21	Redwoods 21	Yes
RW22	Redwoods 22	No
RW23	Redwoods 23	No
RW24	Redwoods 24	No
RW25	Redwoods 25	No
RW26	Redwoods 26	No
RW27	Redwoods 27	No
RW28	Redwoods 28	No
RW29	Redwoods 29	No
RW30	Redwoods 30	No

Table 4. Mean relative abundance (RA, birds within 50 m/point) for species detected during 2008, 2011, 2014, 2017, and 2021 point count surveys at Redwood National and State Parks, and proportion of routes with detections for each species in 2021. Species are ordered in decreasing order of abundance for 2021 at the park unit; those detected in previous years, but not in 2021, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Riparian[1]	CalPIF Oak[2]	CalPIF Conifer[3]	CalPIF Coastal Scrub[4]	ContPIF N. Pacific Rainforest[5,6,7]	CDFW N. Coast and Klamath Province[8]
Pacific-slope Flycatcher	*Empidonax difficilis*	0.771	0.492	0.467	0.752	0.56	0.933	–	–	–	–	–	–
Chestnut-backed Chickadee	*Poecile rufescens*	0.375	0.323	0.262	0.342	0.45	0.8	–	–	–	–	–	–
Pacific Wren [9]	*Troglodytes pacificus*	0.354	0.287	0.338	0.391	0.25	0.733	–	–	–	–	–	–
Brown Creeper	*Certhia americana*	0.135	0.159	0.097	0.211	0.22	0.533	–	–	X	–	–	–
Hermit Warbler	*Dendroica occidentalis*	0.057	0.056	0.062	0.087	0.22	0.533	–	–	–	–	–	–
Steller's Jay	*Cyanocitta stelleri*	0.162	0.164	0.133	0.087	0.18	0.467	–	–	X	–	–	–

[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

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Table 4 (continued). Mean relative abundance (RA, birds within 50 m/point) for species detected during 2008, 2011, 2014, 2017, and 2021 point count surveys at Redwood National and State Parks, and proportion of routes with detections for each species in 2021. Species are ordered in decreasing order of abundance for 2021 at the park unit; those detected in previous years, but not in 2021, are listed at the end of the table. Conservation information available from selected plans is identified in rightmost columns. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	RA 2008	RA 2011	RA 2014	RA 2017	RA 2021	Proportion of Routes 2021	CalPIF Riparian[1]	CalPIF Oak[2]	CalPIF Conifer[3]	CalPIF Coastal Scrub[4]	ContPIF N. Pacific Rainforest[5,6,7]	CDFW N. Coast and Klamath Province[8]
Golden-crowned Kinglet	*Regulus satrapa*	0.234	0.128	0.262	0.255	0.14	0.467	–	–	X	–	–	–
Acorn Woodpecker	*Melanerpes formicivorus*	0	0.005	0.005	0.012	0.08	0.133	–	X	–	–	–	–
Swainson's Thrush	*Catharus ustulatus*	0.094	0.123	0.118	0.149	0.08	0.2	X	–	–	–	–	–
Wilson's Warbler	*Wilsonia pusilla*	0.276	0.174	0.256	0.379	0.057	0.8	X	–	–	–	D	–
Hutton's Vireo	*Vireo huttoni*	0.115	0.144	0.046	0.155	0.02	0.133	–	X	–	–	–	X
Red-breasted Nuthatch	*Sitta canadensis*	0.01	0.087	0.01	0.037	0.02	0.133	–	–	X	–	–	–
Tree Swallow	*Tachycineta bicolor*	0.005	0	0	0	0.02	0.067	X	–	–	–	–	–

[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)

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Wrentit	*Chamaea fasciata*	0.052	0.036	0.056	0.031	0.02	0.067	–	–	–	X	D	–
Black-capped Chickadee	*Poecile atricapillus*	0	0	0	0	0.014	0.067	–	–	–	–	–	–
Black-headed Grosbeak	*Pheucticus melanocephalus*	0.005	0.01	0.005	0.012	0.01	0.067	X	–	–	–	–	–
Grasshopper Sparrow	*Ammodramus savannarum*	0	0	0.015	0	0.01	0.067	–	–	–	–	–	–
Hermit Thrush	*Catharus guttatus*	0.026	0.046	0.046	0.056	0.01	0.067	–	–	–	–	–	–
Lazuli Bunting	*Passerina amoena*	0.01	0.021	0	0.019	0.01	0.067	–	–	–	–	–	–
Red Crossbill	*Loxia curvirostra*	0.031	0.067	0.056	0.031	0.01	0.067	–	–	–	–	–	–

[1] RHJV 2004

[2] CalPIF 2002b

[3] CalPIF 2002a

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Song Sparrow	*Melospiza melodia*	0.01	0.041	0.021	0.019	0.01	0.067	X	–	–	–	–	–
Western Tanager	*Piranga ludoviciana*	0	0	0	0	0.01	0.067	–	–	X	–	–	–
Western Wood-Pewee	*Contopus sordidulus*	0.005	0.01	0.005	0	0.01	0.067	–	–	–	–	–	–
Allen's Hummingbird	*Selasphorus sasin*	0	0.021	0.015	0.031	0	0	–	–	–	–	W	–
American Robin	*Turdus migratorius*	0	0.01	0.005	0.006	0	0	–	–	–	–	–	–
Anna's Hummingbird	*Calypte anna*	0.005	0	0	0	0	0	–	–	–	–	–	–
Band-tailed Pigeon	*Patagioenas fasciata*	0.052	0.067	0.041	0.043	0	0	–	X	–	–	W	–

[1] RHJV 2004

[2] CalPIF 2002b

[3] CalPIF 2002a

[4] CalPIF 2004

[5] Rosenberg et al. 2016

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Black-throated Gray Warbler	*Dendroica nigrescens*	0.021	0.021	0.01	0	0	0	–	–	X	–	–	–
Bushtit	*Psaltriparus minimus*	0.005	0	0.005	0.012	0	0	–	–	–	–	–	–
Cassin's Vireo	*Vireo cassinii*	0	0.005	0	0	0	0	–	–	–	–	–	–
Chipping Sparrow	*Spizella passerina*	0	0.005	0	0	0	0	–	–	X	–	–	–
Common Raven	*Corvus corax*	0.01	0	0.01	0	0	0	–	–	–	–	–	–
Dark-eyed Junco	*Junco hyemalis*	0.021	0.031	0.005	0	0	0	–	–	X	–	–	–
Downy Woodpecker	*Picoides pubescens*	0.005	0.005	0	0	0	0	–	–	–	–	–	–

[1] RHJV 2004

[2] CalPIF 2002b

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European Starling	*Sturnus vulgaris*	0.01	0	0	0	0	0	–	X	–	–	–	–
Gray Jay	*Perisoreus canadensis*	0.031	0.01	0.046	0.025	0	0	–	–	X	–	–	–
Hairy Woodpecker	*Picoides villosus*	0.021	0.031	0.01	0.037	0	0	–	–	–	–	–	–
Lesser Goldfinch	*Spinus psaltria*	0	0	0	0.006	0	0	–	–	–	–	–	–
MacGillivray's Warbler	*Oporornis tolmiei*	0	0.005	0	0	0	0	–	–	X	–	–	–
Marbled Murrelet	*Brachyramphus marmoratus*	0.005	0.005	0	0	0	0	–	–	–	–	–	–

[1] RHJV 2004

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Mountain Quail	*Oreortyx pictus*	0	0.005	0	0	0	0	–	–	X	X	–	–
Northern Flicker	*Colaptes auratus*	0.01	0.005	0	0	0	0	–	–	–	–	–	–
Northern Saw-whet Owl	*Aegolius acadicus*	0.005	0	0	0	0	0	–	–	–	–	–	–
Olive-sided Flycatcher	*Contopus cooperi*	0	0.005	0	0	0	0	–	–	X	–	W	X
Orange-crowned Warbler	*Vermivora celata*	0.01	0	0	0.006	0	0	–	–	–	–	–	–
Pileated Woodpecker	*Dryocopus pileatus*	0	0	0.021	0.012	0	0	–	–	X	–	–	X

[1] RHJV 2004

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Pine Siskin	*Spinus pinus*	0.016	0.01	0	0	0	0	–	–	–	–	D	–
Purple Finch	*Carpodacus purpureus*	0	0	0.005	0	0	0	–	–	X	–	–	–
Purple Martin	*Progne subis*	0	0	0	0.025	0	0	–	–	–	–	–	X
Red-breasted Sapsucker	*Sphyrapicus ruber*	0	0	0.01	0.012	0	0	–	–	–	–	–	–
Ruffed Grouse	*Bonasa umbellus*	0.005	0	0	0	0	0	–	–	–	–	–	–
Rufous Hummingbird	*Selasphorus rufus*	0.005	0.031	0	0	0	0	–	–	–	–	W	–
Savannah Sparrow	*Passerculus sandwichensis*	0.01	0.01	0	0	0	0	–	–	–	–	–	–

[1] RHJV 2004

[2] CalPIF 2002b

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Sharp-shinned Hawk	*Accipiter striatus*	0.005	0	0	0	0	0	–	–	–	–	–	–
Sooty Grouse	*Dendragapus fuliginosus*	0	0	0.005	0	0	0	–	–	–	–	W	–
Spotted Towhee	*Pipilo maculatus*	0	0.015	0.015	0	0	0	–	–	–	–	–	X
Varied Thrush	*Ixoreus naevius*	0.099	0.015	0.123	0.143	0	0	–	–	–	–	D	–
Vaux's Swift	*Chaetura vauxi*	0.094	0.067	0.092	0.093	0	0	–	–	X	–	–	X
Warbling Vireo	*Vireo gilvus*	0	0.005	0	0	0	0	X	–	–	–	–	–
Western Scrub-Jay	*Aphelocoma californica*	0.005	0	0	0	0	0	–	X	–	–	–	–

[1] RHJV 2004

[2] CalPIF 2002b

[3] CalPIF 2002a

[4] CalPIF 2004

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White-crowned Sparrow	*Zonotrichia leucophrys*	0	0.015	0.015	0	0	0	–	–	–	–	–	–
Yellow-rumped Warbler	*Dendroica coronata*	0.01	0	0	0	0	0	–	–	X	–	–	–

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[2] CalPIF 2002b

[3] CalPIF 2002a

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Table 5. List of additional species detected at Redwood National and State Parks in 2021 (not counted within 50 m during VCP point count surveys) and conservation status. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	CalPIF Riparian[1]	CalPIF Oak[2]	CalPIF Conifer[3]	CalPIF Coastal Scrub[4]	ContPIF N. Pacific Rainforest[5,6,7]	CDFW N. Coast and Klamath Province[8]
Allen's Hummingbird	*Selasphorus sasin*	–	–	–	–	W	–
Band-tailed Pigeon	*Patagioenas fasciata*	–	X	–	–	W	–
Barn Swallow	*Hirundo rustica*	–	–	–	–	–	–
California Quail	*Callipepla californica*	–	X	–	–	–	X
Common Raven	*Corvus corax*	–	–	–	–	–	–
Cooper's Hawk	*Accipiter cooperii*	–	–	–	–	–	–
Dark-eyed Junco	*Junco hyemalis*	–	–	X	–	–	–
Great Horned Owl	*Bubo virginianus*	–	–	–	–	–	–
House Wren	*Troglodytes aedon*	–	–	–	–	–	–
Lesser Goldfinch	*Spinus psaltria*	–	–	–	–	–	–
Northern Flicker	*Colaptes auratus*	–	–	–	–	–	–
Pileated Woodpecker	*Dryocopus pileatus*	–	–	X	–	–	X
Pine Siskin	*Spinus pinus*	–	–	–	–	D	–
Red-tailed Hawk	*Buteo jamaicensis*	–	–	–	–	–	–
Sooty Grouse	*Dendragapus fuliginosus*	–	–	–	–	W	X
Turkey Vulture	*Cathartes aura*	–	–	–	–	–	–
Varied Thrush	*Ixoreus naevius*	–	–	–	–	D	–

[1] RHJV 2004

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Oregon Caves National Monument and Preserve Ecological Monitoring Station

The ecological monitoring station at Oregon Caves National Monument and Preserve was run 17 times during 2021. In 2021, we redefined the dates that encompass the breeding and migration seasons; future summary reports will use this updated methodology to define the breeding and migration seasons for all years. Seven visits occurred during the breeding season (June 3rd to August 5th) and ten visits during the fall dispersal and migration season (August 11th to October 12th). On all visits, two area searches were completed. The banding crew was led by KBO staff Claire Stuyck and monitoring was completed with the assistance of Nolan Clements, Molly Heal, Stephanie Loredo, Victor Sanchez, and Sam Webb.

In 2021, 53 species were detected at Oregon Caves National Monument and Preserve at the ecological monitoring station (Table 6). Thirty-one species were captured during mist-netting, 18 during the breeding season and 27 during the migration season. In addition, this is the first year that Hermit-Townsend Warblers (hybrid) were detected at this site. During area searches 32 species were detected, 20 during the breeding season and 30 during the migration season. Sixteen additional species were recorded on species checklists only. Overall, the number of species surveyed aligns with past efforts. From 2008 through 2017, 38–59 total species were detected, 27–36 species were captured during mist-netting, and 17–31 species were detected during area search surveys annually (Stephens et al. 2009; Stephens, Alexander, and Mohren 2010; Stephens et al. 2011; Stephens and Mohren 2012; Stephens and Mohren 2013; Stephens 2014; Stephens 2015; Stephens 2016; Stephens 2017; Stephens and Armstrong 2018; Stephens and Armstrong 2019).

Table 6. Results from the constant effort monitoring station at Oregon Caves National Monument and Preserve in 2021, showing total mist net captures and relative abundance (birds/area search plot) during breeding (3 June to 5 August) and migration (11 August 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. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	Total Captures (breeding)	Total Captures (migration)	Relative abundance (breeding)	Relative abundance (migration)	ODFW Conifer[1,5]	Cont. PIF Pacific Birds[2,3,4,5]
Acorn Woodpecker	*Melanerpes formicivorus*	0	0	n/a	n/a	–	–
American Robin	*Turdus migratorius*	0	2	0.071	0.200	–	–
Black-headed Grosbeak	*Pheucticus melanocephalus*	9	1	0.500	0.150	–	–
Black-throated Gray Warbler	*Setophaga nigrescens*	0	0	n/a	n/a	–	–
Brown Creeper	*Certhia americana*	1	1	n/a	0.500	–	–
Canada Jay	*Perisoreus canadensis*	1	0	n/a	0.300	–	–
Cassin's Vireo	*Vireo cassinii*	0	0	n/a	n/a	–	–
Chestnut-backed Chickadee	*Poecile rufescens*	8	9	0.214	0.250	–	–
Cedar Waxwing	*Bombycilla cedrorum*	0	0	n/a	n/a	–	–
Common Raven	*Corvus corax*	0	0	n/a	n/a	–	–
Dark-eyed Junco	*Junco hyemalis*	42	27	1.143	1.300	–	–
Downy Woodpecker	*Dryobates pubescens*	0	0	n/a	n/a	–	–
Fox Sparrow	*Passerella iliaca*	0	7	n/a	0.250	–	–

[1] Altman and Alexander 2012

[2] Rosenberg et al. (2016)

[3] D are 'Common Birds in Decline' for the Pacific Birds Habitat Joint Venture region in Rosenberg et al. (2016)

[4] W are 'Watch List Species' (Rosenberg et al. 2016)

[5] X are species in the conservation plan

Table 6 (continued). Results from the constant effort monitoring station at Oregon Caves National Monument and Preserve in 2021, showing total mist net captures and relative abundance (birds/area search plot) during breeding (3 June to 5 August) and migration (11 August 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. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	Total Captures (breeding)	Total Captures (migration)	Relative abundance (breeding)	Relative abundance (migration)	ODFW Conifer[1,5]	Cont. PIF Pacific Birds[2,3,4,5]
Golden-crowned Kinglet	*Regulus satrapa*	1	7	0.071	0.250	–	–
Golden-crowned Sparrow	*Zonotrichia atricapilla*	0	2	n/a	0.150	–	–
Green-tailed Towhee	*Pipilo chlorurus*	0	1	n/a	n/a	–	–
Hairy Woodpecker	*Dryobates villosus*	0	0	0.214	0.050	–	–
Hermit Thrush	*Catharus guttatus*	0	11	n/a	0.150	–	–
Hermit Warbler	*Setophaga occidentalis*	12	2	0.214	0.100	X	–
Lazuli Bunting	*Passerina amoena*	1	0	0.071	n/a	X	–
Lesser Goldfinch	*Spinus psaltria*	0	0	n/a	n/a	–	–
MacGillivray's Warbler	*Geothlypis tolmiei*	18	9	0.929	0.650	–	–
Mountain Chickadee	*Poecile gambeli*	0	2	0.071	0.150	–	–
Mountain Quail	*Oreortyx pictus*	0	0	n/a	0.200	–	–
Nashville Warbler	*Oreothlypis ruficapilla*	52	7	1.571	0.250	X	–
Northern Flicker	*Colaptes auratus*	0	1	0.143	0.150	X	–

[1] Altman and Alexander 2012

[2] Rosenberg et al. (2016)

[3] D are 'Common Birds in Decline' for the Pacific Birds Habitat Joint Venture region in Rosenberg et al. (2016)

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Table 6 (continued). Results from the constant effort monitoring station at Oregon Caves National Monument and Preserve in 2021, showing total mist net captures and relative abundance (birds/area search plot) during breeding (3 June to 5 August) and migration (11 August 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. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	Total Captures (breeding)	Total Captures (migration)	Relative abundance (breeding)	Relative abundance (migration)	ODFW Conifer[1,5]	Cont. PIF Pacific Birds[2,3,4,5]
Northern Pygmy-Owl	*Glaucidium gnoma*	0	0	n/a	n/a	–	–
Orange-crowned Warbler	*Oreothlypis celata*	0	2	n/a	0.300	X	–
Olive-sided Flycatcher	*Contopus cooperi*	0	0	n/a	n/a	X	W
Pacific Wren	*Troglodytes pacificus*	0	1	0.357	0.450	X	–
Pine Siskin	*Spinus pinus*	0	0	n/a	n/a	–	D
Pileated Woodpecker	*Dryocopus pileatus*	0	0	n/a	n/a	X	–
Pacific-slope Flycatcher	*Empidonax difficilis*	4	4	0.357	0.150	X	–
Purple Finch	*Haemorhous purpureus*	0	0	n/a	n/a	X	–
Red-breasted Nuthatch	*Sitta canadensis*	7	15	0.857	0.550	–	–
Red-breasted Sapsucker	*Sphyrapicus ruber*	6	1	0.786	0.250	–	–
Red Crossbill	*Loxia curvirostra*	0	0	n/a	n/a	–	–
Red-tailed Hawk	*Buteo jamaicensis*	0	0	n/a	0.050	–	–
Rufous Hummingbird	*Selasphorus rufus*	6	0	n/a	n/a	X	W

[1] Altman and Alexander 2012

[2] Rosenberg et al. (2016)

[3] D are 'Common Birds in Decline' for the Pacific Birds Habitat Joint Venture region in Rosenberg et al. (2016)

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Table 6 (continued). Results from the constant effort monitoring station at Oregon Caves National Monument and Preserve in 2021, showing total mist net captures and relative abundance (birds/area search plot) during breeding (3 June to 5 August) and migration (11 August 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. X are species in the conservation plan; – are species not in the conservation plan; D are 'Common Bird in Decline' for the Pacific Birds Joint Venture region in Rosenberg et al. (2016); W are 'Watch List Species' (Rosenberg et al. 2016).

Common Name	Scientific Name	Total Captures (breeding)	Total Captures (migration)	Relative abundance (breeding)	Relative abundance (migration)	ODFW Conifer[1,5]	Cont. PIF Pacific Birds[2,3,4,5]
Sooty Grouse	*Dendragapus fuliginosus*	0	0	n/a	0.050	–	W
Spotted Towhee	*Pipilo maculatus*	0	1	n/a	0.050	–	–
Steller's Jay	*Cyanocitta stelleri*	9	3	1.143	1.100	–	–
Swainson's Thrush	*Catharus ustulatus*	2	4	0.357	0.200	–	–
Townsend's Solitaire	*Myadestes townsendi*	0	0	n/a	n/a	–	–
Varied Thrush	*Ixoreus naevius*	0	1	n/a	0.100	X	D
Warbling Vireo	*Vireo gilvus*	0	0	n/a	n/a	–	–
Western Tanager	*Piranga ludoviciana*	0	1	0.071	n/a	X	–
Western Wood-Pewee	*Contopus sordidulus*	0	0	0.071	0.050	–	–
White-headed Woodpecker	*Dryobates albolarvatus*	0	0	n/a	n/a	–	–
Wilson's Warbler	*Cardellina pusilla*	1	33	n/a	0.650	–	D
Vaux's Swift	*Chaetura vauxi*	0	0	n/a	n/a	–	–
Yellow Warbler	*Setophaga petechia*	0	1	n/a	n/a	–	–
Yellow-rumped Warbler	*Setophaga coronata*	2	0	n/a	n/a	–	–

[1] Altman and Alexander 2012

[2] Rosenberg et al. (2016)

[3] D are 'Common Birds in Decline' for the Pacific Birds Habitat Joint Venture region in Rosenberg et al. (2016)

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Summary

This thirteenth 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, of the 10 most abundant species, three are Partners in Flight focal species for sagebrush habitat (Oak/Juniper Titmouse, Gray Flycatcher, and Western Meadowlark) and two are California Wildlife Conservation Strategy focal species for the Modoc Plateau region (Gray Flycatcher and Western Meadowlark) (CalPIF 2005, CDFW 2015). (Table 1). Relative abundance appeared to be lower in 2021 compared with 2017 for many common species, although California Scrub-Jay and Oak/Juniper Titmouse had lower abundance in 2017 compared to 2021. Long-term monitoring will add to our understanding of relative abundance estimates in these first five years.

At Redwood National and State Parks, Pacific-slope Flycatcher was the most abundant species in the Park in 2021 (Table 3). Of the ten most abundant species detected during point count survey, six (Wilsons's Warbler, Golden-crowned Kinglet, Brown Creeper, Acorn Woodpecker, Steller's Jay, Swainson's Thrush) are Partners in Flight focal species for riparian, oak, or conifer habitat (RHJV 2004, CalPIF 2002b, CalPIF 2002a). One of those is a common bird in steep decline (Wilson's Warbler) (Rosenberg et al. 2016). In 2021, we reduced the number of survey locations at Redwood National and State Parks to allow surveyors to work in pairs for safety reasons and will continue to complete surveys in the park using this modified procedure in the future.

Dark-eyed 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 2021. Of the ten most frequently captured species, Nashville Warbler and Wilson's Warbler are PIF focal species in coniferous forest (Altman and Alexander 2012), Wilson's Warbler is also a common bird in steep decline (Rosenberg et al. 2016). The Chestnut-backed Chickadee, a Continental Partners in Flight Watch List species was 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 thirteenth 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.

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Natural Resource Stewardship and Science
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525