



Riparian Landbird Monitoring in Golden Gate National Recreation Area and Point Reyes National Seashore

Progress Report for 2019–2020

Natural Resource Data Series NPS/SFAN/NRDS—2022/1356



ON THE COVER

Orange-crowned Warbler

Photograph by: Mark Dettling

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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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Executive Summary

This document contains an abbreviated progress report for landbird monitoring conducted from 16 August 2019 through 15 August 2020 in predominantly riparian habitat found in Point Reyes National Seashore and Golden Gate National Recreation Area as part of the National Park Service's (NPS) Inventory and Monitoring (I&M) Program, and following protocols established for this purpose in these two parks (originally Gardali et al. 2010; most recent revision Gardali et al. 2019). The Analysis and Synthesis reports—or in some cases, publications in their stead—that are produced every six years (e.g., Humple and Porzig 2014, Dettling et al. 2021) include in-depth analyses and discussion that are not the purview of this progress report. This progress report deviates slightly from the structure of previous progress reports (e.g., Dettling and Humple 2020) following a joint decision by Point Blue and NPS to restrict this version to truly a “report on progress”, with limited results.

Monitoring was conducted by Point Blue Conservation Science (hereafter Point Blue) at 15 study sites within the parks using one or both of two methods, point counts and constant-effort mist netting. We report on point-count surveys that were conducted during the peak landbird breeding season (May–June) of 2020, and mist netting (and associated bird banding) that was conducted in fall 2019 through summer 2020. Monitoring at the entire suite of sites takes place every three years. Additionally, monitoring occurs annually at a subset of “core” sites (mist netting and point counting) as part of Point Blue Conservation Science's Palomarin Field Station network of intensive monitoring sites and as a complement to the I&M Program (Gardali et al. 2019).

Site narratives were updated to reflect changes in vegetation and other environmental factors. One change in effort is that two sites that previously were considered core Palomarin sites, are now surveyed on the every-three-year schedule with the rest of the entire suite of sites: Lagunitas Creek because we no longer mist net there; and Arroyo Hondo, where we have never mist netted, for consistency with our selection of which sites are core, given limited staff capacity.

Due especially to the SARS-CoV-2 (COVID-19) pandemic and initial shelter-in-place orders, as well as to some funding restrictions and impacts of fire, deviations to the mist-netting schedule occurred during this period.

Public outreach, via live demonstrations, is an important component of Point Blue's mist-netting programs but was curtailed significantly due to safety concerns related to the COVID-19 pandemic, resulting in the closure of the Palomarin Field Station and elimination of class visits to our riparian mist-netting sites. However, approximately 225 members of the public viewed mist netting at these sites during this year-long period either in person, prior to the closure, through organized class visits or virtually through one of three online live demonstrations. We were also able to interact with hundreds more people as drop-in visitors prior to the closure.

In total, 118 bird species were detected during surveys this year across the monitoring sites. Concurrent with the data collection and production of this report, a publication (Dettling et al. 2021) was produced based on long-term data from this riparian landbird monitoring effort.

Acknowledgments

We thank the National Park Service, and especially Point Reyes National Seashore and Golden Gate National Recreation Area and their staff, for support of this monitoring program. We acknowledge Point Blue biologists H. Allen, R. DiGaudio, and M. Elrod for collecting point-count data in 2020; M. Mahoney (from Point Blue) for reviewing a draft of this report; numerous Point Blue interns and banding supervisor R. Cormier for mist-netting efforts; and T. Gardali for overseeing this project as Point Blue's Pacific Coast and Central Valley Group Director. We thank J. Hickey (NPS) for reviewing a draft of this report; T. Gardali, D. George, M. Herzog, M. Koenen, D. Press, W. Merkle, S. Allen, M. Denn, and J. Hickey for their contributions to the development and/or implementation of the riparian monitoring plan. We additionally thank Marin County Parks (especially S. Hubert and M. Martin) and California State Parks (especially C. Freeman and B. Hardcastle) for supporting the component of this work that occurs in Bolinas Lagoon Open Space Preserve and Mount Tamalpais State Park, respectively; the U.S. Bird Banding Lab for providing bands and other support; and L. R. Mewaldt, C. J. Ralph, D. DeSante and G. Geupel for their role in establishing and maintaining long-term data collection at the Palomarin Field Station. We are grateful to the additional funders and supporters of our science and intern training at the Palomarin Field Station and our network of monitoring sites in the region. We acknowledge that this monitoring, and the Palomarin Field Station itself, occurs on the unceded ancestral lands of the Coast Miwok people of present-day Marin and southern Sonoma counties (who, together with the Southern Pomo, today are recognized as a tribe by the United States Congress and called the Federated Indians of Graton Rancheria).

Introduction

This report summarizes the landbird monitoring conducted over a one-year period in 2019–2020 in riparian habitat of Point Reyes National Seashore (PORE) and Golden Gate National Recreation Area (GOGA) as part of the National Park Service’s (NPS) Inventory and Monitoring (I&M) Program. The objectives of this ongoing work are to monitor productivity and survival of bird populations, to detect any trends in these populations due to natural or human-caused environmental changes, and in certain circumstances to monitor the effects of management actions (Gardali et al. 2019). Landbirds are recognized as indicators of changing ecosystems (Carignan and Villard 2002) and climate (MacMynowski et al. 2007). They are also relatively easy to study 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 and engender a great deal of public interest. Several landbird species that occur regularly in PORE and GOGA are state 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).

Here we report on landbird monitoring effort and describe changes to the protocol that were made during the time period of interest.

Methods

We report on the landbird-monitoring effort in PORE and GOGA from 16 August 2019 through 15 August 2020—a timing based on inclusion of three distinct seasons (fall 2019, winter 2019–2020, and breeding season 2020) and the I&M protocol, which involves monitoring our full suite of riparian point count sites every third year.

The protocol for this monitoring project is described fully in Gardali et al. (2010, updated 2019). Briefly, monitoring was conducted at established sites throughout PORE and in the Marin County portions of GOGA (Figure 1). Sites were predominantly located within willow-alder riparian areas. All sites had been established and surveyed previously, prior to development of the monitoring protocol (Gardali et al. 2010, updated in 2019), for inventory, monitoring, or other purposes. The full monitoring protocol was implemented in 2010–2011 (Jennings and Humple 2014; Humple and Porzig 2014), 2013–2014 (Dettling and Humple 2015), 2016–2017 (Dettling and Humple 2020), and this report is for the fourth year of full implementation, 2019–2020.

All survey locations are in riparian habitat on NPS lands with three exceptions: 1) the inclusion of two mist-netting sites at the Palomarin Field Station in PORE (Palomarin Main Nets and Palomarin Upper Nets), where habitat is predominantly coastal scrub, Douglas-fir, and mixed evergreen hardwood forest; 2) the inclusion of mist netting and point counting at Pine Gulch, a riparian site in the Bolinas Lagoon Open Space Preserve (BLOSP) managed by Marin County Parks; and 3) the inclusion of part of the Redwood Creek riparian point-count transect, in Mount Tamalpais State Park (MTSP) managed by California State Parks, and contiguous to the rest of the transect located in GOGA. These sites are included in the monitoring protocol (Gardali et al. 2019) and are long-term, core Point Blue monitoring sites. Collectively, we refer herein to all the sites as the Marin County I&M sites.

Two monitoring methods were used: constant-effort mist netting (year-round for some sites) and point-count surveys (breeding season only). Mist netting (and associated bird banding) takes place at established core locations where Point Blue’s Palomarin Field Station conducts ongoing, annual, long-term monitoring, but only data collected between the above dates are included in the progress report. At all sites where mist netting occurs, point counts are conducted annually (hereafter, the core Palomarin sites; however, see Changes to Monitoring Protocol below), but we report only on the data from this one year. Every third year during the breeding season, the core Palomarin sites (riparian and non-riparian) plus an additional full suite of sites are surveyed through this I&M program (Gardali et al. 2019). Before the I&M program, long-term monitoring was already underway at the mist-netting stations and at the point-count transects at those sites and a few others. Additional point-count transects were chosen from a larger number of historically surveyed PORE and GOGA riparian sites based on habitat type and the existence of historical data (Table 1).

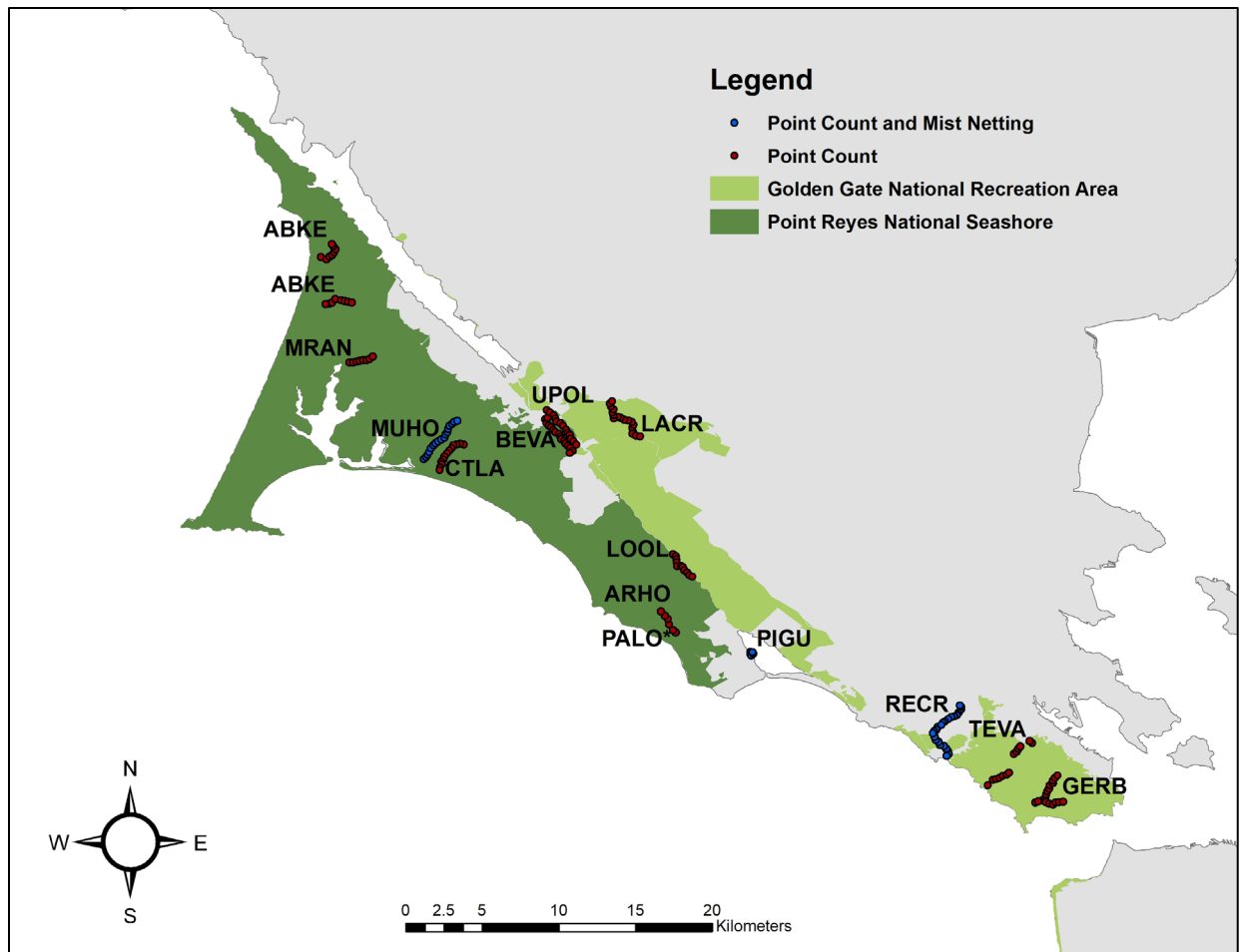


Figure 1. NPS I&M riparian site locations within Marin County surveyed by Point Blue Conservation Science in 2019–2020. Full site names are in Table 1. Exact locations of mist-netting stations are not highlighted but are within the area covered by the associated point-count transect (for those indicated in blue; see legend). Also shown is the Palomarin Field Station (PALO), which includes PN and PGUP, two non-riparian mist-netting sites included in this report and the I&M protocols (Gardali et al. 2019).

Table 1. NPS I&M sites within Marin County where point count and mist netting occurred, Point Blue Conservation Science. PC=point count, MN=mist netting. Year begun refers to PC and MN, respectively; and number of years surveyed refers to PC.

Park	Site Name	Code	# pts	Season	Method	Year begun	# yrs surveyed (PC) ^a
GOGA	Lagunitas Creek	LACR	18	Breeding, Fall	PC (MN ^b)	1997 (2001 ^b)	22
	Gerbode Valley	GERB	18	Breeding	PC	1997	7
	Redwood Creek (lower + upper)	RECR	24	Breeding, Fall	PC, MN	1997, 2001	24
	Tennessee Valley	TEVA	13	Breeding	PC	1997	6
PORE	Abbott's / Kehoe	ABKE	16	Breeding	PC	1997	6
	Arroyo Hondo	ARHO	6 ^c	Breeding	PC	1997	22
	Bear Valley	BEVA	16	Breeding	PC	1997	6
	Coast Trail Laguna	CTLA	13	Breeding	PC	1997	7
	Lower Olema Creek	LOOL	11	Breeding	PC	1997	11
	M Ranch	MRAN	8	Breeding	PC	1997	6
	Muddy Hollow	MUHO	15	Year-round	PC, MN	1997, 1995	24
	Upper Olema Creek	UPOL	13	Breeding	PC	1997	7
	Palomarin Main Nets (PORE) ^d	PN	–	Year-round	MN	1966	n/a
Other	Palomarin Upper Nets (PORE) ^d	PGUP	–	Year-round	MN	1992	n/a
	Pine Gulch	PIGU	5	Year-round	PC, MN	1997, 1994	24
Total Points		–	176	–	–	–	–

^a Constant-effort mist netting was conducted yearly since it was begun at each site; point counting was not done every year (see Gardali et al. 2019, Table 1, for historical monitoring schedule).

^b Lagunitas Creek mist-netting site was discontinued in the fall of 2016 due to salmon restoration activities that created a new creek channel through a few net locations.

^c The number of points on this transect was incorrectly reported as 7 in Jennings and Humple 2014 and Humple and Porzig 2014.

^d These sites are located at the Palomarin Field Station, whose on-site mist-netting efforts are included in the monitoring protocol (Gardali et al. 2019) although they are not in riparian habitat. The effort and results for mist netting at these sites are included in this report, but the non-riparian point counts also conducted there are not (nor in this table, nor in Figure 1).

The Variable Circular Plot method was used for all point-count surveys conducted in 2020. Thirteen transects were surveyed, each with 5 to 24 point-count stations (hereafter points) and totaling 176 points. Surveys began approximately 15 minutes after local sunrise and were completed within four hours, when bird activity is generally the highest. Each point 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 1 May and 30 June, with a minimum of 10 days between the two visits. Redwood Creek was effectively split into two subtransects (Lower and Upper; see Standard Operating Procedure (SOP) 4 [Gardali et al. 2019]) as it requires two days to complete. SOP 6 of the riparian landbird monitoring protocol (Gardali et al. 2019) lays out the above protocols in greater detail, and SOP 4 includes narrative descriptions of point-count transects.

For constant-effort mist netting (which includes banding individual birds with a uniquely numbered leg band), we generally followed the nationally standardized Monitoring Avian Productivity and Survival protocols (MAPS; DeSante et al. 2000). SOP 7 of the riparian landbird monitoring protocol (Gardali et al. 2019) defines fully how Point Blue protocols differ from MAPS protocols and where to find the comprehensive Point Blue protocols (in the internal *Palomarin Handbook: Point Blue's Landbird Procedures*). There were 20 nets at Palomarin, 11 at Redwood Creek, and 10 at each of the other sites, with nets run for 6-hours per day when possible. One full day with no net closures equals 120-net hours at Palomarin, 66 at Redwood Creek, and 60 at the other sites. Per the protocol, the mist-netting station at Redwood Creek was operated 1 May through 31 October and the four other stations were operated year-round. The Palomarin Main Nets were run six days per week May through November and three days per week December through April. At all other sites, nets were run approximately once every 10 days November through mid-August and once every seven days mid-August through October to reduce the chance of missing pulses of migrating birds. Mist netting occurs annually at all these sites, not only once every three years. For a number of the sites, we were not able to follow this protocol in 2020 due to travel restrictions related to the COVID-19 pandemic (see below).

All birds captured were identified to species, age, and sex using criteria in the Identification Guide to North American Birds (Pyle 1997) and most were banded with a uniquely numbered aluminum band provided by the Bird Banding Laboratory of the U.S. Geological Survey/Biological Resources Division. Some species (e.g., gamebirds; hummingbirds at sites other than Palomarin) were not banded due to permitting or other constraints. Mist netting was conducted primarily by Point Blue interns who received at least four weeks intensive training in safe capture, handling and measuring techniques by the staff supervisor, and continue advanced training the rest of their internship.

For both methods, fieldwork was not conducted during periods of rain, high wind, or other adverse weather conditions, as these can affect bird behavior, capture rates, and detectability, and in the case of mist netting can affect bird safety.

Changes to the Monitoring Protocol

For all point-count transects, biologists updated site narratives to reflect current vegetation, trail, and other environmental conditions to improve navigation to points. GPS coordinates were also corrected where site descriptions were unambiguous, but GPS coordinates were incorrect. However, this year we did not have to do any minor relocation of points, as is occasionally required in rare instances where substantial plant growth or changes to waterbodies (creeks or ponds) hinders reasonable access. All changes to GPS coordinates were also made on the California Avian Data Center (see

Data Management and Availability, below). All changes to site narratives were described in the “revision history” embedded within each of the individual transect narratives. SOP 4 (Gardali et al. 2019) includes all changes described above through the 2018 season; the most current version of the narratives made since the most recent publication of the SOP is always maintained by Point Blue (and currently that version supersedes the SOP for the annually monitored transects that had minor site changes in 2020).

One effort change is that two point-count transects that were considered core sites, and surveyed every year, are now only surveyed every three years, as part of the full suite of sites (Gardali et al. 2019). Core sites are of interest to Point Blue research outside of the I&M Program with the data we collect fulfilling our own Palomarin Field Station research goals as well as contributing to the NPS I&M Program. Due, in part, to funding and capacity constraints following the 2017 breeding season, we decided that our core riparian sites for point counts would only be those where we also had mist-netting stations (i.e., Redwood Creek, Muddy Hollow, and Pine Gulch; also the non-riparian site, Palomarin), thus standardizing our modern rationale for core sites. The Lagunitas Creek and Arroyo Hondo point-count transects had been a part of the group of core sites (Lagunitas Creek because we previously mist netted there; and Arroyo Hondo, where we have never mist netted, because of its proximity to our Palomarin Field Station), but now will be surveyed only every three years as part of the full suite of sites.

Short-term Methodological Changes

Due to funding shortfalls and COVID-19 pandemic related challenges, we were not able to follow the schedule outlined in the protocol and had to pause monitoring at some sites; these changes do not reflect a decision to make long-term changes to our monitoring regime.

In fall 2019 (from 16 August to 3 November), mist netting occurred at the Palomarin Main Nets, but did not occur at Redwood Creek, Muddy Hollow, Palomarin Upper Nets, or Pine Gulch because funding constraints inhibited us from hiring a full intern crew. In winter 2019–2020 (4 November 2019 to 1 March 2020), we were able to operate on the normal schedule at Palomarin Main Nets and only one additional site (Pine Gulch), and, again due to funding constraints limiting our crew size, we were not able to operate the other sites typically operated in winter (Muddy Hollow and Palomarin Upper Nets). The standard schedule for Redwood Creek is for monitoring only May through October, so effort for this site was not impacted. We were able to hire a full intern crew for the spring/summer 2020 season and therefore were able to return (at least initially; see below) to the mist-netting schedule outlined in the protocol starting on 2 March 2020.

However, only two weeks later on 17 March 2020, in order to combat the spread of SARS-CoV-2, Marin County put a shelter-in-place order in effect that allowed only limited travel for essential activities. From 18 March 2020 to 20 May 2020, we limited mist netting to the areas in the immediate vicinity of the Palomarin Field Station (that only included the Palomarin Main Nets and the Palomarin Upper Nets). Work at these sites continued because the interns lived there and because the banders, most of whom lived together, were considered a “pod” for the purposes of the pandemic and could therefore also work together. By mid-May 2020 shelter-in-place restrictions had eased to allow outdoor work and we received permission from NPS to recommence fieldwork, so we resumed

mist netting at those sites which were not easily accessible to the public (the latter being an internal Point Blue decision, not an agency one). From 21 May 2020 to 15 Aug 2020 (the end of this reporting period), mist netting occurred following the protocol at the Palomarin Main Nets, Redwood Creek, Muddy Hollow, and Palomarin Upper Nets, but not at Pine Gulch because many of the mist nets there are on public trails (note, Pine Gulch was reinstated subsequently outside of this reporting period).

We were able to follow the timing in the protocol for point-count surveys, though we only received permission (from Marin County Parks, California State Parks, and NPS) to conduct fieldwork in mid-May. The first round of surveys occurred in those last two weeks of May (so while it is within the confines of the protocol, it took place during a truncated period) and the second round throughout June.

In addition, the prevalence of mist-net closures based on poor Air Quality Index (AQI) due to smoke from wildfires has increased in recent years. We recently standardized our protocols for when to close nets (for the safety of the banders as well as the birds) based on $AQI \geq 150$ or, if below 150, based on the conditions experienced by the banders and their own sensitivity. The Purple Air (www.purpleair.com) and/or AirNow (<https://fire.airnow.gov/>) websites are consulted to assess the AQI for the nearest Purple Air sensor and get a sense of air quality for the region in order to interpolate the AQI at each mist-netting site. As of November 2020, a sensor was established at the Palomarin Field Station, and its data also can be accessed via the Purple Air website. Note that the impacts of the local August 2020 Woodward Fire are outside of the temporal scope of this report.

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 projects CNPSM and PALO, for SFAN partners (contact report authors for additional personnel access, as well as for critical guidance on how best to access the data and when to do so; alternatively, Point Blue can simply provide the data). Updated GPS points can be downloaded from CADC in a variety of formats for mapping or uploading to GPS receivers; GPS points are also listed in SOP 4 (Gardali et al. 2019), the most current versions are maintained on CADC and in the current narrative, therefore one of those should be checked rather than the SOP unless the SOP is up to date.

To access point-count data through CADC, you will need to register for an account. Before downloading data, you should contact a Point Blue project manager so they can provide some specific, critical guidance, go to <http://data.pointblue.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 “Biologists”
4. Enter your user name, click enter, then enter your password and click Log In.

5. Select the project you wish to view or download data for (CNPSM or PALO) in the box on the left
6. On the right-hand side of the page under Project Management Tools choose “Download Observations”
7. You will then have a variety of options for selecting and filtering the data you want to download. Once you have selected the locations and time span, you can choose the “CSV (Excel) file” button next to the Point Count Observations heading to download all the data. We recommend that you talk to the Point Blue project lead (dhumple@pointblue.org) regarding this process and some of the limitations of the download process before doing any statistical analyses.

To download GPS points for study sites:

1. Follow steps 1 through 4 above
2. Select the project you wish to view or download data for (CNPSM or PALO) in the box on the left
3. On the right-hand side of the page under Project Management Tools choose “Download Locations to GPS, GIS, and more”
4. 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.

Electronic databases of all mist-netting data, along with scans of point-count raw data sheets, are provided to the National Park Service on a supplemental CD on a yearly basis.

Effort Summary

Five biologists conducted point counts, and at least 13 biologists conducted constant-effort mist netting, during the one-year period covered in this report (see Table 2 for primary staff and interns responsible for mist netting this season; additional volunteers who helped collect the data are not listed herein). Point-count surveys were conducted during May (visit 1) and June (visit 2), 2020 (Table 3). Mist netting followed the site-specific schedule outlined in the Methods; dates of visits are not listed here, but Table 4 summarizes the amount of time mist nets were operated (“net hours” or netting effort) for each site and season, which are recorded in order to correct capture rates for varying effort among years in analyses.

Table 2. Primary observers who conducted fieldwork, NPS I&M sites within Marin County, fall 2019 through summer 2020, Point Blue Conservation Science. PC = point count; MN = mist netting.

Name	Role	Method	Year
Diana Humple	Project Lead	PC, MN	2019, 2020
Renée Cormier	MN Field Lead	MN	2019, 2020
Mark Dettling	PC Field Lead	PC, MN	2019, 2020
Hilary Allen	Field Technician	PC, MN	2019, 2020
Ryan DiGaudio	Field Technician	PC	2020
Megan Elrod	Field Technician	PC	2020
Sarah Mueller	Intern bander	MN	2019
Olivia Wang	Intern bander	MN	2019
Samantha Chavez	Intern bander	MN	2019, 2020
Hannah Roodenrijs	Intern bander	MN	2019, 2020
Bernarda Vasquez Avila	Intern bander	MN	2020
Mary Kate Lisi	Intern bander	MN	2020
Mary DeAquino	Intern bander	MN	2020
Brandon Dunnahoo	Intern bander	MN	2020

Table 3. Dates of point-count surveys by transect, NPS I&M sites within Marin County, 2020, Point Blue Conservation Science.

Transect	Station Code	Visit 1	Visit 2
Abbot's/Kehoe	ABKE	5/26/2020	6/12/2020
Arroyo Hondo	ARHO	5/15/2020	6/25/2020
Bear Valley	BEVA	5/16/2020	6/3/2020
Coast Trail Laguna	CTLA	5/25/2020	6/9/2020
Gerbode Valley	GERB	5/28/2020	6/22/2020
Lagunitas Creek	LACR	5/15/2020	6/5/2020
Lower Olema Creek	LOOL	5/26/2020	6/10/2020
M Ranch	MRAN	5/21/2020	6/8/2020
Muddy Hollow	MUHO	5/21/2020	6/24/2020
Pine Gulch	PIGU	5/16/2020	6/10/2020
Redwood Creek ^a	RECR	5/27/2020	6/19/2020, 6/24/2020
Tennessee Valley	TEVA	5/26/2020	6/11/2020
Upper Olema Creek	UPOL	5/27/2020	6/17/2020

^a Redwood Creek transect is subdivided into two subtransects (Upper and Lower; see SOP 4 (Gardali et al. 2019) due to the number of points, thus multiple survey dates.

Table 4. Number of mist-net hours by station, NPS I&M sites within Marin County, fall 2019 through summer 2020, Point Blue Conservation Science. One mist-net hour is one 12-meter mist net (the standard size we use at these sites) operated for 1 hour; see Methods for explanation of how total net hours are calculated daily at each site. For this protocol, fall is defined as 16 August 2019 to 31 October 2019 and winter is defined as 1 November 2019 to 30 April 2020. Spring/summer is defined as 1 May 2020 to 15 August 2020.

Station	Fall 2019 (hr)	Winter 2019–2020 (hr)	Spring/Summer 2020 (hr)
Palomarin Main Nets	7,013.80	10,699.71	10,520.77
Palomarin Upper Nets ^a	–	332.50	587.56
Pine Gulch ^a	–	721.65	–
Muddy Hollow ^a	–	116.25	452.50
Redwood Creek ^{ab}	–	–	559.75

^a Mist-net hour totals affected by situational effort deviations described in Methods resulting in less effort than previous years; typically mist net totals affected by shorter-term drivers (e.g., weather).

^b Protocol is for mist-net station to be operated 1 May through 31 October, not year-round like the other sites.

A total of 118 species were detected by point counts and mist netting combined (Table 5). Of these, 51 were detected by point count only, 21 were detected by mist netting only, and the remaining 46 species by both methods.

Table 5. All species recorded by point count (summer) and mist-netting (year-round) survey methods at NPS I&M sites in Marin County and at Palomarin Field Station mist-netting sites, combined, fall 2019 through summer 2020, Point Blue Conservation Science.

Common Name	Scientific Name	Point Count	Mist Netting
Acorn Woodpecker	<i>Melanerpes formicivorus</i>	X	–
Allen's Hummingbird	<i>Selasphorus sasin</i>	X	X
American Crow	<i>Corvus brachyrhynchos</i>	X	–
American Goldfinch	<i>Spinus tristis</i>	X	X
American Redstart	<i>Setophaga ruticilla</i>	–	X
American Robin	<i>Turdus migratorius</i>	X	X
Anna's Hummingbird	<i>Calypte anna</i>	X	X
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	X	–
Band-tailed Pigeon	<i>Patagioenas fasciata</i>	X	X
Barn Swallow	<i>Hirundo rustica</i>	X	X
Belted Kingfisher	<i>Megaceryle alcyon</i>	X	–
Bewick's Wren	<i>Thryomanes bewickii</i>	X	X
Black Phoebe	<i>Sayornis nigricans</i>	X	X
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	X	X
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	–	X
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	X	–
Brewer's Sparrow	<i>Spizella breweri</i>	–	X
Brown Creeper	<i>Certhia americana</i>	X	X
Brown Pelican	<i>Pelecanus occidentalis</i>	X	–
Brown-headed Cowbird	<i>Molothrus ater</i>	X	X
Bullock's Oriole	<i>Icterus bullockii</i>	X	–
Bushtit	<i>Psaltiriparus minimus</i>	X	X
California Quail	<i>Callipepla californica</i>	X	X
California Scrub-Jay	<i>Aphelocoma californica</i>	X	X
California Towhee	<i>Melospiza crissalis</i>	X	X
Canada Goose	<i>Branta canadensis</i>	X	–

Table 5 (continued). All species recorded by point count (summer) and mist-netting (year-round) survey methods at NPS I&M sites in Marin County and at Palomarin Field Station mist-netting sites, combined, fall 2019 through summer 2020, Point Blue Conservation Science.

Common Name	Scientific Name	Point Count	Mist Netting
Caspian Tern	<i>Hydroprogne caspia</i>	X	–
Cedar Waxwing	<i>Bombycilla cedrorum</i>	X	–
Chestnut-backed Chickadee	<i>Poecile rufescens</i>	X	X
Chipping Sparrow	<i>Spizella passerina</i>	X	–
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	X	–
Common Raven	<i>Corvus corax</i>	X	–
Common Yellowthroat	<i>Geothlypis trichas</i>	X	X
Cooper's Hawk	<i>Accipiter cooperii</i>	–	X
Dark-eyed Junco	<i>Junco hyemalis</i>	X	X
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	X	–
Downy Woodpecker	<i>Dryobates pubescens</i>	X	X
Eurasian Collared-Dove	<i>Streptopelia decaocto</i>	X	–
European Starling	<i>Sturnus vulgaris</i>	X	–
Fox Sparrow	<i>Passerella iliaca</i>	–	X
Gadwall	<i>Mareca strepera</i>	X	–
Golden-crowned Kinglet	<i>Regulus satrapa</i>	X	X
Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>	–	X
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	X	–
Great Blue Heron	<i>Ardea herodias</i>	X	–
Great Egret	<i>Ardea alba</i>	X	–
Great Horned Owl	<i>Bubo virginianus</i>	X	–
Hairy Woodpecker	<i>Dryobates villosus</i>	X	X
Hammond's Flycatcher	<i>Empidonax hammondii</i>	–	X
Hermit Thrush	<i>Catharus guttatus</i>	X	X
Hooded Warbler	<i>Setophaga citrina</i>	X	–
House Finch	<i>Haemorhous mexicanus</i>	X	X
House Sparrow	<i>Passer domesticus</i>	X	–
House Wren	<i>Troglodytes aedon</i>	–	X
Hutton's Vireo	<i>Vireo huttoni</i>	X	X

Table 5 (continued). All species recorded by point count (summer) and mist-netting (year-round) survey methods at NPS I&M sites in Marin County and at Palomarin Field Station mist-netting sites, combined, fall 2019 through summer 2020, Point Blue Conservation Science.

Common Name	Scientific Name	Point Count	Mist Netting
Killdeer	<i>Charadrius vociferus</i>	X	–
Lazuli Bunting	<i>Passerina amoena</i>	X	X
Least Flycatcher	<i>Empidonax minimus</i>	–	X
Lesser Goldfinch	<i>Spinus psaltria</i>	X	–
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	–	X
MacGillivray's Warbler	<i>Geothlypis tolmiei</i>	X	X
Mallard	<i>Anas platyrhynchos</i>	X	–
Marsh Wren	<i>Cistothorus palustris</i>	X	X
Mourning Dove	<i>Zenaida macroura</i>	X	–
Northern Flicker	<i>Colaptes auratus</i>	X	X
Northern Harrier	<i>Circus cyaneus</i>	X	–
Northern Mockingbird	<i>Mimus polyglottos</i>	X	–
Northern Parula	<i>Setophaga americana</i>	X	–
Nuttall's Woodpecker	<i>Dryobates nuttallii</i>	X	–
Oak Titmouse	<i>Baeolophus inornatus</i>	X	–
Olive-sided Flycatcher	<i>Contopus cooperi</i>	X	–
Orange-crowned Warbler	<i>Leiothlypis celata</i>	X	X
Osprey	<i>Pandion haliaetus</i>	X	–
Pacific Wren	<i>Troglodytes pacificus</i>	X	X
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>	X	X
Peregrine Falcon	<i>Falco peregrinus</i>	X	–
Pileated Woodpecker	<i>Dryocopus pileatus</i>	X	X
Pine Siskin	<i>Spinus pinus</i>	X	X
Purple Finch	<i>Haemorhous purpureus</i>	X	X
Purple Martin	<i>Progne subis</i>	X	–
Pygmy Nuthatch	<i>Sitta pygmaea</i>	X	–
Red Crossbill	<i>Loxia curvirostra</i>	X	–
Red-breasted Nuthatch	<i>Sitta canadensis</i>	X	X
Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>	–	X

Table 5 (continued). All species recorded by point count (summer) and mist-netting (year-round) survey methods at NPS I&M sites in Marin County and at Palomarin Field Station mist-netting sites, combined, fall 2019 through summer 2020, Point Blue Conservation Science.

Common Name	Scientific Name	Point Count	Mist Netting
Red-eyed Vireo	<i>Vireo olivaceus</i>	X	–
Red-shouldered Hawk	<i>Buteo lineatus</i>	X	X
Red-tailed Hawk	<i>Buteo jamaicensis</i>	X	–
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	X	X
Rufous Hummingbird	<i>Selasphorus rufus</i>	–	X
Ruby-crowned Kinglet	<i>Corthylio calendula</i>	–	X
Savannah Sparrow	<i>Passerculus sandwichensis</i>	X	–
Sharp-shinned Hawk	<i>Accipiter striatus</i>	–	X
Song Sparrow	<i>Melospiza melodia</i>	X	X
Spotted Towhee	<i>Pipilo maculatus</i>	X	X
Steller's Jay	<i>Cyanocitta stelleri</i>	X	X
Swainson's Thrush	<i>Catharus ustulatus</i>	X	X
Swamp Sparrow	<i>Melospiza georgiana</i>	–	X
Tree Swallow	<i>Tachycineta bicolor</i>	X	–
Townsend's Warbler	<i>Setophaga townsendi</i>	–	X
Turkey Vulture	<i>Cathartes aura</i>	X	–
Varied Thrush	<i>Ixoreus naevius</i>	–	X
Violet-green Swallow	<i>Tachycineta thalassina</i>	X	–
Virginia Rail	<i>Rallus limicola</i>	X	–
Warbling Vireo	<i>Vireo gilvus</i>	X	X
Western Bluebird	<i>Sialia mexicana</i>	X	X
Western Gull	<i>Larus occidentalis</i>	X	–
Western Scrub-Jay	<i>Aphelocoma californica</i>	X	–
Western Tanager	<i>Piranga ludoviciana</i>	–	X
Western Wood-Pewee	<i>Contopus sordidulus</i>	X	–
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	X	X
White-tailed Kite	<i>Elanus leucurus</i>	X	–
White-throated Swift	<i>Aeronautes saxatalis</i>	X	–
Wild Turkey	<i>Meleagris gallopavo</i>	X	–

Table 5 (continued). All species recorded by point count (summer) and mist-netting (year-round) survey methods at NPS I&M sites in Marin County and at Palomarin Field Station mist-netting sites, combined, fall 2019 through summer 2020, Point Blue Conservation Science.

Common Name	Scientific Name	Point Count	Mist Netting
Wilson's Warbler	<i>Cardellina pusilla</i>	X	X
Wrentit	<i>Chamaea fasciata</i>	X	X
Yellow Warbler	<i>Setophaga petechia</i>	–	X
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	–	X
Yellow-rumped Warbler	<i>Setophaga coronata</i>	–	X

Public Outreach

Point Blue invites schools and other groups to view mist netting and bird banding at Palomarin, Muddy Hollow, and, occasionally, the other riparian sites. Palomarin was open to the public from 16 August 2019 to 16 March 2020, and then closed to the public for the remainder of the reporting period due to safety concerns related to the COVID-19 pandemic. We did not host any groups in person at any site after 16 March 2020. Prior to the closure we hosted 12 groups (approximately 225 people) with many more people visiting the field station and sometimes our riparian mist-netting sites as drop-in visitors. These visitors were introduced to mist netting as well as numerous natural history, conservation biology, avian ecology, and climate-smart conservation concepts by our staff and interns or by displays in our Nature Center. We began to explore the idea of live virtual demonstrations during the summer of 2020 and hosted three virtual events on the Point Blue Facebook page in June and July 2020. More than 60 people participated in these live virtual events in real time and the posted recordings reached hundreds more. We look forward to resuming our in-person demonstrations but will also continue to use virtual events to reach a broader and more diverse audience.

Discussion

We do not present any trends, figures, or summary results, as the Analysis and Synthesis reports that are produced every six years (e.g., Humple and Porzig 2014, Dettling et al. 2021) are meant to include the in-depth analyses and discussion. These progress reports usually include simple summaries of results; however, a joint decision by Point Blue and NPS was made to drop those summaries to allow for increased effort on other I&M tasks.

The last cycle of the Analysis and Synthesis resulted in a manuscript, *Protected areas safeguard landbird populations in central coastal California: Evidence from long-term population trends* (Dettling et al. 2021), in lieu of a report. We mention it here despite being outside this reporting period, because we wrote the bulk of it during this period. The next such report—in whatever format it takes—will be produced after the 2024 riparian landbird monitoring season in Pinnacles National Park (Humple et al. 2017) and in combination with results from that park, and inclusive of the 2023 full suite of monitoring slated to take place in Point Reyes National Seashore and Golden Gate National Recreation Area.

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1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525