National Park Service
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Natural Resource Stewardship and Science

North Coast and Cascades Network Landbird Monitoring

Report for the 2016 Field Season

Natural Resource Report NPS/NCCN/NRR—2017/1495

ON THIS PAGE
2016 field crew at North Cascades National Park Complex
Photograph by: Mandy Holmgren (The Institute for Bird Populations)

ON THE COVER
Orange-crowned Warbler (*Oreothlypis celata*)
Photograph by: Graham Montgomery (The Institute for Bird Populations)

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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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Executive Summary

In 2016 the North Coast and Cascades Network (NCCN) continued to implement the Network's Landbird Monitoring Protocol, in partnership with The Institute for Bird Populations. The protocol was partially implemented (with data collected from the annual panel only) as part of protocol development (2005–2006), and has subsequently been implemented fully (including data collection on the annual panel as well as all of the five alternating panels) for the past ten years (2007–2016). In 2016 we conducted 1,096 point counts at point count survey stations along 66 transects in the large wilderness parks of the NCCN, including Mount Rainier National Park (MORA), North Cascades National Park Complex (NOCA), and Olympic National Park (OLYM).

We detected 158 bird species and one hybrid in the three large parks, 99 of which were detected during one or more point counts. For 58 species (all species detected at least 50 times on annual-panel transects between 2005 and 2016), we present the total number of detections on annual-panel transects in each park during the 2005–2016 field seasons. We caution, however, that these detection totals have not been adjusted for differences in survey effort, observer effects, or potential differences in detectability of birds between years; such adjustments will be made in conjunction with our periodic trend analyses (e.g., Saracco et al. 2014, Ray et al. 2017).

We also conducted 73 point counts at Lewis and Clark National Historical Park (LEWI) in 2016, including 36 at Cape Disappointment, 29 at Fort Clatsop, five at Sunset Beach, and three at Yeon. Our field crew detected 86 bird species while in the park, 71 of which were detected during point counts. We present the number of detections, and the number of points with detections, for each species detected during point counts at LEWI.

After 2015 yielded the highest number of bird detections since the start of the monitoring project, there was a decrease in detections of many species in 2016. However, detections of many species dropped only to levels similar to those seen in 2014. Red crossbill and evening grosbeak detections declined significantly in 2016, which accounted for much of the decrease in detections across the annual-panel transects. We also saw sharp decreases in detections of mountain chickadees. However, there were several species we detected in slightly or moderately greater numbers in the three large parks in 2016 than in previous years. A few of these include cedar waxwing, Swainson's thrush, brown creeper, and black swift. Each of these species had more detections in 2016 than in any of the previous 11 years. While the numbers of detections of several individual species increased, the overall number of birds (all species pooled) was down from 2015. Interpretation of this result will need to wait until our next multi-year trend analysis, which will account for annual variation in survey effort, observer effects, and detection probability.

Acknowledgments

We thank the 2016 crew members for their hard work and dedication to the project: M. Frye, E. Grim, K. Krohn, R. Levering, J. Love, G. Montgomery, and E. Tudor. We thank K. Jenkins (FRESC Olympic Field Station) and the entire NCCN Landbird Monitoring Group for their contributions toward developing the NCCN Landbird Monitoring Protocol and guiding its implementation. We thank T. Chestnut, P. Happe, and C. Clatterbuck for providing program oversight at the respective parks; B. Boekelheide for assistance during training; and S. Gremel, V. Gempko, and R. Christophersen for help with logistics and field work during the season. We thank K. Beirne and N. Antonova for GIS training and support and K. Beirne for providing maps for this report; J. Boetsch for extensive help with data management; L. Grace for help with formatting this report to National Park Service standards; M. Huff, NCCN Inventory and Monitoring Program Manager, for his support of the project; P. Happe and R. Christophersen for reviews of the draft report; and the ESRI Nonprofit Organization Program for software support provided to The Institute for Bird Populations. This is Contribution No. 552 of The Institute for Bird Populations.

Introduction

Reported declines of many Neotropical migratory bird species and other bird species breeding in North America have stimulated interest in avian population trends, and mechanisms driving those trends (Robbins et al. 1989, DeSante and George 1994, Peterjohn et al. 1995). Data from the North American Breeding Bird Survey indicate that many landbird populations in Pacific Northwest coniferous forests have been declining (Andelman and Stock 1994a, 1994b, Sharp 1996, Saab and Rich 1997, Altman 1999, 2000, Sauer et al. 2008, North American Bird Conservation Initiative, U.S. Committee 2009).

Threats to bird populations breeding in Pacific Northwest conifer forests include outright habitat loss as well as forest management practices that discourage the development of old-growth conditions (Bolsinger and Waddell 1993). Since European settlement, large tracts of low-elevation coniferous forest have been lost to residential and agricultural development, with the overall extent of old-growth forest reduced by more than half since World War II (Bolsinger and Waddell 1993). Landscapes that have been managed for timber production are now dominated by early- and mid-successional forests (Bunnell et al. 1997), and exhibit increased fragmentation as well as a variety of altered structural characteristics that likely affect bird community composition (Meslow and Wight 1975, Hagar et al. 1995, Bunnell et al. 1997, Altman 1999).

Pacific Northwest landbirds breeding in habitats other than conifer forests face substantial threats as well. Species that breed in the subalpine and alpine zones may be exposed to visitor impacts, ecological changes resulting from alterations of the natural fire regime, and perhaps most importantly, may be among the birds most strongly affected by climate change during the coming decades. Indeed, Oregon-Washington Partners in Flight has explicitly called on the National Park Service to take responsibility for monitoring birds in high-elevation areas throughout the Pacific Northwest (Altman and Bart 2001). Pacific Northwest migratory landbirds also face additional threats on their wintering grounds and along migration routes, including loss or alteration of stopover habitat.

The three large parks in the North Coast and Cascades Network (NCCN)—Olympic National Park (OLYM), North Cascades National Park Service Complex (NOCA), and Mount Rainier National Park (MORA)—range from sea level to nearly 4,400 m and contain huge tracts of late-successional conifer forest on the Olympic Peninsula and the west slope of the Cascades, as well as large areas dominated by subalpine and alpine plant communities. NOCA also contains substantial tracts of more arid conifer forest typical of the east side of the Cascades, which hosts a somewhat distinct avifauna (Altman 2000) compared to other areas in the three large parks. San Juan Island National Historical Park (SAJH), in the rain shadow of the Olympic Mountains, contains small but important examples of coastal prairie and Garry Oak (*Quercus garryana*) woodlands, plant communities that are fairly rare in western Washington (Atkinson and Sharpe 1985) and host unusual bird communities (Lewis and Sharpe 1987, Siegel et al. 2009e). Lewis and Clark National Historical Park (LEWI) contains lowland wetlands as well as coastal and upland forests, and extends our program's area of inference substantially southward. Avian inventory projects assessing park- and/or habitat-

specific abundance of all commonly occurring bird species at all five parks (Siegel et al. 2009e, Siegel et al. 2009a, Siegel et al. 2009d, Wilkerson et al. 2009a, Siegel et al. 2009c) have provided baseline information for assessing changes in bird abundance and distribution over time due to climate change or other factors, as well as reference information for assessing the effects of more intensive land management practices elsewhere in the region (Siegel et al. 2012, Ray et al. 2017).

National parks in the NCCN and elsewhere fulfill vital roles as both refuges for bird species dependent on late-successional forest conditions (American Bird Conservation Initiative, U.S. Committee 2011), and as reference sites for assessing the effects of climate change, land use, and land cover changes on bird populations throughout the larger Pacific Northwest region (Silsbee and Peterson 1991, Siegel et al. 2012). Monitoring population trends at reference sites in national parks is especially important because parks are among the sites in the United States where population trends due to large-scale regional or global change patterns are likely least confounded with local changes in land-use (Simons et al. 1999). Additionally, long-term monitoring of landbirds throughout the NCCN is expected to provide information that will influence future decisions about important management issues in the parks, including visitor impacts, fire management, and the effects of introduced species.

The specific objectives of the NCCN Landbird Monitoring Project are:

1) To detect trends in the density of as many landbird species (including passerines, near passerines, and galliformes) as possible throughout accessible areas of five NCCN parks during the breeding season.

2) To track changes in the breeding season distribution of landbird species throughout accessible areas of the three large wilderness parks.

This report and subsequent annual reports for the Landbird Monitoring Project are intended primarily as administrative reports. More comprehensive analyses of the data, including trend analysis that accounts for the potentially confounding effects of variation in detectability and sampling effort, are conducted in conjunction with periodic detailed trend analyses. For the first trend analysis report, which summarizes data from 2005–2012, see Saracco et al. (2014). More recently, we developed a new analytical framework for this project that integrates several recent developments in Bayesian N-mixture modeling to assess landbird trends and evaluate the role of climatic and other spatiotemporal variables in driving those trends. Our first paper utilizing the new framework to evaluate population trends of 39 species between 2005 and 2014 (Ray et al. 2017).

Study Area

The study area for the NCCN Landbird Monitoring Project (Figure 1) includes areas of MORA, NOCA and OLYM that are accessible by foot and lie within one km of a road or trail, as well as all of SAJH (including both American Camp and English Camp) and portions of LEWI.

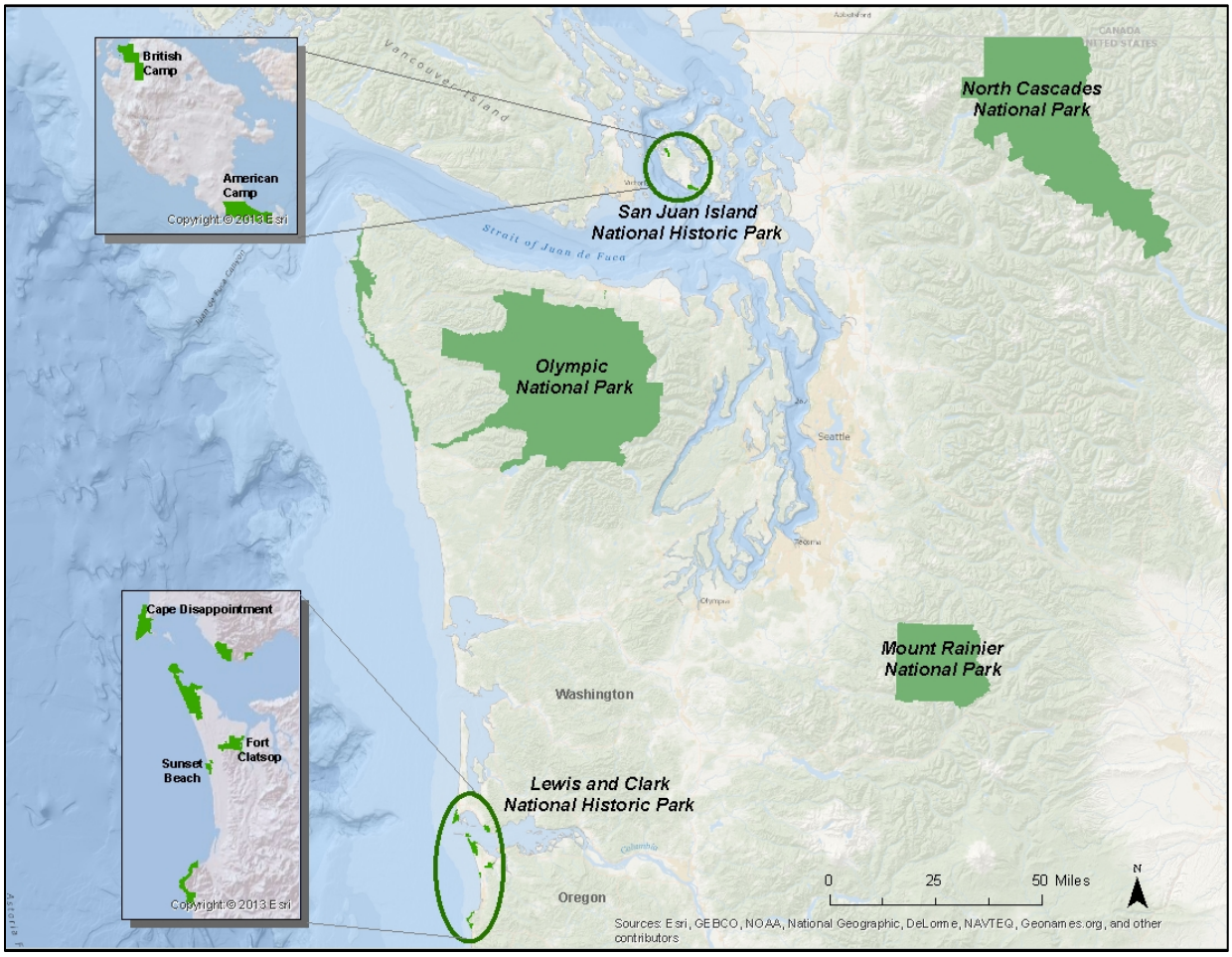


Figure 1. National Park Service units participating in the North Coast and Cascades Network Landbird Monitoring Project.

Methods

Sample Design

A detailed description of the sample design for the NCCN Landbird Monitoring Project is provided in the NCCN Landbird Monitoring Protocol (Siegel et al. 2007). In brief, the sample design for the three large parks utilizes six panels of transects in each park. At NOCA and at OLYM each panel includes four low-elevation transects (transect starting points < 650 m), four mid-elevation transects (transect starting points between 650 m and 1,350 m) and four high-elevation transects (transect starting points >1,350 m). At MORA the sample design is the same as at the other two large parks, except there are only two low-elevation transects in each panel, and the cutoff between low-elevation transects and mid-elevation transects is 800 m rather than 650 m. All transect starting points are on park roads or trails, and the transects consist of a line of approximately 10–15 points, extending perpendicularly (or as close to perpendicularly as topographic and physiographic features allow) in both directions away from the trail.

In 2016 we implemented the full study design in the three large parks for the tenth consecutive year, including surveys of the annual panel (‘Ann1’) as well as the fifth alternating panel (‘Alt6’) (Figures 2–4). During the first two years of protocol development (2005–2006) we surveyed only the annual panel (Siegel et al. 2006, 2009b). We provide results from each of the first nine years of full implementation in Siegel et al. (2008), Wilkerson et al. (2009b, 2010), and Holmgren et al. (2011, 2012, 2013, 2014, 2015, and 2016). Multi-year trend analyses are provided in Saracco et al. (2014) and Ray et al. (2017).

At the two smaller parks (LEWI and SAJH), the sample design consists of a systematic grid of point count survey stations, with the two parks scheduled to be surveyed in alternating years. In the summer of 2016 we surveyed the grid at LEWI (Figure 5).

Crew Training and Certification

Mandy Holmgren, a Staff Biologist with The Institute for Bird Populations, served as the 2016 Field Lead. Mandy began training five field technicians on April 30, including one returning crew member, who assisted with training. Training followed guidelines described in the NCCN Landbird Monitoring Protocol (Siegel et al. 2007). By the end of the official training session on May 18, none of the four new field technicians had passed the rigorous point count certification exam, and were not able to begin collecting data. Two technicians passed within two weeks of the end of training, but the other two technicians never passed the exam and consequently did not conduct any point counts during the field season. Instead, they worked on other field tasks and data entry. Two former IBP field technicians were able to fill in at points during the season, working for 11 mornings in total. Rodney Siegel, the Executive Director of The Institute for Bird Populations, was also able to fill in for four mornings. All individuals who collected data during the 2016 field season (Table 1) were employees or volunteers of The Institute for Bird Populations or employees of the National Park Service.

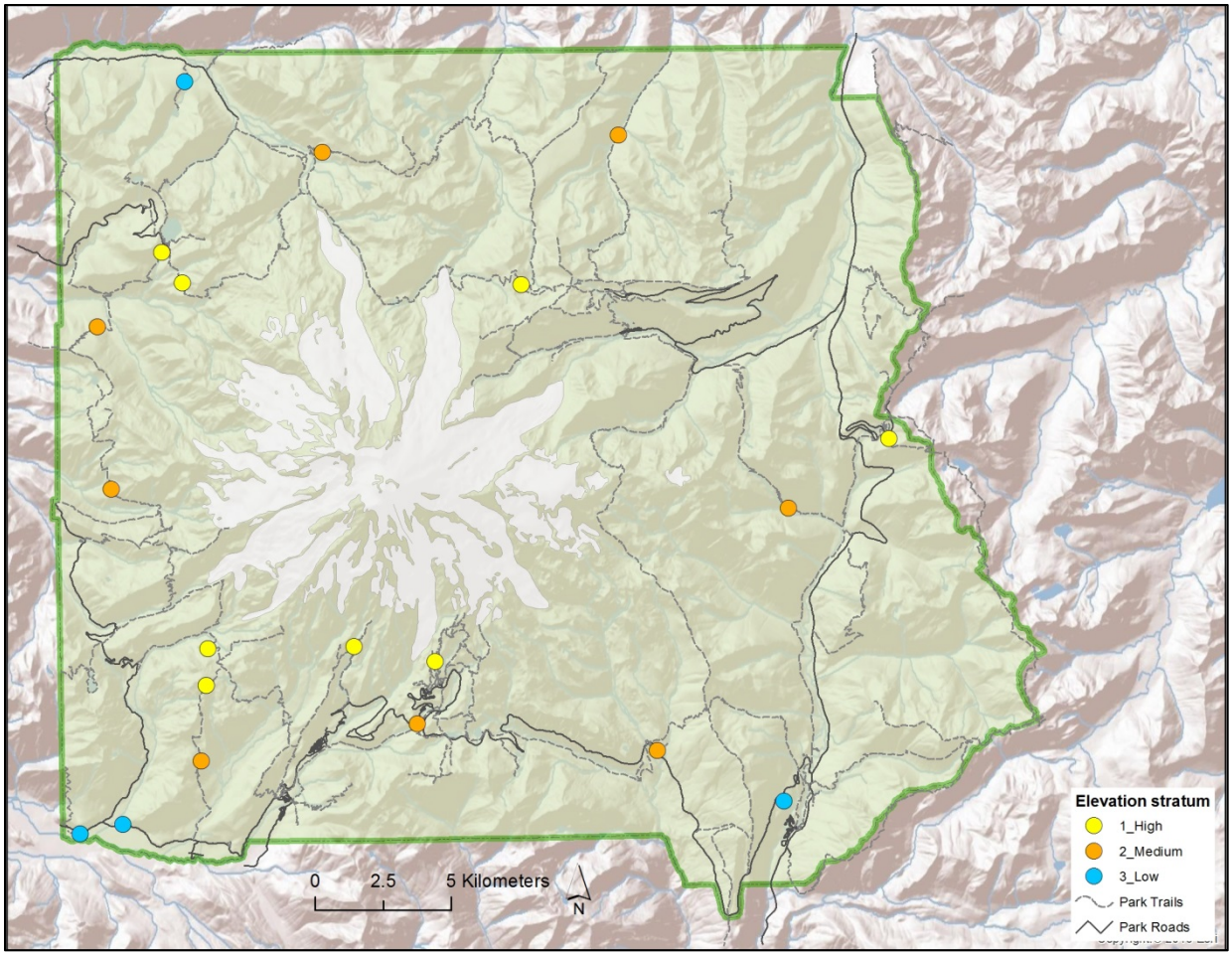


Figure 2. Approximate locations of transects conducted at Mount Rainier National Park in 2016.

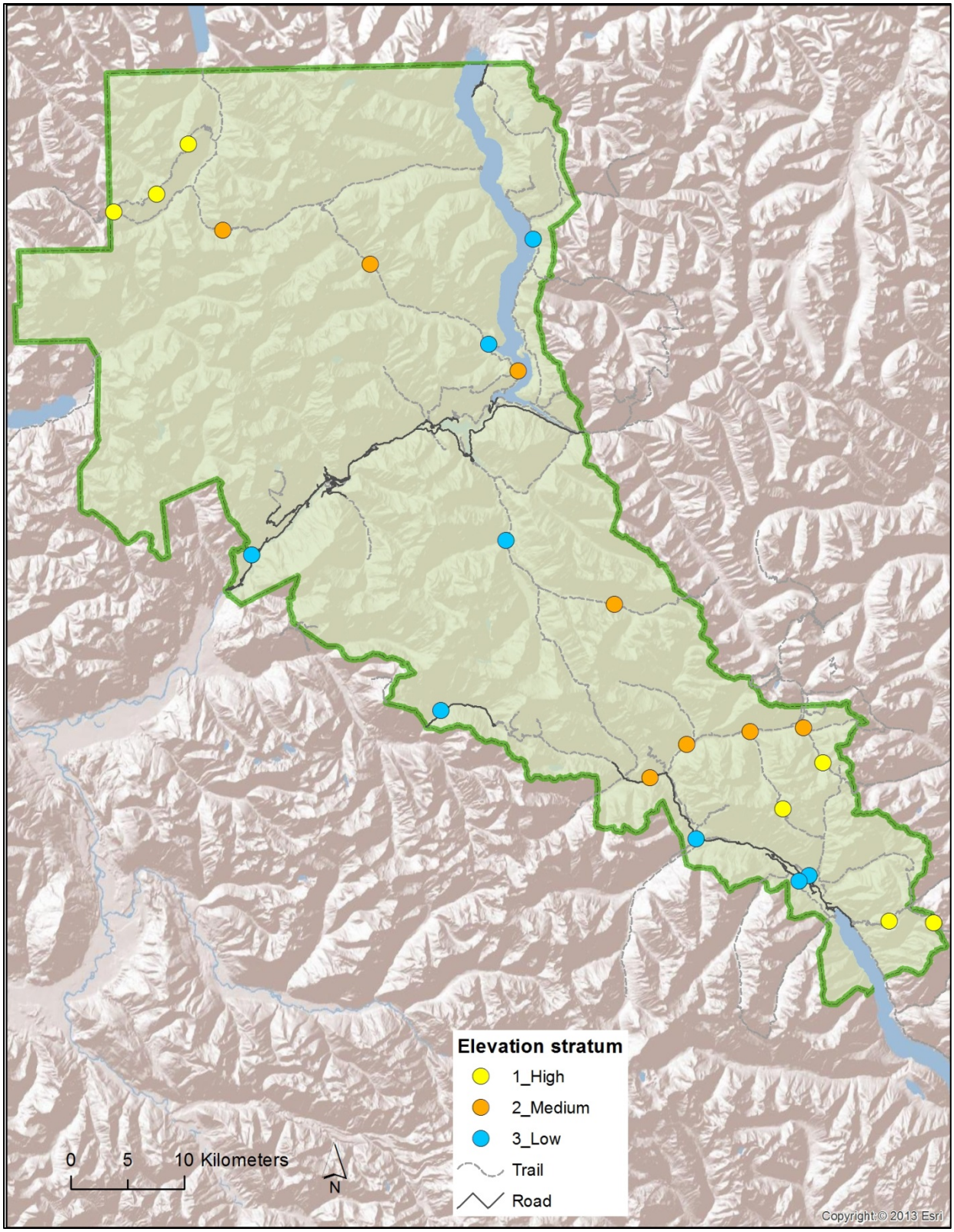


Figure 3. Approximate locations of transects conducted at North Cascades National Park Complex in 2016.

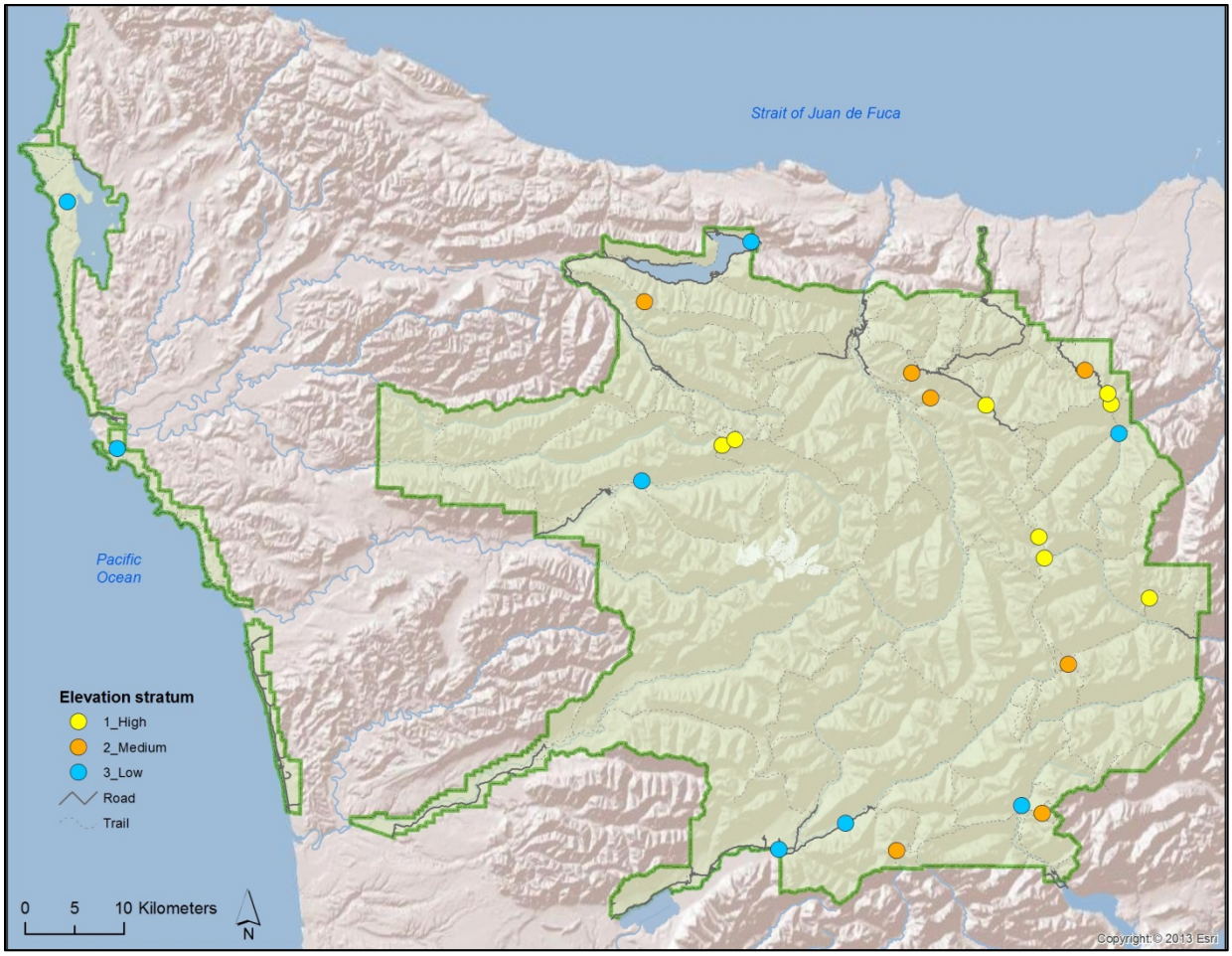


Figure 4. Approximate locations of transects conducted at Olympic National Park in 2016.

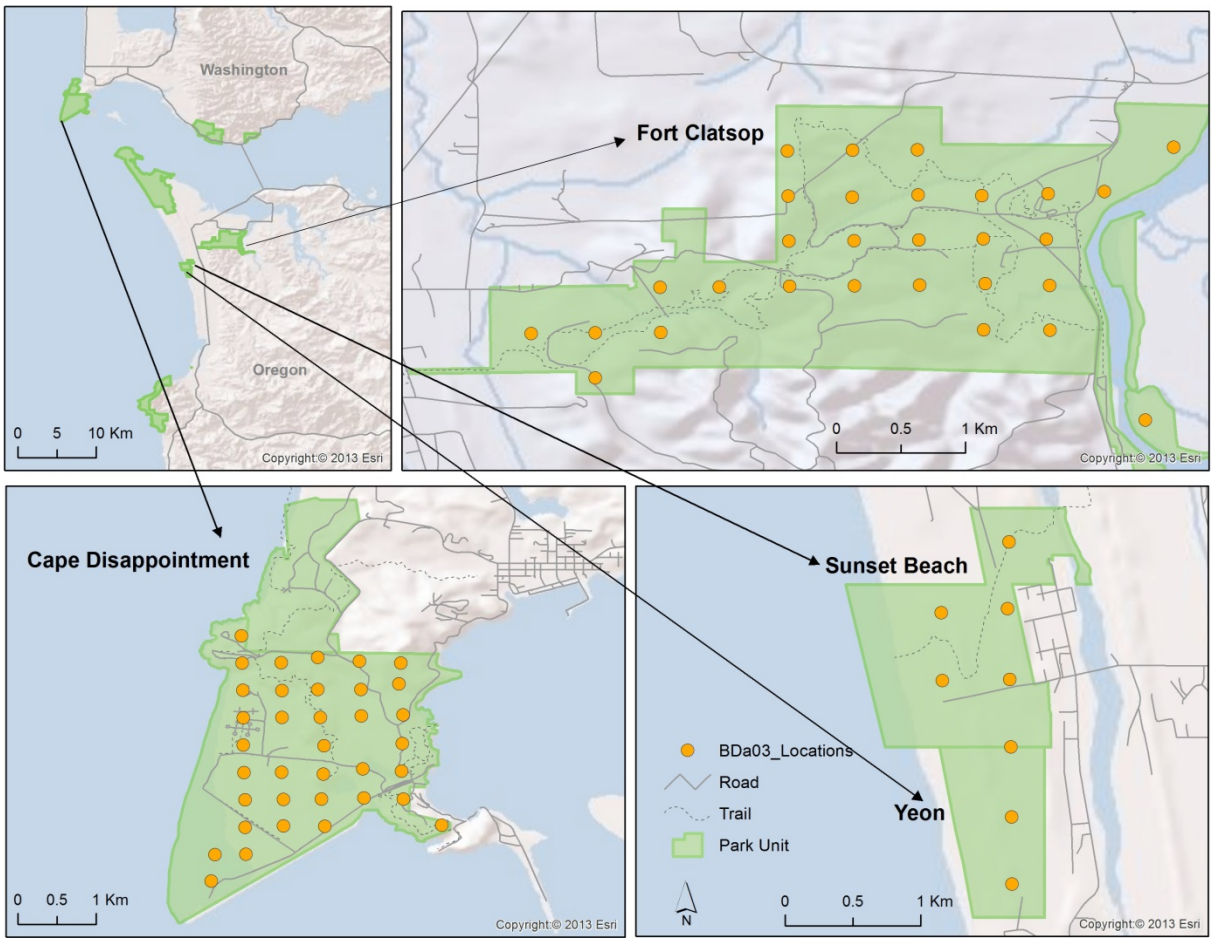


Figure 5. Locations of point count stations surveyed at Lewis and Clark National Historical Park in 2016; adjacent point count stations are 350 m apart.

Table 1. Observers who conducted point counts in the North Coast and Cascades Network in 2016.

Observer	Role
Martin Frye	Technician
Scott Gremel	NPS Biologist
Mandy Holmgren	Field Lead
Katherine Krohn	Technician
Ryan Levering	Technician
Jay Love	Technician
Graham Montgomery	Technician
Rodney Siegel	Project Lead

Data Collection

All point count data were collected between May 26 and May 30 at LEWI, between June 15 and July 31 at MORA, between June 12 and July 30 at NOCA, and between June 1 and July 25 at OLYM. At

the three large parks, low-elevation transects were generally surveyed first, followed by the mid-elevation transects, and finally the high-elevation transects.

Data collection followed the detailed procedures explained in the NCCN Landbird Monitoring Protocol (Siegel et al. 2007). Crew members generally worked in pairs to survey a single transect each morning. They were provided with maps and coordinates indicating the location of transect 'starting points' for those transects that had not yet been established, the starting points lying directly on trails or roads. There were five transects (NOCA-1072, NOCA-1090, MORA-4058, MORA-4062, and MORA-4084) that had not been established before 2016 due to snow and logistical issues in 2011, when the Alt6 panel of transects was previously sampled. Crew members were also provided maps and coordinates of all point count station locations on the transects, as well as narrative descriptions of point count stations and the travel routes between successive stations. These were used to locate the same point count stations that were previously established and surveyed. Beginning within 10 minutes of official sunrise, each observer conducted a point count, and then continued along the transect route, conducting another point count every 200 m until 3.5 hours after official local sunrise.

At each point count station observers recorded the starting time, scored the degree of noise interference caused by such factors as flowing water or wind, recorded the weather conditions, and then began the seven-minute point count. The point count was partitioned into three time intervals (0–3:00 min, 3:01–5:00 min, and 5:01–7:00 min). Observers noted each time interval in which they detected each individual bird. Birds observed in the first three minutes allow comparison with Breeding Bird Survey data (Sauer et al. 2008), which are based on three-minute counts. Observers estimated the horizontal distance, to the nearest meter, to each bird detected. The observers also recorded whether the distance estimates were based on an aural or visual detection, and whether the bird ever sang during the point count. Prior to 2011 we used point count with durations of only five minutes broken into two time intervals (0–3:00 min, 3:01–5:00 min), but in 2011 we added the third time interval to make the data more useful for analysis within an occupancy modeling framework that relies on detection or non-detection of individual birds within multiple time intervals to estimate detection probability.

After completing their last point count each morning, observers retraced their steps back to the starting point. Along the way, they conducted a brief habitat assessment at each of the survey points. The brief habitat assessment consisted of characterizing habitat within a 50-m radius of the survey point, noting the primary (and secondary, if appropriate) plant community type, canopy cover class, and tree size class, according to the categories developed by Pacific Meridian Resources (1996). While conducting the habitat assessments, observers also used Global Positioning System (GPS) units to collect location data files. Where necessary, observers amended narrative descriptions of the point locations.

Whenever crew members detected species thought to be rare in the park or difficult to detect during diurnal point count surveys, they completed "Rare Bird Report Forms", including descriptions of the birds' appearance, behavior, and precise location. These reports covered not only birds detected during point counts, but also birds detected while sampling vegetation, hiking between transects,

relaxing at camp in the evening, or at any other time during the field season, including the pre-season training session. Additionally, crew members recorded a complete list of all incidental bird species detected in the park throughout the field season, including common species that might not have been recorded during point counts or were not rare enough to warrant a rare bird report.

After completing their fieldwork each day, partners reviewed each other's data forms for missing or incorrectly recorded data, discussed any interesting or surprising bird detections, and completed a Transect Visit Log summarizing the day's efforts.

Data Management

The Landbird monitoring protocol for national parks in the North Coast and Cascades Network (Siegel et al. 2007) requires crews working at each large park to enter as much of their own data into the NCCN Landbird Monitoring Project's Microsoft Access database throughout the field season as they can. The crew worked three additional days at the end of the field season to work on data entry and verification. The Field Lead finished verifying the remaining data after the field season. Data entry procedures followed the guidelines in Siegel et al. (2007).

The database includes built-in quality assurance components such as pick-lists and validation rules to test for missing data or illogical combinations. After entering the data, the crew members and Field Lead verified the database records for complete and accurate transcription by retrieving and visually comparing the data associated with each sampling event against the original forms.

Once all data for the season were entered and verified, the Field Lead conducted a rigorous quality review on the data set by running a set of pre-built validation queries to check for completeness, missing or out-of-range values, logical consistency, and structural integrity. Errors identified during this review were corrected where possible, and annotations related to specific issues raised by each query were stored within the project database as needed and appropriate. The data set was then certified as complete and ready for use. Output for this report was generated using standard summary queries in the project database.

At the end of the field season, field forms were scanned and stored with digital records. Photographic images were processed to remove poor quality or duplicative files, given names according to convention, and organized according to project requirements. GPS data associated with sampling events were downloaded and processed, and the resulting coordinate data were then uploaded into the project database.

Data Analysis

We summarized and tabulated data according to the template in Siegel et al. (2007). We present survey results without making any adjustments for detectability, which may vary substantially by species, habitat, observer, or other factors. In conjunction with periodic trend analyses for this monitoring project, factors affecting detectability of birds during point counts are assessed quantitatively, allowing for annual results to be adjusted to account for variable detectability (Buckland et al. 2001, Nichols et al. 2009). Results in this report that have not yet been adjusted to account for detectability should be viewed as provisional only.

Results

In 2016 we surveyed 66 of the 68 intended transects in the large parks, including 32 transects from the annual-panel, and 34 transects from the fifth alternating panel (Table 2-3). There were two intended annual transects that were not sampled in 2016, OLYM-3122 and NOCA-1019. Appendix 1 provides a detailed multi-year survey history of all transects sampled in the large parks to date. We conducted 353 individual point counts at MORA, 382 point counts at NOCA and 361 point counts at OLYM (Table 2). We also conducted 73 point counts at LEWI, including 36 at Cape Disappointment, 29 at Fort Clatsop, five at Sunset Beach, and three at Yeon. During the 1,096 point counts in the three large parks, we counted 10,725 individual birds. Across the three large parks, we documented the presence of 158 species and one hybrid (Table 4), 99 of which were detected during point counts; the remaining 59 species were recorded only as incidental detections or on "Rare Bird Report Forms". At LEWI our field crew detected 86 species while in the park, 71 of which were detected during point counts.

For the annual-panel transects only, the number of individuals of each species detected during point counts (unlimited radius) and the number of transects on which each species was detected are provided in Table 5. On the annual-panel transects we detected 56 bird species during point counts at MORA, 69 species during point counts at NOCA, and 54 species during point counts at OLYM (Table 5). Pooling detections on annual-panel transects across all species, we amassed 1,612 individual bird detections (average of 8.86 detections/point) at MORA, 2,297 detections (average of 11.10 detections/point) at NOCA, and 1,825 detections (average of 10.37 detections per point) at OLYM (Table 5). The five most frequently detected species on the annual-panel transects in 2016 were: Pacific wren (479 detections), dark-eyed junco (449 detections), varied thrush (446 detections), pine siskin (368 detections), and chestnut-backed chickadee (295 detections).

Pooling data across the annual-panel transects as well as the transects in the fifth alternating panel ("Alt6"), the number of individuals of each species detected during point counts (unlimited radius) and the number of transects on which each species was detected are provided in Table 6. Using data pooled across all transects, we detected 63 bird species during point counts at MORA, 75 species during point counts at NOCA, and 68 species during point counts at OLYM (Table 6). Considering data from the 66 surveyed transects, the five most frequently detected species were: Pacific wren (897 detections), dark-eyed junco (893 detections), varied thrush (778 detections), pine siskin (685 detections), and golden-crowned kinglet (549 detections).

We combined detections of Townsend's warbler, hermit warbler, Townsend's/hermit warbler hybrids, and unidentified Townsend's/hermit warblers in Tables 5 and 6, and Figure 6. These two species hybridize extensively at MORA and OLYM, and are very difficult to tell apart within these hybrid zones. All detections in this report listed as Townsend's/hermit warblers at NOCA are likely Townsend's warblers.

Marbled murrelet and spotted owl, the two bird species occurring in these parks that are listed under the Endangered Species Act, were both detected at times other than point counts this year and were

documented on “Rare Bird Report Forms.” Marbled murrelet was also detected during point counts. Detections of these species at times other than point counts are summarized in Table 7.

For 58 species (all species for which we amassed at least 50 point count detections over the period between 2005 and 2016), we present the total number of detections of each species on each park’s annual panel transects during the 2005–2016 field seasons (Figure 6). We caution, however, that these detection totals have not been adjusted for differences in survey effort, observer effects, or potential differences in detectability of birds between years; such adjustments will be made in conjunction with trend analyses in a future multi-year report.

At LEWI our 73 point counts yielded 1,912 detections of 71 species (Table 8), a detection rate of 26.19 birds per point. These data include 268 detections of Caspian terns, a non-landbird species that tends to occur in large flocks, which can greatly inflate our total number of detections and average number of detections per point. When this species is excluded to provide a better comparison with data from previous years, 1,644 birds were detected with a detection rate of 22.52 birds per point. The most frequently detected species (after Caspian tern) was Swainson’s thrush (177 detections), followed by Wilson’s warbler (106 detections), Pacific-slope flycatcher (98 detections), Pacific wren (82 detections), and American robin (81 detections).

Table 2. North Coast and Cascades Network landbird monitoring transects at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks that were surveyed or intended to be surveyed in 2016.

Park	Panel	Elevation	Transect	No. of points surveyed
MORA	Ann1	Low	4001	15
MORA	Ann1	Low	4005	14
MORA	Ann1	Medium	4002	14
MORA	Ann1	Medium	4004	20
MORA	Ann1	Medium	4009	17
MORA	Ann1	Medium	4012	24
MORA	Ann1	High	4003	15
MORA	Ann1	High	4007	22
MORA	Ann1	High	4011	17
MORA	Ann1	High	4014	24
MORA	Alt6	Low	4031	13
MORA	Alt6	Low	4034	12
MORA	Alt6	Medium	4077	18
MORA	Alt6	Medium	4078	22
MORA	Alt6	Medium	4081	19
MORA	Alt6	Medium	4084	17
MORA	Alt6	High	4058	19
MORA	Alt6	High	4062	19

Table 2 (continued). North Coast and Cascades Network landbird monitoring transects at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks that were surveyed or intended to be surveyed in 2016.

Park	Panel	Elevation	Transect	No. of points surveyed
MORA	Alt6	High	4064	15
MORA	Alt6	High	4067	17
NOCA	Ann1	Low	1013	15
NOCA	Ann1	Low	1017	15
NOCA	Ann1	Low	1020	17
NOCA	Ann1	Low	1023	22
NOCA	Ann1	Medium	1015	19
NOCA	Ann1	Medium	1018	25
NOCA	Ann1	Medium	1022	18
NOCA	Ann1	Medium	1024	14
NOCA	Ann1	High	1014	22
NOCA	Ann1	High	1016	17
NOCA	Ann1	High	1019	0
NOCA	Ann1	High	1021	23
NOCA	Alt6	Low	1068	15
NOCA	Alt6	Low	1070	14
NOCA	Alt6	Low	1074	18
NOCA	Alt6	Low	1075	16
NOCA	Alt6	Medium	1047	15
NOCA	Alt6	Medium	1051	12
NOCA	Alt6	Medium	1053	19
NOCA	Alt6	Medium	1056	14
NOCA	Alt6	High	1072	9
NOCA	Alt6	High	1088	13
NOCA	Alt6	High	1090	16
NOCA	Alt6	High	1092	14
OLYM	Ann1	Low	3001	14
OLYM	Ann1	Low	3121	19
OLYM	Ann1	Low	3126	16
OLYM	Ann1	Low	3134	20
OLYM	Ann1	Medium	3122	0
OLYM	Ann1	Medium	3123	16
OLYM	Ann1	Medium	3130	10
OLYM	Ann1	Medium	3200	23
OLYM	Ann1	High	3124	14
OLYM	Ann1	High	3125	15
OLYM	Ann1	High	3127	15

Table 2 (continued). North Coast and Cascades Network landbird monitoring transects at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks that were surveyed or intended to be surveyed in 2016.

Park	Panel	Elevation	Transect	No. of points surveyed
OLYM	Ann1	High	3128	14
OLYM	Alt6	Low	3172	14
OLYM	Alt6	Low	3177	10
OLYM	Alt6	Low	3181	16
OLYM	Alt6	Low	3182	18
OLYM	Alt6	Medium	3187	21
OLYM	Alt6	Medium	3190	15
OLYM	Alt6	Medium	3195	13
OLYM	Alt6	Medium	3198	13
OLYM	Alt6	High	3189	16
OLYM	Alt6	High	3191	16
OLYM	Alt6	High	3192	15
OLYM	Alt6	High	3196	18

Table 3. Summary history of North Coast and Cascades Network landbird monitoring transects at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks completed through 2016.

Park	Elevation Stratum	Number of transects completed											
		2005[a]	2006[a]	2007[b]	2008[c]	2009[d]	2010[e]	2011[f]	2012[b]	2013[c]	2014[d]	2015[e]	2016[f]
MORA	Low	2	2	4	4	4	4	4	4	4	4	4	4
	Medium	4	4	8	8	8	8	6	8	8	8	8	8
	High	4	4	8	8	8	7	3	8	8	8	8	8
	All	10	10	20	20	20	19	13	20	20	20	20	20
NOCA	Low	4	4	8	8	7	8	8	8	8	8	7	8
	Medium	4	4	7	7	8	8	8	8	7	8	8	8
	High	4	4	7	5	8	6	5	8	8	8	8	7
	All	12	12	22	20	23	22	21	24	24	24	23	23
OLYM	Low	4	4	8	8	8	8	8	8	8	8	8	8
	Medium	4	3	8	7	8	8	7	8	8	8	8	7
	High	4	4	7	8	8	8	8	8	8	8	8	8
	All	12	11	23	23	24	24	23	24	24	24	24	23
All Parks	Low	10	10	20	20	20	20	20	20	20	20	19	20
	Medium	12	11	23	22	24	24	21	24	24	24	24	23
	High	12	12	22	21	24	21	16	24	24	24	24	23
	All	34	33	65	63	68	65	57	68	68	68	67	66

[a]Only the annual panel transects were surveyed in 2005 and 2006, during the protocol development phase of the project.

[b]The annual panel along with the first alternating panel were surveyed in 2007 and 2012.

[c]The annual panel along with the second alternating panel were surveyed in 2008 and 2013.

[d]The annual panel along with the third alternating panel were surveyed in 2009 and 2014.

[e]The annual panel along with the fourth alternating panel were surveyed in 2010 and 2015.

[f]The annual panel along with the fifth alternating panel were surveyed in 2011 and 2016.

Table 4. All species recorded in the three large North Coast and Cascades Network parks during the 2016 field season, including the pre-season training session.

Common Name	Scientific Name
Canada Goose *	*Branta canadensis*
Wood Duck *	*Aix sponsa*
American Wigeon *	*Anas americana*
Mallard *	*Anas platyrhynchos*
Cinnamon Teal *	*Anas cyanoptera*
Northern Shoveler *	*Anas clypeata*
Northern Pintail *	*Anas acuta*
Green-winged Teal *	*Anas crecca*
Redhead *	*Aythya americana*
Ring-necked Duck *	*Aythya collaris*
Harlequin Duck *	*Histrionicus histrionicus*
Surf Scoter *	*Melanitta perspicillata*
Bufflehead *	*Bucephala albeola*
Barrow's Goldeneye	*Bucephala islandica*
Hooded Merganser *	*Lophodytes cucullatus*
Common Merganser	*Mergus merganser*
Red-breasted Merganser *	*Mergus serrator*
Ruffed Grouse	*Bonasa umbellus*
White-tailed Ptarmigan	*Lagopus leucura*
Sooty Grouse	*Dendragapus fuliginosus*
Pied-billed Grebe *	*Podilymbus podiceps*
Red-necked Grebe *	*Podiceps grisegena*
Western Grebe *	*Aechmophorus occidentalis*
Band-tailed Pigeon	*Patagioenas fasciata*
Eurasian Collared-dove	*Streptopelia decaocto*
Mourning Dove *	*Zenaida macroura*
Common Nighthawk *	*Chordeiles minor*
Black Swift	*Cypseloides niger*
Vaux's Swift	*Chaetura vauxi*
Anna's Hummingbird *	*Calypte anna*
Rufous Hummingbird	*Selasphorus rufus*
Calliope Hummingbird	*Selasphorus calliope*
American Coot *	*Fulica americana*
Black Oystercatcher *	*Haematopus bachmani*
Killdeer *	*Charadrius vociferus*
Spotted Sandpiper	*Actitis macularius*
Greater Yellowlegs *	*Tringa melanoleuca*
Marbled Murrelet	*Brachyramphus marmoratus*

* Indicates species that were detected only at times other than during point counts.

Table 4 (continued). All species recorded in the three large North Coast and Cascades Network parks during the 2016 field season, including the pre-season training session.

Common Name	Scientific Name
Ring-billed Gull *	*Larus delawarensis*
Western Gull *	*Larus occidentalis*
California Gull *	*Larus californicus*
Common Loon *	*Gavia immer*
Brandt's Cormorant *	*Phalacrocorax penicillatus*
Double-crested Cormorant *	*Phalacrocorax auritus*
Pelagic Cormorant *	*Phalacrocorax pelagicus*
Great Blue Heron *	*Ardea herodias*
Turkey Vulture *	*Cathartes aura*
Osprey	*Pandion haliaetus*
Bald Eagle	*Haliaeetus leucocephalus*
Sharp-shinned Hawk *	*Accipiter striatus*
Cooper's Hawk *	*Accipiter cooperii*
Red-tailed Hawk	*Buteo jamaicensis*
Golden Eagle *	*Aquila chrysaetos*
Western Screech-Owl	*Megascops kennicottii*
Great Horned Owl *	*Bubo virginianus*
Northern Pygmy-Owl	*Glaucidium gnoma*
Spotted Owl *	*Strix occidentalis*
Barred Owl	*Strix varia*
Belted Kingfisher	*Megaceryle alcyon*
Red-naped Sapsucker *	*Sphyrapicus nuchalis*
Red-breasted Sapsucker	*Sphyrapicus ruber*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
American Three-toed Woodpecker	*Picoides dorsalis*
Black-backed Woodpecker *	*Picoides arcticus*
Northern Flicker	*Colaptes auratus*
Pileated Woodpecker	*Dryocopus pileatus*
American Kestrel *	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine Falcon	*Falco peregrinus*
Prairie Falcon *	*Falco mexicanus*
Olive-sided Flycatcher	*Contopus cooperi*
Western Wood-Pewee	*Contopus sordidulus*
Willow Flycatcher	*Empidonax traillii*
Least Flycatcher *	*Empidonax minimus*
Hammond's Flycatcher	*Empidonax hammondii*

* Indicates species that were detected only at times other than during point counts.

Table 4 (continued). All species recorded in the three large North Coast and Cascades Network parks during the 2016 field season, including the pre-season training session.

Common Name	Scientific Name
Dusky Flycatcher	*Empidonax oberholseri*
Pacific-slope Flycatcher	*Empidonax difficilis*
Say's Phoebe *	*Sayornis saya*
Western Kingbird *	*Tyrannus verticalis*
Eastern Kingbird *	*Tyrannus tyrannus*
Hutton's Vireo	*Vireo huttoni*
Cassin's Vireo	*Vireo cassinii*
Warbling Vireo	*Vireo gilvus*
Red-eyed Vireo	*Vireo olivaceus*
Gray Jay	*Perisoreus canadensis*
Steller's Jay	*Cyanocitta stelleri*
Clark's Nutcracker	*Nucifraga columbiana*
American Crow	*Corvus brachyrhynchos*
Northwestern Crow *	*Corvus caurinus*
Common Raven	*Corvus corax*
Horned Lark	*Eremophila alpestris*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta thalassina*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Cliff Swallow *	*Petrochelidon pyrrhonota*
Barn Swallow	*Hirundo rustica*
Black-capped Chickadee *	*Poecile atricapillus*
Mountain Chickadee	*Poecile gambeli*
Chestnut-backed Chickadee	*Poecile rufescens*
Bushtit *	*Psaltriparus minimus*
Red-breasted Nuthatch	*Sitta canadensis*
Brown Creeper	*Certhia americana*
Rock Wren	*Salpinctes obsoletus*
Canyon Wren	*Catherpes mexicanus*
House Wren	*Troglodytes aedon*
Pacific Wren	*Troglodytes pacificus*
Marsh Wren *	*Cistothorus palustris*
American Dipper	*Cinclus mexicanus*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Western Bluebird *	*Sialia mexicana*
Mountain Bluebird	*Sialia currucoides*
Townsend's Solitaire	*Myadestes townsendi*

* Indicates species that were detected only at times other than during point counts.

Table 4 (continued). All species recorded in the three large North Coast and Cascades Network parks during the 2016 field season, including the pre-season training session.

Common Name	Scientific Name
Veery	*Catharus fuscescens*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
American Robin	*Turdus migratorius*
Varied Thrush	*Ixoreus naevius*
Gray Catbird *	*Dumetella carolinensis*
European Starling	*Sturnus vulgaris*
Cedar Waxwing	*Bombycilla cedrorum*
American Pipit	*Anthus rubescens*
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*
Pine Grosbeak	*Pinicola enucleator*
House Finch *	*Haemorhous mexicanus*
Purple Finch	*Haemorhous purpureus*
Cassin's Finch	*Haemorhous cassinii*
Red Crossbill	*Loxia curvirostra*
Pine Siskin	*Spinus pinus*
American Goldfinch *	*Spinus tristis*
Evening Grosbeak	*Coccothraustes vespertinus*
Orange-crowned Warbler	*Oreothlypis celata*
Nashville Warbler	*Oreothlypis ruficapilla*
MacGillivray's Warbler	*Geothlypis tolmiei*
Common Yellowthroat	*Geothlypis trichas*
American Redstart *	*Setophaga ruticilla*
Yellow Warbler	*Setophaga petechia*
Yellow-rumped Warbler	*Setophaga coronata*
Black-throated Gray Warbler	*Setophaga nigrescens*
Townsend's Warbler	*Setophaga townsendi*
Townsend's x Hermit Warbler hybrid	*Setophaga townsendi x occidentalis*
Hermit Warbler *	*Setophaga occidentalis*
Wilson's Warbler	*Cardellina pusilla*
Spotted Towhee	*Pipilo maculatus*
Chipping Sparrow	*Spizella passerina*
Savannah Sparrow	*Passerculus sandwichensis*
Fox Sparrow	*Passerella iliaca*
Song Sparrow	*Melospiza melodia*
Lincoln's Sparrow	*Melospiza lincolnii*
White-crowned Sparrow	*Zonotrichia leucophrys*
Golden-crowned Sparrow *	*Zonotrichia atricapilla*

* Indicates species that were detected only at times other than during point counts.

Table 4 (continued). All species recorded in the three large North Coast and Cascades Network parks during the 2016 field season, including the pre-season training session.

Common Name	Scientific Name
Dark-eyed Junco	*Junco hyemalis*
Western Tanager	*Piranga ludoviciana*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Lazuli Bunting	*Passerina amoena*
Red-winged Blackbird	*Agelaius phoeniceus*
Brown-headed Cowbird	*Molothrus ater*
Bullock's Oriole *	*Icterus bullockii*

* Indicates species that were detected only at times other than during point counts.

Table 5. Number of transects with detections and number of individual detections for each species detected during point counts on annual-panel transects at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks in 2016.

	Number of transects with detections				Number of individual detections			
Species	**MORA**	**NOCA**	**OLYM**	**ALL**	**MORA**	**NOCA**	**OLYM**	**ALL**
Common Merganser	0	1	0	1	0	1	0	1
Ruffed Grouse	2	0	0	2	5	0	0	5
Sooty Grouse	3	8	8	19	9	15	19	43
Band-tailed Pigeon	0	1	3	4	0	4	9	13
Black Swift	0	1	0	1	0	64	0	64
Vaux's Swift	5	4	3	12	32	9	5	46
Rufous Hummingbird	4	9	5	18	20	17	8	45
Spotted Sandpiper	1	2	3	6	2	4	8	14
Marbled Murrelet	0	0	2	2	0	0	7	7
Osprey	2	0	1	3	3	0	1	4
Bald Eagle	0	1	1	2	0	2	1	3
Red-tailed Hawk	1	0	0	1	1	0	0	1
Western Screech-Owl	0	1	0	1	0	1	0	1
Belted Kingfisher	0	1	0	1	0	1	0	1
Red-breasted Sapsucker	1	3	0	4	1	25	0	26
Downy Woodpecker	0	1	0	1	0	1	0	1
Hairy Woodpecker	4	10	10	24	6	25	33	64
American Three-toed Woodpecker	0	1	0	1	0	2	0	2
Northern Flicker	6	7	7	20	17	12	28	57
Pileated Woodpecker	1	4	3	8	1	5	5	11
Merlin	1	0	0	1	1	0	0	1
Peregrine Falcon	1	0	0	1	1	0	0	1
Olive-sided Flycatcher	3	5	5	13	7	21	14	42
Western Wood-Pewee	0	4	1	5	0	24	1	25

*This classification includes individuals identified in the field as Townsend's warblers, hermit warblers, Townsend's/hermit warbler hybrids, and unidentified Townsend's/hermit warblers.

Table 5 (continued). Number of transects with detections and number of individual detections for each species detected during point counts on annual-panel transects at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks in 2016.

	Number of transects with detections				Number of individual detections			
Species	**MORA**	**NOCA**	**OLYM**	**ALL**	**MORA**	**NOCA**	**OLYM**	**ALL**
Willow Flycatcher	0	1	0	1	0	5	0	5
Hammond's Flycatcher	2	8	9	19	12	99	47	158
Dusky Flycatcher	0	2	0	2	0	4	0	4
Pacific-slope Flycatcher	6	6	10	22	57	26	180	263
Cassin's Vireo	0	3	0	3	0	9	0	9
Warbling Vireo	3	6	6	15	8	56	39	103
Red-eyed Vireo	0	3	0	3	0	13	0	13
Gray Jay	4	3	9	16	9	7	33	49
Steller's Jay	5	4	4	13	21	11	22	54
Clark's Nutcracker	0	1	0	1	0	2	0	2
American Crow	0	0	2	2	0	0	6	6
Common Raven	5	3	5	13	12	5	13	30
Horned Lark	1	0	0	1	1	0	0	1
Violet-green Swallow	0	1	0	1	0	2	0	2
Northern Rough-winged Swallow	0	1	1	2	0	1	2	3
Barn Swallow	1	0	0	1	4	0	0	4
Mountain Chickadee	0	2	0	2	0	4	0	4
Chestnut-backed Chickadee	8	10	10	28	87	115	93	295
Red-breasted Nuthatch	9	9	7	25	30	75	43	148
Brown Creeper	8	5	10	23	78	18	56	152
Rock Wren	0	0	1	1	0	0	1	1
Canyon Wren	0	1	0	1	0	1	0	1
House Wren	0	4	1	5	0	9	1	10
Pacific Wren	10	11	11	32	168	136	175	479

*This classification includes individuals identified in the field as Townsend's warblers, hermit warblers, Townsend's/hermit warbler hybrids, and unidentified Townsend's/hermit warblers.

Table 5 (continued). Number of transects with detections and number of individual detections for each species detected during point counts on annual-panel transects at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks in 2016.

	Number of transects with detections				Number of individual detections			
Species	**MORA**	**NOCA**	**OLYM**	**ALL**	**MORA**	**NOCA**	**OLYM**	**ALL**
American Dipper	1	0	2	3	1	0	2	3
Golden-crowned Kinglet	9	8	11	28	98	77	110	285
Ruby-crowned Kinglet	0	1	1	2	0	3	1	4
Mountain Bluebird	1	1	0	2	10	5	0	15
Townsend's Solitaire	2	2	2	6	6	3	5	14
Veery	0	1	0	1	0	3	0	3
Swainson's Thrush	4	7	4	15	14	187	34	235
Hermit Thrush	7	4	7	18	96	52	51	199
American Robin	6	11	9	26	26	97	102	225
Varied Thrush	8	8	11	27	166	146	134	446
European Starling	0	0	1	1	0	0	5	5
Cedar Waxwing	0	4	0	4	0	52	0	52
American Pipit	2	0	1	3	28	0	11	39
Gray-crowned Rosy-Finch	2	0	0	2	18	0	0	18
Pine Grosbeak	1	2	3	6	2	2	8	12
Purple Finch	0	1	0	1	0	2	0	2
Cassin's Finch	1	3	0	4	1	28	0	29
Red Crossbill	2	6	6	14	8	79	21	108
Pine Siskin	7	9	7	23	173	119	76	368
Evening Grosbeak	9	9	5	23	53	80	21	154
Orange-crowned Warbler	1	0	2	3	2	0	4	6
Nashville Warbler	0	3	0	3	0	19	0	19
MacGillivray's Warbler	1	7	3	11	2	54	3	59
Common Yellowthroat	1	0	0	1	1	0	0	1

*This classification includes individuals identified in the field as Townsend's warblers, hermit warblers, Townsend's/hermit warbler hybrids, and unidentified Townsend's/hermit warblers.

Table 5 (continued). Number of transects with detections and number of individual detections for each species detected during point counts on annual-panel transects at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks in 2016.

	Number of transects with detections				Number of individual detections			
Species	**MORA**	**NOCA**	**OLYM**	**ALL**	**MORA**	**NOCA**	**OLYM**	**ALL**
Yellow Warbler	1	5	3	9	2	30	5	37
Yellow-rumped Warbler	4	10	4	18	27	102	19	148
Black-throated Gray Warbler	0	2	4	6	0	11	27	38
Townsend's/Hermit Warbler*	6	6	5	17	80	53	48	181
Wilson's Warbler	3	1	4	8	4	3	49	56
Spotted Towhee	0	1	0	1	0	1	0	1
Chipping Sparrow	1	7	1	9	19	31	2	52
Savannah Sparrow	2	0	0	2	6	0	0	6
Fox Sparrow	1	0	0	1	2	0	0	2
Song Sparrow	1	5	1	7	3	16	5	24
White-crowned Sparrow	3	1	2	6	4	2	7	13
Dark-eyed Junco	10	8	10	28	151	100	198	449
Western Tanager	2	10	5	17	11	85	25	121
Black-headed Grosbeak	1	6	1	8	5	16	2	23
Brown-headed Cowbird	0	2	0	2	0	8	0	8
All species pooled	0	0	0	0	1,612	2,297	1,825	5,734
Detections per point (all species pooled)	0	0	0	0	8.86	11.1	10.37	10.15

*This classification includes individuals identified in the field as Townsend's warblers, hermit warblers, Townsend's/hermit warbler hybrids, and unidentified Townsend's/hermit warblers.

Table 6. Number of transects with detections and number of individual detections for each species detected during point counts (annual- and alternating-panel transects combined) at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks in 2016.

	Number of transects with detections				Number of individual detections			
Species	**MORA**	**NOCA**	**OLYM**	**ALL**	**MORA**	**NOCA**	**OLYM**	**ALL**
Barrow's Goldeneye	1	0	0	1	1	0	0	1
Common Merganser	0	1	0	1	0	1	0	1
Ruffed Grouse	5	0	0	5	8	0	0	8
White-tailed Ptarmigan	0	1	0	1	0	1	0	1
Sooty Grouse	3	15	15	33	9	36	28	73
Band-tailed Pigeon	1	2	7	10	1	5	19	25
Eurasian Collared-dove	0	0	1	1	0	0	1	1
Black Swift	1	4	0	5	7	72	0	79
Vaux's Swift	9	5	6	20	55	10	12	77
Rufous Hummingbird	9	15	14	38	36	30	46	112
Calliope Hummingbird	0	1	0	1	0	4	0	4
Spotted Sandpiper	2	4	4	10	6	6	9	21
Marbled Murrelet	0	0	4	4	0	0	15	15
Osprey	4	0	2	6	6	0	2	8
Bald Eagle	0	2	1	3	0	4	1	5
Red-tailed Hawk	1	0	0	1	1	0	0	1
Western Screech-Owl	0	1	0	1	0	1	0	1
Northern Pygmy-Owl	1	0	0	1	2	0	0	2
Barred Owl	1	0	1	2	2	0	1	3
Belted Kingfisher	0	1	0	1	0	1	0	1
Red-breasted Sapsucker	3	4	1	8	4	26	3	33
Downy Woodpecker	0	2	1	3	0	2	1	3
Hairy Woodpecker	7	16	16	39	11	38	48	97
American Three-toed Woodpecker	0	2	0	2	0	3	0	3
Northern Flicker	13	10	15	38	36	26	61	123
Pileated Woodpecker	5	7	5	17	5	8	8	21
Merlin	1	0	0	1	1	0	0	1

Table 6 (continued). Number of transects with detections and number of individual detections for each species detected during point counts (annual- and alternating-panel transects combined) at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks in 2016.

	Number of transects with detections				Number of individual detections			
Species	**MORA**	**NOCA**	**OLYM**	**ALL**	**MORA**	**NOCA**	**OLYM**	**ALL**
Peregrine Falcon	1	0	0	1	1	0	0	1
Olive-sided Flycatcher	5	10	13	28	13	27	39	79
Western Wood-Pewee	0	7	3	10	0	38	3	41
Willow Flycatcher	0	1	1	2	0	5	2	7
Hammond's Flycatcher	4	15	16	35	16	135	104	255
Dusky Flycatcher	0	6	0	6	0	17	0	17
Pacific-slope Flycatcher	13	10	19	42	142	32	341	515
Hutton’s Vireo	0	0	1	1	0	0	5	5
Cassin's Vireo	0	8	1	9	0	26	1	27
Warbling Vireo	3	15	10	28	8	72	66	146
Red-eyed Vireo	0	3	0	3	0	13	0	13
Gray Jay	12	10	17	39	52	25	49	126
Steller’s Jay	13	9	8	30	40	21	42	103
Clark’s Nutcracker	0	4	0	4	0	20	0	20
American Crow	0	0	4	4	0	0	9	9
Common Raven	7	8	7	22	18	11	16	45
Horned Lark	1	0	2	3	1	0	4	5
Tree Swallow	0	0	1	1	0	0	5	5
Violet-green Swallow	0	2	1	3	0	5	3	8
Northern Rough-winged Swallow	0	1	1	2	0	1	2	3
Barn Swallow	1	0	0	1	4	0	0	4
Mountain Chickadee	1	5	0	6	1	12	0	13
Chestnut-backed Chickadee	18	19	20	57	206	172	160	538
Red-breasted Nuthatch	17	20	18	55	72	150	79	301
Brown Creeper	18	14	18	50	172	40	95	307
Rock Wren	0	0	1	1	0	0	1	1

Table 6 (continued). Number of transects with detections and number of individual detections for each species detected during point counts (annual- and alternating-panel transects combined) at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks in 2016.

	Number of transects with detections				Number of individual detections			
Species	**MORA**	**NOCA**	**OLYM**	**ALL**	**MORA**	**NOCA**	**OLYM**	**ALL**
Canyon Wren	0	2	0	2	0	2	0	2
House Wren	0	7	2	9	0	26	2	28
Pacific Wren	20	21	23	64	365	197	335	897
American Dipper	1	0	3	4	1	0	4	5
Golden-crowned Kinglet	18	20	23	61	186	141	222	549
Ruby-crowned Kinglet	0	1	3	4	0	3	8	11
Mountain Bluebird	1	1	0	2	10	5	0	15
Townsend's Solitaire	2	8	5	15	6	12	10	28
Veery	0	1	0	1	0	3	0	3
Swainson's Thrush	8	17	8	33	25	360	52	437
Hermit Thrush	15	12	15	42	194	110	104	408
American Robin	12	20	17	49	37	167	185	389
Varied Thrush	17	16	23	56	333	200	245	778
European Starling	0	0	1	1	0	0	5	5
Cedar Waxwing	0	7	2	9	0	64	7	71
American Pipit	4	1	4	9	31	15	21	67
Gray-crowned Rosy-Finch	2	0	0	2	18	0	0	18
Pine Grosbeak	2	3	7	12	5	3	12	20
Purple Finch	0	1	0	1	0	2	0	2
Cassin's Finch	1	7	0	8	1	42	0	43
Red Crossbill	5	9	13	27	23	107	86	216
Pine Siskin	14	19	16	49	301	225	159	685
Evening Grosbeak	19	16	10	45	180	96	54	330
Orange-crowned Warbler	1	1	7	9	2	1	22	25
Nashville Warbler	0	5	0	5	0	53	0	53
MacGillivray's Warbler	1	14	5	20	2	110	6	118

Table 6 (continued). Number of transects with detections and number of individual detections for each species detected during point counts (annual- and alternating-panel transects combined) at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks in 2016.

	Number of transects with detections				Number of individual detections			
Species	**MORA**	**NOCA**	**OLYM**	**ALL**	**MORA**	**NOCA**	**OLYM**	**ALL**
MacGillivray's Warbler	1	14	5	20	2	110	6	118
Common Yellowthroat	1	0	1	2	1	0	1	2
Yellow Warbler	1	7	5	13	2	33	8	43
Yellow-rumped Warbler	7	19	10	36	45	187	55	287
Black-throated Gray Warbler	0	4	5	9	0	16	57	73
Townsend's/Hermit Warbler*	11	13	9	33	99	92	79	270
Wilson's Warbler	5	2	8	15	6	5	90	101
Spotted Towhee	0	3	0	3	0	6	0	6
Chipping Sparrow	2	16	3	21	20	83	8	111
Savannah Sparrow	2	0	0	2	6	0	0	6
Fox Sparrow	2	2	0	4	3	4	0	7
Song Sparrow	1	5	5	11	3	16	18	37
Lincoln's Sparrow	1	0	0	1	1	0	0	1
White-crowned Sparrow	3	1	5	9	4	2	21	27
Dark-eyed Junco	20	19	21	60	313	173	407	893
Western Tanager	4	20	9	33	16	224	52	292
Black-headed Grosbeak	1	11	3	15	5	28	6	39
Lazuli Bunting	0	1	0	1	0	2	0	2
Red-winged Blackbird	0	0	1	1	0	0	1	1
Brown-headed Cowbird	0	3	1	4	0	9	1	10
All species pooled	0	0	0	0	3,181	3,920	3,624	10,725
Detections per point (all species pooled)	0	0	0	0	9.01	10.26	10.04	9.79
Number of species detected during point counts	0	0	0	0	63	75	68	98

Table 7. Species listed under the Endangered Species Act recorded on "Rare Bird Detection Forms" in each park in 2016, excluding individuals that were also detected during point counts.

	Number of birds detected (excluding individuals also detected during point counts)		
Species	**Mount Rainier**	**North Cascades**	**Olympic**
Spotted Owl	1	1	0
Marbled Murrelet	0	0	1

Table 8. Number of points with detections and number of individual detections for each species detected during point counts at Lewis and Clark National Historical Park in 2016.

Species	Number of points with detections	Number of individual detections
Canada Goose	3	18
Wood Duck	1	1
Mallard	5	8
Ring-necked Pheasant	1	1
Band-tailed Pigeon	10	10
Eurasian Collared-dove	4	4
Vaux's Swift	1	1
Anna's Hummingbird	3	3
Rufous Hummingbird	5	6
Western Gull	3	32
California Gull	1	1
Caspian Tern	8	268
Pacific Loon	1	1
Double-crested Cormorant	1	2
Pelagic Cormorant	1	75
Brown Pelican	2	65
Great Blue Heron	2	2
Turkey Vulture	1	1
Osprey	2	2
Bald Eagle	7	7
Downy Woodpecker	1	1
Hairy Woodpecker	7	8
Northern Flicker	2	2
Pileated Woodpecker	1	1
Peregrine Falcon	1	1
Olive-sided Flycatcher	8	8
Western Wood-Pewee	3	3
Pacific-slope Flycatcher	52	98
Hutton's Vireo	5	6

Table 8 (continued). Number of points with detections and number of individual detections for each species detected during point counts at Lewis and Clark National Historical Park in 2016.

Species	Number of points with detections	Number of individual detections
Warbling Vireo	17	25
Steller's Jay	11	16
American Crow	36	60
Common Raven	7	9
Tree Swallow	3	6
Violet-green Swallow	3	5
Northern Rough-winged Swallow	1	1
Cliff Swallow	1	2
Barn Swallow	4	13
Black-capped Chickadee	6	9
Chestnut-backed Chickadee	23	30
Bushtit	1	1
Red-breasted Nuthatch	1	1
Brown Creeper	14	18
Pacific Wren	44	82
Marsh Wren	8	27
Bewick's Wren	8	12
Golden-crowned Kinglet	35	48
Swainson's Thrush	66	177
American Robin	50	81
Varied Thrush	3	3
European Starling	1	1
Cedar Waxwing	7	13
Purple Finch	39	44
Red Crossbill	11	63
American Goldfinch	11	18
Orange-crowned Warbler	22	35
Common Yellowthroat	21	35
Yellow Warbler	12	16
Yellow-rumped Warbler	8	9
Black-throated Gray Warbler	27	37
Hermit Warbler	23	40
Wilson's Warbler	54	106
Spotted Towhee	6	10
Savannah Sparrow	2	4
Song Sparrow	33	52
White-crowned Sparrow	17	22

Table 8 (continued). Number of points with detections and number of individual detections for each species detected during point counts at Lewis and Clark National Historical Park in 2016.

Species	Number of points with detections	Number of individual detections
Dark-eyed Junco	24	39
Western Tanager	25	29
Black-headed Grosbeak	31	40
Red-winged Blackbird	8	13
Brown-headed Cowbird	16	24

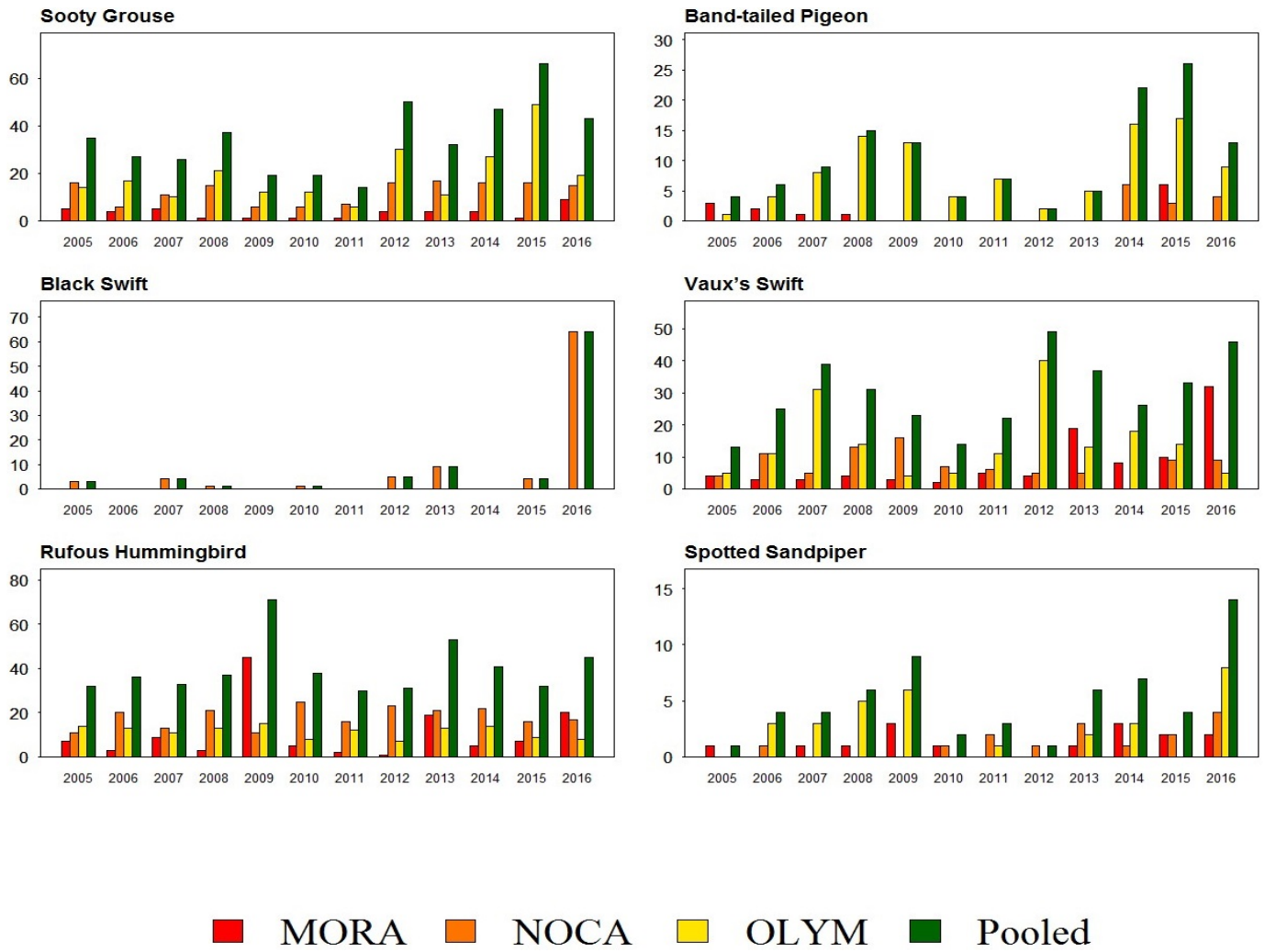
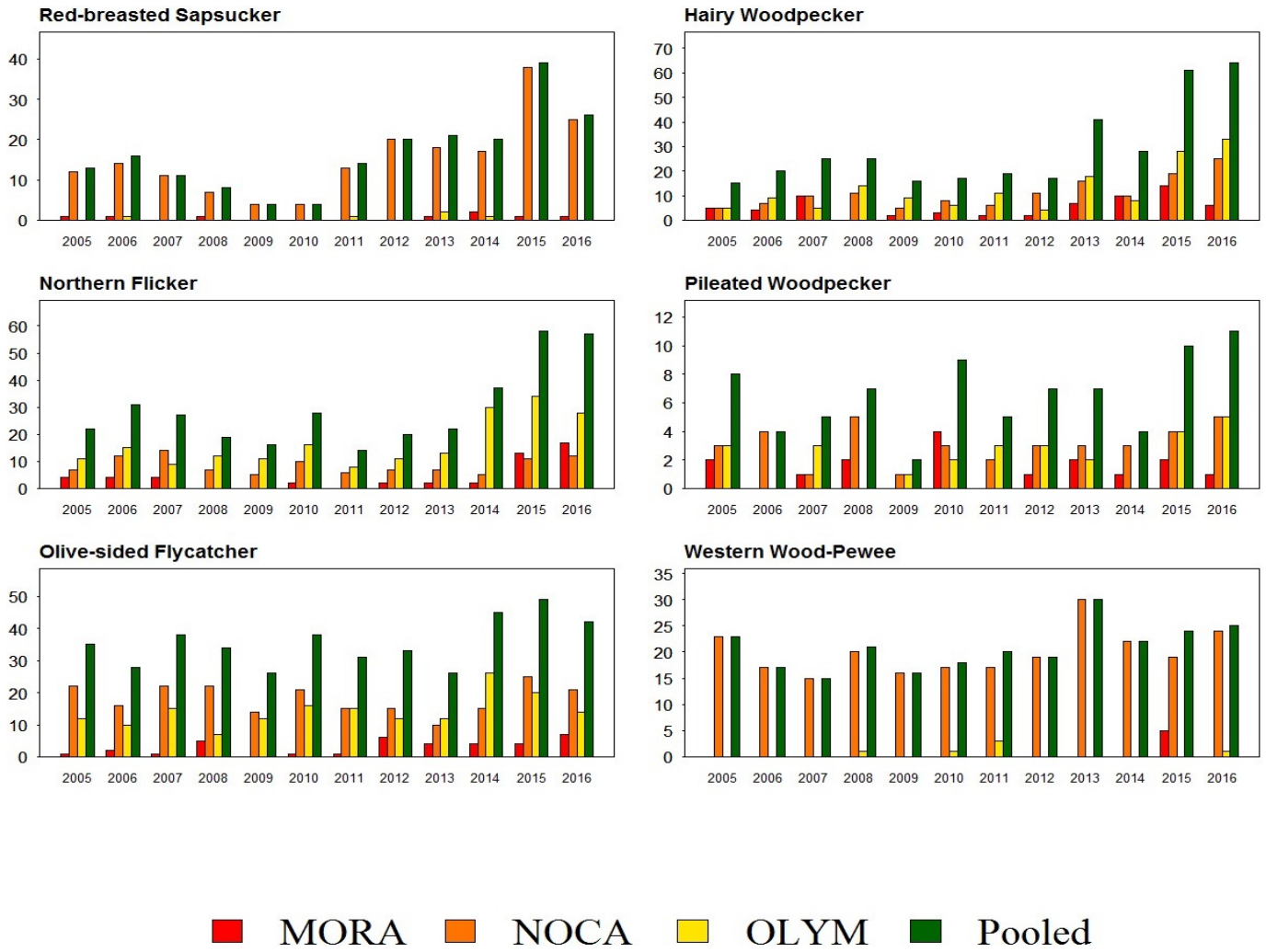


Figure 6. Number of times each species was detected on annual-panel transects at Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM) National Parks, and all three parks pooled (always presented in that order) during the 2005–2016 field seasons. The figure includes all species for which we amassed at least 50 point count detections on annual-panel transects over the 12 years indicated. Numbers of detections are unadjusted for differences in survey effort or potential differences in detectability of birds between years. These adjustments will be made in conjunction with our periodic trend analyses.



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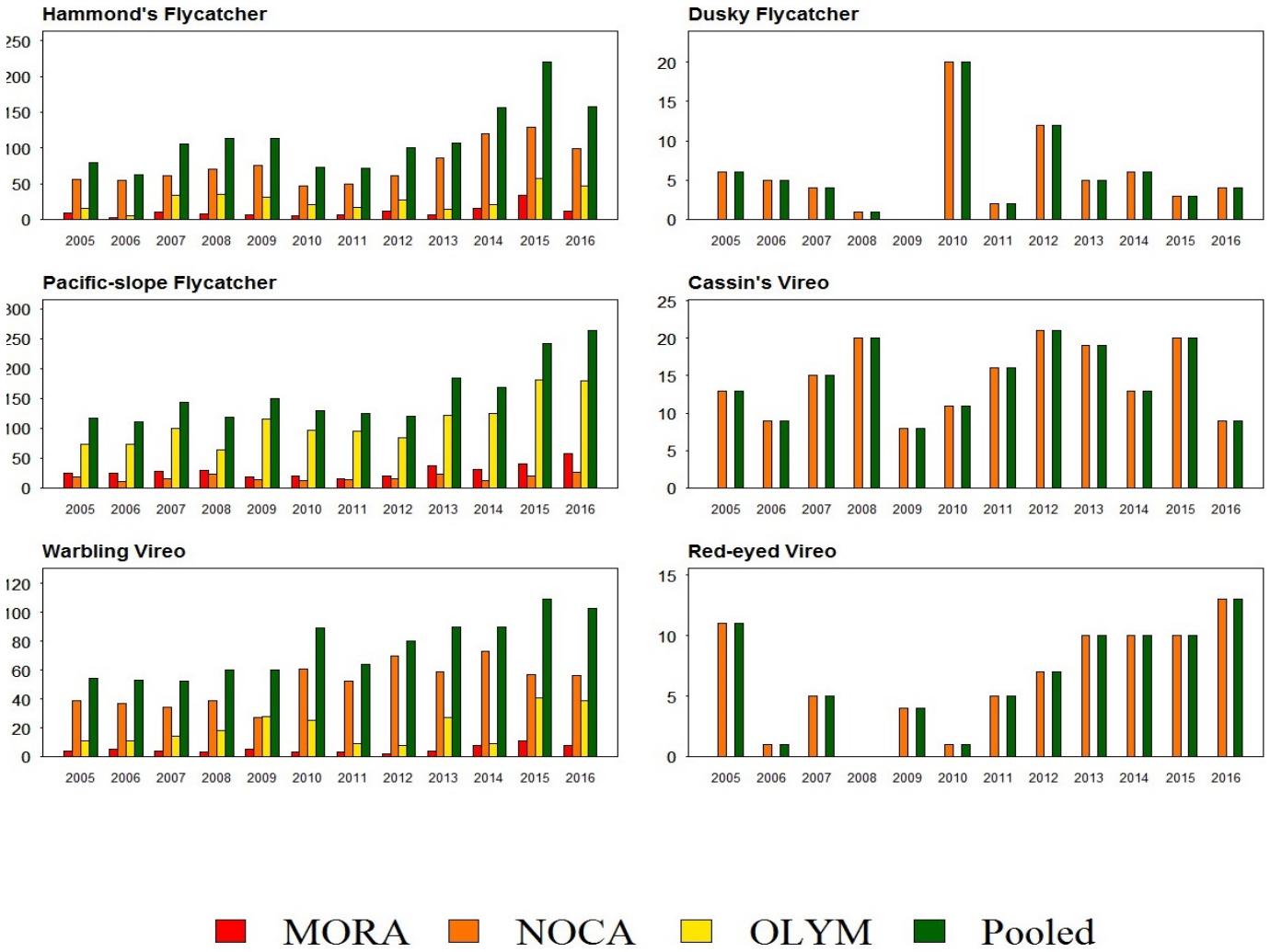

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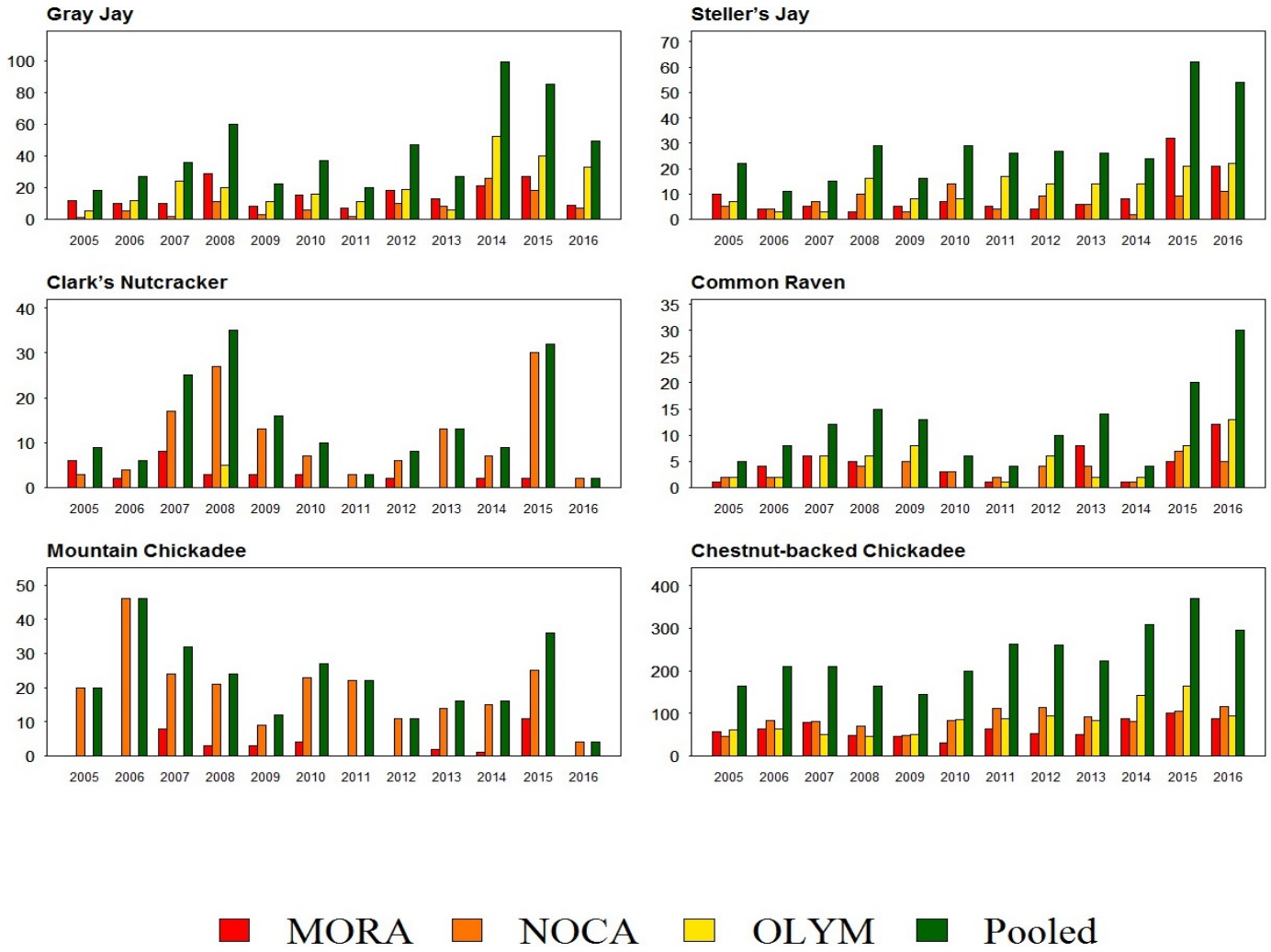

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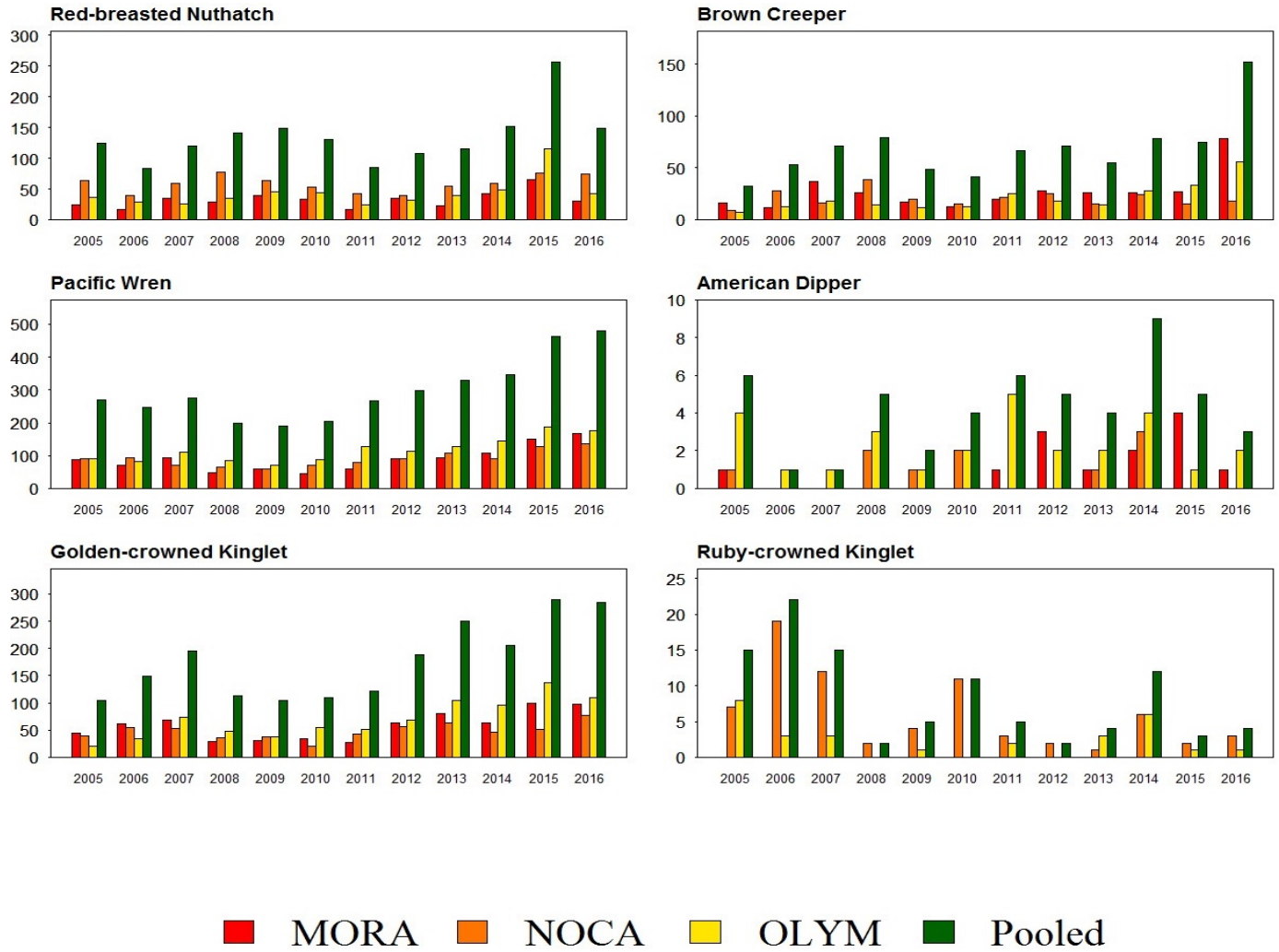

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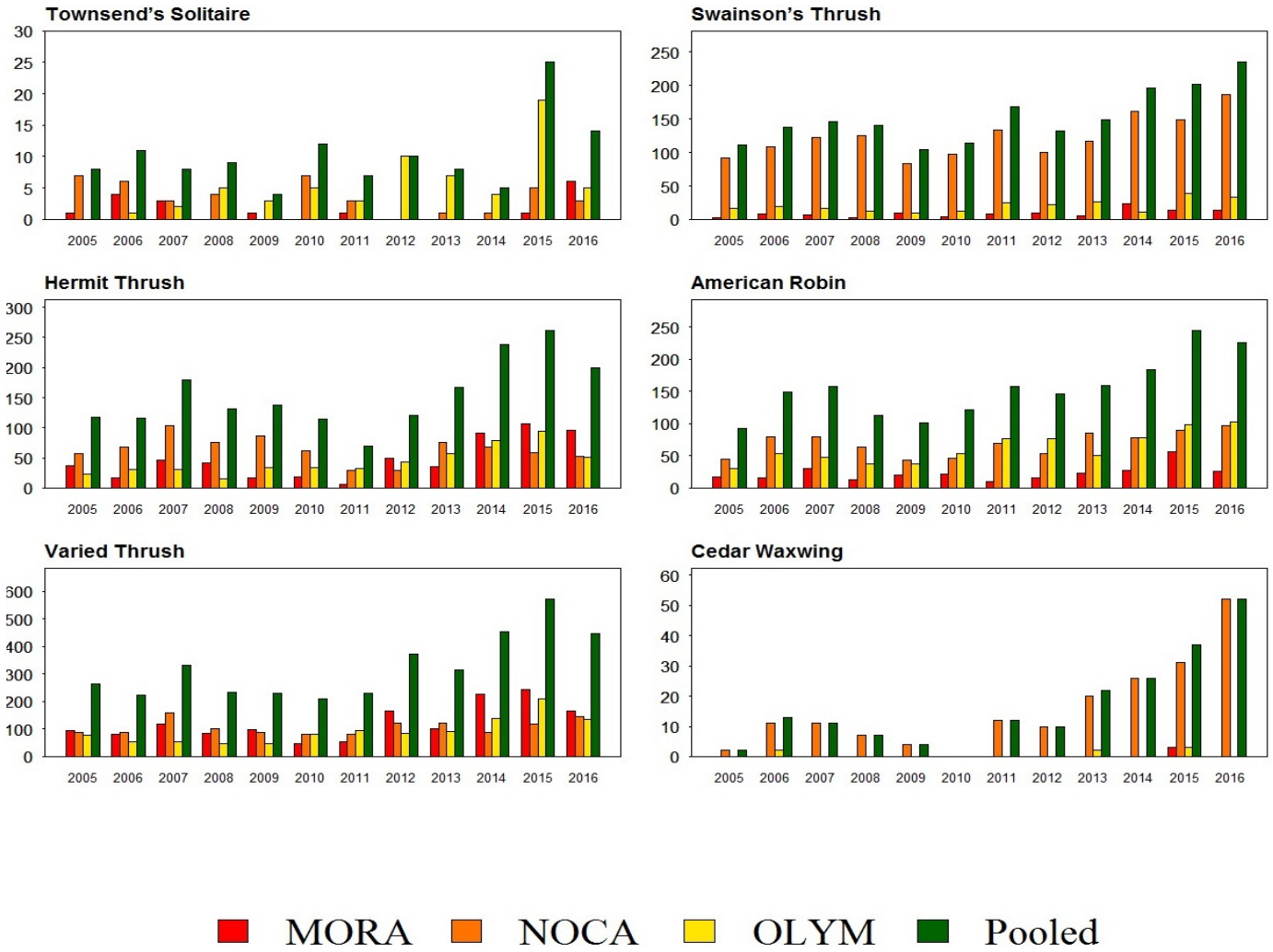

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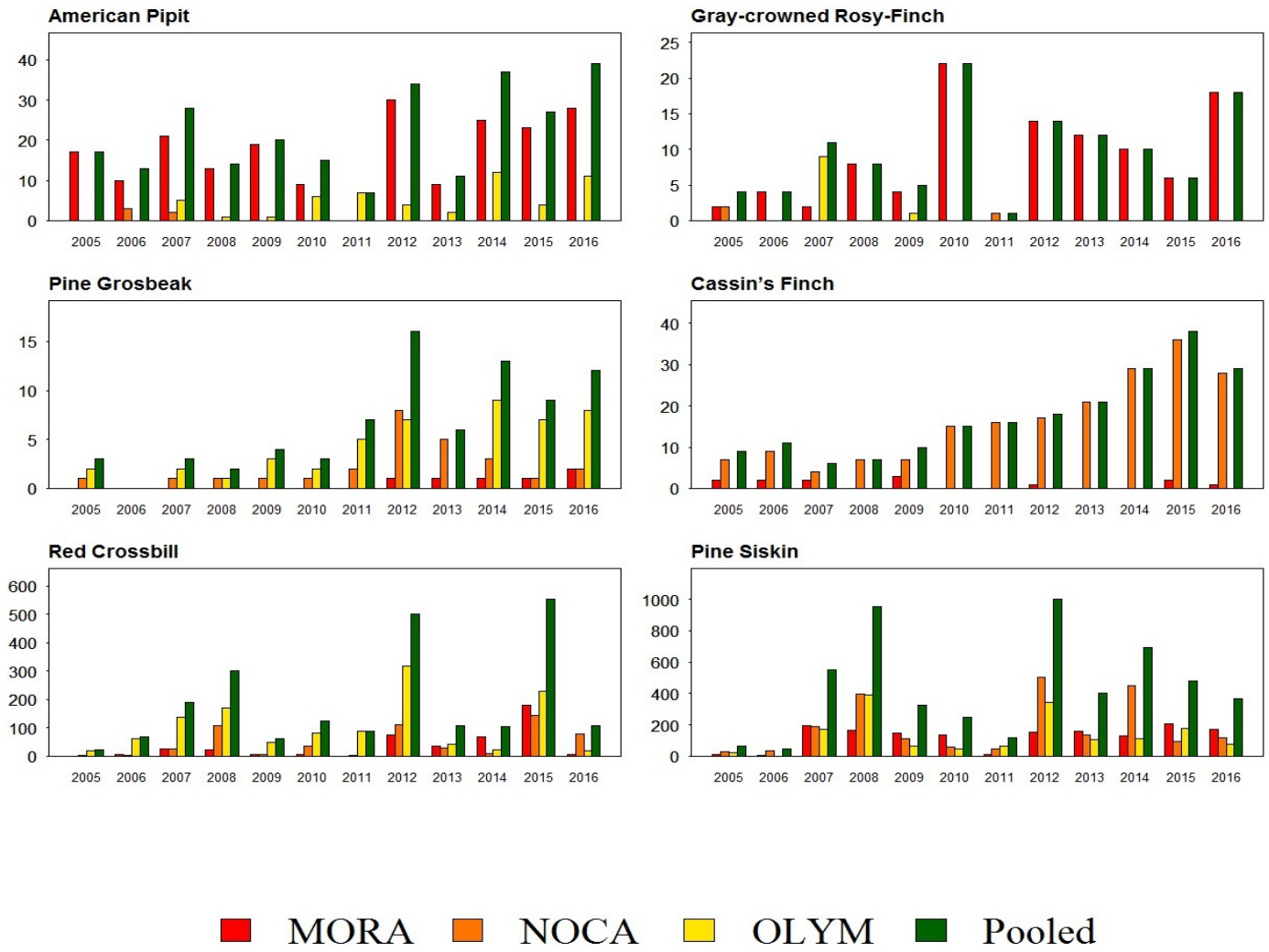

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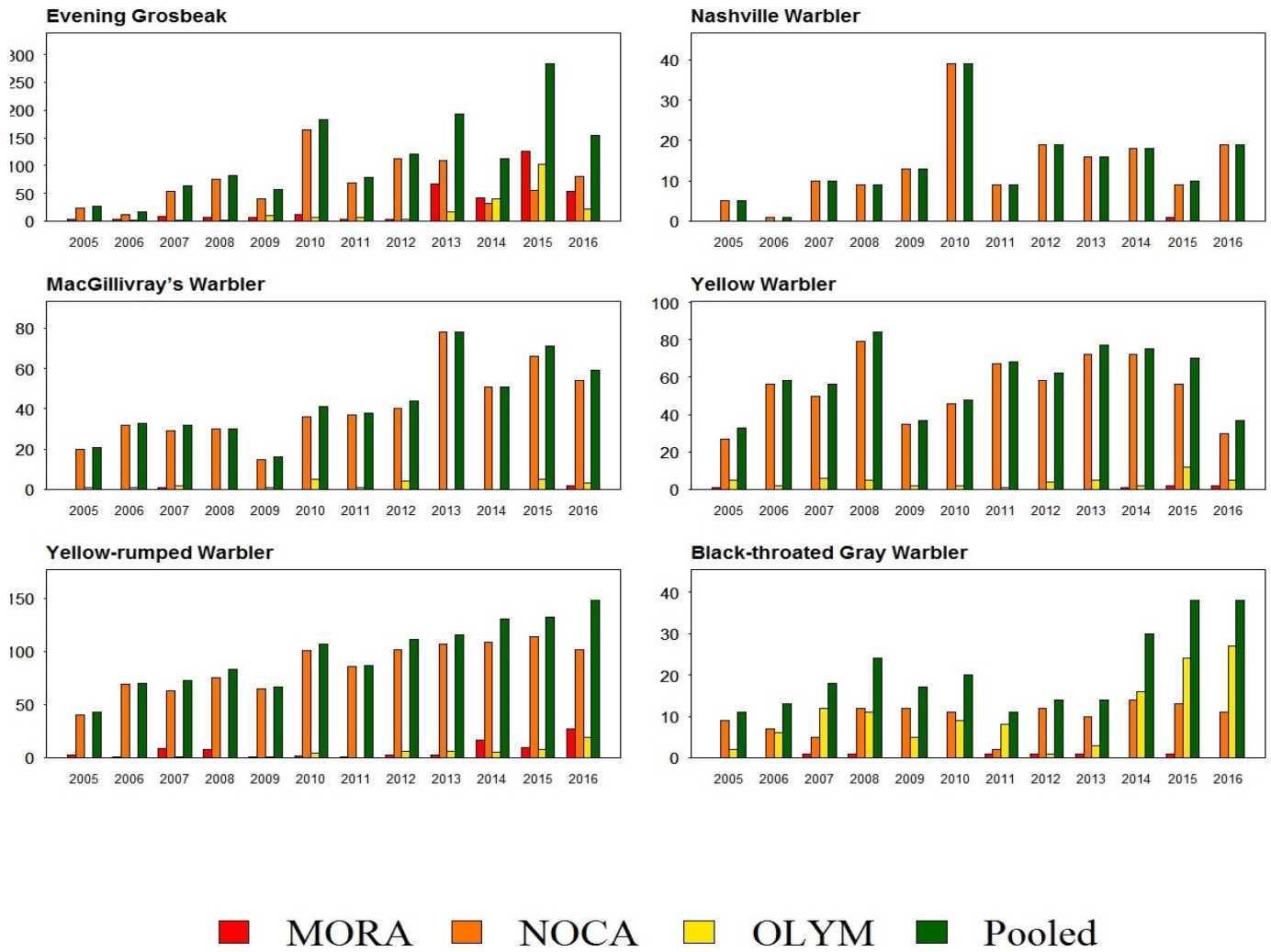

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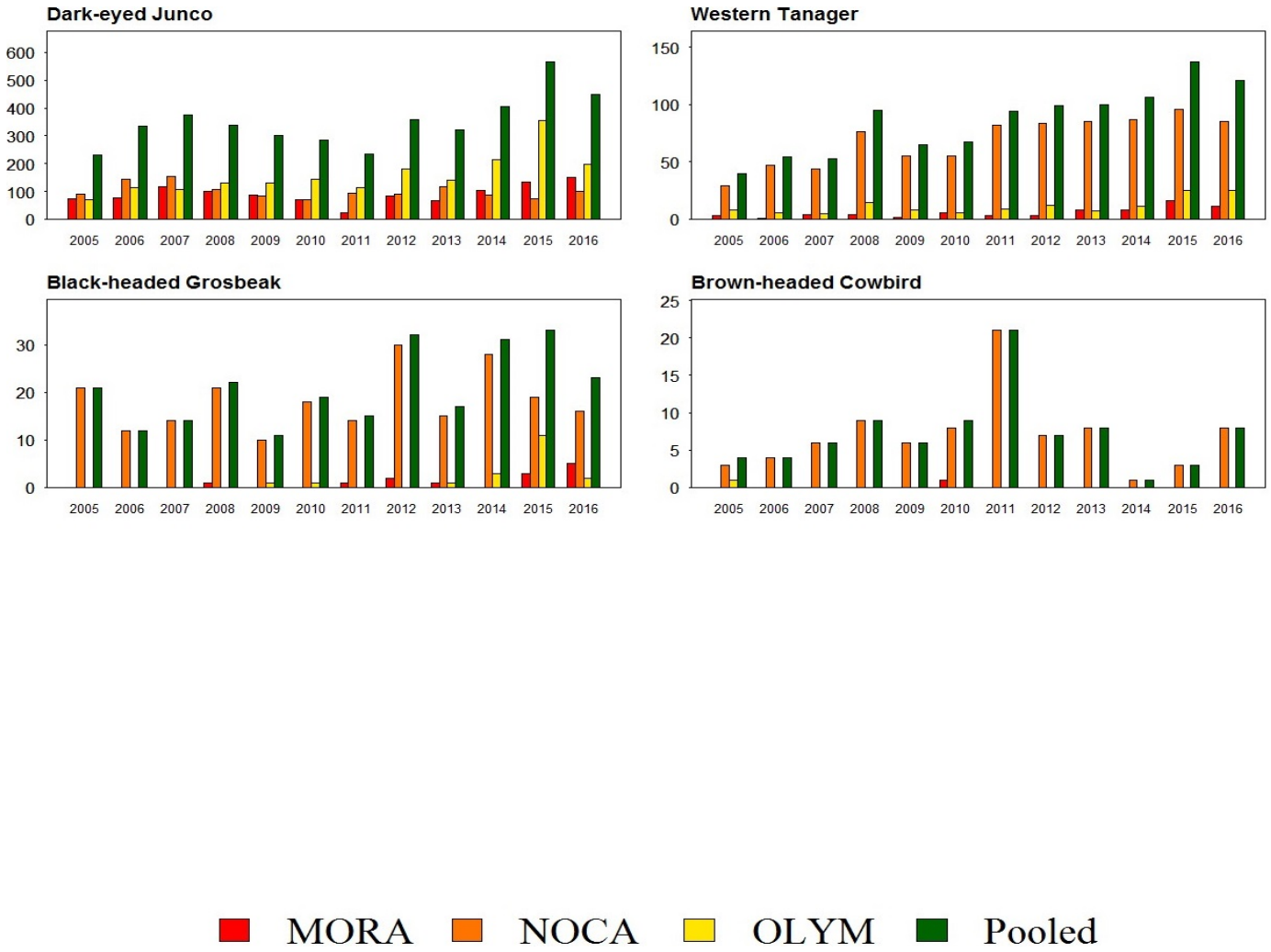

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Discussion

We completed our tenth year of full implementation of the NCCN Landbird Monitoring Project with the experience gained from two pilot field seasons (2005 and 2006) and nine previous years of full protocol implementation. Our procedures for season preparation, data collection, data management, data analysis, and reporting (Siegel et al. 2007) have all been well vetted, and required no substantial changes this year. Due to one technician backing out a week before training started, as well as two of the technicians never passing the bird identification evaluation, there were only four crew members who were able to conduct point counts full-time throughout the field season. However, several qualified people were able to fill in for portions of the field season, including two former crew members, the Executive Director of The Institute for Bird Populations, and a National Park Service Wildlife Biologist.

With a slightly above-average January through March snowpack across all three parks, April and early May experienced unusually hot and dry weather conditions, causing rapid snowmelt and ultimately a below-average snowpack in June and July (Baccus *in prep.*, Wright and Lofgren *in prep*.). Snowpack blocking travel to transects was generally not an issue in the 2016 season and we were able to survey 66 of the 68 intended transects in the three large parks. We missed one transect at each of NOCA and OLYM due to a shortage of available surveyors and an inability to arrange time-saving boat travel at the end of the season.

After 2015 yielded the highest number of bird detections since the start of the monitoring project, there was a decrease in detections of many species in 2016. However, detections of many species dropped only to levels similar to those seen in 2014. Red crossbill and evening grosbeak detections declined markedly in 2016, which accounted for much of the decrease in detections across the annual-panel transects (108 detections of red crossbills on annual-panel transects in 2016, compared to 553 detections in 2015; 154 detections of evening grosbeaks in 2016, compared to 283 detections in 2015). Cassin's finch, a species whose detections had been rising steadily since the start of the monitoring project, dropped slightly from 2015 but the detection numbers were similar to those seen in 2014. Mountain chickadee detections dropped in 2016, to the lowest number since the start of the monitoring project (four detections in 2016, compared to 36 detections in 2016 and 11 detections in 2012, the previous year with the next lowest number of detections), a result consistent with downward trends we have modeled for this species (Ray et al. 2017). We also had only one Clark's nutcracker detection in 2016. While this is not a species we typically detect in high numbers, one detection is the lowest we have seen since the start of the monitoring project, another finding consistent with our recent trend analyses (Holmgren et al. 2016, Ray et al. 2017).

In contrast, there were several species we detected in slightly or moderately greater numbers in the three large parks in 2016 than in previous years. These include cedar waxwing, Swainson's thrush, spotted sandpiper, brown creeper, and black swift. Each of these species had more detections in 2016 than in any of the previous 11 years. Numbers of detections increased substantially for brown creepers and black swifts. The rise in black swift detections comes primarily from one transect, where there were several very large flocks seen foraging overhead. Despite occurring widely across

western North America, black swifts are not abundant anywhere in their summer range. As of 2002, only about 80 specific nesting localities had been documented due to their proximity to hard-to-access waterfalls and steep cliffs (Lowther and Collins 2002). Flocks of the size we observed in NOCA merit further attention in future years to determine nesting status, particularly since there are so few nesting records range-wide. Woodpecker detections also generally remained high in 2016 after the notable increase in detections in 2015 (Holmgren et al. 2016).

After notable increases in observations of several rare species in 2015, we did not detect as many of these in 2016. One such example is that in contrast to 2015, we did not detect any lazuli buntings in OLYM or MORA in 2016, which is more typical as they are normally detected by our crews only east of the Cascade crest in NOCA. However, we continued to see greater numbers of chipping sparrows at OLYM, a bird we generally only see in very restricted locations in the park, and a rock wren again at OLYM, a species that typically prefers the drier habitat of central and eastern Washington. It is worth monitoring such species closely in future years, though many of these increases in detections of rarer species are not reflected in our point count data, as they are observations made while hiking between sites, or outside of point count periods. If increases in detections of these species continue, they will likely start to become present in our point count data.

There was one Eurasian collared-dove detected at OLYM during a point count in 2016, and the species was also detected at OLYM and NOCA at times or locations outside of point counts. No Eurasian collared-doves were detected in MORA, during or outside of point counts. The range of this non-native bird has expanded rapidly across North America. Breeding Bird Survey data from 1966 to 2010 have shown increases in numbers everywhere the species has been recorded. The success of this species can be attributed to widespread seed availability in the form of backyard feeders as well as increased tree planting in urban and suburban areas (Romagosa 2012). While the doves are less common in more rural or natural areas, they will inhabit such areas if there is food available (Romagosa 2012). The areas we detected them not during counts are in developed parts of the parks (near campgrounds or roads), but we will continue to take particular note of them, as this project presents a good opportunity to monitor this species and whether it expands its range into more natural areas.

At LEWI, overall detections increased from 1,377 in 2014 to 1,644 in 2016 (for this purpose, excluding the high number of Caspian terns from this total to better compare to previous years), only surveying the park in alternating years. There were notable increases in detections of a few species, including Swainson's thrush, Wilson's warbler, Pacific-slope flycatcher, black-throated gray warbler, and common yellowthroat. Interestingly, red crossbill detections increased from six in 2014 to 63 in 2016, despite the sharp decrease in detections at the three large parks. There was no substantial change in brown-headed cowbird detections, which increased by one detection from 2014 numbers. Four Eurasian collared-doves were detected in point counts in LEWI in 2016, up from two in 2014. (Holmgren et al. 2015).

The data presented in this report are not corrected for factors such as detectability, annual variation in survey effort, or observer effects. The NCCN Landbird Monitoring Project's periodic trend analyses will explicitly account for this variation.

Conclusions

The NCCN Landbird Monitoring Project has had another successful year, with a comprehensive, field-tested protocol, two years of annual-panel data collected during the protocol development phase (2005–2006), and ten full years of project implementation (2007–2016) that includes data collection on the annual panel as well as all five of the alternating panels. We were able to survey 66 of the 68 intended transects in 2016. Preliminary analysis indicates a slight decline in numbers of several bird species from our all-time high species counts of 2015, but some of these species only dropped down to levels similar to those seen in 2014. While the numbers of detections of several individual species increased, the overall number of birds detected (pooling across species) was down from 2015. However, interpretation of this result will need to wait until our next multi-year trend analysis, which will account for annual variation in survey effort, observer effects, and detection probability.

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Appendix A: Detailed survey history of each transect sampled in the large parks to date.

Park	Panel	Elevation class	Transect	Number of points surveyed											
				2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
MORA	Ann1	Low	4001	10	12	12	12	12	10	11	14	16	16	15	15
MORA	Ann1	Low	4005	11	11	11	11	12	9	10	13	13	14	14	14
MORA	Ann1	Medium	4002	11	11	11	12	11	13	13	15	15	15	16	14
MORA	Ann1	Medium	4004	18	17	18	18	13	15	10	17	17	18	18	20
MORA	Ann1	Medium	4009	14	14	15	15	11	13	10	15	15	15	16	17
MORA	Ann1	Medium	4012	16	16	14	19	19	13	0	17	19	20	23	24
MORA	Ann1	High	4003	12	12	12	12	12	10	12	13	14	15	15	15
MORA	Ann1	High	4007	20	20	20	20	20	20	0	20	20	20	25	22
MORA	Ann1	High	4011	13	11	14	17	17	15	0	16	16	17	17	17
MORA	Ann1	High	4014	10	16	14	16	16	15	0	17	17	18	22	24
MORA	Alt2	Low	4006	0	0	10	0	0	0	0	9	0	0	0	0
MORA	Alt2	Low	4008	0	0	9	0	0	0	0	12	0	0	0	0
MORA	Alt2	Medium	4015	0	0	11	0	0	0	0	12	0	0	0	0
MORA	Alt2	Medium	4017	0	0	12	0	0	0	0	13	0	0	0	0
MORA	Alt2	Medium	4020	0	0	9	0	0	0	0	8	0	0	0	0
MORA	Alt2	Medium	4026	0	0	10	0	0	0	0	11	0	0	0	0
MORA	Alt2	High	4016	0	0	19	0	0	0	0	20	0	0	0	0
MORA	Alt2	High	4019	0	0	20	0	0	0	0	20	0	0	0	0
MORA	Alt2	High	4027	0	0	13	0	0	0	0	14	0	0	0	0
MORA	Alt2	High	4075	0	0	14	0	0	0	0	11	0	0	0	0
MORA	Alt3	Low	4010	0	0	0	13	0	0	0	0	14	0	0	0
MORA	Alt3	Low	4018	0	0	0	12	0	0	0	0	14	0	0	0
MORA	Alt3	Medium	4028	0	0	0	11	0	0	0	0	12	0	0	0
MORA	Alt3	Medium	4042	0	0	0	12	0	0	0	0	13	0	0	0

Appendix A (continued): Detailed survey history of each transect sampled in the large parks to date.

Park	Panel	Elevation class	Transect	Number of points surveyed											
				2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
MORA	Alt3	Medium	4044	0	0	0	15	0	0	0	0	16	0	0	0
MORA	Alt3	Medium	4048	0	0	0	13	0	0	0	0	12	0	0	0
MORA	Alt3	High	4029	0	0	0	14	0	0	0	0	14	0	0	0
MORA	Alt3	High	4030	0	0	0	12	0	0	0	0	15	0	0	0
MORA	Alt3	High	4032	0	0	0	15	0	0	0	0	15	0	0	0
MORA	Alt3	High	4033	0	0	0	18	0	0	0	0	19	0	0	0
MORA	Alt4	Low	4021	0	0	0	0	12	0	0	0	0	13	0	0
MORA	Alt4	Low	4022	0	0	0	0	17	0	0	0	0	17	0	0
MORA	Alt4	Medium	4057	0	0	0	0	10	0	0	0	0	14	0	0
MORA	Alt4	Medium	4060	0	0	0	0	24	0	0	0	0	24	0	0
MORA	Alt4	Medium	4061	0	0	0	0	15	0	0	0	0	17	0	0
MORA	Alt4	Medium	4065	0	0	0	0	13	0	0	0	0	15	0	0
MORA	Alt4	High	4035	0	0	0	0	12	0	0	0	0	14	0	0
MORA	Alt4	High	4036	0	0	0	0	14	0	0	0	0	16	0	0
MORA	Alt4	High	4039	0	0	0	0	11	0	0	0	0	13	0	0
MORA	Alt4	High	4043	0	0	0	0	18	0	0	0	0	19	0	0
MORA	Alt5	Low	4024	0	0	0	0	0	25	0	0	0	0	25	0
MORA	Alt5	Low	4025	0	0	0	0	0	9	0	0	0	0	15	0
MORA	Alt5	Medium	4068	0	0	0	0	0	9	0	0	0	0	15	0
MORA	Alt5	Medium	4073	0	0	0	0	0	13	0	0	0	0	19	0
MORA	Alt5	Medium	4074	0	0	0	0	0	13	0	0	0	0	15	0
MORA	Alt5	Medium	4076	0	0	0	0	0	15	0	0	0	0	17	0
MORA	Alt5	High	4045	0	0	0	0	0	12	0	0	0	0	21	0
MORA	Alt5	High	4046	0	0	0	0	0	10	0	0	0	0	13	0
MORA	Alt5	High	4052	0	0	0	0	0	12	0	0	0	0	16	0
MORA	Alt5	High	4055	0	0	0	0	0	0	0	0	0	0	0	0

Appendix A (continued): Detailed survey history of each transect sampled in the large parks to date.

Park	Panel	Elevation class	Transect	Number of points surveyed											
				2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
MORA	Alt5	High	4083	0	0	0	0	0	0	0	0	0	0	18	0
MORA	Alt6	Low	4031	0	0	0	0	0	0	10	0	0	0	0	13
MORA	Alt6	Low	4034	0	0	0	0	0	0	10	0	0	0	0	12
MORA	Alt6	Medium	4077	0	0	0	0	0	0	12	0	0	0	0	18
MORA	Alt6	Medium	4078	0	0	0	0	0	0	9	0	0	0	0	22
MORA	Alt6	Medium	4081	0	0	0	0	0	0	10	0	0	0	0	19
MORA	Alt6	Medium	4084	0	0	0	0	0	0	0	0	0	0	0	17
MORA	Alt6	High	4058	0	0	0	0	0	0	0	0	0	0	0	19
MORA	Alt6	High	4062	0	0	0	0	0	0	0	0	0	0	0	19
MORA	Alt6	High	4064	0	0	0	0	0	0	10	0	0	0	0	15
NOCA	Ann1	Low	1013	12	11	14	12	11	9	13	15	15	15	0	15
NOCA	Ann1	Low	1017	13	12	9	12	12	12	13	14	14	15	14	15
NOCA	Ann1	Low	1020	15	12	13	15	16	12	16	17	17	18	18	17
NOCA	Ann1	Low	1023	18	19	19	20	21	20	21	21	21	21	22	22
NOCA	Ann1	Medium	1015	12	16	17	17	15	15	16	17	17	19	18	19
NOCA	Ann1	Medium	1018	16	21	21	23	22	25	25	23	25	25	24	25
NOCA	Ann1	Medium	1022	13	13	11	13	14	13	14	15	15	17	16	18
NOCA	Ann1	Medium	1024	9	10	11	12	10	11	10	13	13	13	14	14
NOCA	Ann1	High	1014	15	19	19	0	20	0	0	20	21	21	22	22
NOCA	Ann1	High	1016	14	15	14	16	15	14	15	17	17	17	17	17
NOCA	Ann1	High	1019	12	12	10	12	12	12	12	13	13	13	14	0
NOCA	Ann1	High	1021	18	21	22	23	22	19	17	24	24	24	24	23
NOCA	Alt2	Low	1001	0	0	11	0	0	0	0	13	0	0	0	0
NOCA	Alt2	Low	1005	0	0	13	0	0	0	0	15	0	0	0	0
NOCA	Alt2	Low	1006	0	0	10	0	0	0	0	12	0	0	0	0
NOCA	Alt2	Low	1010	0	0	12	0	0	0	0	16	0	0	0	0

Appendix A (continued): Detailed survey history of each transect sampled in the large parks to date.

Park	Panel	Elevation class	Transect	Number of points surveyed											
				2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NOCA	Alt2	Medium	1003	0	0	12	0	0	0	0	15	0	0	0	0
NOCA	Alt2	Medium	1004	0	0	13	0	0	0	0	14	0	0	0	0
NOCA	Alt2	Medium	1009	0	0	0	0	0	0	0	16	0	0	0	0
NOCA	Alt2	Medium	1011	0	0	19	0	0	0	0	19	0	0	0	0
NOCA	Alt2	High	1002	0	0	18	0	0	0	0	20	0	0	0	0
NOCA	Alt2	High	1007	0	0	13	0	0	0	0	14	0	0	0	0
NOCA	Alt2	High	1008	0	0	0	0	0	0	0	14	0	0	0	0
NOCA	Alt2	High	1012	0	0	15	0	0	0	0	19	0	0	0	0
NOCA	Alt3	Low	1027	0	0	0	13	0	0	0	0	16	0	0	0
NOCA	Alt3	Low	1028	0	0	0	13	0	0	0	0	14	0	0	0
NOCA	Alt3	Low	1029	0	0	0	13	0	0	0	0	15	0	0	0
NOCA	Alt3	Low	1034	0	0	0	13	0	0	0	0	14	0	0	0
NOCA	Alt3	Medium	1025	0	0	0	15	0	0	0	0	15	0	0	0
NOCA	Alt3	Medium	1026	0	0	0	14	0	0	0	0	15	0	0	0
NOCA	Alt3	Medium	1057	0	0	0	0	0	0	0	0	13	0	0	0
NOCA	Alt3	Medium	1031	0	0	0	19	0	0	0	0	20	0	0	0
NOCA	Alt3	High	1032	0	0	0	0	0	0	0	0	13	0	0	0
NOCA	Alt3	High	1037	0	0	0	0	0	0	0	0	20	0	0	0
NOCA	Alt3	High	1039	0	0	0	20	0	0	0	0	20	0	0	0
NOCA	Alt3	High	1040	0	0	0	21	0	0	0	0	19	0	0	0
NOCA	Alt4	Low	1036	0	0	0	0	20	0	0	0	0	25	0	0
NOCA	Alt4	Low	1054	0	0	0	0	11	0	0	0	0	16	0	0
NOCA	Alt4	Low	1061	0	0	0	0	10	0	0	0	0	13	0	0
NOCA	Alt4	Low	1122	0	0	0	0	0	0	0	0	0	22	0	0
NOCA	Alt4	Medium	1033	0	0	0	0	20	0	0	0	0	23	0	0
NOCA	Alt4	Medium	1035	0	0	0	0	16	0	0	0	0	18	0	0

Appendix A (continued): Detailed survey history of each transect sampled in the large parks to date.

Park	Panel	Elevation class	Transect	Number of points surveyed											
				2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NOCA	Alt4	Medium	1038	0	0	0	0	13	0	0	0	0	18	0	0
NOCA	Alt4	Medium	1041	0	0	0	0	14	0	0	0	0	17	0	0
NOCA	Alt4	High	1048	0	0	0	0	11	0	0	0	0	13	0	0
NOCA	Alt4	High	1049	0	0	0	0	12	0	0	0	0	17	0	0
NOCA	Alt4	High	1050	0	0	0	0	13	0	0	0	0	16	0	0
NOCA	Alt4	High	1052	0	0	0	0	11	0	0	0	0	13	0	0
NOCA	Alt5	Low	1062	0	0	0	0	0	8	0	0	0	0	11	0
NOCA	Alt5	Low	1063	0	0	0	0	0	9	0	0	0	0	16	0
NOCA	Alt5	Low	1065	0	0	0	0	0	11	0	0	0	0	13	0
NOCA	Alt5	Low	1067	0	0	0	0	0	8	0	0	0	0	13	0
NOCA	Alt5	Medium	1042	0	0	0	0	0	15	0	0	0	0	17	0
NOCA	Alt5	Medium	1043	0	0	0	0	0	9	0	0	0	0	13	0
NOCA	Alt5	Medium	1044	0	0	0	0	0	11	0	0	0	0	15	0
NOCA	Alt5	Medium	1045	0	0	0	0	0	10	0	0	0	0	10	0
NOCA	Alt5	High	1055	0	0	0	0	0	13	0	0	0	0	16	0
NOCA	Alt5	High	1058	0	0	0	0	0	0	0	0	0	0	18	0
NOCA	Alt5	High	1060	0	0	0	0	0	9	0	0	0	0	14	0
NOCA	Alt5	High	1064	0	0	0	0	0	10	0	0	0	0	15	0
NOCA	Alt6	Low	1068	0	0	0	0	0	0	13	0	0	0	0	15
NOCA	Alt6	Low	1070	0	0	0	0	0	0	12	0	0	0	0	14
NOCA	Alt6	Low	1074	0	0	0	0	0	0	14	0	0	0	0	18
NOCA	Alt6	Low	1075	0	0	0	0	0	0	11	0	0	0	0	16
NOCA	Alt6	Medium	1047	0	0	0	0	0	0	13	0	0	0	0	15
NOCA	Alt6	Medium	1051	0	0	0	0	0	0	11	0	0	0	0	12
NOCA	Alt6	Medium	1053	0	0	0	0	0	0	13	0	0	0	0	19
NOCA	Alt6	Medium	1056	0	0	0	0	0	0	13	0	0	0	0	14

Appendix A (continued): Detailed survey history of each transect sampled in the large parks to date.

Park	Panel	Elevation class	Transect	Number of points surveyed											
				2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
NOCA	Alt6	High	1072	0	0	0	0	0	0	0	0	0	0	0	9
NOCA	Alt6	High	1088	0	0	0	0	0	0	12	0	0	0	0	13
NOCA	Alt6	High	1090	0	0	0	0	0	0	0	0	0	0	0	16
NOCA	Alt6	High	1092	0	0	0	0	0	0	14	0	0	0	0	14
OLYM	Ann1	Low	3001	11	10	8	10	11	12	12	13	12	13	13	14
OLYM	Ann1	Low	3121	11	15	17	17	17	14	17	15	17	17	19	19
OLYM	Ann1	Low	3126	9	10	11	13	13	13	15	15	15	14	15	16
OLYM	Ann1	Low	3134	16	16	18	18	18	18	19	19	19	19	18	20
OLYM	Ann1	Medium	3122	14	12	14	0	16	16	0	16	17	18	18	0
OLYM	Ann1	Medium	3123	10	10	12	14	14	15	15	15	15	16	17	16
OLYM	Ann1	Medium	3130	9	9	8	9	9	9	9	10	10	10	10	10
OLYM	Ann1	Medium	3200	0	0	22	23	21	23	22	23	23	22	23	23
OLYM	Ann1	High	3124	9	10	10	11	11	11	11	12	12	13	14	14
OLYM	Ann1	High	3125	9	11	13	13	14	15	11	14	12	15	15	15
OLYM	Ann1	High	3127	7	9	13	15	14	15	15	15	15	15	16	15
OLYM	Ann1	High	3128	10	11	11	11	10	11	12	13	12	14	14	14
OLYM	Alt2	Low	3138	0	0	10	0	0	0	0	12	0	0	0	0
OLYM	Alt2	Low	3142	0	0	14	0	0	0	0	14	0	0	0	0
OLYM	Alt2	Low	3144	0	0	13	0	0	0	0	13	0	0	0	0
OLYM	Alt2	Low	3145	0	0	13	0	0	0	0	14	0	0	0	0
OLYM	Alt2	Medium	3133	0	0	8	0	0	0	0	16	0	0	0	0
OLYM	Alt2	Medium	3135	0	0	11	0	0	0	0	13	0	0	0	0
OLYM	Alt2	Medium	3137	0	0	10	0	0	0	0	11	0	0	0	0
OLYM	Alt2	Medium	3141	0	0	14	0	0	0	0	15	0	0	0	0
OLYM	Alt2	High	3132	0	0	19	0	0	0	0	19	0	0	0	0
OLYM	Alt2	High	3136	0	0	11	0	0	0	0	11	0	0	0	0

Appendix A (continued): Detailed survey history of each transect sampled in the large parks to date.

Park	Panel	Elevation class	Transect	Number of points surveyed											
				2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
OLYM	Alt2	High	3139	0	0	16	0	0	0	0	13	0	0	0	0
OLYM	Alt2	High	3140	0	0	0	0	0	0	0	12	0	0	0	0
OLYM	Alt3	Low	3146	0	0	0	15	0	0	0	0	15	0	0	0
OLYM	Alt3	Low	3149	0	0	0	10	0	0	0	0	12	0	0	0
OLYM	Alt3	Low	3151	0	0	0	12	0	0	0	0	17	0	0	0
OLYM	Alt3	Low	3153	0	0	0	11	0	0	0	0	16	0	0	0
OLYM	Alt3	Medium	3143	0	0	0	10	0	0	0	0	11	0	0	0
OLYM	Alt3	Medium	3150	0	0	0	11	0	0	0	0	12	0	0	0
OLYM	Alt3	Medium	3152	0	0	0	11	0	0	0	0	13	0	0	0
OLYM	Alt3	Medium	3154	0	0	0	15	0	0	0	0	16	0	0	0
OLYM	Alt3	High	3147	0	0	0	19	0	0	0	0	19	0	0	0
OLYM	Alt3	High	3148	0	0	0	14	0	0	0	0	16	0	0	0
OLYM	Alt3	High	3156	0	0	0	10	0	0	0	0	11	0	0	0
OLYM	Alt3	High	3157	0	0	0	11	0	0	0	0	12	0	0	0
OLYM	Alt4	Low	3155	0	0	0	0	10	0	0	0	0	12	0	0
OLYM	Alt4	Low	3159	0	0	0	0	11	0	0	0	0	12	0	0
OLYM	Alt4	Low	3161	0	0	0	0	11	0	0	0	0	12	0	0
OLYM	Alt4	Low	3163	0	0	0	0	15	0	0	0	0	15	0	0
OLYM	Alt4	Medium	3160	0	0	0	0	10	0	0	0	0	12	0	0
OLYM	Alt4	Medium	3167	0	0	0	0	11	0	0	0	0	14	0	0
OLYM	Alt4	Medium	3168	0	0	0	0	10	0	0	0	0	15	0	0
OLYM	Alt4	Medium	3174	0	0	0	0	14	0	0	0	0	15	0	0
OLYM	Alt4	High	3158	0	0	0	0	14	0	0	0	0	18	0	0
OLYM	Alt4	High	3164	0	0	0	0	14	0	0	0	0	17	0	0
OLYM	Alt4	High	3171	0	0	0	0	12	0	0	0	0	15	0	0
OLYM	Alt4	High	3173	0	0	0	0	10	0	0	0	0	12	0	0

Appendix A (continued): Detailed survey history of each transect sampled in the large parks to date.

Park	Panel	Elevation class	Transect	Number of points surveyed											
				2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
OLYM	Alt5	Low	3165	0	0	0	0	0	10	0	0	0	0	12	0
OLYM	Alt5	Low	3166	0	0	0	0	0	12	0	0	0	0	15	0
OLYM	Alt5	Low	3169	0	0	0	0	0	8	0	0	0	0	13	0
OLYM	Alt5	Low	3170	0	0	0	0	0	11	0	0	0	0	11	0
OLYM	Alt5	Medium	3178	0	0	0	0	0	11	0	0	0	0	14	0
OLYM	Alt5	Medium	3183	0	0	0	0	0	13	0	0	0	0	15	0
OLYM	Alt5	Medium	3184	0	0	0	0	0	16	0	0	0	0	20	0
OLYM	Alt5	Medium	3185	0	0	0	0	0	9	0	0	0	0	11	0
OLYM	Alt5	High	3175	0	0	0	0	0	12	0	0	0	0	15	0
OLYM	Alt5	High	3179	0	0	0	0	0	16	0	0	0	0	19	0
OLYM	Alt5	High	3180	0	0	0	0	0	16	0	0	0	0	19	0
OLYM	Alt5	High	3188	0	0	0	0	0	12	0	0	0	0	18	0
OLYM	Alt6	Low	3172	0	0	0	0	0	0	14	0	0	0	0	14
OLYM	Alt6	Low	3177	0	0	0	0	0	0	10	0	0	0	0	10
OLYM	Alt6	Low	3181	0	0	0	0	0	0	16	0	0	0	0	16
OLYM	Alt6	Low	3182	0	0	0	0	0	0	16	0	0	0	0	18
OLYM	Alt6	Medium	3187	0	0	0	0	0	0	20	0	0	0	0	21
OLYM	Alt6	Medium	3190	0	0	0	0	0	0	14	0	0	0	0	15
OLYM	Alt6	Medium	3195	0	0	0	0	0	0	12	0	0	0	0	13
OLYM	Alt6	Medium	3198	0	0	0	0	0	0	11	0	0	0	0	13
OLYM	Alt6	High	3189	0	0	0	0	0	0	16	0	0	0	0	16
OLYM	Alt6	High	3191	0	0	0	0	0	0	15	0	0	0	0	16
OLYM	Alt6	High	3192	0	0	0	0	0	0	14	0	0	0	0	15
OLYM	Alt6	High	3196	0	0	0	0	0	0	15	0	0	0	0	18

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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