



Riparian Landbird Monitoring in Pinnacles National Park

Progress Report for 2015

Natural Resource Data Series NPS/SFAN/NRDS—2016/1042



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ON THE COVER

Canyon Wren (*Catherpes mexicanus*) in alert posture perched atop a lichen encrusted boulder
Photograph by: Ryan DiGaudio

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Mark D. Dettling and Diana L. Humple

Point Blue Conservation Science
3820 Cypress Dr. Suite 11
Petaluma, CA 94954

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The Natural Resource Data Series is intended for the timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

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 biologists who were not directly involved in the collection, analysis, or reporting of the data. Data in this report were collected and summarized using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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Executive Summary

This document contains a brief progress report for landbird monitoring conducted in 2015 in riparian habitats in Pinnacles National Park (PINN) as part of the National Park Service's Inventory and Monitoring Program. Surveys were part of a pilot year undertaken to finalize methodologies outlined in the draft Protocol Implementation Plan (PIP) for Riparian Landbird Monitoring in Pinnacles National Park submitted for regional review (Humple and Dettling 2016). This PIP was based on Gardali et al. 2010. The Analysis and Synthesis reports (combined with those from the Point Reyes National Seashore and the Golden Gate National Recreation Area) that are produced every six years (e.g., Humple and Porzig 2012) include in-depth analyses and discussion that are not objectives of this progress report. The field methods followed at PINN are standardized with those already approved and published by the Inventory and Monitoring Program for riparian landbird monitoring in Point Reyes National Seashore and Golden Gate National Recreation Area, with little variation anticipated.

Landbird monitoring was conducted by Point Blue Conservation Science (hereafter Point Blue; formerly PRBO Conservation Science) in Pinnacles National Park along nine transects using the point count method. The surveys were conducted during the breeding season of 2015. Monitoring at these locations is planned to occur every three years, with this being the first year of implementation (Humple and Dettling 2016, Gardali et al. 2010). Of the 67 bird species that were detected, 23 were California Partners in Flight Focal Species (CalPIF 2000, CalPIF 2002a, CalPIF 2002b, CalPIF 2004, CalPIF 2009, RHJV 2004), two were also California Bird Species of Special Concern (Shuford and Gardali 2008), and two more were also listed as vulnerable to climate change in California (Gardali et al. 2012). Transect narratives to facilitate the relocation of point count stations were either created or updated (to reflect changes in vegetation) depending on whether or not the transect was newly established or established during a previous project, and are included in the Protocol Implementation Plan (Humple and Dettling 2016).

Acknowledgments

We thank the National Park Service, and especially Pinnacles National Park and their staff, for support of this monitoring program. We acknowledge Point Blue biologist R. DiGaudio for collecting point count data in 2015 and T. Gardali for overseeing this project as Point Blue's Pacific Coast and Central Valley Group Director. We thank P. Johnson and D. George for coordination assistance of this field work; A. Kennedy and N. Seavy for reviewing a draft of this report; and T. Gardali, D. George, M. Herzog, M. Koenen, D. Press, W. Merkle, S. Allen, and M. Denn for their contributions to the development and/or implementation of the riparian monitoring plan for Point Reyes National Seashore and Golden Gate National Recreation Area, that formed the foundation for field survey methodologies used for the work at Pinnacles National Park.

Introduction

Point Blue conducted landbird monitoring in 2015 in riparian habitat of Pinnacles National Park (PINN) as part of the National Park Service's Inventory and Monitoring Program. The objectives of this ongoing work are to detect any trends in riparian landbird populations in PINN and in certain circumstances to monitor the effects of management actions (Gardali et al. 2010). Landbirds are recognized as indicators of changing ecosystems (Carignan and Villard 2002) and climate (MacMynowski et al. 2007). They are also relatively easy to monitor and allow for monitoring a suite of species (Ralph et al. 1993, Hutto 1998) representing diverse ecological requirements. Finally, landbirds are an important natural resource, engendering a great deal of public interest. Several landbird species that occur regularly in PINN are California Bird Species of Special Concern (Shuford and Gardali 2008) or California Partners in Flight Focal Species (CalPIF 2000, CalPIF 2002a, CalPIF 2002b, CalPIF 2004, CalPIF 2009, RHJV 2004).

Landbird monitoring has been conducted intermittently in Pinnacles National Park as part of various monitoring programs, including in more recent years by Point Blue (Haff et al. 2003; Humple and Gardali 2004, 2006); for a complete summary of monitoring history, see Humple and Dettling (2016). Following pilot testing and monitoring program refinements, riparian habitat was selected as the priority habitat for future monitoring in all the San Francisco Bay Area Network (SFAN) parks to provide information for the greatest number of birds (both richness and abundance). For the purposes of this work, we define riparian habitat as riparian vegetation located along a drainage, stream, or river. The riparian landbird monitoring protocol for the Golden Gate National Recreation Area (GOGA) and Point Reyes National Seashore (PORE), two other parks within SFAN, was finalized in 2010 without including PINN in its scope, and implementation in those two parks began in 2011 (Gardali et al. 2010). Due to interest in implementing a similar landbird monitoring program in PINN, protocols for this third park were drafted in 2012, reviewed within SFAN in 2013, and data collection initiated in 2015 as a pilot field year in which to finalize selection of new survey points. Final revisions to the Protocol Implementation Plan (PIP) (Humple and Dettling 2016) were being completed simultaneously with this report. As with the other parks, focusing on legacy sites for which data exist from previous years increases the potential to detect longer-term population trends; additionally, new sites were included in the monitoring effort due to recent land acquisitions including riparian habitat that have not previously been inventoried or monitored.

Here, we report results of avian monitoring conducted in the spring of 2015 along nine riparian transects in Pinnacles National Park (Humple and Dettling 2016, Gardali et al. 2010). These sites were identified for long-term monitoring as part of the Pinnacles Riparian Landbird Monitoring Protocols (earlier drafts of the current PIP, Humple and Dettling 2016). After every other survey year (the first due after the 2018 survey season), we will produce more in-depth Analysis and Synthesis reports.

Here we report a species list and numbers of individuals detected, noting which species have special conservation status.

Methods

The protocol for this monitoring project is described fully in the Protocol Implementation Plan for Pinnacles National Park (Humple and Dettling 2016) and the Riparian Landbird Monitoring Protocol for Point Reyes National Seashore and Golden Gate National Recreation Area (Gardali et al. 2010). Briefly, monitoring was conducted along riparian transects throughout PINN (Figure 1). Previously-monitored point count survey transects that contained point count stations within riparian habitat were selected for long-term monitoring, which will allow for the use of previously collected data. Some point count stations on these transects are in coastal scrub or oak woodland vegetation, and even birds detected within riparian habitat often use adjoining vegetation types, so sampling is not exclusive to riparian habitat or riparian bird species. Three new transects were established in 2015 in riparian habitat acquired by the park since the last point count monitoring effort in 2006. The long-term vision of this monitoring protocol is that all of these sites will be surveyed during the breeding season, every three years, with 2015 being the first year of implementation.

The Variable Circular Plot method was used for all point count surveys conducted in 2015. We surveyed nine transects, each consisting of 2-12 points and totaling 77 points (Table 1). Surveys began approximately 15 minutes after local sunrise and were completed within four hours, when bird activity is generally the highest. Each point count station was surveyed for a 5-minute sampling period. Individuals of all species detected were recorded as occurring in distance intervals from the point: 0-10 meters (m), 10-20m, 20-30m, 30-50m, 50-100m, >100m; or as flyovers. Biologists with experience identifying birds of the region by sight and sound conducted all point counts. Point count surveys were conducted twice during the peak landbird breeding season, between the last week in April and the first week in June, with a minimum of 10 days between the two visits. Surveys were not conducted during periods of rain, high wind, or other adverse weather conditions, as these can affect bird behavior and detectability. The riparian bird monitoring protocols (Humple and Dettling 2016 and SOP 6 in Gardali et al. 2010) lay out the above protocols in greater detail.

Table 1. Summary information for point count transects surveyed in Pinnacles National Park, CA, in 2015 by Point Blue Conservation Science. More information about legacy point counts can be found in the Protocol Implementation Plan (Humple and Dettling 2016)

Transect name	Station code	# total pts^a	# riparian pts^b	First year surveyed^{a,c}	Total # years surveyed^{a,c}
Balconies	BALC	10	6	1984	8
Grassy Canyon	GRCA	7	4	2001	2
Headquarters	HEAD	7	4	1984	8
Lower McCabe Canyon	LMCC	5	5	2015	1
North Fork Chalone Creek	NFCC	12	12	1984	9
Rose Canyon	ROCA	2	2	2015	1
Sandy Creek	SACR	11	11	2015	1
South Wilderness Trail	SWTR	11	11	2002	5
Upper Chalone	UPCH	12	6	2001	2
<i>Total Points</i>		<i>77</i>	<i>61</i>		

^a For BALC, NFCC, and HEAD, not all points were surveyed in all prior years (see metadata in narratives of PIP for details; Humple and Dettling 2016).

^b For details of which points are riparian, see metadata in narratives of PIP for details (Humple and Dettling 2016).

^c Breeding seasons only shown here (some winter surveys done in 1980s/1990s, including in 1983). Total number of years surveyed includes current year (2015).

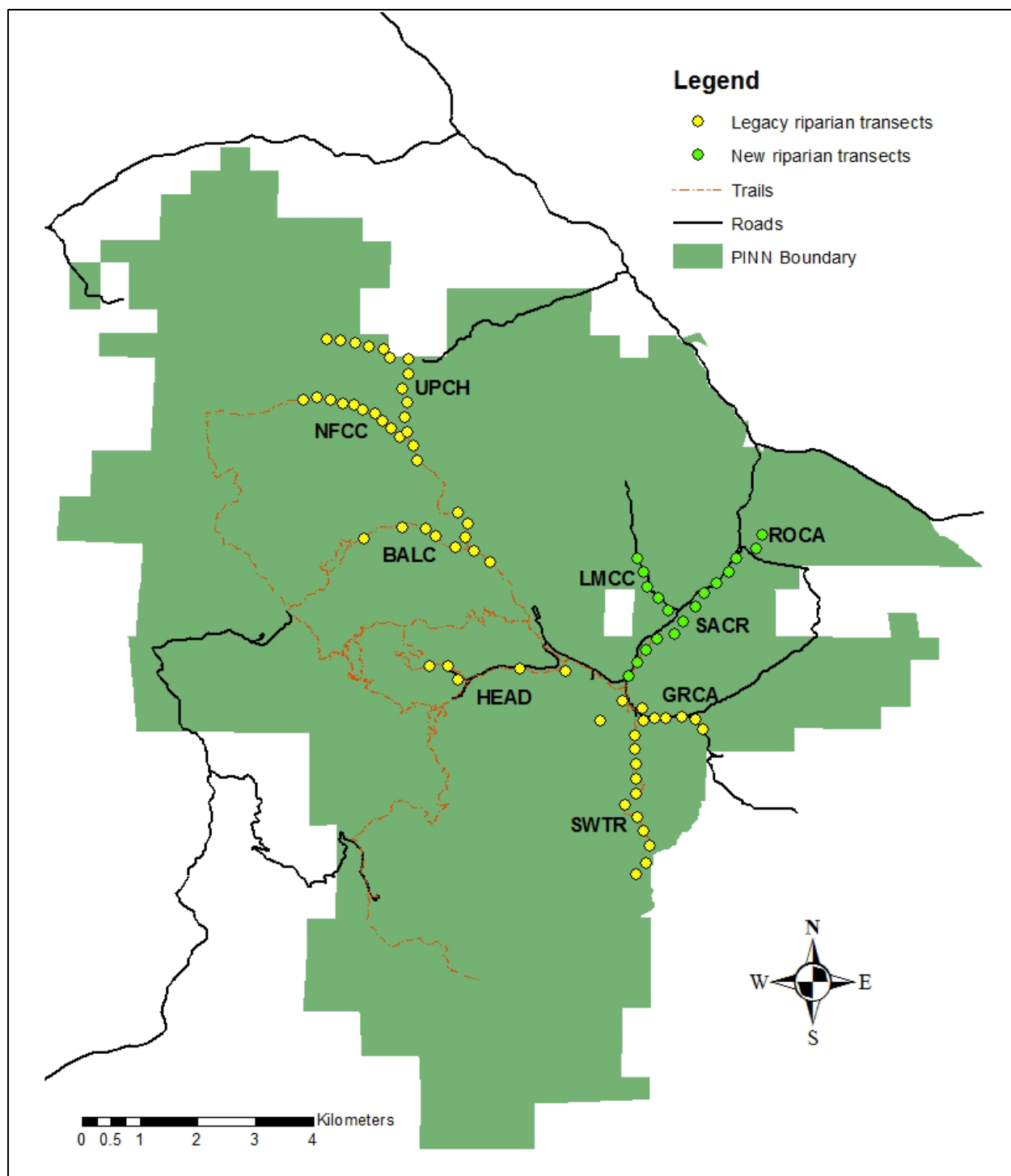


Figure 1. Locations of riparian point counts surveyed in Pinnacles National Park, CA, in 2015 by Point Blue Conservation Science. Full site names are in Table 1. The new riparian transects were established in 2015.

Changes to the Monitoring Protocol

For all point count transects, biologists updated or created narratives to reflect current vegetation, trail, and general environmental conditions to improve navigation to point count stations, as previously surveyed transects had not been visited in at least nine years. These narratives can be found in the newly-created Protocol Implementation Plan (PIP) for Riparian Bird Monitoring in Pinnacles National Park (Humple and Dettling 2016). GPS coordinates were also corrected where site descriptions in the narratives were unambiguous but GPS coordinates were incorrect. In rare instances, where substantial changes to plant growth or waterbodies (creeks or ponds) occurred since the point count stations were established, and accessing these points would have required a level of disturbance to the area that may have altered bird behavior and compromised the survey, or would have been unreasonable within the time frame of point count surveys or impractical, points were relocated to nearby sites which were as similar as possible to the original site. In these cases, new GPS coordinates were recorded, and transect narratives were edited to reflect the change. All recent changes to narratives are described in the “revision history log” embedded within each of the narratives. The protocol for GOGA and PORE (Gardali et al. 2010) called for each point to be flagged each year. We did not flag any of the points due to the high likelihood that over the course of three years between surveys the flagging would deteriorate and become useless. Appendix A of the PIP (Humple and Dettling 2016) contains the updated narratives and the revision history, including all changes described above. All changes to GPS coordinates are also made on the California Avian Data Center (see Data Management and Availability, below).

One important change, reflected in the narratives, was that one point count station was moved in the Upper Chalone (UPCH) transect from where the previous narrative had it located. Point UPCH03 was moved about 40 m from an area of very thick scrub vegetation to a spot along the pig fence, which is consistent with several other points in the transect. It is unclear if the coordinates were wrong or if the vegetation changed. Accessing the point as described in the previous narrative would have caused unnecessary disturbance during the breeding season and taken an unreasonable amount of time given the constraints of the survey window.

Photo Documentation of Point Count Locations

Observers took photographs at every point count station (n=77) in 2015, as per the request of the National Park Service and for archiving purposes in order to provide a visual assessment of the habitat. Each observer followed the same guidelines described here. Photographs were taken in a direction that illustrated the representative vegetation being surveyed. The direction (relative to magnetic north) was recorded. All photos were taken at eye level (~1.5 m). The photo files are labeled in the following way: (transect four letter code)_(point number)_(direction in degrees). For example NFCC_12_150deg is the photo from the North Fork Chalone Creek transect, point number 12, looking in the direction of 150 degrees. The photographs are in JPEG format.

This photo documentation is not planned to be repeated during each subsequent year of surveys. Photos are archived on the server at Point Blue Conservation Science (Z:\Terrestrial\programs_and_projects\pinnacles\site_descriptions\PC_photo_documentation), and are also included as a DVD supplement to this report (Supplement A) for archiving by the National

Park Service. In Appendix A, one photograph per transect is shown to represent the typical habitat found in that transect, and provide a sense of the archival photo documentation.

Data Management and Availability

Point count data discussed in this report are available to download from the California Avian Data Center (CADC), a regional node of the Avian Knowledge Network (AKN) hosted by Point Blue Conservation Science. The data are available there under project PINN for appropriate SFAN partners (contact Diana Humple for additional personnel access, dhumple@pointblue.org). Updated GPS coordinates can be downloaded from CADC in a variety of formats for mapping or uploading to GPS receivers; GPS coordinates are also listed in the narratives (in the PIP; Humple and Dettling 2016).

To access point count data through CADC, once you have a CADC account with access to this project, go to <http://data.prbo.org/cadc2/>, then follow the steps below:

1. Click “Go” in the red My CADC box on the right-hand side of the page.
2. Select “I want to log in to my MyCADC account”
3. Select “Analysts Tools”
4. Enter your user name, click enter, then enter your password and click Log In.
5. Click Point Counts, then select the project you wish to view or download data for (PINN)
6. You will then have a variety of options for selecting and filtering the data you want to download. Once you have selected the locations, time span, and other parameters, you can choose “Get selected data as - CSV file” to download all the data; or you can use the analyst’s tools to view various summaries of the data. It is recommended that you talk to the Point Blue project lead (dhumple@pointblue.org) regarding this process and some of the limitations of it before doing any statistical analyses through CADC.

To download GPS coordinates for study sites:

1. Follow steps 1 and 2 above.
2. Select “Biologists”
3. Select “Get maps and coordinates”
4. Select the appropriate project as in 5 above.
5. You will then be able to select which locations you want to download coordinates for, and to select a variety of formats to download them in.

A shapefile/geodatabase of the most up-to-date GPS locations of the point count stations, PDF scans of point count raw data sheets, and a .csv file of the point count data are being provided to the National Park Service on a DVD supplement (Supplement A) to this report.

Results

Three biologists conducted point counts twice between 29 April and 29 May 2015 (Table 2 and 3); efforts were made to complete the second round of surveys earlier than normal due to potential for the extreme drought conditions to cause early termination of breeding by Pinnacles landbirds. A total of 77 points were surveyed with 18 of those being newly established in 2015 (Table 1, Figure 1).

For the following summary we report the total tally of species detected at all distances from the observer, including birds flying over, for all of the survey points. A total of 67 species were detected by point count in 2015 (Table 4). The ten most-commonly detected species, in decreasing order of abundance, were California Quail, Spotted Towhee, Western Scrub-Jay, Mourning Dove, Acorn Woodpecker, Oak Titmouse, Ash-throated Flycatcher, Bewick's Wren, Wrentit, followed by House Wren and Black-headed Grosbeak tied for tenth (Table 4). Of the 67 species detected, 19 species had ten or fewer individual detections (Table 4). Twenty-three species detected are California Partners in Flight Habitat Conservation Plan Focal Species (CalPIF 2000, CalPIF 2002a, CalPIF 2002b, CalPIF 2004, CalPIF 2009, RHJV 2004), and of these, two are California Bird Species of Special Concern (Shuford and Gardali 2008) and two others are listed as vulnerable to climate change in California (Gardali et al. 2012; Table 4).

Table 2. Primary observers who conducted field work at Pinnacles National Park, CA in 2015 by Point Blue Conservation Science.

Name	Role
Diana Humple	Project Lead, Site Selection, Point Count Surveys
Mark Dettling	Field Coordinator, Point Count Surveys, Data Management
Ryan DiGaudio	Field Technician, Point Count Surveys, Data Management

Table 3. Dates of point count surveys by transect, Pinnacles National Park, CA in 2015 by Point Blue Conservation Science.

Transect name	Station code	Visit 1	Visit 2
Balconies	BALC	29-Apr	26-May
Grassy Canyon	GRCA	29-Apr	29-May
Headquarters	HEAD	1-May	29-May
Lower McCabe Canyon	LMCC	29-Apr	28-May
North Fork Chalone Creek	NFCC	30-Apr	27-May
Rose Canyon	ROCA	29-Apr	28-May
Sandy Creek	SACR	30-Apr	28-May
South Wilderness Trail	SWTR	1-May	26-May
Upper Chalone	UPCH	30-Apr	27-May

Table 4. Number of individual detections of each species on riparian point count transects, Pinnacles National Park, CA in 2015 by Point Blue Conservation Science. Includes observations at all distances (not just within 50m), flyover observations, and both visits, and are not averaged per point (some individuals detected at multiple points), so count may not represent actual abundance. Species are listed in taxonomic order (Clements et al. 2015). Continued on next page.

Common Name	Scientific Name	PC Total
California Quail	<i>Callipepla californica</i>	274
Wild Turkey	<i>Meleagris gallopavo</i>	14
Turkey Vulture	<i>Cathartes aura</i>	27
Red-shouldered Hawk	<i>Buteo lineatus</i>	2
Red-tailed Hawk	<i>Buteo jamaicensis</i>	4
Eurasian Collared-Dove	<i>Streptopelia decaocto</i>	24
Mourning Dove	<i>Zenaida asiatica</i>	203
Greater Roadrunner ^{a,b}	<i>Geococcyx californianus</i>	3
White-throated Swift	<i>Aeronautes saxatalis</i>	10
Anna's Hummingbird	<i>Calypte anna</i>	21
Hummingbird spp.	<i>Trochilidae</i> spp.	7
Acorn Woodpecker ^a	<i>Melanerpes formicivorus</i>	173
Nuttall's Woodpecker ^a	<i>Picoides nuttallii</i>	47
Downy Woodpecker	<i>Picoides pubescens</i>	6
Hairy Woodpecker	<i>Picoides villosus</i>	11
Northern Flicker	<i>Colaptes auratus</i>	62
Woodpecker spp.	<i>Picidae</i> spp.	6
American Kestrel	<i>Falco sparverius</i>	1
Western Wood-Pewee	<i>Contopus sordidulus</i>	40
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>	4
Black Phoebe	<i>Sayornis nigricans</i>	12
Ash-throated Flycatcher ^a	<i>Myiarchus cinerascens</i>	167
Western Kingbird	<i>Tyrannus verticalis</i>	16
Hutton's Vireo	<i>Vireo huttoni</i>	38
Warbling Vireo ^a	<i>Vireo gilvus</i>	42
Steller's Jay	<i>Cyanocitta stelleri</i>	18
Western Scrub-Jay ^a	<i>Aphelocoma californica</i>	204
American Crow	<i>Corvus brachyrhynchos</i>	29
Common Raven ^a	<i>Corvus corax</i>	15
Violet-green Swallow	<i>Tachycineta thalassina</i>	32
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	1
Swallow spp.	<i>Hirundinidae</i> spp.	7
Oak Titmouse ^a	<i>Baeolophus inornatus</i>	172
Bushtit	<i>Psaltiriparus minimus</i>	39
White-breasted Nuthatch	<i>Sitta carolinensis</i>	62

^a California Partners in Flight Habitat Conservation Plans Focal Species (includes all habitats; CalPIF 2000, CalPIF 2002a, CalPIF 2002b, CalPIF 2004, CalPIF 2009, RHJV 2004).

^c Listed as vulnerable to climate change in California (Gardali et al. 2012).

^b California Bird Species of Special Concern (Shuford and Gardali 2008).

Table 4 (continued). Number of individual detections of each species on riparian point count transects, Pinnacles National Park, CA in 2015 by Point Blue Conservation Science. Includes observations at all distances (not just within 50m), flyover observations, and both visits, and are not averaged per point (some individuals detected at multiple points), so count may not represent actual abundance. Species are listed in taxonomic order (Clements et al. 2015).

Common Name	Scientific Name	PC Total
Canyon Wren	<i>Catherpes mexicanus</i>	2
House Wren	<i>Troglodytes aedon</i>	100
Bewick's Wren	<i>Thryomanes bewickii</i>	149
Blue-gray Gnatcatcher ^a	<i>Poliophtila caerulea</i>	16
Wrentit ^a	<i>Chamaea fasciata</i>	138
Western Bluebird ^a	<i>Sialia mexicana</i>	13
Swainson's Thrush ^{a,b}	<i>Catharus ustulatus</i>	5
American Robin	<i>Turdus migratorius</i>	1
California Thrasher	<i>Toxostoma redivivum</i>	31
European Starling	<i>Sturnus vulgaris</i>	25
Cedar Waxwing	<i>Bombycilla cedrorum</i>	14
Phainopepla ^a	<i>Phainopepla nitens</i>	9
Orange-crowned Warbler	<i>Oreothlypis celata</i>	87
Yellow Warbler ^{a,c}	<i>Setophaga petechia</i>	1
Black-throated Gray Warbler ^a	<i>Setophaga nigrescens</i>	2
Townsend's Warbler	<i>Setophaga townsendi</i>	5
Wilson's Warbler ^a	<i>Cardellina pusilla</i>	37
Yellow-breasted Chat ^{a,c}	<i>Icteria virens</i>	1
Dark-eyed Junco ^a	<i>Junco hyemalis</i>	18
Bell's Sparrow ^a	<i>Artemisiospiza belli</i>	5
Song Sparrow ^a	<i>Melospiza melodia</i>	55
California Towhee	<i>Melozona crissalis</i>	69
Rufous-crowned Sparrow ^a	<i>Aimophila ruficeps</i>	13
Spotted Towhee	<i>Pipilo maculatus</i>	257
Western Tanager ^a	<i>Piranga ludoviciana</i>	7
Black-headed Grosbeak ^a	<i>Pheucticus melanocephalus</i>	100
Lazuli Bunting	<i>Passerina caerulea</i>	51
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	12
Brown-headed Cowbird	<i>Molothrus ater</i>	16
Bullock's Oriole	<i>Icterus bullockii</i>	15
House Finch	<i>Haemorhous mexicanus</i>	40
Purple Finch	<i>Haemorhous purpureus</i>	29
Lesser Goldfinch	<i>Spinus psaltria</i>	17
Lawrence's Goldfinch	<i>Spinus lawrencei</i>	38
American Goldfinch	<i>Spinus tristis</i>	1

^a California Partners in Flight Habitat Conservation Plans Focal Species (includes all habitats; CalPIF 2000, CalPIF 2002a, CalPIF 2002b, CalPIF 2004, CalPIF 2009, RHJV 2004).

^c Listed as vulnerable to climate change in California (Gardali et al. 2012).

^b California Bird Species of Special Concern (Shuford and Gardali 2008).

Discussion

We do not present any trends or figures, or discuss the above results in any depth, as the Analysis and Synthesis reports that are produced every six years (e.g., Humple and Porzig 2012), are meant to include the in-depth analyses and discussion. The next Analysis and Synthesis report will be produced following the 2018 field season.

This report summarized the first year of landbird monitoring at Pinnacles since the mid-2000s, and the first year of implementation of the Protocol Implementation Plan for Riparian Landbird Monitoring in Pinnacles National Park (Humple and Dettling 2016). This first year of implementation of the monitoring was done after completing the first draft of this protocol, and with approval of the NPS to proceed with that still in draft form as a pilot year to finalize selection of monitoring locations. The field methods themselves are standardized with those already approved for riparian landbird monitoring in Point Reyes National Seashore and Golden Gate National Recreation Area, with little variation anticipated.

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Appendix A. Representative Photos for Each Transect

Photos were taken of every point count station surveyed in 2015. A photo from one point along each transect was chosen to illustrate the type of habitat surveyed by the transect (noting that for many of these transects, habitat was not uniform within or among points). Each photo below is labeled with the transect name and the point number. Photos from each point can be found in Supplement A.



Balconies – BALC09



Grassy Canyon – GRCA03



Headquarters – HEAD06



Lower McCabe Canyon – LMCC04



North Fork Chalone Creek – NFCC06



Rose Canyon – ROCA02



Sandy Creek – SACR06



South Wilderness Trail – SWTR03



Upper Chalone – UPCH05

Supplement A. Photo Documentation of the Riparian Point Count Locations, GIS Files, Electronic Copies of Raw Data Sheets, and a Spreadsheet of Entered Data for Pinnacles National Park, 2015.

See separate DVD provided to National Park Service (not part of electronic version of report). Data on file with the San Francisco Bay Area Network Inventory and Monitoring Program.

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

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Natural Resource Stewardship and Science

1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov



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