



Klamath Network Landbird Monitoring Annual Report

2009 Results from Oregon Caves National Monument and Whiskeytown National Recreation Area

Natural Resource Data Series NPS/KLMN/NRDS—2010/043



Black-throated Gray Warbler
5/30/05, Lake Creek Rd Ore.
Photo by James L. Vaudais

ON THE COVER

Black-throated Gray Warbler

Photograph by: James Livaudais

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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 2009, the Klamath Inventory and Monitoring Network (KLMN) of the National Park Service implemented the second year of a long-term landbird monitoring protocol. Klamath Bird Observatory, in partnership with the KLMN, developed the protocol and completed this second 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 2009, point counts were completed, along with corresponding species checklists and habitat surveys, at 30 locations within Whiskeytown National Recreation Area. 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 second 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 thank Daniel Sarr at the Klamath Network for his contributions to the Landbird Monitoring Protocol. Implementation of the monitoring program would not have been possible without the help of the park staff. Special thanks to Barbara Alberti, Jennifer Gibson, Jim Richardson, John Roth, and Russ Weatherbee for their logistical support in 2009. The dedication of the field crews made this season successful. Point count surveys were completed by Lyndia Hammer and Jim DeStaebler. The Constant Effort Monitoring Station was run by Bob Frey, KBO Biologist and Banding Project Lead; William Garcia, Park Flight and KBO Intern; and KBO Interns Adam Beeler, Karl Fairchild, Stuart Fety, Whitney Haskell, Todd Jones, Lindsey Kufta-Christie, and Daphne Swope.

Introduction

In 2009, the Klamath Inventory and Monitoring Network (KLMN) of the National Park Service implemented the second year of their long-term Landbird Monitoring Protocol (Stephens et al. 2010). Klamath Bird Observatory, in partnership with the KLMN, developed the protocol and has completed the monitoring since 2008. This annual report provides a summary of 2009 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. 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 historic bird monitoring efforts (Stephens et al. 2010).

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. 2010, Stephens and Alexander 2010). 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, will optimize 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 frame for Crater Lake National Park, Lassen Volcanic National Park, Lava Beds National Monument, and Redwood National and State Parks includes 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 nonriparian 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., location 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 Klamath Network Landbird Monitoring Protocol, each of the six park units is to be monitored every third year using point counts and associated methodologies. In 2008, the first year of implementation, Lava Beds National Park and Redwood National and State Parks were surveyed. In 2009, monitoring was scheduled for Lassen Volcanic National Park and Whiskeytown National Recreation Area. However, due to logistical constraints that were encountered during monumenting the survey sites, monitoring did not occur at Lassen Volcanic National Park. Surveys will be implemented at Lassen Volcanic National Park, in addition to Crater Lake National Park and Oregon Caves National Monument in 2010. In addition, the constant effort monitoring station at Oregon Caves National Monument was operated in 2009, and is operated annually.

Training

Point count surveyors participated in a two day training session at the onset of the field season. During this training, field technicians 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 2009. 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, habitat surveys, point counts, and area searches. 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 unbanded 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 Protocol (Stephens et al. 2010).

Data

Data Delivery

Data were entered into relational databases to store the variety of information collected in the field. Five databases are associated with each survey methodology (Point Count, Mist Net, 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 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 2002a, 2002b, 2004, 2005; 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

Whiskeytown National Recreation Area

In 2009, we established and surveyed 30 permanent point count survey routes at Whiskeytown National Recreation Area, each consisting of 12 survey points (Figure 1). The sampling frame at Whiskeytown National Recreation Area included all roads, trails, and power lines. The 2009 point count surveys recorded 83 species within 50 m of the stations (Table 1). An additional 27 species were detected, recorded outside of 50 m during point count surveys and accounted for on species checklists (Table 2).

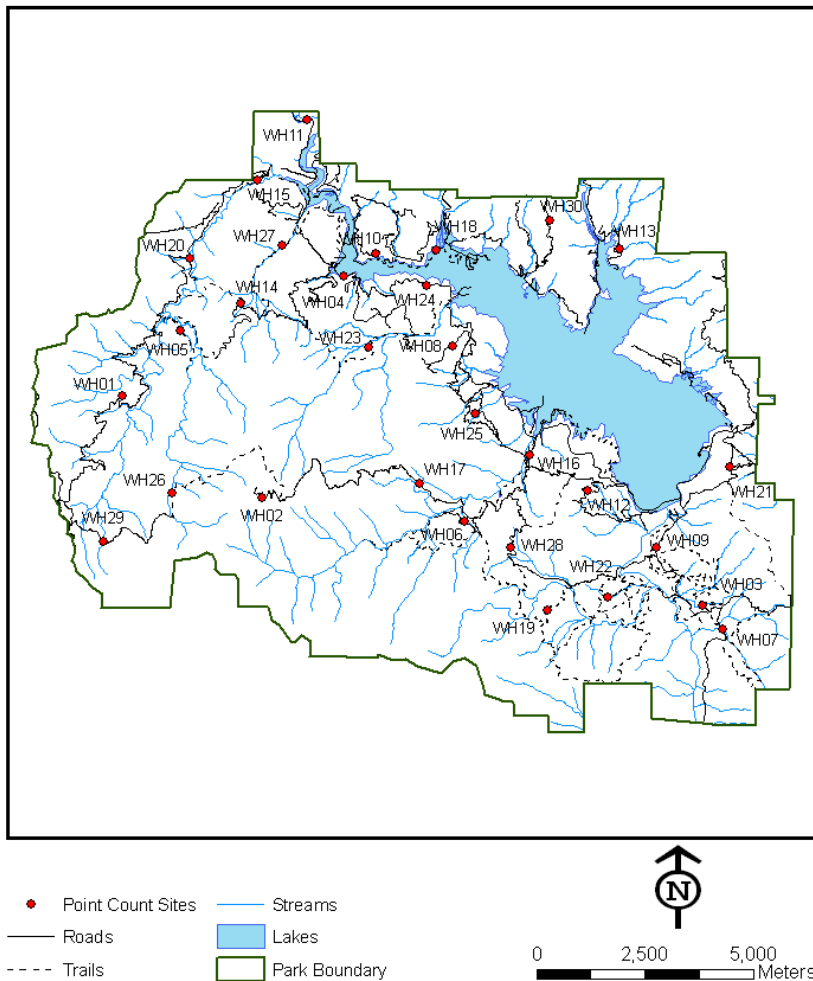


Figure 1. Location of point count routes at Whiskeytown National Recreation Area.

Table 1. Relative abundance (birds/point) for species detected within 50 m during 2009 VCP point count surveys, in decreasing order of abundance, at Whiskeytown National Recreation Area and conservation status.

Common Name	Relative Abundance	CalPIF			Continental PIF ⁴	CDFG ⁵
		Riparian ¹	Oak ²	Conifer ³	Pacific	CA wildlife: Cons. strategy
Black-throated Gray Warbler (<i>Dendroica nigrescens</i>)	0.439			X	X	
Cliff Swallow (<i>Petrochelidon pyrrhonota</i>)	0.389					
Orange-crowned Warbler (<i>Vermivora celata</i>)	0.267					
Spotted Towhee (<i>Pipilo maculatus</i>)	0.225					
Wilson's Warbler (<i>Wilsonia pusilla</i>)	0.186	X				
Lesser Goldfinch (<i>Carduelis psaltria</i>)	0.183					
Bushtit (<i>Psaltiriparus minimus</i>)	0.172					
Black-headed Grosbeak (<i>Pheucticus melanocephalus</i>)	0.164	X				
Cassin's Vireo (<i>Vireo cassinii</i>)	0.150					
Oregon Junco (<i>Junco hyemalis</i>)	0.150			X		
Brown-headed Cowbird (<i>Molothrus ater</i>)	0.106					
Blue-gray Gnatcatcher (<i>Poliophtila melanocephalus</i>)	0.103		X			
Anna's Hummingbird (<i>Calypte anna</i>)	0.086					
Western Tanager (<i>Piranga ludoviciana</i>)	0.086			X		
Townsend's Warbler (<i>Dendroica townsendi</i>)	0.078					
Steller's Jay (<i>Cyanocitta stelleri</i>)	0.072			X	X	
Yellow Warbler (<i>Dendroica petechia</i>)	0.072	X				X
Warbling Vireo (<i>Vireo gilvus</i>)	0.067	X				
Hutton's Vireo (<i>Vireo huttoni</i>)	0.058		X			
Wrentit (<i>Chamaea fasciata</i>)	0.058				X	
Pacific-slope Flycatcher (<i>Empidonax difficilis</i>)	0.056				X	
Red-breasted Nuthatch (<i>Sitta canadensis</i>)	0.053			X		
Nashville Warbler (<i>Vermivora ruficapilla</i>)	0.047					
Oak Titmouse (<i>Baeolophus inornatus</i>)	0.044		X		X	X
American Robin (<i>Turdus migratorius</i>)	0.042					
Audubon's Warbler (<i>Dendroica coronata</i>)	0.042					
Lazuli Bunting (<i>Passerina amoena</i>)	0.042					
Western Scrub-Jay (<i>Aphelocoma californica</i>)	0.042		X		X	
Acorn Woodpecker (<i>Melanerpes formicivorus</i>)	0.039		X			
Ash-throated Flycatcher (<i>Myiarchus cinerascens</i>)	0.039		X			
Fox Sparrow (<i>Passerella iliaca</i>)	0.036			X	X	
Mourning Dove (<i>Zenaida macroura</i>)	0.036					
Hairy Woodpecker (<i>Picoides villosus</i>)	0.031					
Dusky Flycatcher (<i>Empidonax oberholseri</i>)	0.028					
Hermit Warbler (<i>Dendroica occidentalis</i>)	0.028				X	X
Barn Swallow (<i>Hirundo rustica</i>)	0.025					
Bewick's Wren (<i>Thryomanes bewickii</i>)	0.025		X			

Table 1. Relative abundance (birds/point) for species detected within 50 m during 2009 point count surveys, in decreasing order of abundance, at Whiskeytown National Recreation Area and conservation status (continued).

Common Name	Relative Abundance	CalPIF			Continental PIF ⁴	CDFG ⁵
		Riparian ¹	Oak ²	Conifer ³	Pacific	CA wildlife: Cons. strategy
Mountain Chickadee (<i>Poecile gambeli</i>)	0.025					
Bullock's Oriole (<i>Icterus bullockii</i>)	0.019					
Common Raven (<i>Corvus corax</i>)	0.019					
Tree Swallow (<i>Tachycineta bicolor</i>)	0.019	X				
Turkey Vulture (<i>Cathartes aura</i>)	0.019					
MacGillivray's Warbler (<i>Oporornis tolmiei</i>)	0.017			X		
Red-shafted Flicker (<i>Colaptes Auratus</i>)	0.017					
California Quail (<i>Callipepla californica</i>)	0.014		X			
California Towhee (<i>Pipilo crissalis</i>)	0.014		X		X	
Song Sparrow (<i>Melospiza melodia</i>)	0.014	X				
Yellow-breasted Chat (<i>Icteria virens</i>)	0.014	X				X
Northern Rough-winged Swallow (<i>Stelgidopteryx serripennis</i>)	0.011					
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	0.011					
Violet-green Swallow (<i>Tachycineta thalassina</i>)	0.011					
Western Wood-Pewee (<i>Contopus sordidulus</i>)	0.011					
American Goldfinch (<i>Carduelis tristis</i>)	0.008					
Black-capped Chickadee (<i>Poecile atricapillus</i>)	0.008					X
Brown Creeper (<i>Certhia americana</i>)	0.008			X		
Canada Goose (<i>Branta canadensis</i>)	0.008					
Olive-sided Flycatcher (<i>Contopus cooperi</i>)	0.008			X	X	X
Pine Siskin (<i>Carduelis pinus</i>)	0.008					
Band-tailed Pigeon (<i>Columba fasciata</i>)	0.006		X		X	
Black Phoebe (<i>Euphagus cyanocephalus</i>)	0.006					
Brewer's Blackbird (<i>Euphagus cyanocephalus</i>)	0.006					
Chipping Sparrow (<i>Spizella passerine</i>)	0.006			X		X
Cooper's Hawk (<i>Accipiter cooperii</i>)	0.006					X
European Starling (<i>Sturnus vulgaris</i>)	0.006					
Mallard (<i>Anas platyrhynchos</i>)	0.006					
Rufous Hummingbird (<i>Selasphorus rufus</i>)	0.006				X	X
Townsend's Solitaire (<i>Myadestes townsendi</i>)	0.006					
Western Kingbird (<i>Tyrannus verticalis</i>)	0.006					
Cedar Waxwing (<i>Bombycilla cedrorum</i>)	0.003					
Chestnut-backed Chickadee (<i>Poecile rufescens</i>)	0.003				X	
Evening Grosbeak (<i>Coccothraustes vespertinus</i>)	0.003					
Golden-crowned Sparrow (<i>Zonotrichia atricapilla</i>)	0.003				X	
Great Blue Heron (<i>Ardea herodias</i>)	0.003					

Table 1. Relative abundance (birds/point) for species detected within 50 m during 2009 point count surveys, in decreasing order of abundance, at Whiskeytown National Recreation Area and conservation status (continued).

Common Name	Relative Abundance	CalPIF			Continental PIF ⁴	CDFG ⁵
		Riparian ¹	Oak ²	Conifer ³	Pacific	CA wildlife: Cons. strategy
Hammond's Flycatcher (<i>Empidonax hammondii</i>)	0.003					
House Wren (<i>Troglodytes aedon</i>)	0.003					
Mountain Quail (<i>Oreortyx pictus</i>)	0.003			X	X	
Nuttall's Woodpecker (<i>Picoides nuttalli</i>)	0.003		X		X	X
Osprey (<i>Pandion haliaetus</i>)	0.003					
Purple Finch (<i>Carpodacus purpureus</i>)	0.003			X		
Pygmy Nuthatch (<i>Sitta pygmaea</i>)	0.003					
Red-breasted Sapsucker (<i>Sphyrapicus ruber</i>)	0.003				X	X
Rufous-crowned Sparrow (<i>Aimophila ruficeps</i>)	0.003					X
Winter Wren (<i>Troglodytes troglodytes</i>)	0.003				X	

¹RHJV 2004, ²CalPIF 2002b, ³CalPIF 2002a, ⁴Rich 2004, ⁵CDFG 2005

Table 2. List of additional species detected at Whiskeytown National Recreation Area in 2009 (not counted within 50 m during VCP point count surveys) and conservation status.

Common Name	CalPIF			Continental PIF ⁴	CDFG ⁵
	Riparian ¹	Oak ²	Conifer ³	Pacific	CA wildlife: Cons. strategy
American Crow (<i>Corvus brachyrhynchos</i>)					
American Dipper (<i>Cinclus mexicanus</i>)					
Bald Eagle (<i>Haliaeetus leucocephalus</i>)				X	X
Belted Kingfisher (<i>Ceryle alcyon</i>)					
California Thrasher (<i>Toxostoma redivivum</i>)					X
Common Merganser (<i>Mergus merganser</i>)					
Common Yellowthroat (<i>Geothlypis trichas</i>)	X				
Downy Woodpecker (<i>Picoides pubescens</i>)					
Gray Flycatcher (<i>Empidonax wrightii</i>)			X		
Green Heron (<i>Butorides virescens</i>)					
Hermit Thrush (<i>Catharus guttatus</i>)					
House Finch (<i>Carpodacus mexicanus</i>)					
Northern Pygmy-Owl (<i>Glaucidium gnoma</i>)		X			
Northern Saw-whet Owl (<i>Aegolius acadicus</i>)					
Northern Shoveler (<i>Anas clypeata</i>)					
Pileated Woodpecker (<i>Dryocopus pileatus</i>)			X		
Red Crossbill (<i>Loxia curvirostra</i>)					
Red-tailed Hawk (<i>Buteo jamaicensis</i>)					
Sharp-shinned Hawk (<i>Accipiter striatus</i>)					X
Spotted Sandpiper (<i>Actitis macularia</i>)	X				
Swainson's Thrush (<i>Catharus ustulatus</i>)	X				
Vaux's Swift (<i>Chaetura vauxi</i>)					X
Western Screech-Owl (<i>Otus kennicottii</i>)					
White-breasted Nuthatch (<i>Sitta carolinensis</i>)		X			
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)					
Wild Turkey (<i>Meleagris gallopavo</i>)					
Willow Flycatcher (<i>Empidonax traillii</i>)	X			X	X

¹RHJV 2004, ²CalPIF 2002b, ³CalPIF 2002a, ⁴Rich 2004, ⁵CDFG 2005

Oregon Caves National Monument

The ecological monitoring station at Oregon Caves National Monument was run 14 times during 2009. Eight visits occurred during the breeding season (12 June to 25 August) and six visits during the fall dispersal and migration season (9 September to 8 October). During three visits, only one area search was completed due to high capture rates (8/1 and 8/11) or cold temperatures (9/10); situations which require that the mist nets to be checked more frequently. On all other visits, two area searches were completed.

In 2009, 59 species were detected at Oregon Caves National Monument (Table 3). Thirty-two species were captured during mist-netting, 22 during the breeding season and 23 during the migration season. During area searches 22 species were detected, 20 during the breeding season and 10 during the migration seasons. Overall, the number of species surveyed surpassed 2008 when 38 species were detected, 27 species were captured during mist-netting and 19 species were detected on area search surveys (Stephens et al. 2009).

Table 3. Results from the ecological monitoring station at Oregon Caves National Monument; total mist net captures and relative abundance (birds/area search plot) during breeding (12 June to 25 August) and migration (3 September to 8 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	ORWA PIF Conifer ¹	Continental PIF ² Pacific
American Robin (<i>Turdus migratorius</i>)						
Audubon's Warbler (<i>Dendroica coronata</i>)	4		0.286			
Band-tailed Pigeon (<i>Columba fasciata</i>)					X	X
Barred Owl (<i>Strix varia</i>)						
Black-capped Chickadee (<i>Poecile atricapillus</i>)			0.143			
Black-headed Grosbeak (<i>Pheucticus melanocephalus</i>)	11					
Brown Creeper (<i>Certhia americana</i>)	1		0.071	0.364	X	
Bushtit (<i>Psaltriparus minimus</i>)			0.143			
Cassin's Vireo (<i>Vireo cassinii</i>)	1					
Cedar Waxwing (<i>Bombycilla cedrorum</i>)						
Chestnut-backed Chickadee (<i>Poecile rufescens</i>)	7	7	0.214	0.546		X
Chipping Sparrow (<i>Spizella passerine</i>)			0.071			
Common Raven (<i>Corvus corax</i>)						
Dusky Flycatcher (<i>Empidonax oberholseri</i>)	1	1				
Evening Grosbeak (<i>Coccothraustes vespertinus</i>)						
Fox Sparrow (<i>Passerella iliaca</i>)	1	5				X
Golden-crowned Kinglet (<i>Regulus satrapa</i>)	13	4	0.143	0.909		
Golden-crowned Sparrow (<i>Zonotrichia atricapilla</i>)		2				X
Gray Jay (<i>Perisoreus canadensis</i>)	2			0.455		
Hammond's Flycatcher (<i>Empidonax hammondi</i>)	3	3			X	
Hairy Woodpecker (<i>Picoides villosus</i>)			0.071			
Hermit Thrush (<i>Catharus guttatus</i>)		4				
Hermit Warbler (<i>Dendroica occidentalis</i>)	7		0.500		X	X
House Wren (<i>Troglodytes aedon</i>)						
MacGillivray's Warbler (<i>Oporornis tolmiei</i>)	25	1	0.286			
Mountain Chickadee (<i>Poecile gambeli</i>)						
Mountain Quail (<i>Oreortyx pictus</i>)						X
Nashville Warbler (<i>Vermivora ruficapilla</i>)	23		0.500			
Northern Pygmy-Owl (<i>Glaucidium gnoma</i>)						

Table 3. Results from the ecological monitoring station at Oregon Caves National Monument; complete list of species detected on checklists, total mist net captures and relative abundance (birds/area search plot) during breeding (12 June to 25 August) and migration (3 September to 8 October), and conservation status (continued).

Common Name	Total captures breeding season	Total captures migration season	Relative abundance breeding season	Relative abundance migration season	ORWA PIF Conifer ¹	Continental PIF ² Pacific
Olive-sided Flycatcher (<i>Contopus cooperi</i>)					X	X
Orange-crowned Warbler (<i>Vermivora celata</i>)	2	2			X	
Oregon Junco	83	40	1.286	1.273		
Pacific-slope Flycatcher (<i>Empidonax difficilis</i>)	15	3	0.143		X	X
Pileated Woodpecker (<i>Dryocopus pileatus</i>)			0.071		X	
Pine Siskin (<i>Carduelis pinus</i>)						
Purple Finch (<i>Carpodacus purpureus</i>)		1				
Red-breasted Nuthatch (<i>Sitta canadensis</i>)	4	8	0.571	0.636		
Red-breasted Sapsucker (<i>Sphyrapicus ruber</i>)		2				X
Red-shafted Flicker (<i>Colaptes Auratus</i>)	1					
Red-tailed Hawk (<i>Buteo jamaicensis</i>)						
Ruby-crowned Kinglet (<i>Regulus calendula</i>)		2				
Rufous Hummingbird (<i>Selasphorus rufus</i>)	3		0.071		X	X
Sharp-shinned Hawk (<i>Accipiter striatus</i>)						
Sooty Grouse (<i>Dendragapus fuliginosus</i>)						X
Steller's Jay (<i>Cyanocitta stelleri</i>)	4	4	0.643	0.727		X
Swainson's Thrush (<i>Catharus ustulatus</i>)	2	9	0.000	0.091		
Townsend's Warbler (<i>Dendroica townsendi</i>)		1				
Unknown Hummingbird	1					
Unknown Selasphorus Hummingbird	1					
Varied Thrush (<i>Ixoreus naevius</i>)		2			X	X
Warbling Vireo (<i>Vireo gilvus</i>)		2				
Western Tanager (<i>Piranga ludoviciana</i>)						
Western Wood-Pewee (<i>Contopus sordidulus</i>)						
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)		1				
Wilson's Warbler (<i>Wilsonia pusilla</i>)	15	17	0.071	0.273	X	
Winter Wren (<i>Troglodytes troglodytes</i>)		1	0.071		X	X
Yellow Warbler (<i>Dendroica petechia</i>)			0.071	0.091		

¹Altman 1999, ²Rich 2004

Discussion

This second year of the KLMN landbird monitoring provided information on avian community composition and the status of landbirds at Whiskeytown National Recreation Area. 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 Whiskeytown National Recreation Area, of the 10 most abundant species, four are Partners in Flight and/or California Wildlife Conservation Strategy focal species (Table 1). These included species that are indicators of riparian (Wilson's Warbler, Black-headed Grosbeak) and coniferous forest (Black-throated Gray Warbler, Oregon Junco) ecosystems (RHJV 2004, CalPIF 2002a). The Black-throated Gray Warbler prefers open conifer or oak forests with a brushy understory or shrubby stands of trees, a habitat that is found at Whiskeytown National Recreation Area. This species is a Stewardship Species in the Pacific avifaunal biome, where 69% of the breeding population occurs (Rich et al. 2004) and should be considered in long-term land management planning. Species indicative of oak woodlands were also frequently detected at Whiskeytown National Recreation Area.

Many of the species monitored at Oregon Caves National Monument are Partners in Flight coniferous forest focal species and are of continental importance (Table 3). Wilson's Warbler, a Partners in Flight focal species in coniferous forest, was the second most frequently captured species during the combined breeding and migration seasons in 2009 (CalPIF 2002a). 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, 15 conifer and mixed-forest Partners in Flight focal species and species of continental importance were detected in the monument. In 2009, no Oregon Conservation Strategy species were detected (ODFW 2005).

Implementation of the KLMN landbird monitoring protocol began in 2008. Landbird status and community composition results from this second year of monitoring will provide information to park managers at Whiskeytown National Recreation Area, and will contribute to avian trend monitoring in the parks. In addition, continuation of monitoring 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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