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Natural Resource Stewardship and Science

Klamath Network Landbird Monitoring Annual Report

2010 Results from Crater Lake National Park, Lassen Volcanic National Park, and Oregon Caves National Monument

Natural Resource Data Series NPS/KLMN/NRDS—2011//175

ON THE COVER
Wilson's Warbler
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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. This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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Abstract

In 2010, the Klamath Inventory and Monitoring Network (KLMN) of the National Park Service implemented the third year of a long-term landbird monitoring protocol. Klamath Bird Observatory, in partnership with the KLMN, developed the protocol and completed this third 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 2010, point counts were completed, along with corresponding species checklists and habitat surveys at 35 locations within Crater Lake National Park, 25 locations within Lassen Volcanic National Park, and 4 locations within Oregon Caves National Monument. 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 during the breeding and fall migration seasons. Relative abundance (birds/station), as measured by using point count and area search methods, were 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 third 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

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Introduction

In 2010, the Klamath Inventory and Monitoring Network (KLMN) of the National Park Service implemented the third year of their long-term landbird monitoring protocol (Stephens et al. 2010b). Klamath Bird Observatory, in partnership with the KLMN, developed the protocol and has implemented the monitoring since 2008. This annual report provides a summary of 2010 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, located in southern Oregon and northern California, includes Crater Lake National Park (CRLA), Lassen Volcanic National Park (LAVO), Lava Beds National Monument (LABE), Oregon Caves National Monument (ORCA), Redwood National and State Parks (RNSP), 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).

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 et al. 2010b). 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 historic bird monitoring efforts (Stephens et al. 2010b).

The 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 (Frey et al. 2011, Stephens and Alexander 2011). 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 15 years. This effort has yielded a substantial regional dataset with information about landbird distribution, population trends, and population demographics (Alexander et al. 2004). 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.

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 will be completed every third year beginning in 2011, to include results of species detectability and density, community and habitat structure, and landbird status and trends.

Methods

Sampling Design

The KLMN Landbird Monitoring Protocol incorporates multiple standard avian sampling methods (Ralph et al. 1993), 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. 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 bisect 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, the sampling frame included locations between 100 m and 1000 m from a road or trail within the proposed expansion. 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.

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. 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, operation of an ongoing constant effort monitoring station following standard protocols (Ralph et al. 2004) continued during the breeding season (early May through early August) as well as during the fall dispersal and migration seasons (mid 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. In 2008, the first year of implementation, Lava Beds National Park and Redwood National and State Parks were surveyed. Monitoring was scheduled for Lassen Volcanic National Park and Whiskeytown National Recreation Area in 2009. However, due to logistical constraints that were encountered during monumenting of survey sites, monitoring did not occur at Lassen Volcanic National Park in 2009. In 2010, surveys were be implemented at Crater Lake National Park, Lassen Volcanic National Park, and Oregon Caves National Monument. In addition, the constant effort monitoring station at Oregon Caves National Monument was operated in 2010, and is operated annually.

Training

Point count surveyors participated in a two to three day training session at the onset of the field season. Point count surveyors who had implemented the KLMN Landbird Monitoring Protocol in previous years received two days of training and new surveyors received an additional training day. During this training, point count surveyors were instructed on protocol implementation. Training exercises included group calibration for distance estimation and simultaneous point count and vegetation surveys in the field. A certification test, which included various written and audio exercises, was implemented in 2010. Interns that operated the constant effort monitoring stations 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 begin within 15 minutes of sunrise. The observer uses 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 are 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 nearest minute), detection type (e.g., visual, song, call), and breeding status are also recorded. Point count surveys are completed within 3 or 4 hours of sunrise.

Constant Effort Monitoring Station

The constant effort monitoring station incorporates 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 has 10 nets set in an array. This arrangement optimizes bird capture and meets logistical constraints. Mist nets are opened within 15 minutes of local sunrise and operated for 5 hours. Nets are not operated during inclement weather conditions that might affect capture rates or bird safety. All birds that are captured are identified to species, aged and sexed according to Pyle (1997), and checked for signs of breeding condition (i.e., cloacal protuberances and brood patches), plus additional biometrics are collected. All captured birds, excluding hummingbirds and game birds, are banded with a U.S. Geological Survey Bird Banding Laboratory aluminum butt-end leg band.

Two area search surveys are completed at the mist net site on each day the site is operated. This method provides 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 moves around the designated area for a 20 minute period, recording all birds seen or heard.

Species Checklists

Species checklists are completed in conjunction with all bird monitoring efforts, including point count, habitat, and area search surveys and mist netting. Species checklists add value to survey data by documenting encounters of all species during an effort. Checklists enable 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 are completed at each point count station and at each mist net location following a standard methodology (Ralph et al. 1993). The surveys are designed specifically to account for habitat aspects associated with the feeding and nesting requirement of birds. The habitat sampling is conducted using a vegetation relevé method that is suitable for any vegetation type and provides 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 are 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 analysis as described in the KLMN Landbird Monitoring Protocol (Stephens et al. 2010b).

Data

Data Delivery

Data were entered into relational databases to store the variety of information collected in the field. Six databases are used, each one associated with a survey methodology (Point Count, Mist Net and Net Hours, Vegetation, Area Search, and Checklist), and an additional database is used to store location information for each site. The verified, validated, and certified data were submitted to the KLMN where they were subjected to another round of validation and then 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. 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 1999, 2000; CalPIF 2002; RHJV 2004; Rich et al. 2004), and conservation status from the Oregon and California State Wildlife Conservation Strategies (CDFG 2005, ODFW 2005) are highlighted in the results where applicable.

Results

Crater Lake National Park

In 2010 we surveyed 35 permanent point count survey routes at Crater Lake National Park, each consisting of 12 survey stations (Figure 1). The sampling frame at Crater Lake National Park includes both matrix and alpine areas. The 2010 point count surveys recorded 42 species within 50 m of the stations (Table 1). An additional 15 species were detected. These 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).

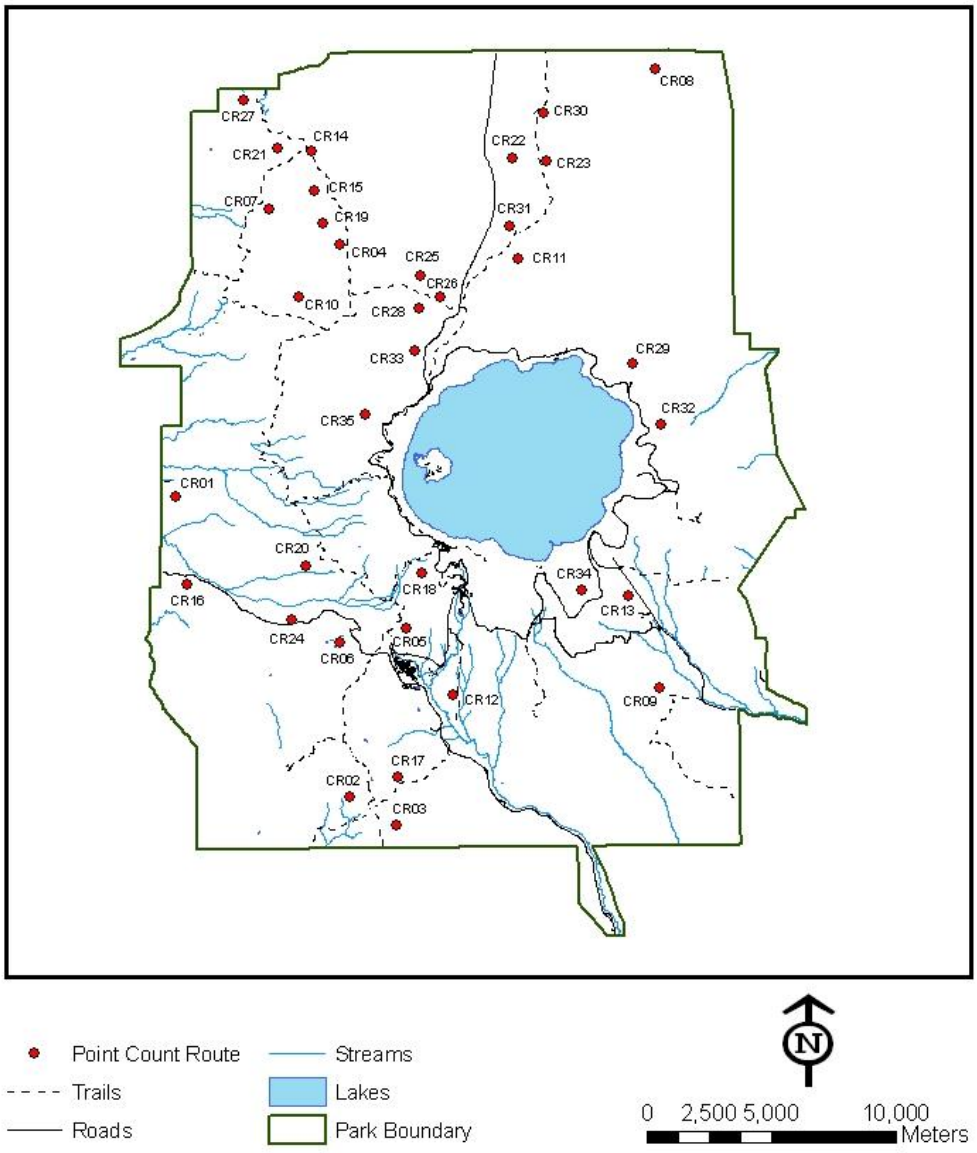

Figure 1. Location of point count routes at Crater Lake National Park.

Table 1. Relative abundance (birds/station) for species detected within 50 m during 2010 VCP point count surveys, in decreasing order of abundance, at Crater Lake National Park and conservation status.

		OR/WA PIF		Continental PIF[3]		ODFW Conservation Strategy[4]	
Species	Relative Abundance	Conifer[1]	Eastslope[2]	Intermountain West	Pacific	West Cascades	East Cascades
Pine Siskin (*Carduelis pinus*)	3.143						
Red-breasted Nuthatch (*Sitta canadensis*)	0.748						
Oregon Junco (*Junco hyemalis oregonus*)	0.624						
Audubon's Warbler (*Dendroica coronata auduboni*)	0.614						
Mountain Chickadee (*Poecile gambeli*)	0.576						
Red Crossbill (*Loxia curvirostra*)	0.333	X					
Brown Creeper (*Certhia americana*)	0.260	X	X				
Western Tanager (*Piranga ludoviciana*)	0.248						
American Robin (*Turdus migratorius*)	0.210						
Clark's Nutcracker (*Nucifraga columbiana*)	0.191		X	X			
Golden-crowned Kinglet (*Regulus satrapa*)	0.176						
Gray Jay (*Perisoreus canadensis*)	0.169						
Hermit Thrush (*Catharus guttatus*)	0.160		X				
Lesser Goldfinch (*Carduelis psaltria*)	0.121						
Hermit Warbler (*Dendroica occidentalis*)	0.100	X			X		
Steller's Jay (*Cyanocitta stelleri*)	0.093				X		
Townsend's Solitaire (*Myadestes townsendi*)	0.088						
Mountain Bluebird (*Sialia currucoides*)	0.067			X			
Chipping Sparrow (*Spizella passerina*)	0.052		X				
Horned Lark (*Eremophila alpestris*)	0.045						
Black-backed Woodpecker (*Picoides arcticus*)	0.041		X				X
Hairy Woodpecker (*Picoides villosus*)	0.041						
Cassin's Finch (*Carpodacus cassinii*)	0.026			X			
Dusky Flycatcher (*Empidonax oberholseri*)	0.026			X			
Rufous Hummingbird (*Selasphorus rufus*)	0.024	X		X	X		
Red-breasted Sapsucker (*Sphyrapicus ruber*)	0.019				X		
House Finch (*Carpodacus mexicanus*)	0.014						
Pileated Woodpecker (*Dryocopus pileatus*)	0.012	X					
Cassin's Vireo (*Vireo cassinii*)	0.010						
Hammond's Flycatcher (*Empidonax hammondii*)	0.007	X					
Nashville Warbler (*Vermivora ruficapilla*)	0.007		X				
Western Wood-Pewee (*Contopus sordidulus*)	0.007						
Olive-sided Flycatcher (*Contopus cooperi*)	0.005	X	X	X	X	X	X
Pacific-slope Flycatcher (*Empidonax difficilis*)	0.005	X			X		
Varied Thrush (*Ixoreus naevius*)	0.005	X			X		
Winter Wren (*Troglodytes troglodytes*)	0.005	X			X		

Table 2. Relative abundance (birds/station) for species detected within 50 m during 2010 VCP point count surveys, in decreasing order of abundance, at Crater Lake National Park and conservation status (continued).

		OR/WA PIF		Continental PIF[3]		ODFW Conservation Strategy[4]	
Species	Relative Abundance	Conifer[1]	Eastslope[2]	Intermountain West	Pacific	West Cascades	East Cascades
Cedar Waxwing (*Bombycilla cedrorum*)	0.002						
Common Nighthawk (*Chordeiles minor*)	0.002						
Fox Sparrow (*Passerella iliaca*)	0.002				X		
MacGillivray's Warbler (*Oporornis tolmiei*)	0.002						
Vesper Sparrow (*Pooecetes gramineus*)	0.002						
Violet-green Swallow (*Tachycineta thalassina*)	0.002						

[1]Altman 1999, [2]Altman 2000, [3]Rich 2004, [4]ODFW 2005

Table 2. List of additional species detected at Crater Lake National Park in 2010 (not counted within 50 m during VCP point count surveys) and conservation status.

	OR/WA PIF		Continental PIF[3]		ODFW Conservation Strategy[4]	
Species	Conifer[1]	Eastslope[2]	Intermountain West	Pacific	West Cascades	East Cascades
Black-capped Chickadee (*Poecile atricapilla*)						
Canada Goose (*Branta canadensis*)						
Common Raven (*Corvus corax*)						
Downy Woodpecker (*Picoides pubescens*)						
House Wren (*Troglodytes aedon*)						
Mountain Quail (*Oreortyx pictus*)				X		
Northern Pygmy-Owl (*Glaucidium gnoma*)						
Purple Finch (*Carpodacus purpureus*)						
Purple Martin (*Progne subis*)						
Pygmy Nuthatch (*Sitta pygmaea*)		X				
Red-shafted Flicker (*Colaptes auratus cafer*)						
Song Sparrow (*Melospiza melodia*)						
Turkey Vulture (*Cathartes aura*)						
Warbling Vireo (*Vireo gilvus*)						
Williamson's Sapsucker (*Sphyrapicus thyroideus*)		X	X			

[1]Altman 1999, [2]Altman 2000, [3]Rich 2004, [4]ODFW 2005

Lassen Volcanic National Park

In 2010 we surveyed 25 permanent point count survey routes at Lassen Volcanic National Park, each consisting of 10 to 12 survey stations (Figure 2, Table 3). All survey routes were originally established with 12 survey stations, but during this initial year of protocol implementation three points were dropped due to safety and time constraints (Table 3). The sampling frame at Lassen Volcanic National Park is riparian, including both streams and wetlands. The 2010 point count surveys recorded 54 species within 50 m of the stations (Table 4). An additional 24 species were detected. These 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 5).

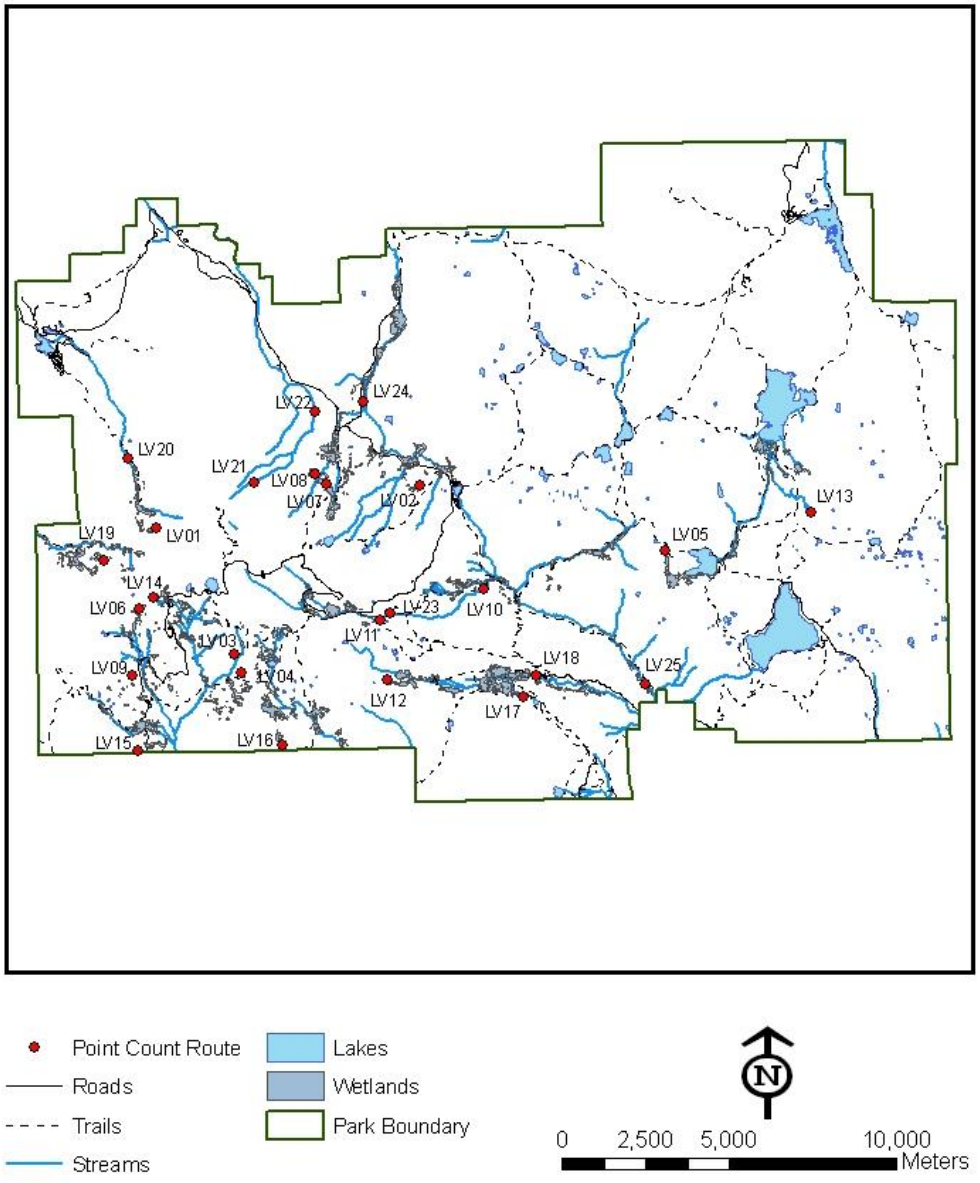

Figure 2. Location of point count routes at Lassen Volcanic National Park.

Table 3. Long-term landbird monitoring sites established at Lassen Volcanic National Park, and the number of stations at each point count route.

Point Count Route	Route Name	Number of Stations
LV01	Lassen Volcanic 01	11
LV02	Lassen Volcanic 02	12
LV03	Lassen Volcanic 03	12
LV04	Lassen Volcanic 04	12
LV05	Lassen Volcanic 05	12
LV06	Lassen Volcanic 06	12
LV07	Lassen Volcanic 07	12
LV08	Lassen Volcanic 08	12
LV09	Lassen Volcanic 09	12
LV10	Lassen Volcanic 10	12
LV11	Lassen Volcanic 11	12
LV12	Lassen Volcanic 12	12
LV13	Lassen Volcanic 13	12
LV14	Lassen Volcanic 14	12
LV15	Lassen Volcanic 15	12
LV16	Lassen Volcanic 16	12
LV17	Lassen Volcanic 17	12
LV18	Lassen Volcanic 18	12
LV19	Lassen Volcanic 19	10
LV20	Lassen Volcanic 20	12
LV21	Lassen Volcanic 21	12
LV22	Lassen Volcanic 22	12
LV23	Lassen Volcanic 23	12
LV24	Lassen Volcanic 24	12
LV25	Lassen Volcanic 25	12
Total		297

Table 4. Relative abundance (birds/station) for species detected within 50 m during 2010 VCP point count surveys, in decreasing order of abundance, at Lassen Volcanic National Park and conservation status.

		CalPIF		Contin-ental PIF[3]	CDFG[4]
Species	Relative Abundance	Riparian[1]	Conifer[2]	Pacific	CA wildlife: Cons. strategy
Oregon Junco (*Junco hyemalis oregonus*)	0.640		X		
Wilson's Warbler (*Wilsonia pusilla*)	0.293	X			

Table 4. Relative abundance (birds/station) for species detected within 50 m during 2010 VCP point count surveys, in decreasing order of abundance, at Lassen Volcanic National Park and conservation status (continued).

		CalPIF		Continental PIF[3]	CDFG[4]
Species	Relative Abundance	Riparian[1]	Conifer[2]	Pacific	CA wildlife: Cons. strategy
Pine Siskin (*Carduelis pinus*)	0.266				
American Robin (*Turdus migratorius*)	0.242				
Lincoln's Sparrow (*Melospiza lincolnii*)	0.229				
Golden-crowned Kinglet (*Regulus satrapa*)	0.216		X		
Mountain Chickadee (*Poecile gambeli*)	0.212				
Audubon's Warbler (*Dendroica coronata auduboni*)	0.158				
Brown Creeper (*Certhia americana*)	0.125		X		
Warbling Vireo (*Vireo gilvus*)	0.125	X			
Steller's Jay (*Cyanocitta stelleri*)	0.104			X	
Cassin's Finch (*Carpodacus cassinii*)	0.094				
Western Wood-Pewee (*Contopus sordidulus*)	0.074				
Winter Wren (*Troglodytes troglodytes*)	0.061			X	
Rufous Hummingbird (*Selasphorus rufus*)	0.051			X	
MacGillivray's Warbler (*Oporornis tolmiei*)	0.047		X		
Red-breasted Nuthatch (*Sitta canadensis*)	0.047		X		
Song Sparrow (*Melospiza melodia*)	0.044	X			
Western Flycatcher (*Empidonax difficilis* or *E. occidentalis*)	0.044			X	
Orange-crowned Warbler (*Vermivora celata*)	0.040				
Spotted Sandpiper (*Actitis macularia*)	0.027	X			
Mountain Quail (*Oreortyx pictus*)	0.024			X	
Western Tanager (*Piranga ludoviciana*)	0.024		X		
Chipping Sparrow (*Spizella passerina*)	0.020				
Hairy Woodpecker (*Picoides villosus*)	0.020				
Evening Grosbeak (*Coccothraustes vespertinus*)	0.017				
Nashville Warbler (*Vermivora ruficapilla*)	0.017				
Tree Swallow (*Tachycineta bicolor*)	0.017	X			
White-headed Woodpecker (*Picoides albolarvatus*)	0.017			X	
American Dipper (*Cinclus mexicanus*)	0.014				
Fox Sparrow (*Passerella iliaca*)	0.014		X	X	
Green-tailed Towhee (*Pipilo chrorurus*)	0.014				
Red-breasted Sapsucker (*Sphyrapicus ruber*)	0.014			X	
White-crowned Sparrow (*Zonotrichia leucophrys*)	0.010				
Canada Goose (*Branta canadensis*)	0.007				
Clark's Nutcracker (*Nucifraga columbiana*)	0.007				
Hermit Warbler (*Dendroica occidentalis*)	0.007			X	
Mountain Bluebird (*Sialia currucoides*)	0.007				

Table 4. Relative abundance (birds/station) for species detected within 50 m during 2010 VCP point count surveys, in decreasing order of abundance, at Lassen Volcanic National Park and conservation status (continued).

		CalPIF		Continental PIF[3]	CDFG[4]
Species	Relative Abundance	Riparian[1]	Conifer[2]	Pacific	CA wildlife: Cons. strategy
Sooty Grouse (*Dendragapus fuliginosus*)	0.007			X	
White-breasted Nuthatch (*Sitta carolinensis*)	0.007				
Yellow Warbler (Dendroica petechia*)*	0.007	X			X
Band-tailed Pigeon (*Columba fasciata*)	0.003			X	
Barn Swallow (*Hirundo rustica*)	0.003				
Black-backed Woodpecker (*Picoides arcticus*)	0.003		X		
Calliope Hummingbird (*Stellula calliope*)	0.003				
Dusky Flycatcher (*Empidonax oberholseri*)	0.003				
Hammond's Flycatcher (*Empidonax hammondii*)	0.003				
House Wren (*Troglodytes aedon*)	0.003				
Red-shafted Flicker (*Colaptes auratus cafer*)	0.003				
Red-winged Blackbird (*Agelaius phoeniceus*)	0.003				
Rock Wren (*Salpinctes obsoletus*)	0.003				
Townsend's Solitaire (*Myadestes townsendi*)	0.003				
Varied Thrush (*Ixoreus naevius*)	0.003			X	
Wilson's Snipe (*Gallinago gallinago*)	0.003				

[1]RHJV 2004, [2]CalPIF 2002, [3]Rich 2004, [4]CDFG 2005

Table 5. List of additional species detected at Lassen Volcanic National Park in 2010 (not counted within 50 m during VCP point count surveys) and conservation status.

	CalPIF		Continental PIF[3]	CDFG[4]
Species	Riparian[1]	Conifer[2]	Pacific	CA wildlife: Cons. strategy
Brewer's Blackbird (*Euphagus cyanocephalus*)				
Brown-headed Cowbird (*Molothrus ater*)				
Cassin's Vireo (*Vireo cassinii*)				
Common Nighthawk (*Chordeiles minor*)				
Common Raven (*Corvus corax*)				
Downy Woodpecker (*Picoides pubescens*)				
Gray Jay (*Perisoreus canadensis*)				
Hermit Thrush (*Catharus guttatus*)				

Table 5. List of additional species detected at Lassen Volcanic National Park in 2010 (not counted within 50 m during VCP point count surveys) and conservation status (continued).

	CalPIF		Continental PIF[3]	CDFG[4]
Species	Riparian[1]	Conifer[2]	Pacific	CA wildlife: Cons. strategy
Lark Sparrow (*Chondestes grammacus*)				
Lazuli Bunting (*Passerina amoena*)				
Lesser Goldfinch (*Carduelis psaltria*)				
Mallard (*Anas platyrhynchos*)				
Olive-sided Flycatcher (*Contopus cooperi*)		X	X	
Osprey (*Pandion haliaetus*)				X
Pacific-slope Flycatcher (*Empidonax difficilis*)			X	
Pileated Woodpecker (*Dryocopus pileatus*)		X		
Purple Finch (*Carpodacus purpureus*)				
Red Crossbill (*Loxia curvirostra*)				
Red-tailed Hawk (*Buteo jamaicensis*)				
Turkey Vulture (*Cathartes aura*)				
Vaux's Swift (*Chaetura vauxi*)		X		X
Vesper Sparrow (*Pooecetes gramineus*)				
Western Scrub-Jay (*Aphelocoma californica*)			X	
Williamson's Sapsucker (*Sphyrapicus thyroideus*)				

[1]RHJV 2004, [2]CalPIF 2002, [3]Rich 2004, [4]CDFG 2005

Oregon Caves National Monument

Point Count Surveys

In 2010 we surveyed 4 permanent point count survey routes at Oregon Caves National Monument, each consisting of 12 survey stations (Figure 3). The sampling frame at Oregon Caves National Monument included matrix areas. The 2010 point count surveys recorded 28 species within 50 m of the stations (Table 5). An additional 24 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 6).

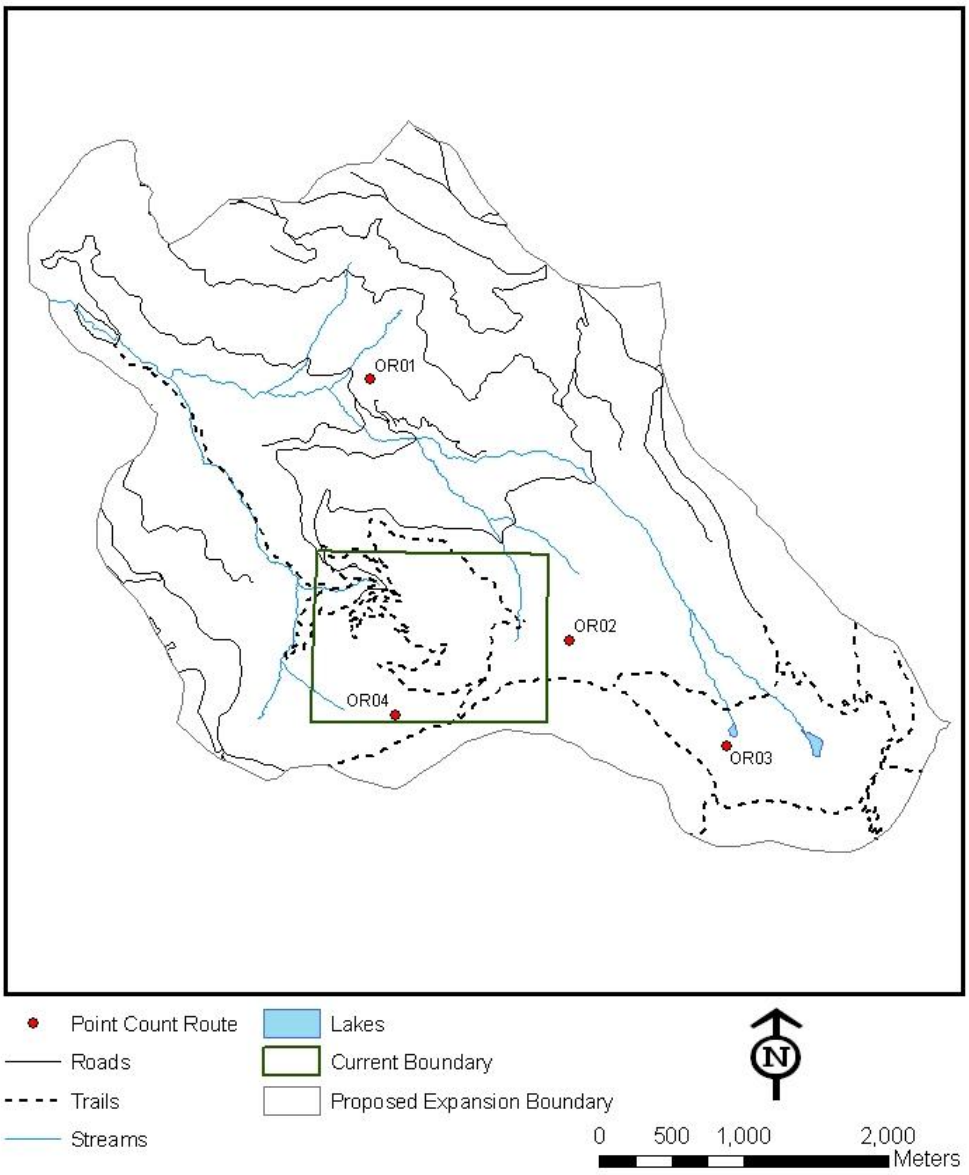

Figure 3. Location of point count routes at Oregon Caves National Monument.

Table 6. Relative abundance (birds/station) for species detected within 50 m during 2010 VCP point count surveys, in decreasing order of abundance, at Oregon Caves National Monument and conservation status.

		OR/WA PIF	Continental PIF[2]	ODFW Conservation Strategy[3]
Species	Relative Abundance	Conifer[1]	Pacific	Klamath Mts
Golden-crowned Kinglet *(Regulus satrapa)*	0.292			
Oregon Junco *(Junco hyemalis oregonus)*	0.250			
Audubon's Warbler *(Dendroica coronata auduboni)*	0.229			
Hermit Warbler (*Dendroica occidentalis*)	0.229	X	X	
Chestnut-backed Chickadee (*Poecile rufescens*)	0.188		X	
Red-breasted Nuthatch (*Sitta canadensis*)	0.188			
Black-throated Gray Warbler (*Dendroica nigrescens*)	0.167		X	
Pine Siskin (*Carduelis pinus*)	0.125			
Brown Creeper (*Certhia americana*)	0.104	X		
Fox Sparrow (*Passerella iliaca*)	0.104		X	
Steller's Jay (*Cyanocitta stelleri*)	0.104		X	
Red Crossbill (*Loxia curvirostra*)	0.083	X		
Dusky Flycatcher (*Empidonax oberholseri*)	0.063			
Hermit Thrush (*Catharus guttatus*)	0.063			
Rufous Hummingbird (*Selasphorus rufus*)	0.063	X	X	
Hairy Woodpecker (*Picoides villosus*)	0.042			
Lincoln's Sparrow (*Melospiza lincolnii*)	0.042	X		
Mountain Chickadee (*Poecile gambeli*)	0.042			
Pacific-slope Flycatcher (*Empidonax difficilis*)	0.042	X	X	
Red-breasted Sapsucker (*Sphyrapicus ruber*)	0.042		X	
American Robin (*Turdus migratorius*)	0.021			
Gray Jay (*Perisoreus canadensis*)	0.021			
MacGillivray's Warbler (*Oporornis tolmiei*)	0.021			
Mountain Quail (*Oreortyx pictus*)	0.021		X	
Pileated Woodpecker (*Dryocopus pileatus*)	0.021	X		
Red-shafted Flicker (*Colaptes auratus cafer*)	0.021			
Sooty Grouse (*Dendragapus fuliginosus*)	0.021		X	
Winter Wren (*Troglodytes troglodytes*)	0.021	X	X	

[1]Altman 1999, [2]Rich 2004, [3]ODFW 2005

Table 7. List of additional species detected at Oregon Caves National Monument in 2010 (not counted within 50 m during VCP point count surveys) and conservation status.

	OR/WA PIF	Continental PIF[2]	ODFW Conservation Strategy[3]
Species	Conifer[1]	Pacific	Klamath Mts
American Dipper (*Cinclus mexicanus*)			
Bald Eagle (*Haliaeetus leucocephalus*)		X	
Black-headed Grosbeak (*Pheucticus melanocephalus*)			
Band-tailed Pigeon (*Columba fasciata*)	X	X	
Cassin's Vireo (*Vireo cassinii*)			
Common Raven (*Corvus corax*)			
Green-tailed Towhee (*Pipilo chlorurus*)			
Hammond's Flycatcher (*Empidonax hammondii*)	X		
Hutton's Vireo (*Vireo huttoni*)	X		
Lazuli Bunting (*Passerina amoena*)			
Mourning Dove (*Zenaida macroura*)			
Nashville Warbler (*Vermivora ruficapilla*)			
Olive-sided Flycatcher (*Contopus cooperi*)	X	X	
Spotted Towhee (*Pipilo maculatus*)			
Townsend's Solitaire (*Myadestes townsendi*)			
Turkey Vulture (*Cathartes aura*)			
Varied Thrush (*Ixoreus naevius*)	X	X	
Violet-green Swallow (*Tachycineta thalassina*)			
Warbling Vireo (*Vireo gilvus*)			
Western Tanager (*Piranga ludoviciana*)			
Western Wood-Pewee (*Contopus sordidulus*)			
White-headed Woodpecker (*Picoides albolarvatus*)		X	X
Wilson's Warbler (*Wilsonia pusilla*)	X		
Wrentit (*Chamaea fasciata*)		X	

[1]Altman 1999, [2]Rich 2004, [3]ODFW 2005

Ecological Monitoring Station

The ecological monitoring station at Oregon Caves National Monument was run 14 times during 2010. Eight visits occurred during the breeding season (14 June to 21 August) and six visits during the fall dispersal and migration season (1 September to 6 October). On all visits, two area searches were completed.

In 2010, 49 species were detected at Oregon Caves National Monument at the ecological monitoring station (Table 8). Thirty species were captured during mist-netting, 20 during the breeding season and 19 during the migration season. During area searches 31 species were detected, 24 during the breeding season and 18 during the migration seasons. Overall, the number of species surveyed aligns with past efforts. During 2008 and 2009, 38 and 59 species

were detected, 27 and 32 species were captured during mist-netting, and 19 and 22 species were detected on area search surveys respectively (Stephens et al. 2009, Stephens et al. 2010a).

Table 8. Results from the ecological monitoring station at Oregon Caves National Monument; total mist net captures and relative abundance (birds/area search plot) during breeding (14 June to 21 August) and migration (1 September to 6 October), and conservation status. Species included in this table with no capture or abundance values were detected at the site, but not within a search area or captured in a mist-net.

Common Name	Total captures breeding season	Total captures migration season	Relative abundance breeding season	Relative abundance migration season	OR/WA PIF Conifer[1]	Continental PIF[2] Pacific
Allen's Hummingbird (*Selasphorus sasin*)	1					X
American Robin (*Turdus migratorius*)	1	1	0.188	0.083		
Audubon's Warbler *(Dendroica coronata auduboni)*	4		0.063			
Bald Eagle (*Haliaeetus leucocephalus*)						X
Band-tailed Pigeon (*Columba fasciata*)					X	X
Brown Creeper (*Certhia americana*)	2		0.375	0.250	X	
Bushtit (*Psaltriparus minimus*)					X	
Chestnut-backed Chickadee (*Poecile rufescens*)	2		0.063			X
Common Raven (*Corvus corax*)			0.125			
Dusky Flycatcher (*Empidonax oberholseri*)	1					X
Fox Sparrow (*Passerella iliaca*)		7		0.083		X
Golden-crowned Kinglet (*Regulus satrapa*)		5	0.063	0.667		
Golden-crowned Sparrow (*Zonotrichia atricapilla*)		2		0.083		
Gray Jay (*Perisoreus canadensis*)		1	0.063	0.167		
Hairy Woodpecker (*Picoides villosus*)			0.063	0.083		
Hermit Thrush (*Catharus guttatus*)		10				
Hermit Warbler (*Dendroica occidentalis*)	4		0.250		X	X
MacGillivray's Warbler *(Oporornis tolmiei)*	17	1	1.000			
Mountain Chickadee (*Poecile gambeli*)			0.063	0.083		
Mountain Quail (*Oreortyx pictus*)	3		0.125			X
Mourning Dove (*Zenaida macroura*)			0.063			
Nashville Warbler (*Vermivora ruficapilla*)	7		0.063			
Northern Flicker (*Colaptes auratus*)				0.083		
Northern Pygmy-Owl (*Glaucidium gnoma*)		1				
Orange-crowned Warbler (*Vermivora celata*)		1			X	
Oregon Junco (*Junco hyemalis oregonus*)	23	22	1.625	0.667		
Pacific-slope Flycatcher (*Empidonax difficilis*)	8	1	0.063		X	X
Pileated Woodpecker (*Dryocopus pileatus)*			0.125	0.167	X	
Pine Siskin (*Carduelis pinus*)	1			0.083		
Red-breasted Nuthatch (*Sitta canadensis*)	12	1	1.250	0.583		
Red-breasted Sapsucker (*Sphyrapicus ruber*)	1	1		0.083		X
Red-tailed Hawk (*Buteo jamaicensis*)						
Ruby-crowned Kinglet (*Regulus calendula*)		11				

Table 8. Results from the ecological monitoring station at Oregon Caves National Monument; total mist net captures and relative abundance (birds/area search plot) during breeding (14 June to 21 August) and migration (1 September to 6 October), and conservation status. Species included in this table with no capture or abundance values were detected at the site, but not within a search area or captured in a mist-net (continued).

Common Name	Total captures breeding season	Total captures migration season	Relative abundance breeding season	Relative abundance migration season	OR/WA PIF Conifer[1]	Continental PIF[2] Pacific
Rufous Hummingbird (*Selasphorus rufus*)	7				X	X
Sharp-shinned Hawk (*Accipiter striatus*)						
Song Sparrow (*Melospiza melodia*)						
Sooty Grouse (*Dendragapus fuliginosus*)			0.125			X
Steller's Jay (*Cyanocitta stelleri*)		1	0.938	0.250		X
Swainson's Thrush (*Catharus ustulatus*)	3	5		0.083		
Townsend's Solitaire (*Myadestes townsendi*)						
Townsend's Warbler (*Dendroica townsendi*)		1		0.083		
Varied Thrush (*Ixoreus naevius*)	1	1			X	X
Western Wood-Pewee (*Contopus sordidulus*)			0.125			
Wilson's Warbler (*Wilsonia pusilla)*	25	6	0.188	0.083	X	
Winter Wren (*Troglodytes troglodytes*)	1		0.125		X	X
Yellow Warbler (*Dendroica petechia*)			0.188			

[1]Altman 1999, [2]Rich 2004

Discussion

This third year of the KLMN landbird monitoring provided information on avian community composition and the status of landbirds at Crater Lake National Park, Lassen Volcanic National Park, and Oregon Caves National Monument. In addition, the monitoring at Oregon Caves National Monument 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 Crater Lake National Park, of the 10 most abundant species, three are Partners in Flight focal species (Table 1). All three of these species are coniferous forest focal species (Brown Creeper, Clark's Nutcracker, Red Crossbill) (Altman 1999, Altman 2000, Rich et al 2004). The Clark's Nutcracker inhabits forests with Whitebark Pine, a habitat that is found at Crater Lake National Park. This species is a Stewardship Species in the intermountain west avifaunal biome, where 89% of the population both breeds and overwinters (Rich et al. 2004) and should be considered in long-term land management planning.

At Lassen Volcanic National Monument, of the 10 most abundant species, five are Partners in Flight focal species (Table 4). Three of these species are coniferous forest focal species (Brown Creeper, Golden-crowned Kinglet, Oregon Junco) (CalPIF 2002) and two are riparian focal species (Warbling Vireo and Wilson's Warbler) (RHJV 2004). The mix of focal species is reflective of the sampling frame at Lassen Volcanic National Monument which includes both wetlands and streams which are adjacent to coniferous forest.

The most abundant species detected during point count surveys at Oregon Caves National Monument represent a variety of habitats and many are of continental importance (Table 6). Of the ten most abundant species detected during point count surveys, four are PIF focal species in coniferous forest (Brown Creeper, Chestnut-backed Chickadee, Hermit Warbler, Steller's Jay), one in mixed woodlands (Black-throated Gray Warbler), and one in western shrublands (Fox Sparrow) (Altman 1999, Rich et al. 2004).

Wilson's Warbler, a Partners in Flight focal species in coniferous forest, was the second most frequently captured species at Oregon Caves National Monument ecological monitoring station during the combined breeding and migration seasons in 2010 (CalPIF 2002). The breeding season captures were likely during the later part of the breeding season during a period of post-breeding dispersal (Frey et al. 2007). The Pacific-slope Flycatcher; also a Partners in Flight focal species in coniferous forest, was frequently captured during the breeding season. This species is a Stewardship Species in the pacific avifaunal biome, where 91% of the breeding population occurs (Rich et al. 2004). Oregon Caves National Monument contains important forest ecosystems; in total, 22 conifer and mixed-forest Partners in Flight focal species and species of continental importance were detected at the ecological monitoring station. In 2010, no Oregon Conservation Strategy species were detected (ODFW 2005).

At Oregon Caves National Monument, 20 species were detected during point count surveys that were not detected at the ecological monitoring station in 2010. This is likely because the point count sites cover a diverse array of habitats relative to the single ecological monitoring station. Thirteen species were detected at the ecological monitoring station and not during point count surveys. This can be attributed to both the duration of the survey season (i.e. fall migration) and the additional survey effort (14 visits).

Implementation of the KLMN Landbird Monitoring Protocol began in 2008. Landbird status and community composition results from this third year of monitoring will provide information to park managers at Crater Lake National Park, Lassen Volcanic National Park, and Oregon Caves National Monument, and will contribute to avian trend monitoring in the parks. In addition, continuation of the constant effort monitoring station at Oregon Caves National Monument contributes to long-term 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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