National Park Service
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Natural Resource Stewardship and Science

# North Coast and Cascades Network Landbird Monitoring

## *Report for the 2011 Field Season*

Natural Resource Technical Report NPS/NCCN/NRTR—2012/605

**ON THE COVER**
White-tailed Ptarmigan, North Cascades National Park
Photograph by: (Jay Love, The Institute for Bird Populations)

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*Report for the 2011 Field Season*

Natural Resource Technical Report NPS/NCCN/NRTR—2012/605

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July 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

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Please cite this publication as:

Holmgren, A. L., R. L. Wilkerson, R. B. Siegel, and R. C. Kuntz II. 2012. North Coast and Cascades Network landbird monitoring: Report for the 2011 field season. Natural Resource Technical Report NPS/NCCN/NRTR—2012/605. National Park Service, Fort Collins, Colorado.

NPS 963/115933, July 2012

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# Executive Summary

In 2011, the North Coast and Cascades Network (NCCN) Landbird Monitoring Project continued to follow the comprehensive, field-tested protocol, with two years of annual-panel data collected during the protocol development phase (2005 and 2006), and five years of full project implementation (2007, 2008, 2009, 2010, and 2011) including data collection on the annual panel as well as all of the five alternating panels. In 2011 we conducted 771 point counts at point count survey stations located along 57 transects in the NCCN, including Mount Rainier National Park (MORA), North Cascades National Park Complex (NOCA), and Olympic National Park (OLYM). We faced a challenging year due to extremely late-lingering snow as well as some unexpected communication problems with the crew. We missed more transects than usual at MORA, the direct result of snow but exacerbated by logistics-related problems. We are implementing some procedural changes in 2012 to avoid similar problems in the future.

We detected 137 bird species in the three large parks, 94 of which were detected during one or more point counts. For 58 species (all species detected at least 22 times on annual-panel transects between 2005 and 2011), we present the total number of detections on annual-panel transects in each park during the 2005, 2006, 2007, 2008, 2009, 2010, and 2011 field seasons. We caution, however, that these detection totals have not been adjusted for differences in survey effort or potential differences in detectability of birds between years; such adjustments will be made in conjunction with our periodic trend analyses.

At San Juan Island National Historical Park (SAJH), we conducted 54 point counts, including 38 at American Camp and 16 at English Camp. Our field crew detected 71 bird species while in the park, 64 of which were detected during point counts. We present the number of detections, and the number of point counts with detections, for each species detected during point counts at SAJH.

After the overall increase in the number of birds detected in 2010 in the large parks, 2011 yielded an overall decrease in detections on annual-panel transects. This decrease was in part driven by the decline in evening grosbeak detections at NOCA, dropping from 164 detections in 2010 to 72 detections in 2011. The detection totals of evening grosbeaks in 2011 were relatively consistent with totals prior to 2010. It should also be emphasized that in 2011 we faced the heaviest snowpack since the beginning of our monitoring project in 2005. Closer analyses of the data may indicate concomitant changes in abundance and distribution of some species from previous years as a result of the persistent snowpack and related factors, such as delayed plant phenology and insect activity. In addition, because there were fewer high-elevation transects surveyed at MORA in 2011 than in previous years, fewer birds were detected, which also affected our total number of detections. This was particularly notable for species that we tend to detect in greater numbers at higher elevations, such as pine siskin and dark-eyed junco. The Landbird Monitoring Project's periodic trend analyses will explicitly account for annual variation in survey effort.

Preliminary results indicate we will have robust sample sizes for many species when we conduct trend analyses, and that we are detecting substantial year-to-year changes in bird populations. These changes, when analyzed in the context of annual weather variation and perhaps other factors, should yield interesting and useful findings about the drivers of avian population

dynamics of Pacific Northwest forests, and are likely to spur additional targeted research and help refine management priorities and needs within these parks.

## Acknowledgments

We thank the 2011 crew members for their hard work and dedication to the project: J. Ajani, K. Coffman, B. Dudek, J. Love, M. McCloy, R. Niese, E. Smith, and N. VanDyken. 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. We thank S. Gremel and C. Gratten for help with field work during the season and thank S. Gremel for assistance during training. We thank P. Happe, M. Reid, and D. Sweeny, for assistance and logistical support at the respective parks, N. Antonova and K. Beirne for GIS training and support, and J. Boetch for extensive help with data management. We thank M. Tingley for computer programming support, and L. Grace for help with formatting this report to National Park Service standards. We thank M. Huff, NCCN Inventory and Monitoring Program Coordinator, for his support of the project. Lastly, we thank the ESRI Conservation Program for software support. This is Contribution No. 435 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 are 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). Additional threats also face the Pacific Northwest's migratory landbirds on their wintering grounds and along migration routes.

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 conifer forest typical of the east side of the Cascades, which hosts a somewhat distinct avifauna (Altman 2000). 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 have been completed at all five parks (Siegel et al. 2009e, Siegel et al. 2009a, Siegel et al. 2009d, Wilkerson et al. 2009a, Siegel et al. 2009c).

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 land use and land cover changes on bird populations throughout the larger Pacific Northwest region (Silsbee and Peterson 1991). These changes may result from regional activities such as land conversion and forest management, or from broader-scale processes such as global climate change. Indeed, monitoring population trends at 'control' 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, will be conducted in conjunction with periodic detailed trend analyses.

## 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 1 km of a road or trail, as well as all of SAJH (including both American Camp and English Camp) and portions of LEWI.

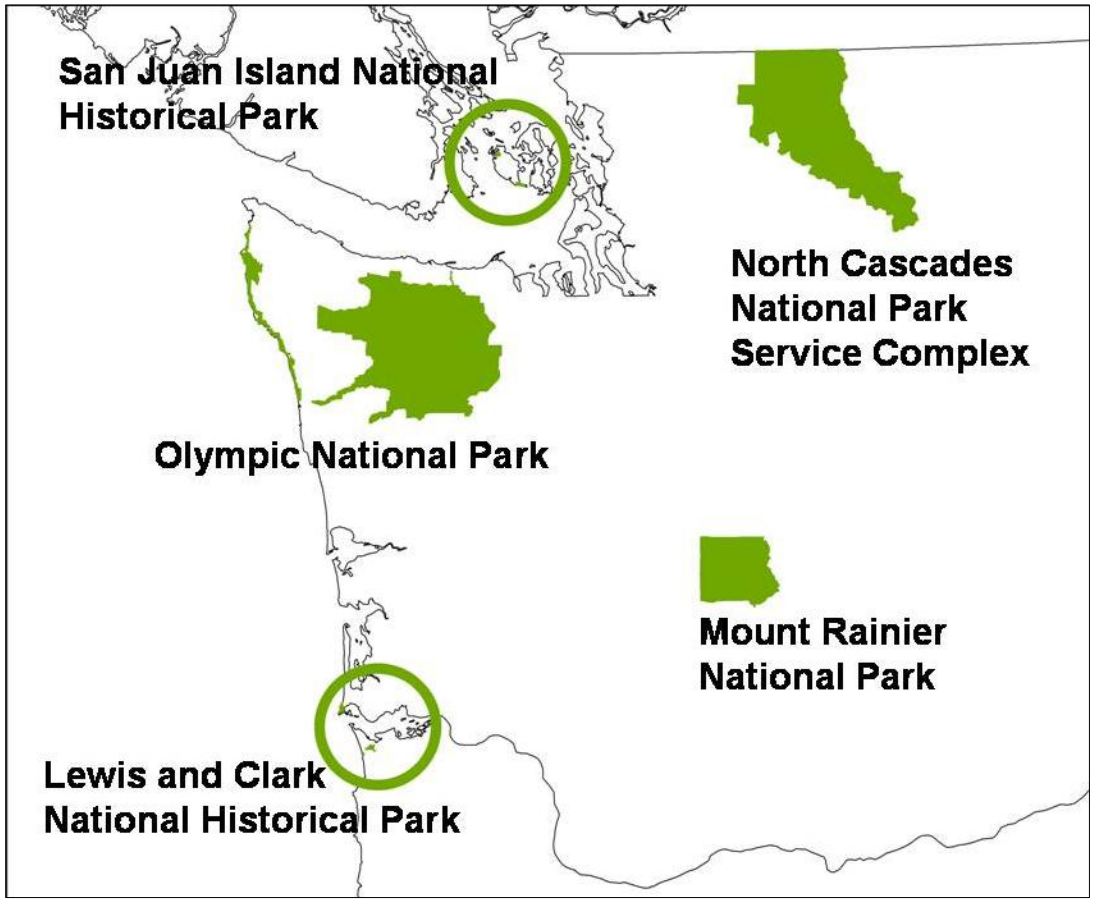


**Figure 1.** National Park Service units participating in the NCCN Landbird Monitoring Project.

# 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 8-12 points, extending perpendicularly (or as close to perpendicularly as topographic and physiographic features allow) in both directions away from the trail.

In 2011 we implemented the full study design in the three large parks for the fifth 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 the first four years of full implementation in Siegel et al. (2008), Wilkerson et al. (2009, 2010), and Holmgren et al. (2011).

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 2011 we surveyed the grid at SAJH (Figure 5).

## Crew Training and Certification

Mandy Holmgren, a Staff Biologist with The Institute for Bird Populations (IBP), served as the 2011 Field Lead. Mandy began training seven field technicians on May 1, with assistance from IBP Staff Biologist Bob Wilkerson, NPS Project Lead Bob Kuntz, and NPS Biologist Scott Gremel. Training followed guidelines described in the NCCN landbird monitoring protocol (Siegel et al. 2007). By the end of the official training session on May 20, two of the seven field technicians had passed the rigorous point count certification exam, and were ready to begin collecting data. Two weeks later one of the remaining five field technicians was also certified, and one more field technician was certified about two weeks after that. Three interns 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. All individuals who collected data during the 2011 field season (Table 1) were employees or field biologist interns of The Institute for Bird Populations or employees of the National Park Service.

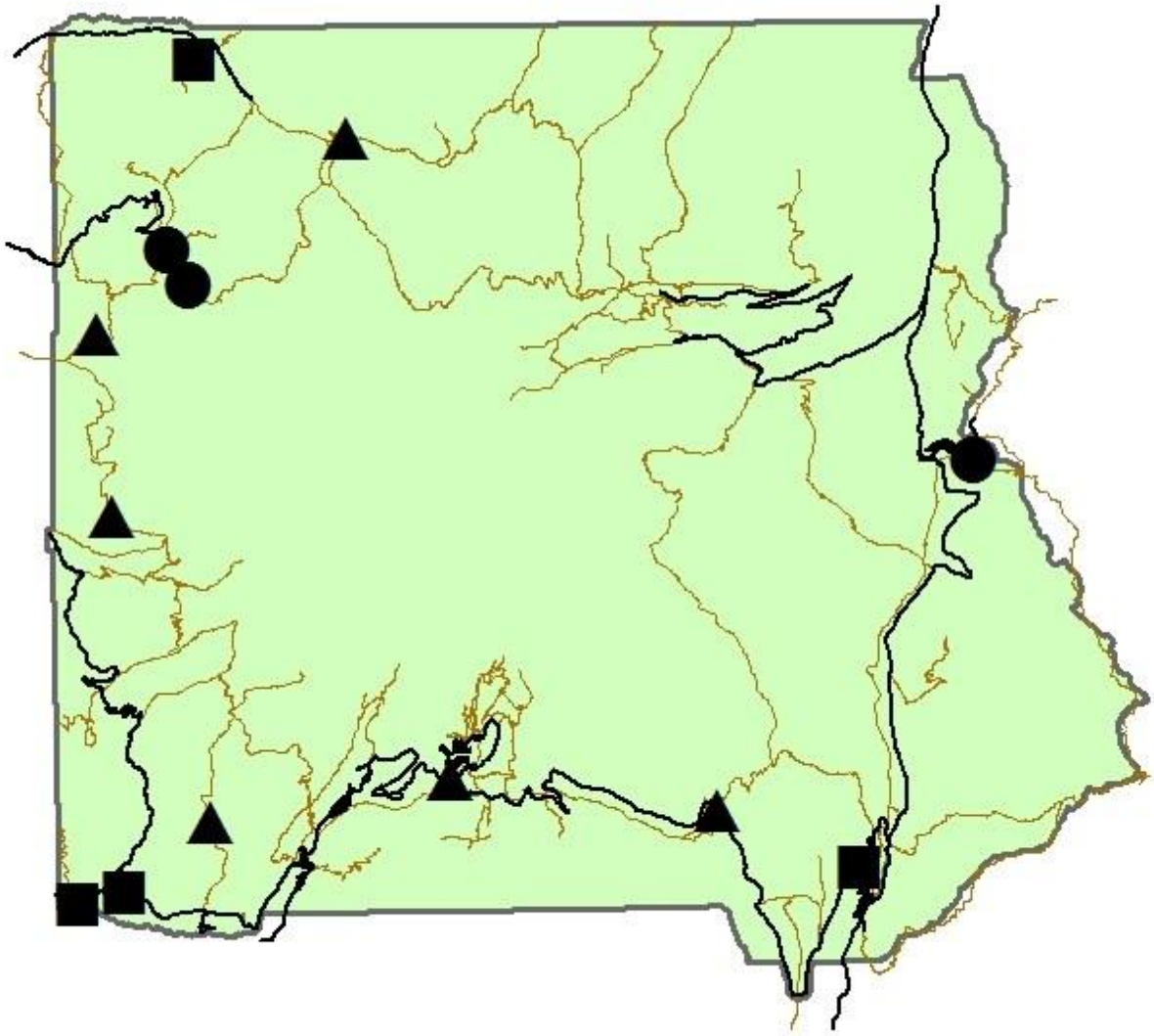

**Figure 2.** Approximate locations of transects conducted at MORA in 2011. Squares indicate low-elevation transects, triangles indicate mid-elevation transects, and circles indicate high-elevation transects. Black lines indicate roads and brown lines indicate trails.

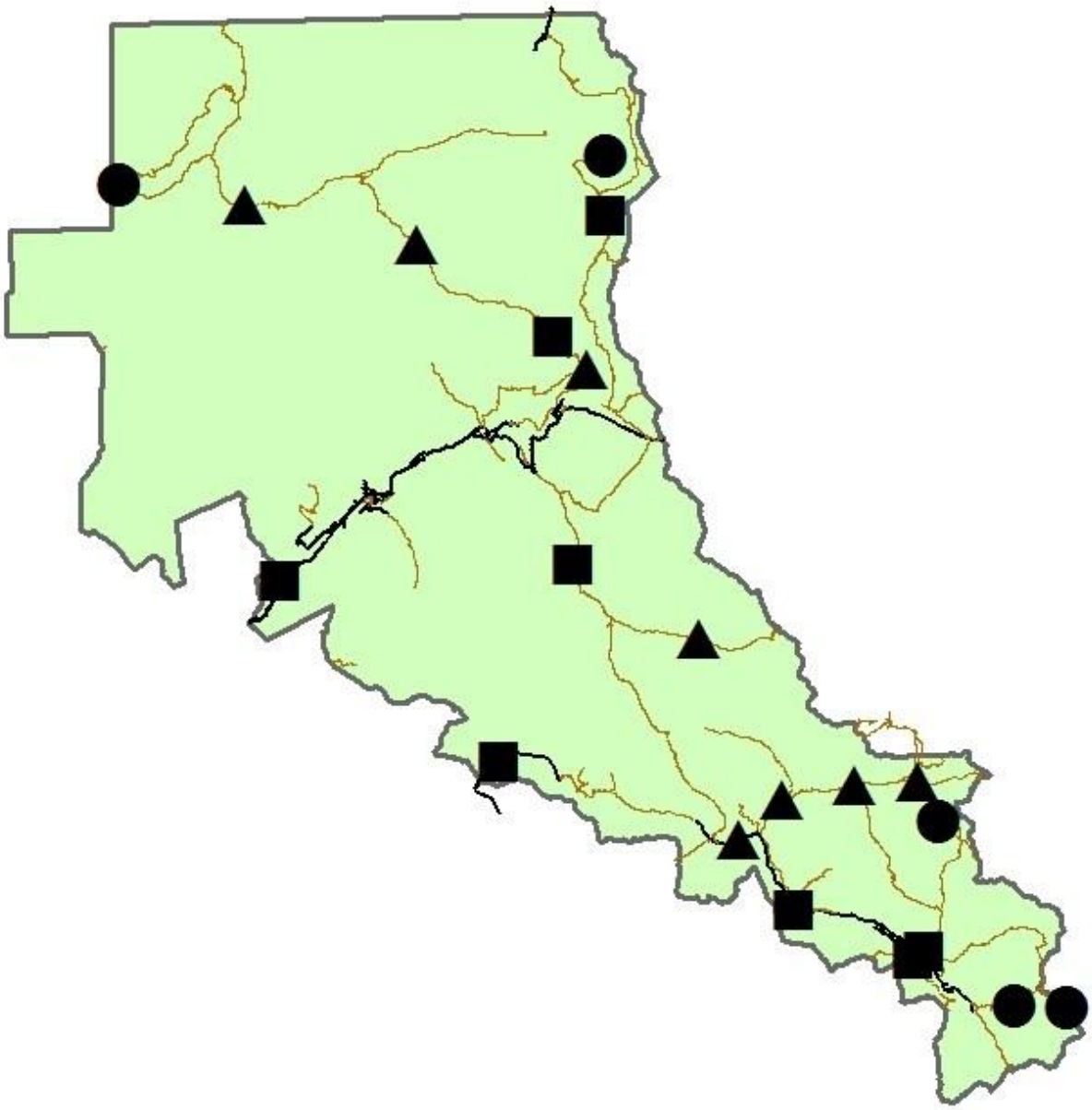

**Figure 3.** Approximate locations of transects conducted at NOCA in 2011. Squares indicate low-elevation transects, triangles indicate mid-elevation transects, and circles indicate high-elevation transects. Black lines indicate roads and brown lines indicate trails.

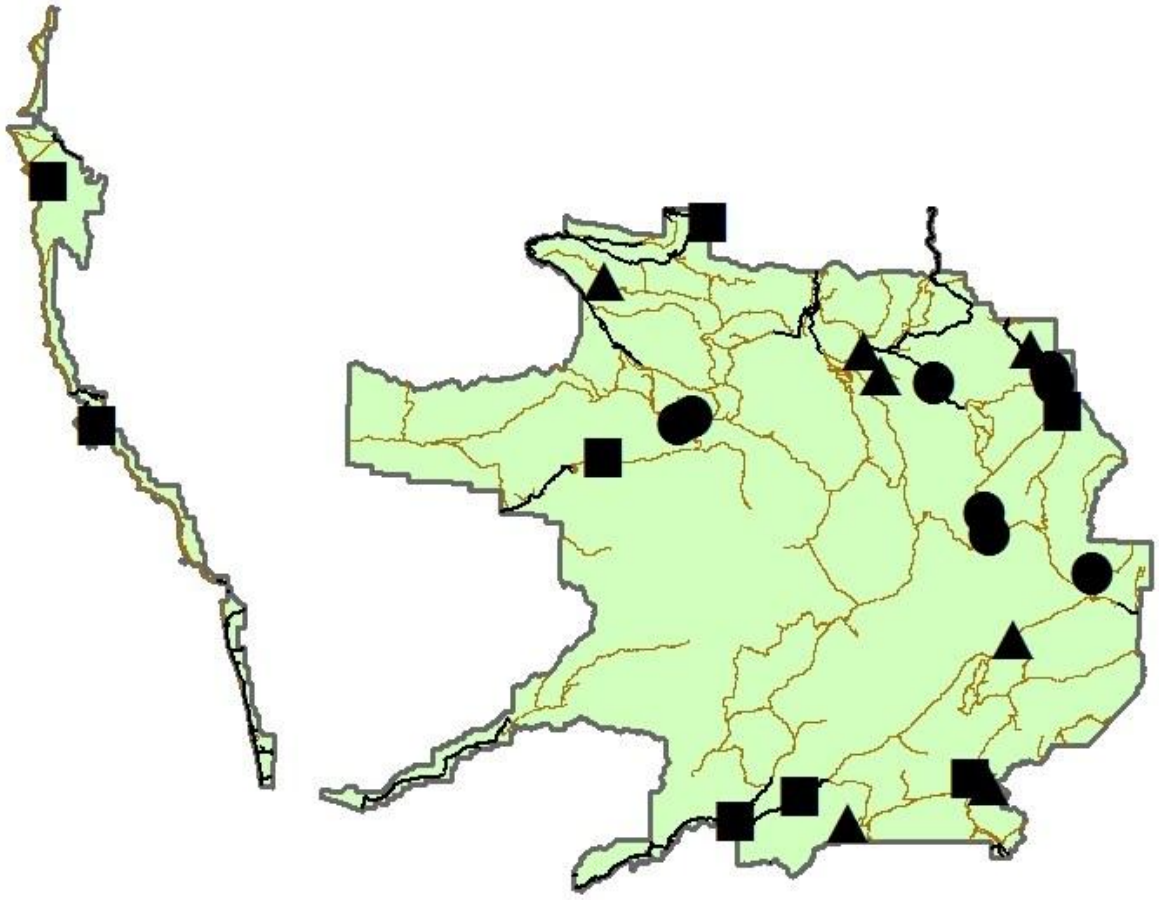

**Figure 4.** Approximate locations of transects conducted at OLYM in 2011. Squares indicate low-elevation transects, triangles indicate mid-elevation transects, and circles indicate high-elevation transects. Black lines indicate roads and brown lines indicate trails.


**Figure 5**. Locations of point count stations surveyed at SAJH in 2011.

**Table 1.** Observers who conducted point counts in the NCCN in 2011.

| Observer | Role |
|---|---|
| Jade Ajani | Technician |
| Karen Coffman | Technician |
| Ben Dudek | Technician |
| Cassidy Grattan | NPS Biological Technician |
| Scott Gremel | NPS Biologist |
| Mandy Holmgren | Field Lead |
| Jay Love | Technician |
| Mike McCloy | Technician |

## Data Collection

All point count data were collected between May 25 and May 29 at SAJH, between June 13 and July 28 at MORA, between June 3 and July 29 at NOCA, and between May 30 and July 30 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. Crew members were provided with maps and coordinates indicating the location of transect 'starting points', which lay directly on trails or roads. Crew members were also provided maps and coordinates of all point count station locations on the already-established annual panel, as well as narrative descriptions of point count stations and the travel routes between successive stations. 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.

When surveying transects on the annual panel, crew members used the maps and narrative descriptions to locate the same point count stations that were established and surveyed in previous years. When surveying transects on the alternating panel, crew members began from the indicated starting points, and then established transect routes according to the guidelines in Siegel et al. (2007).

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 broken into three time intervals (0-3:00, 3:01-5:00, and 5:01-7:00). 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. In previous years we used point count with durations of only five minutes broken into two time intervals (0-3:00, 3:01-5:00), but in 2011 we added the third time interval to make the data more useful for possible future analyses in an occupancy modeling framework.

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.

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 Entry and Validation

Our protocol requires crews working at each large park to enter their own data into the NCCN Landbird Monitoring Project's Microsoft Access database throughout the field season. The crew worked three additional days at the end of the field season to continue entering and verifying data. The remaining data were entered and verified by the Field Lead 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. While entering the data, the data entry person visually reviewed her or his work to ensure that the data on the screen matched the field form. When all the data were entered, we inspected the database for incompleteness and errors, and used the built-in Quality Assurance Tools to check for logical inconsistencies and data outliers. Any errors or data omissions were then corrected.

## 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 will be assessed quantitatively, allowing for annual results to be adjusted to account for variable detectability (Buckland et al. 2001, Nichols et al. 2009). Until that analysis is completed, any results should be viewed as provisional only.

# Results

We surveyed 28 of the 34 annual-panel transects in the large parks, and 29 of the 34 transects in the fifth alternating panel (Table 2), for a total of 57 transects (Table 3). Appendix 1 provides a detailed multi-year survey history of all transects sampled in the large parks to date. We conducted 141 individual point counts at MORA, 299 point counts at NOCA and 331 point counts at OLYM (Table 2). We also conducted 54 point counts at SAJH. During the 771 point counts in the three large parks, we counted 6,655 individual birds. Across the three large parks, we documented the presence of 137 species (Table 4), 94 of which were detected during point counts; the remaining 43 species were recorded only as incidental detections or on "Rare Bird Report Forms".

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 36 bird species during point counts at MORA, 73 species during point counts at NOCA, and 51 species during point counts at OLYM (Table 5). Pooling detections on annual-panel transects across all species, we amassed 405 individual bird detections (6.04 detections/point) at MORA, 1,636 detections (9.46 detections/point) at NOCA, and 1,142 detections (7.23 detections per point) at OLYM (Table 5). The five most frequently detected species on the annual-panel transects in 2011 were: Pacific wren (269 detections), chestnut-backed chickadee (263 detections), dark-eyed junco (233 detections), varied thrush (231 detections), and Swainson's thrush (172 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 47 bird species during point counts at MORA, 78 species during point counts at NOCA, and 63 species during point counts at OLYM (Table 6). Considering data from all 57 surveyed transects, the five most frequently detected species were: dark-eyed junco (525 detections), Pacific wren (504 detections), chestnut-backed chickadee (485 detections), varied thrush (438 detections), and pine siskin (326 detections).

Three species of particular conservation interest—Northern Goshawk, Peregrine Falcon, and Marbled Murrelet—were detected at times other than during point counts, and were documented on "Rare Bird Report Forms". Rare Bird Reports of these species (not including point count detections, which are documented in Table 6) are summarized in Table 7.

For 58 species (all species for which we amassed at least 22 point count detections between 2005 and 2011), we present the total number of detections of each species on each park's annual panel transects during the 2005, 2006, 2007, 2008, 2009, 2010, and 2011 field seasons (Figure 6). We caution, however, that these detection totals have not been adjusted for differences in survey effort or potential differences in detectability of birds between years; such adjustments will be made in conjunction with trend analyses in our upcoming report.

At SAJH our 54 point counts yielded 1,880 detections of 64 species (Table 8), which includes 664 glaucous-winged gull detections. We are excluding this species from our average of detections per point because it is a non-landbird species that tends to occur in large flocks, which

greatly inflates the average number of bird detections per point. Without this species, the detection rate was 22.52 birds per point. The most frequently detected species (after glaucous-winged gull) was American robin (106 detections), followed by American goldfinch (85 detections), white-crowned sparrow (71 detections), savannah sparrow (60 detections), and brown-headed cowbird (59 detections).

**Table 2.** NCCN landbird monitoring transects that were surveyed or intended to be surveyed in 2011.

| Park | Panel | Elevation | Transect | No. of points surveyed |
|---|---|---|---|---|
| MORA | Ann1 | Low | 4001 | 11 |
| MORA | Ann1 | Low | 4005 | 10 |
| MORA | Ann1 | Medium | 4002 | 14 |
| MORA | Ann1 | Medium | 4004 | 10 |
| MORA | Ann1 | Medium | 4009 | 10 |
| MORA | Ann1 | Medium | 4012 | 0 |
| MORA | Ann1 | High | 4003 | 12 |
| MORA | Ann1 | High | 4007 | 0 |
| MORA | Ann1 | High | 4011 | 0 |
| MORA | Ann1 | High | 4014 | 0 |
| MORA | Alt6 | Low | 4031 | 10 |
| MORA | Alt6 | Low | 4034 | 10 |
| MORA | Alt6 | Medium | 4077 | 12 |
| MORA | Alt6 | Medium | 4078 | 9 |
| MORA | Alt6 | Medium | 4081 | 10 |
| MORA | Alt6 | Medium | 4084 | 0 |
| MORA | Alt6 | High | 4058 | 0 |
| MORA | Alt6 | High | 4062 | 0 |
| MORA | Alt6 | High | 4064 | 10 |
| MORA | Alt6 | High | 4067 | 13 |
| | | | | |
| NOCA | Ann1 | Low | 1013 | 13 |
| NOCA | Ann1 | Low | 1017 | 13 |
| NOCA | Ann1 | Low | 1020 | 16 |
| NOCA | Ann1 | Low | 1023 | 21 |
| NOCA | Ann1 | Medium | 1015 | 17 |
| NOCA | Ann1 | Medium | 1018 | 25 |
| NOCA | Ann1 | Medium | 1022 | 14 |
| NOCA | Ann1 | Medium | 1024 | 10 |
| NOCA | Ann1 | High | 1014 | 0 |
| NOCA | Ann1 | High | 1016 | 15 |
| NOCA | Ann1 | High | 1019 | 12 |
| NOCA | Ann1 | High | 1021 | 17 |
| NOCA | Alt6 | Low | 1068 | 13 |
| NOCA | Alt6 | Low | 1070 | 12 |
| NOCA | Alt6 | Low | 1074 | 14 |
| NOCA | Alt6 | Low | 1075 | 11 |
| NOCA | Alt6 | Medium | 1047 | 13 |
| NOCA | Alt6 | Medium | 1051 | 11 |
| NOCA | Alt6 | Medium | 1053 | 13 |
| NOCA | Alt6 | Medium | 1056 | 13 |

**Table 2**. NCCN landbird monitoring transects that were surveyed or intended to be surveyed in 2011 (continued).

| Park | Panel | Elevation | Transect | No. of points surveyed |
|---|---|---|---|---|
| NOCA | Alt6 | High | 1072 | 0 |
| NOCA | Alt6 | High | 1088 | 12 |
| NOCA | Alt6 | High | 1090 | 0 |
| NOCA | Alt6 | High | 1092 | 14 |
| | | | | |
| OLYM | Ann1 | Low | 3001 | 12 |
| OLYM | Ann1 | Low | 3121 | 17 |
| OLYM | Ann1 | Low | 3126 | 15 |
| OLYM | Ann1 | Low | 3134 | 19 |
| OLYM | Ann1 | Medium | 3122 | 0 |
| OLYM | Ann1 | Medium | 3123 | 15 |
| OLYM | Ann1 | Medium | 3130 | 9 |
| OLYM | Ann1 | Medium | 3200 | 22 |
| OLYM | Ann1 | High | 3124 | 11 |
| OLYM | Ann1 | High | 3125 | 11 |
| OLYM | Ann1 | High | 3127 | 15 |
| OLYM | Ann1 | High | 3128 | 12 |
| OLYM | Alt6 | Low | 3172 | 14 |
| OLYM | Alt6 | Low | 3177 | 10 |
| OLYM | Alt6 | Low | 3181 | 16 |
| OLYM | Alt6 | Low | 3182 | 16 |
| OLYM | Alt6 | Medium | 3187 | 20 |
| OLYM | Alt6 | Medium | 3190 | 14 |
| OLYM | Alt6 | Medium | 3195 | 12 |
| OLYM | Alt6 | Medium | 3198 | 11 |
| OLYM | Alt6 | High | 3189 | 16 |
| OLYM | Alt6 | High | 3191 | 15 |
| OLYM | Alt6 | High | 3192 | 14 |
| OLYM | Alt6 | High | 3196 | 15 |

**Table 3.** Summary history of NCCN landbird monitoring transects completed through 2011.

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

[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.

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

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

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

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

**Table 4**. All species recorded in the three large NCCN parks during the 2011 field season, including the pre-season training session. Asterisks indicate species that were detected only at times other than during point counts.

| Common Name | Scientific Name |
|---|---|
| Canada Goose | *Branta canadensis* |
| Wood Duck * | *Aix sponsa* |
| American Wigeon * | *Anas americana* |
| Mallard | *Anas platyrhynchos* |
| Northern Shoveler * | *Anas clypeata* |
| Green-winged Teal * | *Anas crecca* |
| Ring-necked Duck * | *Aythya collaris* |
| Lesser Scaup * | *Aythya affinis* |
| Harlequin Duck * | *Histrionicus histrionicus* |
| Surf Scoter * | *Melanitta perspicillata* |
| White-winged Scoter * | *Melanitta fusca* |
| Bufflehead * | *Bucephala albeola* |
| Barrow's Goldeneye | *Bucephala islandica* |
| Hooded Merganser * | *Lophodytes cucullatus* |
| Common Merganser * | *Mergus merganser* |
| Ruffed Grouse | *Bonasa umbellus* |
| White-tailed Ptarmigan * | *Lagopus leucura* |
| Sooty Grouse | *Dendragapus fuliginosus* |
| Common Loon * | *Gavia immer* |
| Pied-billed Grebe * | *Podilymbus podiceps* |
| Great Blue Heron * | *Ardea herodias* |
| Turkey Vulture * | *Cathartes aura* |
| Osprey | *Pandion haliaetus* |
| Bald Eagle | *Haliaeetus leucocephalus* |
| Sharp-shinned Hawk * | *Accipiter striatus* |
| Northern Goshawk * | *Accipiter gentilis* |
| Swainson's Hawk * | *Buteo swainsoni* |
| Red-tailed Hawk | *Buteo jamaicensis* |
| Merlin | *Falco columbarius* |
| Peregrine Falcon * | *Falco peregrinus* |
| Killdeer * | *Charadrius vociferus* |
| Spotted Sandpiper | *Actitis macularius* |
| Greater Yellowlegs * | *Tringa melanoleuca* |
| Glaucous-winged Gull * | *Larus glaucescens* |
| Marbled Murrelet | *Brachyramphus marmoratus* |
| Band-tailed Pigeon | *Patagioenas fasciata* |
| Eurasian Collared-dove * | *Streptopelia decaocto* |
| Mourning Dove * | *Zenaida macroura* |
| Western Screech-Owl | *Megascops kennicottii* |
| Northern Pygmy-Owl | *Glaucidium gnoma* |
| Barred Owl | *Strix varia* |
| Common Nighthawk | *Chordeiles minor* |
| Black Swift * | *Cypseloides niger* |
| Vaux's Swift | *Chaetura vauxi* |
| Calliope Hummingbird | *Stellula calliope* |
| Rufous Hummingbird | *Selasphorus rufus* |

**Table 4**. All species recorded in the three large NCCN parks during the 2011 field season, including the pre-season training session. Asterisks indicate species that were detected only at times other than during point counts (continued).

| Common Name | Scientific Name |
|---|---|
| Belted Kingfisher | *Megaceryle alcyon* |
| Williamson's Sapsucker | *Sphyrapicus thyroideus* |
| 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* |
| Olive-sided Flycatcher | *Contopus cooperi* |
| Western Wood-Pewee | *Contopus sordidulus* |
| Willow Flycatcher | *Empidonax traillii* |
| Hammond's Flycatcher | *Empidonax hammondii* |
| Dusky Flycatcher | *Empidonax oberholseri* |
| Pacific-slope Flycatcher | *Empidonax difficilis* |
| Say's Phoebe | *Sayornis saya* |
| Cassin's Vireo | *Vireo cassinii* |
| Hutton's Vireo | *Vireo huttoni* |
| 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* |
| 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* |
| Red-breasted Nuthatch | *Sitta canadensis* |
| White-breasted Nuthatch | *Sitta carolinensis* |
| Brown Creeper | *Certhia americana* |
| 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* |
| Mountain Bluebird * | *Sialia currucoides* |

**Table 4**. All species recorded in the three large NCCN parks during the 2011 field season, including the pre-season training session. Asterisks indicate species that were detected only at times other than during point counts (continued).

| Common Name | Scientific Name |
|---|---|
| Townsend's Solitaire | *Myadestes townsendi* |
| 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* |
| American Pipit | *Anthus rubescens* |
| Cedar Waxwing | *Bombycilla cedrorum* |
| Orange-crowned Warbler | *Oreothlypis celata* |
| Nashville Warbler | *Oreothlypis ruficapilla* |
| Yellow Warbler | *Setophaga petechia* |
| Yellow-rumped Warbler | *Setophaga coronata* |
| Black-throated Gray Warbler | *Setophaga nigrescens* |
| Townsend's Warbler | *Setophaga townsendi* |
| Hermit Warbler * | *Setophaga occidentalis* |
| American Redstart * | *Setophaga ruticilla* |
| MacGillivray's Warbler | *Geothlypis tolmiei* |
| Common Yellowthroat | *Geothlypis trichas* |
| Wilson's Warbler | *Cardellina pusilla* |
| Spotted Towhee | *Pipilo maculatus* |
| Chipping Sparrow | *Spizella passerina* |
| Vesper Sparrow * | *Pooecetes gramineus* |
| 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* |
| 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* |
| Gray-crowned Rosy-Finch | *Leucosticte tephrocotis* |
| Pine Grosbeak | *Pinicola enucleator* |
| Purple Finch | *Carpodacus purpureus* |
| Cassin's Finch | *Carpodacus cassinii* |
| Red Crossbill | *Loxia curvirostra* |
| Pine Siskin | *Spinus pinus* |
| American Goldfinch * | *Spinus tristis* |
| Evening Grosbeak | *Coccothraustes vespertinus* |

**Table 5.** Number of transects with detections and number of individual detections for each species detected during point counts on annual-panel transects in the three large NCCN parks in 2011.

| | Number of transects with detections | | | | Number of individual detections | | | |
|---|---|---|---|---|---|---|---|---|
| **Species** | **MORA** | **NOCA** | **OLYM** | **ALL** | **MORA** | **NOCA** | **OLYM** | **ALL** |
| Canada Goose | | 1 | | 1 | | 1 | | 1 |
| Ruffed Grouse | 1 | 1 | | 2 | 1 | 3 | | 4 |
| Sooty Grouse | 1 | 3 | 4 | 8 | 1 | 7 | 6 | 14 |
| Osprey | | 1 | | 1 | | 1 | | 1 |
| Bald Eagle | | | 1 | 1 | | | 1 | 1 |
| Merlin | 1 | | | 1 | 1 | | | 1 |
| Spotted Sandpiper | | 1 | 1 | 2 | | 2 | 1 | 3 |
| Marbled Murrelet | | | 1 | 1 | | | 4 | 4 |
| Band-tailed Pigeon | | | 2 | 2 | | | 7 | 7 |
| Barred Owl | 1 | | | 1 | 1 | | | 1 |
| Common Nighthawk | | 1 | | 1 | | 1 | | 1 |
| Vaux's Swift | 3 | 2 | 2 | 7 | 6 | 6 | 11 | 23 |
| Calliope Hummingbird | | 2 | | 2 | | 2 | | 2 |
| Rufous Hummingbird | 2 | 8 | 7 | 17 | 2 | 17 | 12 | 31 |
| Belted Kingfisher | | | 1 | 1 | | | 1 | 1 |
| Red-naped Sapsucker | | 1 | | 1 | | 1 | | 1 |
| Red-breasted Sapsucker | | 4 | 1 | 5 | | 13 | 1 | 14 |
| Downy Woodpecker | | 1 | 1 | 2 | | 1 | 1 | 2 |
| Hairy Woodpecker | 2 | 3 | 6 | 11 | 2 | 6 | 11 | 19 |
| American Three-toed Woodpecker | | 1 | | 1 | | 1 | | 1 |
| Northern Flicker | | 3 | 6 | 9 | | 6 | 8 | 14 |
| Pileated Woodpecker | | 2 | 1 | 3 | | 2 | 3 | 5 |
| Olive-sided Flycatcher | 1 | 4 | 5 | 10 | 1 | 15 | 15 | 31 |
| Western Wood-Pewee | | 4 | 1 | 5 | | 17 | 3 | 20 |
| Willow Flycatcher | 1 | 1 | | 2 | 1 | 2 | | 3 |
| Hammond's Flycatcher | 1 | 8 | 6 | 15 | 6 | 50 | 17 | 73 |
| Dusky Flycatcher | | 1 | | 1 | | 2 | | 2 |

**Table 5.** Number of transects with detections and number of individual detections for each species detected during point counts on annual-panel transects in the three large NCCN parks in 2011 (continued).

| | Number of transects with detections | | | | Number of individual detections | | | |
|---|---|---|---|---|---|---|---|---|
| **Species** | **MORA** | **NOCA** | **OLYM** | **ALL** | **MORA** | **NOCA** | **OLYM** | **ALL** |
| Pacific-slope Flycatcher | 4 | 4 | 9 | 17 | 16 | 14 | 95 | 125 |
| Say's Phoebe | | 1 | | 1 | | 1 | | 1 |
| Cassin's Vireo | | 5 | | 5 | | 16 | | 16 |
| Hutton's Vireo | | | 1 | 1 | | | 1 | 1 |
| Warbling Vireo | 2 | 7 | 2 | 11 | 3 | 52 | 9 | 64 |
| Red-eyed Vireo | | 2 | | 2 | | 5 | | 5 |
| Gray Jay | 2 | 2 | 5 | 9 | 7 | 2 | 11 | 20 |
| Steller's Jay | 4 | 2 | 3 | 9 | 5 | 4 | 17 | 26 |
| Clark's Nutcracker | | 2 | | 2 | | 4 | | 4 |
| American Crow | | 1 | 1 | 2 | | 1 | 2 | 3 |
| Common Raven | 1 | 2 | 1 | 4 | 1 | 2 | 1 | 4 |
| Tree Swallow | | | 1 | 1 | | | 1 | 1 |
| Violet-green Swallow | | 1 | | 1 | | 5 | | 5 |
| Mountain Chickadee | | 3 | | 3 | | 22 | | 22 |
| Chestnut-backed Chickadee | 6 | 8 | 11 | 25 | 64 | 111 | 88 | 263 |
| Red-breasted Nuthatch | 5 | 8 | 5 | 18 | 18 | 43 | 25 | 86 |
| Brown Creeper | 5 | 6 | 9 | 20 | 20 | 22 | 25 | 67 |
| Canyon Wren | | 1 | | 1 | | 1 | | 1 |
| House Wren | | 1 | | 1 | | 1 | | 1 |
| Pacific Wren | 6 | 7 | 10 | 23 | 59 | 81 | 129 | 269 |
| American Dipper | 1 | | 3 | 4 | 1 | | 5 | 6 |
| Golden-crowned Kinglet | 6 | 7 | 11 | 24 | 28 | 43 | 51 | 122 |
| Ruby-crowned Kinglet | | 2 | 2 | 4 | | 3 | 2 | 5 |
| Townsend's Solitaire | 1 | 3 | 2 | 6 | 1 | 3 | 3 | 7 |
| Veery | | 1 | | 1 | | 2 | | 2 |
| Swainson's Thrush | 4 | 9 | 4 | 17 | 9 | 138 | 25 | 172 |

**Table 5.** Number of transects with detections and number of individual detections for each species detected during point counts on annual-panel transects in the three large NCCN parks in 2011 (continued).

| | Number of transects with detections | | | | Number of individual detections | | | |
|---|---|---|---|---|---|---|---|---|
| **Species** | **MORA** | **NOCA** | **OLYM** | **ALL** | **MORA** | **NOCA** | **OLYM** | **ALL** |
| Hermit Thrush | 3 | 6 | 5 | 14 | 6 | 30 | 33 | 69 |
| American Robin | 4 | 8 | 9 | 21 | 10 | 70 | 77 | 157 |
| Varied Thrush | 5 | 7 | 11 | 23 | 55 | 81 | 95 | 231 |
| American Pipit | | | 2 | 2 | | | 7 | 7 |
| Cedar Waxwing | | 2 | | 2 | | 12 | | 12 |
| Orange-crowned Warbler | | 2 | 1 | 3 | | 2 | 1 | 3 |
| Nashville Warbler | | 4 | | 4 | | 10 | | 10 |
| Yellow Warbler | | 5 | 1 | 6 | | 69 | 1 | 70 |
| Yellow-rumped Warbler | 1 | 8 | | 9 | 1 | 88 | | 89 |
| Black-throated Gray Warbler | 1 | 1 | 2 | 4 | 1 | 2 | 8 | 11 |
| Townsend's Warbler | 5 | 8 | 3 | 16 | 32 | 89 | 11 | 132 |
| MacGillivray's Warbler | | 7 | 1 | 8 | | 37 | 1 | 38 |
| Wilson's Warbler | 1 | 3 | 4 | 8 | 2 | 14 | 24 | 40 |
| Spotted Towhee | | 3 | | 3 | | 5 | | 5 |
| Chipping Sparrow | | 6 | | 6 | | 22 | | 22 |
| Fox Sparrow | | 2 | | 2 | | 4 | | 4 |
| Song Sparrow | 1 | 4 | 2 | 7 | 3 | 10 | 2 | 15 |
| White-crowned Sparrow | | 1 | 1 | 2 | | 1 | 4 | 5 |
| Dark-eyed Junco | 6 | 10 | 11 | 27 | 25 | 94 | 114 | 233 |
| Western Tanager | 2 | 10 | 3 | 15 | 3 | 83 | 9 | 95 |
| Black-headed Grosbeak | 1 | 6 | | 7 | 1 | 15 | | 16 |
| Lazuli Bunting | | 1 | | 1 | | 1 | | 1 |
| Brown-headed Cowbird | | 4 | | 4 | | 21 | | 21 |
| Gray-crowned Rosy-Finch | | 1 | | 1 | | 1 | | 1 |
| Pine Grosbeak | | 1 | 2 | 3 | | 2 | 5 | 7 |
| Purple Finch | | 1 | | 1 | | 3 | | 3 |

**Table 5**. Number of transects with detections and number of individual detections for each species detected during point counts on annual-panel transects in the three large NCCN parks in 2011 (continued).

| | Number of transects with detections | | | | Number of individual detections | | | |
|---|---|---|---|---|---|---|---|---|
| **Species** | **MORA** | **NOCA** | **OLYM** | **ALL** | **MORA** | **NOCA** | **OLYM** | **ALL** |
| Cassin's Finch | | 2 | | 2 | | 16 | | 16 |
| Red Crossbill | | 1 | 8 | 9 | | 2 | 88 | 90 |
| Pine Siskin | 3 | 7 | 7 | 17 | 9 | 48 | 64 | 121 |
| Evening Grosbeak | 2 | 8 | 3 | 13 | 3 | 72 | 6 | 81 |
| All species pooled | | | | | 405 | 1,636 | 1,142 | 3,183 |
| Detections per point (all species pooled) | | | | | 6.04 | 9.46 | 7.23 | 8.00 |

**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) in the three large NCCN parks in 2011.

| | Number of transects with detections | | | | Number of individual detections | | | |
|---|---|---|---|---|---|---|---|---|
| **Species** | **MORA** | **NOCA** | **OLYM** | **ALL** | **MORA** | **NOCA** | **OLYM** | **ALL** |
| Canada Goose | | 2 | | 2 | | 5 | | 5 |
| Mallard | | | 1 | 1 | | | 3 | 3 |
| Barrow's Goldeneye | | | 1 | 1 | | | 1 | 1 |
| Ruffed Grouse | 1 | 1 | | 2 | 1 | 3 | | 4 |
| Sooty Grouse | 4 | 7 | 9 | 20 | 4 | 14 | 15 | 33 |
| Osprey | | 1 | | 1 | | 1 | | 1 |
| Bald Eagle | | | 3 | 3 | | | 3 | 3 |
| Red-tailed Hawk | 1 | | | 1 | 1 | | | 1 |
| Merlin | 1 | | | 1 | 1 | | | 1 |
| Spotted Sandpiper | | 1 | 1 | 2 | | 2 | 1 | 3 |
| Marbled Murrelet | 1 | | 4 | 5 | 1 | | 9 | 10 |
| Band-tailed Pigeon | 1 | | 5 | 6 | 3 | | 16 | 19 |
| Western Screech-Owl | | | 1 | 1 | | | 1 | 1 |
| Northern Pygmy-Owl | | 1 | | 1 | | 1 | | 1 |
| Barred Owl | 1 | 1 | | 2 | 1 | 1 | | 2 |
| Common Nighthawk | | 1 | | 1 | | 1 | | 1 |
| Vaux's Swift | 5 | 3 | 3 | 11 | 12 | 7 | 12 | 31 |
| Calliope Hummingbird | | 5 | | 5 | | 7 | | 7 |
| Rufous Hummingbird | 4 | 11 | 11 | 26 | 5 | 25 | 23 | 53 |
| Belted Kingfisher | | | 2 | 2 | | | 3 | 3 |
| Williamson's Sapsucker | | 1 | | 1 | | 1 | | 1 |
| Red-naped Sapsucker | | 1 | | 1 | | 1 | | 1 |
| Red-breasted Sapsucker | | 5 | 2 | 7 | | 15 | 5 | 20 |
| Downy Woodpecker | | 1 | 1 | 2 | | 1 | 1 | 2 |
| Hairy Woodpecker | 5 | 8 | 9 | 22 | 5 | 19 | 20 | 44 |
| American Three-toed Woodpecker | 1 | 3 | | 4 | 1 | 3 | | 4 |
| Black-backed Woodpecker | | 1 | | 1 | | 1 | | 1 |

**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) in the three large NCCN parks in 2011 (continued).

| | Number of transects with detections | | | | Number of individual detections | | | |
|---|---|---|---|---|---|---|---|---|
| **Species** | **MORA** | **NOCA** | **OLYM** | **ALL** | **MORA** | **NOCA** | **OLYM** | **ALL** |
| Northern Flicker | | 5 | 11 | 16 | | 10 | 18 | 28 |
| Pileated Woodpecker | 2 | 2 | 2 | 6 | 2 | 2 | 6 | 10 |
| Olive-sided Flycatcher | 4 | 6 | 11 | 21 | 7 | 21 | 24 | 52 |
| Western Wood-Pewee | | 8 | 1 | 9 | | 32 | 3 | 35 |
| Willow Flycatcher | 1 | 1 | | 2 | 1 | 2 | | 3 |
| Hammond's Flycatcher | 2 | 14 | 12 | 28 | 10 | 79 | 42 | 131 |
| Dusky Flycatcher | | 3 | | 3 | | 7 | | 7 |
| Pacific-slope Flycatcher | 9 | 10 | 18 | 37 | 35 | 21 | 186 | 242 |
| Say's Phoebe | | 1 | | 1 | | 1 | | 1 |
| Cassin's Vireo | | 10 | | 10 | | 30 | | 30 |
| Hutton’s Vireo | | | 2 | 2 | | | 2 | 2 |
| Warbling Vireo | 2 | 15 | 3 | 20 | 3 | 82 | 25 | 110 |
| Red-eyed Vireo | | 2 | | 2 | | 5 | | 5 |
| Gray Jay | 8 | 5 | 9 | 22 | 21 | 12 | 17 | 50 |
| Steller’s Jay | 7 | 4 | 6 | 17 | 12 | 7 | 31 | 50 |
| Clark’s Nutcracker | 1 | 4 | | 5 | 1 | 10 | | 11 |
| American Crow | | 1 | 3 | 4 | | 1 | 13 | 14 |
| Common Raven | 1 | 3 | 5 | 9 | 1 | 3 | 7 | 11 |
| Horned Lark | | | 1 | 1 | | | 3 | 3 |
| Tree Swallow | | | 2 | 2 | | | 3 | 3 |
| Violet-green Swallow | | 2 | 3 | 5 | | 18 | 10 | 28 |
| Northern Rough-winged Swallow | | | 1 | 1 | | | 3 | 3 |
| Mountain Chickadee | 1 | 5 | | 6 | 2 | 28 | | 30 |
| Chestnut-backed Chickadee | 12 | 17 | 21 | 50 | 118 | 191 | 176 | 485 |
| Red-breasted Nuthatch | 11 | 15 | 14 | 40 | 36 | 90 | 66 | 192 |
| White-breasted Nuthatch | | 1 | | 1 | | 5 | | 5 |

**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) in the three large NCCN parks in 2011 (continued).

| | Number of transects with detections | | | | Number of individual detections | | | |
|---|---|---|---|---|---|---|---|---|
| **Species** | **MORA** | **NOCA** | **OLYM** | **ALL** | **MORA** | **NOCA** | **OLYM** | **ALL** |
| Brown Creeper | 11 | 13 | 15 | 39 | 42 | 37 | 39 | 118 |
| Canyon Wren | | 1 | | 1 | | 1 | | 1 |
| House Wren | | 3 | | 3 | | 7 | | 7 |
| Winter Wren | 13 | 15 | 22 | 50 | 137 | 122 | 245 | 504 |
| American Dipper | 1 | | 3 | 4 | 1 | | 5 | 6 |
| Golden-crowned Kinglet | 12 | 16 | 23 | 51 | 56 | 94 | 126 | 276 |
| Ruby-crowned Kinglet | | 3 | 3 | 6 | | 4 | 3 | 7 |
| Townsend's Solitaire | 1 | 7 | 2 | 10 | 1 | 11 | 3 | 15 |
| Veery | | 1 | | 1 | | 2 | | 2 |
| Swainson's Thrush | 5 | 19 | 8 | 32 | 11 | 240 | 43 | 294 |
| Hermit Thrush | 6 | 13 | 14 | 33 | 15 | 79 | 66 | 160 |
| American Robin | 7 | 15 | 18 | 40 | 14 | 92 | 125 | 231 |
| Varied Thrush | 12 | 14 | 21 | 47 | 126 | 121 | 191 | 438 |
| American Pipit | | | 5 | 5 | | | 14 | 14 |
| Cedar Waxwing | | 2 | 1 | 3 | | 12 | 2 | 14 |
| Orange-crowned Warbler | | 2 | 3 | 5 | | 2 | 11 | 13 |
| Nashville Warbler | | 8 | | 8 | | 30 | | 30 |
| Yellow Warbler | | 10 | 1 | 11 | | 90 | 1 | 91 |
| Yellow-rumped Warbler | 2 | 17 | 3 | 22 | 4 | 192 | 9 | 205 |
| Black-throated Gray Warbler | 1 | 1 | 4 | 6 | 1 | 2 | 27 | 30 |
| Townsend's Warbler | 9 | 18 | 7 | 34 | 44 | 186 | 67 | 297 |
| MacGillivray's Warbler | 1 | 15 | 2 | 18 | 1 | 75 | 2 | 78 |
| Common Yellowthroat | | | 1 | 1 | | | 1 | 1 |
| Wilson's Warbler | 2 | 6 | 7 | 15 | 4 | 18 | 40 | 62 |
| Spotted Towhee | | 6 | 1 | 7 | | 11 | 1 | 12 |
| Chipping Sparrow | | 13 | | 13 | | 91 | | 91 |

**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) in the three large NCCN parks in 2011 (continued).

| | Number of transects with detections | | | | Number of individual detections | | | |
|---|---|---|---|---|---|---|---|---|
| **Species** | **MORA** | **NOCA** | **OLYM** | **ALL** | **MORA** | **NOCA** | **OLYM** | **ALL** |
| Fox Sparrow | 1 | 3 | | 4 | 1 | 7 | | 8 |
| Song Sparrow | 1 | 4 | 5 | 10 | 3 | 10 | 9 | 22 |
| White-crowned Sparrow | | 1 | 2 | 3 | | 1 | 7 | 8 |
| Dark-eyed Junco | 13 | 19 | 22 | 54 | 80 | 166 | 279 | 525 |
| Western Tanager | 2 | 19 | 5 | 26 | 3 | 259 | 21 | 283 |
| Black-headed Grosbeak | 1 | 11 | 2 | 14 | 1 | 34 | 6 | 41 |
| Lazuli Bunting | | 1 | | 1 | | 1 | | 1 |
| Brown-headed Cowbird | | 5 | | 5 | | 22 | | 22 |
| Gray-crowned Rosy-Finch | | 1 | 1 | 2 | | 1 | 6 | 7 |
| Pine Grosbeak | 1 | 1 | 6 | 8 | 9 | 2 | 13 | 24 |
| Purple Finch | | 1 | | 1 | | 3 | | 3 |
| Cassin's Finch | | 7 | | 7 | | 37 | | 37 |
| Red Crossbill | 5 | 7 | 18 | 30 | 44 | 18 | 240 | 302 |
| Pine Siskin | 7 | 15 | 15 | 37 | 45 | 131 | 150 | 326 |
| Evening Grosbeak | 4 | 17 | 7 | 28 | 26 | 210 | 16 | 252 |
| All species pooled | | | | | 953 | 3,186 | 2,516 | 6,655 |
| Detections per point (all species pooled) | | | | | 6.76 | 10.66 | 7.60 | 8.63 |
| Number of species detected during point counts | | | | | 47 | 78 | 63 | 94 |

**Table 7**. Species of potential management concern recorded on 'rare bird' detection forms in each park in 2011, 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** |
| Northern Goshawk | 1 | 1 | |
| Peregrine Falcon | | | 1 |
| Marbled Murrelet | | | 1 |

**Table 8**. Number of points with detections and number of individual detections for each species detected during point counts at SAJH in 2011.

| Species | Number of points with detections | Number of individual detections |
|---|---|---|
| Canada Goose | 6 | 34 |
| Surf Scoter | 2 | 2 |
| California Quail | 4 | 5 |
| Pacific Loon | 1 | 10 |
| Pelagic Cormorant | 1 | 1 |
| Bald Eagle | 11 | 15 |
| Black Oystercatcher | 1 | 4 |
| Glaucous-winged Gull | 9 | 664 |
| Common Murre | 1 | 4 |
| Pigeon Guillemot | 1 | 35 |
| Rhinoceros Auklet | 1 | 1 |
| Band-tailed Pigeon | 3 | 3 |
| Eurasian Collared-dove | 4 | 4 |
| Mourning Dove | 14 | 15 |
| Rufous Hummingbird | 10 | 11 |
| Belted Kingfisher | 1 | 1 |
| Hairy Woodpecker | 2 | 2 |
| Northern Flicker | 6 | 6 |
| Pileated Woodpecker | 6 | 6 |
| Olive-sided Flycatcher | 2 | 2 |
| Pacific-slope Flycatcher | 22 | 35 |
| Hutton's Vireo | 1 | 1 |
| Warbling Vireo | 5 | 6 |
| American Crow | 22 | 36 |
| Common Raven | 14 | 16 |
| Violet-green Swallow | 2 | 2 |
| Northern Rough-winged Swallow | 2 | 2 |
| Barn Swallow | 8 | 11 |
| Chestnut-backed Chickadee | 19 | 28 |
| Red-breasted Nuthatch | 19 | 21 |
| Brown Creeper | 12 | 12 |
| Rock Wren | 1 | 1 |
| Bewick's Wren | 4 | 4 |
| House Wren | 30 | 58 |
| Pacific Wren | 13 | 17 |
| Golden-crowned Kinglet | 9 | 11 |
| Swainson's Thrush | 18 | 22 |
| American Robin | 46 | 106 |
| Varied Thrush | 10 | 14 |

**Table 8**. Number of points with detections and number of individual detections for each species detected during point counts at SAJH in 2011 (continued).

| Species | Number of points with detections | Number of individual detections |
|---|---|---|
| European Starling | 5 | 30 |
| Orange-crowned Warbler | 33 | 47 |
| Yellow Warbler | 4 | 5 |
| Yellow-rumped Warbler | 13 | 14 |
| Black-throated Gray Warbler | 8 | 11 |
| Townsend's Warbler | 3 | 7 |
| MacGillivray's Warbler | 1 | 1 |
| Common Yellowthroat | 7 | 7 |
| Wilson's Warbler | 14 | 14 |
| Spotted Towhee | 30 | 49 |
| Chipping Sparrow | 4 | 5 |
| Vesper Sparrow | 1 | 1 |
| Savannah Sparrow | 20 | 60 |
| Song Sparrow | 20 | 31 |
| White-crowned Sparrow | 36 | 71 |
| Dark-eyed Junco | 12 | 19 |
| Western Tanager | 5 | 5 |
| Black-headed Grosbeak | 7 | 8 |
| Red-winged Blackbird | 13 | 30 |
| Brown-headed Cowbird | 36 | 59 |
| Purple Finch | 23 | 30 |
| House Finch | 20 | 34 |
| Red Crossbill | 2 | 3 |
| Pine Siskin | 18 | 26 |
| American Goldfinch | 34 | 85 |

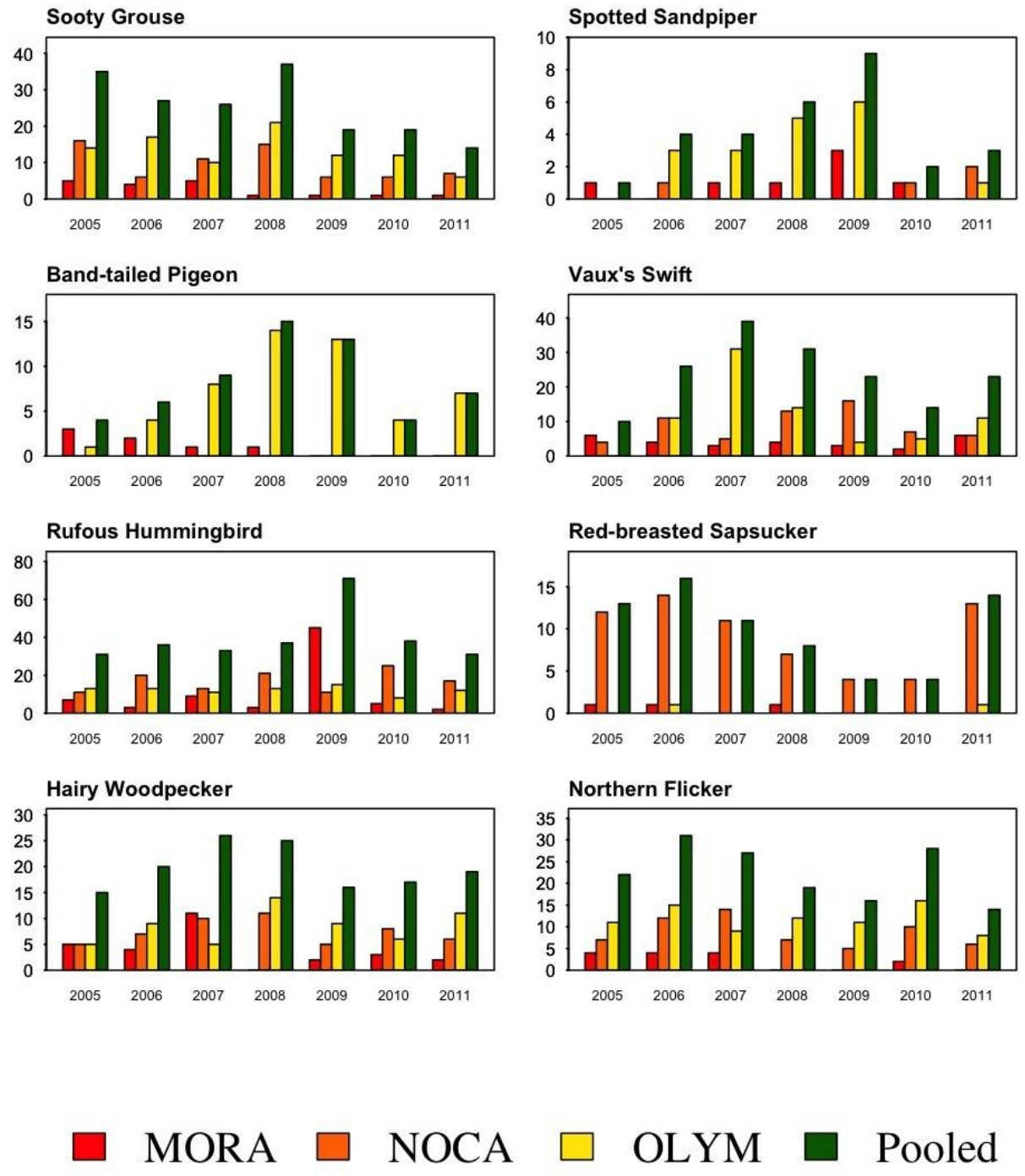


**Figure 6.** Number of times each species was detected on annual-panel transects at MORA, NOCA, OLYM, and all three parks pooled (always presented in that order) during the 2005, 2006, 2007, 2008, 2009, 2010, and 2011 field seasons. The figure includes all species for which we amassed at least 22 point count detections on annual-panel transects over the seven 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.

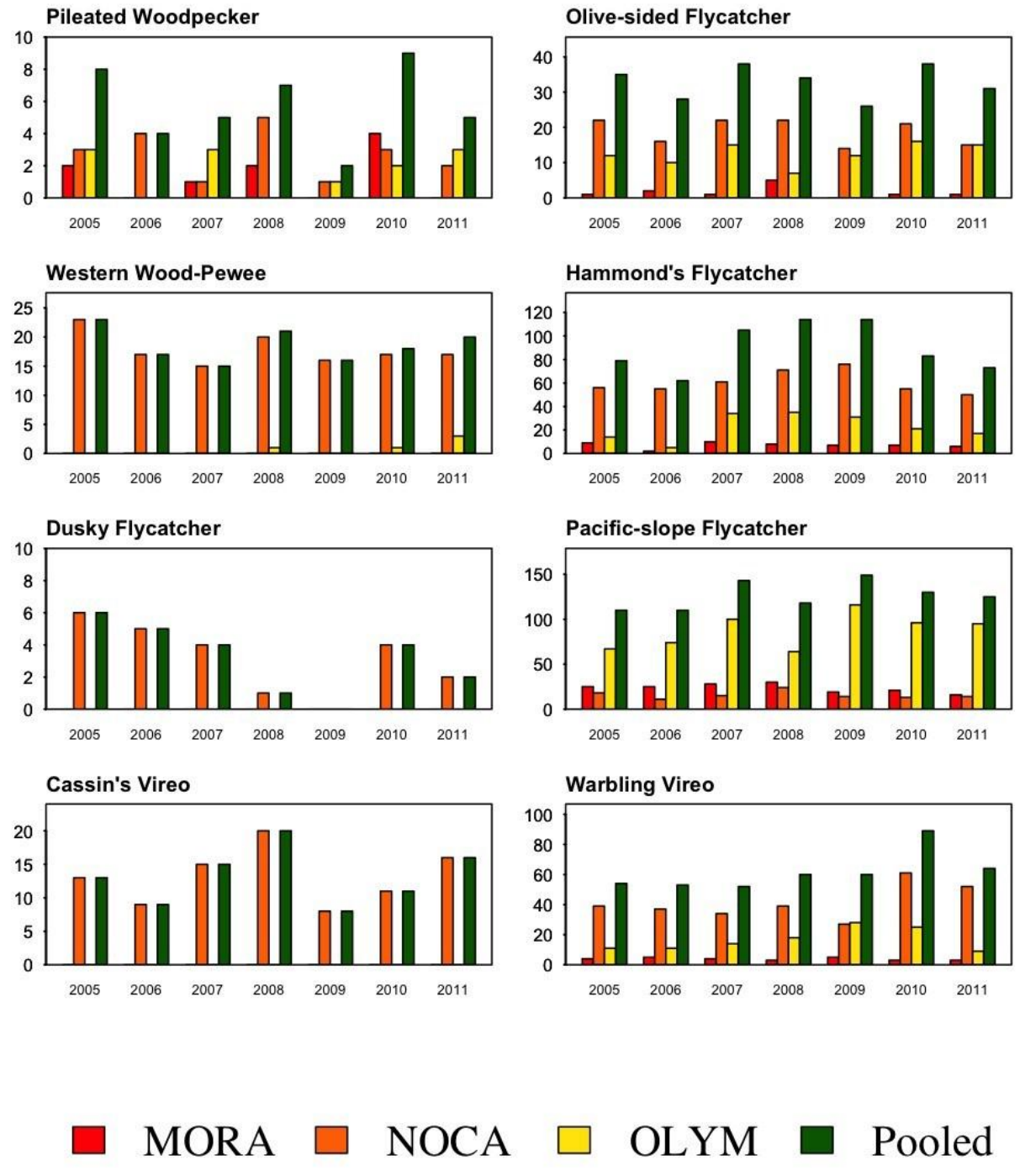


**Figure 6**. Number of times each species was detected on annual-panel transects at MORA, NOCA, OLYM, and all three parks pooled (always presented in that order) during the 2005, 2006, 2007, 2008, 2009, 2010, and 2011 field seasons. The figure includes all species for which we amassed at least 22 point count detections on annual-panel transects over the seven 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 (continued).

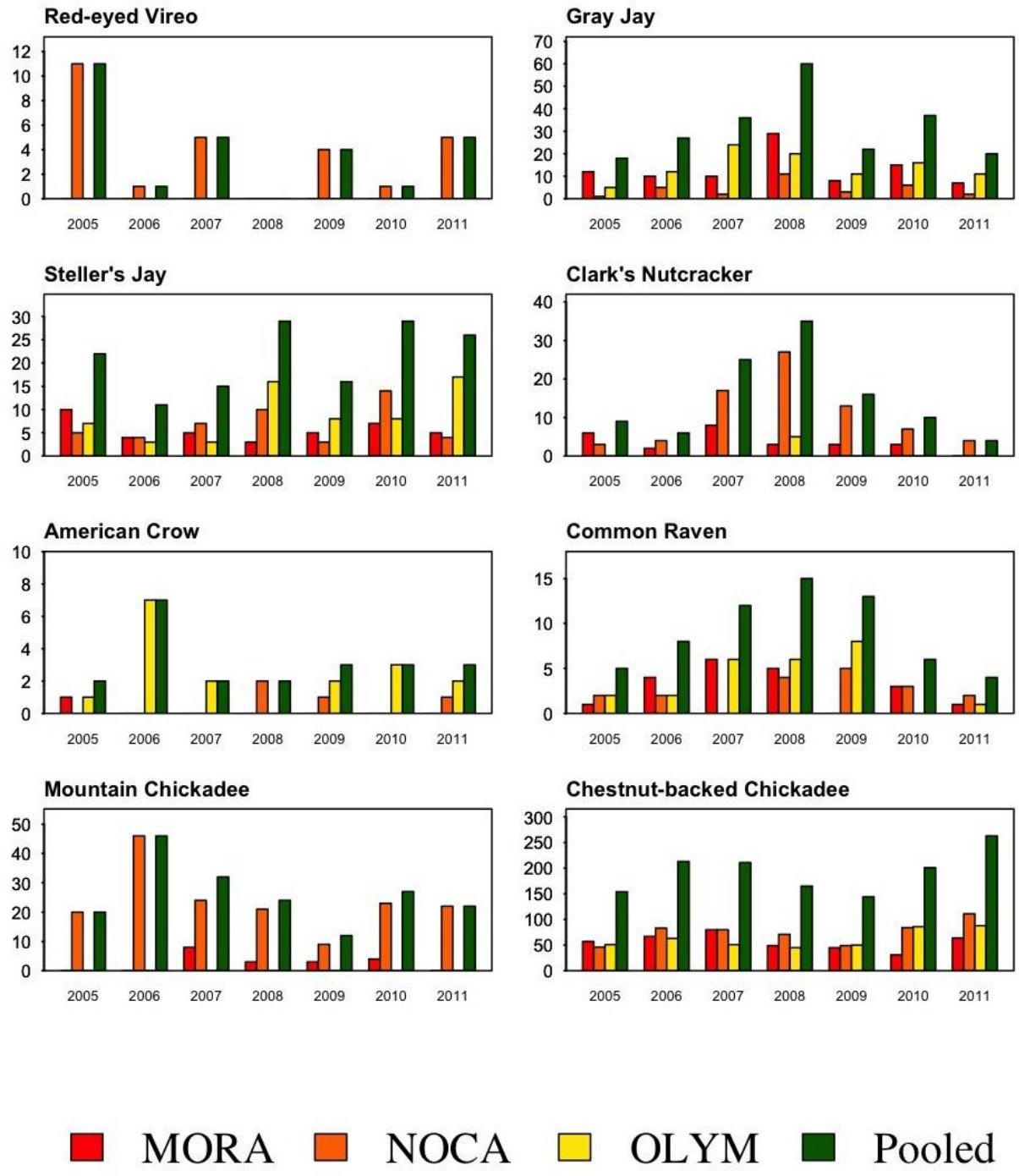


**Figure 6.** Number of times each species was detected on annual-panel transects at MORA, NOCA, OLYM, and all three parks pooled (always presented in that order) during the 2005, 2006, 2007, 2008, 2009, 2010, and 2011 field seasons. The figure includes all species for which we amassed at least 22 point count detections on annual-panel transects over the seven 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 (continued).

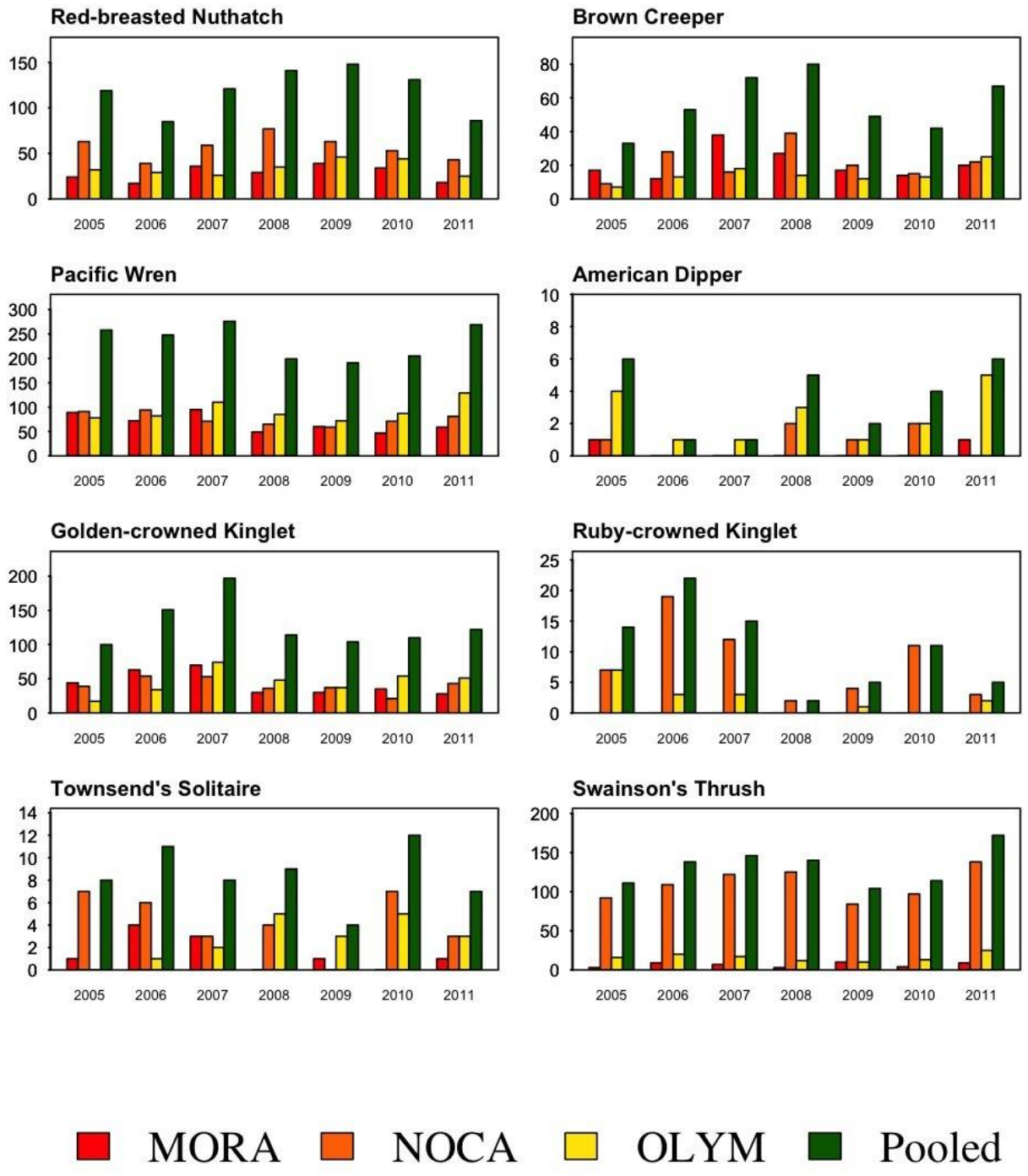


**Figure 6**. Number of times each species was detected on annual-panel transects at MORA, NOCA, OLYM, and all three parks pooled (always presented in that order) during the 2005, 2006, 2007, 2008, 2009, 2010, and 2011 field seasons. The figure includes all species for which we amassed at least 22 point count detections on annual-panel transects over the seven 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 (continued).

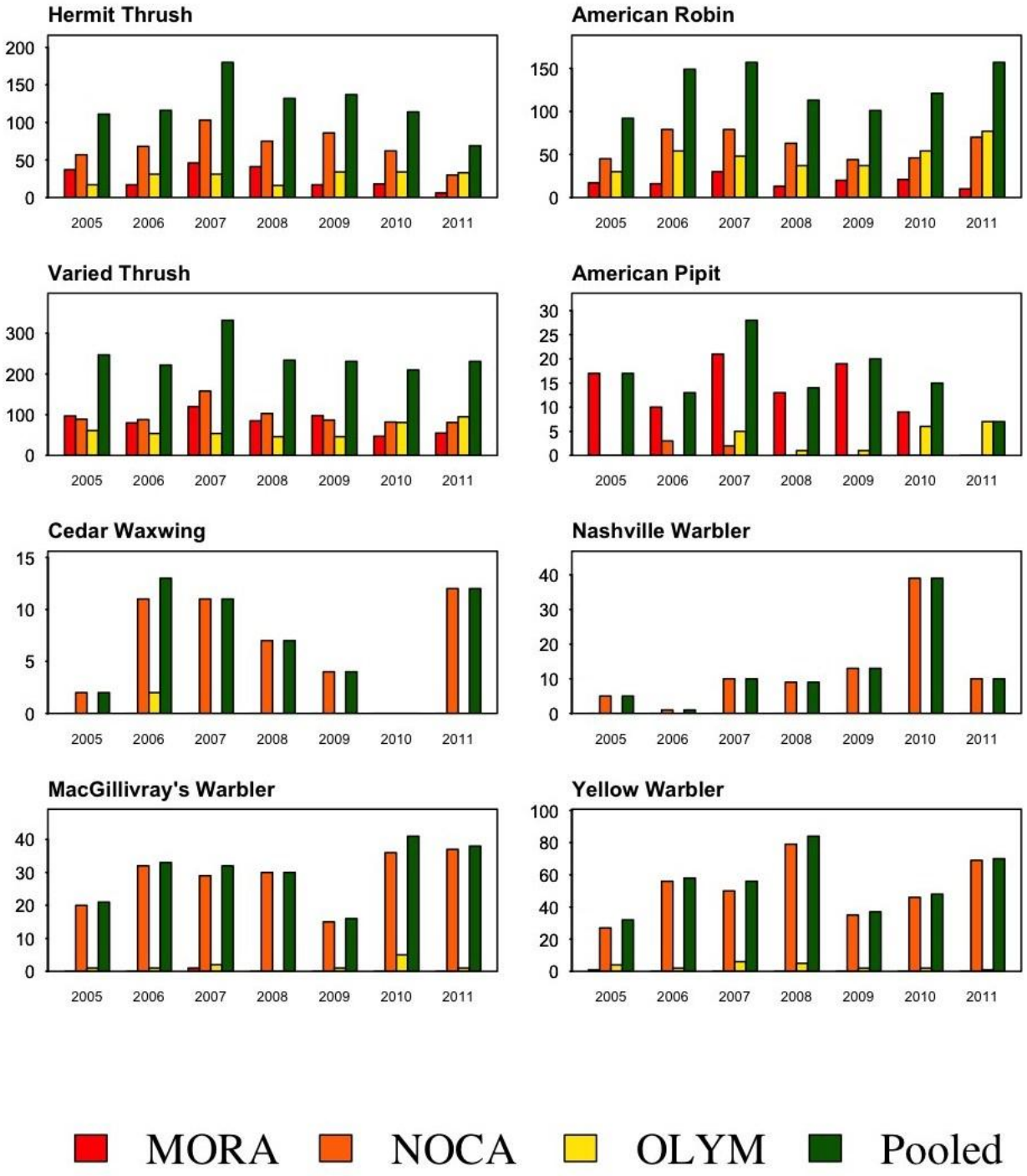


**Figure 6**. Number of times each species was detected on annual-panel transects at MORA, NOCA, OLYM, and all three parks pooled (always presented in that order) during the 2005, 2006, 2007, 2008, 2009, 2010, and 2011 field seasons. The figure includes all species for which we amassed at least 22 point count detections on annual-panel transects over the seven 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 (continued).

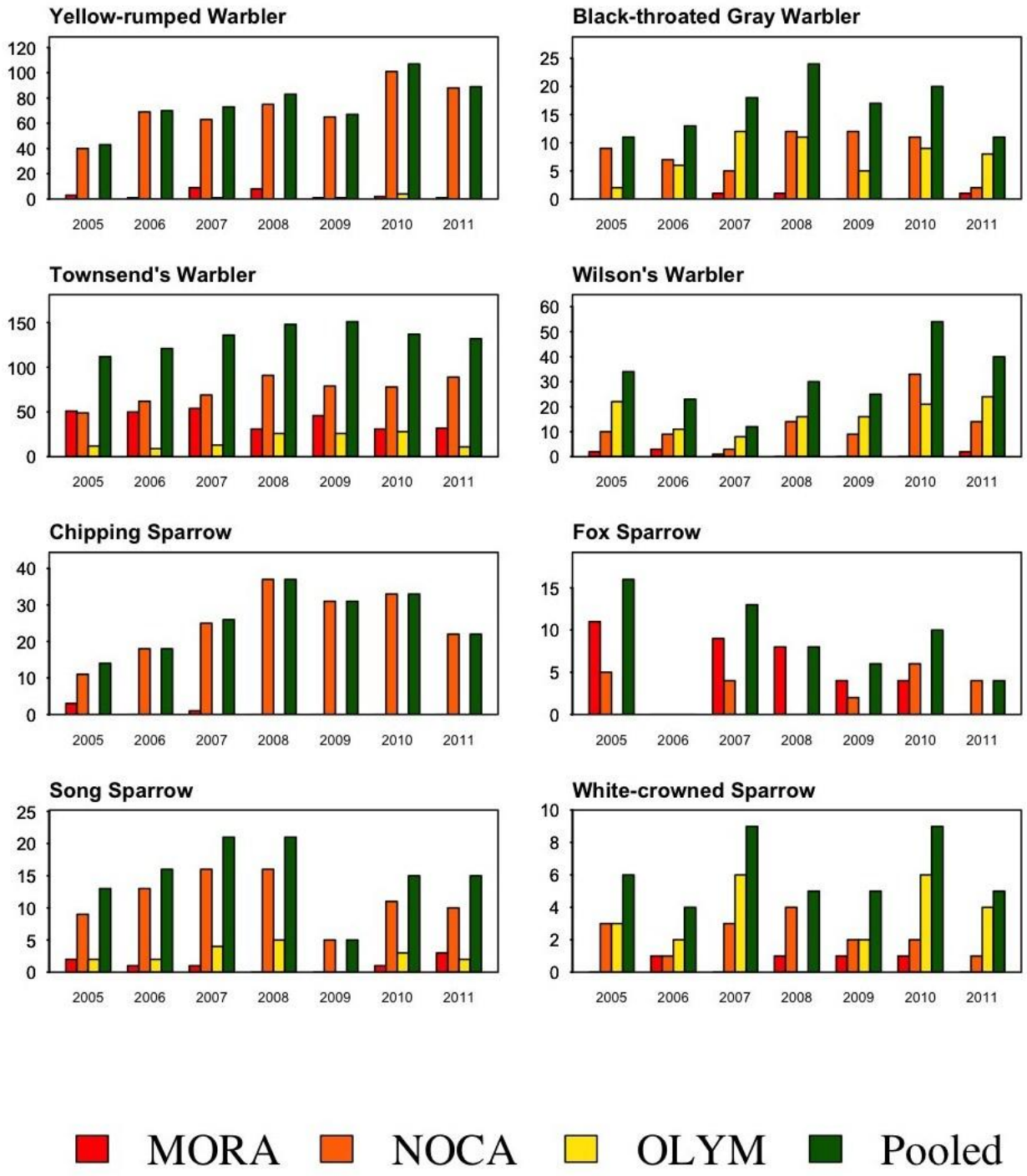


**Figure 6**. Number of times each species was detected on annual-panel transects at MORA, NOCA, OLYM, and all three parks pooled (always presented in that order) during the 2005, 2006, 2007, 2008, 2009, 2010, and 2011 field seasons. The figure includes all species for which we amassed at least 22 point count detections on annual-panel transects over the seven 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 (continued).

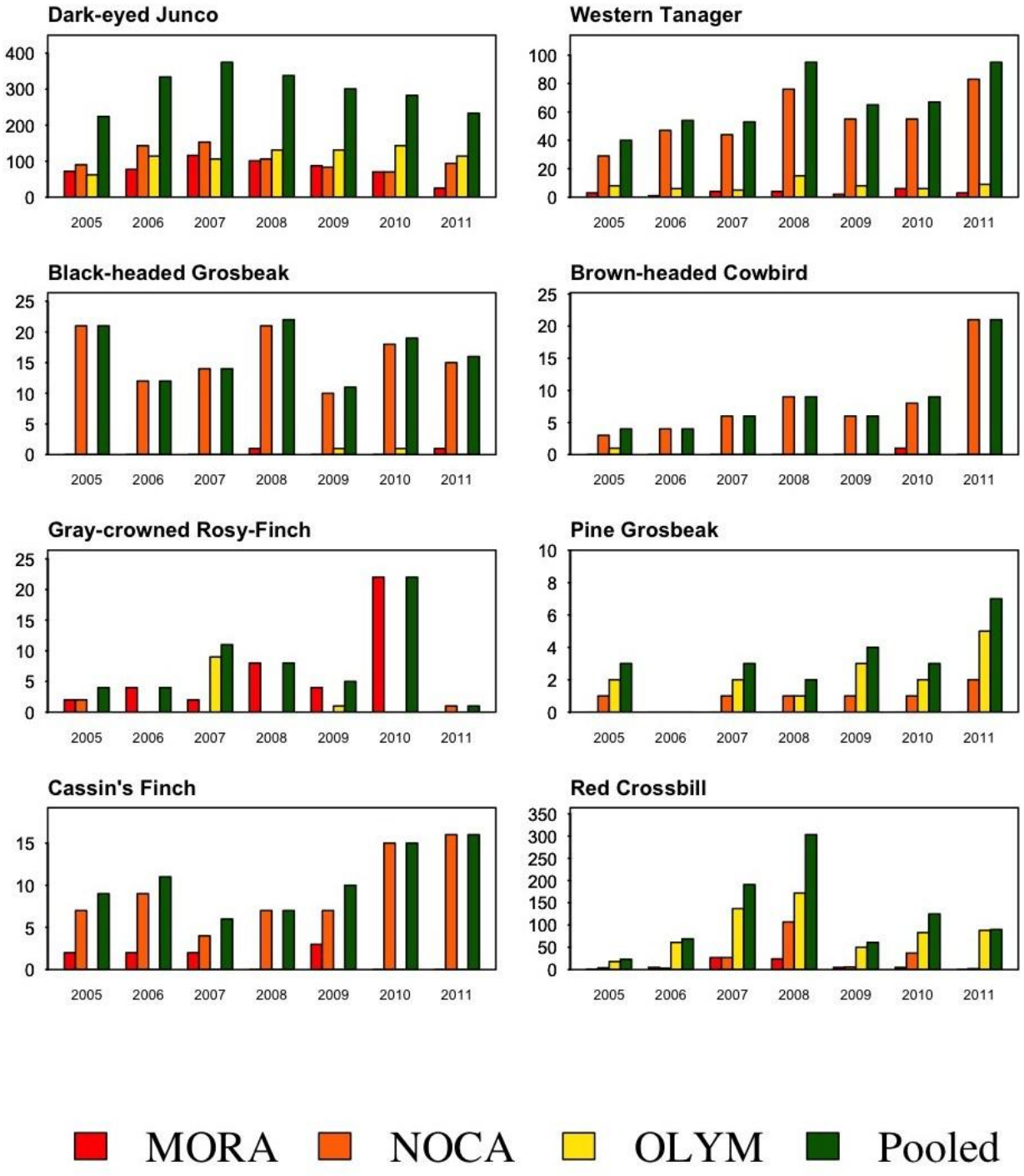


**Figure 6**. Number of times each species was detected on annual-panel transects at MORA, NOCA, OLYM, and all three parks pooled (always presented in that order) during the 2005, 2006, 2007, 2008, 2009, 2010, and 2011 field seasons. The figure includes all species for which we amassed at least 22 point count detections on annual-panel transects over the seven 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 (continued).

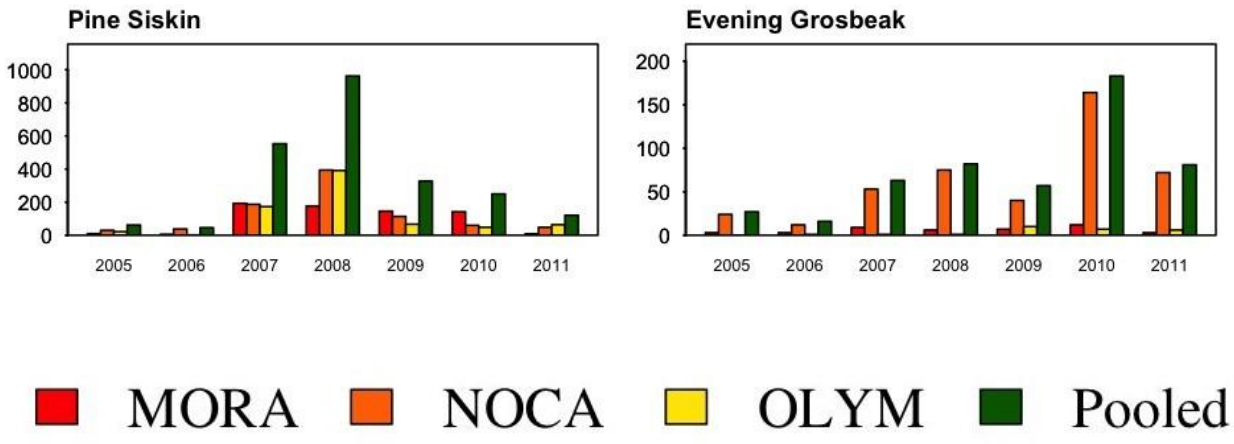


**Figure 6**. Number of times each species was detected on annual-panel transects at MORA, NOCA, OLYM, and all three parks pooled (always presented in that order) during the 2005, 2006, 2007, 2008, 2009, 2010, and 2011 field seasons. The figure includes all species for which we amassed at least 22 point count detections on annual-panel transects over the seven 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 (continued).

# Discussion

We completed our fifth year of full implementation of the Landbird Monitoring Project with the experience gained from two pilot field seasons (2005 and 2006) and four 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 three of the technicians never passing the bird identification evaluation, there were only five crew members who were able to conduct point counts full-time throughout most of the field season. However, a few qualified people were able to fill in, including former technicians and a National Park Service Wildlife Biologist. Another major challenge in 2011 was extremely late-lingering snow across all three large parks, preventing or delaying access to many of our middle and high-elevation transects. The high snowpack, exacerbated by some unexpected communication problems with the crew, resulted in our missing more transects than usual. In the end, we were able to survey a total of 57 out of the 68 intended transects, missing six transects on the annual panel (four at MORA, one at NOCA, and one at OLYM) and five transects on the alternating panel (three at MORA and two at NOCA). In response to these issues, we are implementing some procedural changes in 2012 to avoid similar logistics-related problems in the future. These include improved communication between field crews, field lead, and NPS Lead, and assigning one staff member to provide twice monthly updates to communicate sampling progress to all team members.

Financial constraints are forcing us to reduce the crew to seven people in 2012, but having seven (rather than six as we have had in several of the years since the project started) will provide some flexibility should a technician fail to pass the bird identification evaluation on time, or miss part of the field season for some other reason. It is also our hope that having a seven-person crew will enable us to adhere to the intended schedule for data entry. We have added three days to the end of the field season the last two years, just for data entry and other post-data collection tasks, which has helped us complete the data entry and verification process in a more timely fashion than in previous years. We plan to have the crew work these extra three days again in 2012.

After the overall increase in the number of birds detected in 2010 in the large parks, 2011 yielded an overall decrease in detections on annual-panel transects. This decrease was in part driven by the decline in evening grosbeak detections at NOCA, dropping from 164 detections in 2010 to 72 detections in 2011. The detection totals of evening grosbeaks in 2011 were relatively consistent with totals prior to 2010. It should also be emphasized that in 2011we faced the heaviest snowpack since the beginning of our monitoring project in 2005. Because of the heavy snowpack, closer analyses of the data may indicate changes in abundance and distribution of some species from previous years as a result of both the persistent snowpack and related factors, such as delayed plant phenology and insect activity. In addition, because there were fewer high-elevation transects surveyed at MORA in 2011 than in previous years, fewer birds were detected, which also affected our total number of detections across all large parks. This was particularly notable of species that we tend to detect in greater numbers at higher elevations, such as pine siskins and dark-eyed juncos. The Landbird Monitoring Project's periodic trend analyses will explicitly account for annual variation in survey effort.

There are several other interesting preliminary results from 2011, including an increase in detections of brown-headed cowbird, an obligate nest-parasite that represents a significant threat

to many bird populations throughout North America. Between 2005 and 2010 on the annual-panel transects, brown-headed cowbird detections have consistently remained fewer than 10 per season (four detections in 2005, four detections in 2006, six detections in 2007, nine detections in 2008, six detections in 2009, and nine detections in 2010). In 2011 however, there were 21 detections of brown-headed cowbirds on annual-panel transects. These detections have been almost entirely at NOCA every year. While 21detections in itself not an alarmingly high number and these results are preliminary, this species should continue to be monitored closely in the future. Brown-headed cowbird populations often grow in response to increased food availability associated with packstock operations and other human-influenced factors, and there are specific management responses that can be considered (e.g., Siegle and Ahlers 2004) if the species is revealed over time to be a growing conservation threat.

Swainson's thrush and chestnut-backed chickadee detections also rose in 2011, particularly at NOCA. In contrast, Nashville warbler detections were back down to detection totals seen before 2010, when there was a sharp increase in detections. This decrease was solely at NOCA, as that is the only park where we have ever detected Nashville warblers during point counts for this project.

Detections of red crossbills remained low in 2011, with a slight decline at NOCA and little change at MORA and OLYM. Golden-crowned kinglet and varied thrush annual-panel detections also remained relatively stable since the decline in detections in 2008. However, in 2011 Pacific wren detections increased to detection totals comparable to those in 2007, most notably at OLYM. Pooling results across annual-panel transects in all three parks, in 2007 we recorded 276 Pacific wren detections on annual-panel transects, compared with 199 detections in 2008, 191 detections in 2009, 205 detections in 2010, and 269 detections in 2011 (Siegel et al. 2009b, Siegel et al. 2008, Wilkerson et al. 2009b, Wilkerson et al. 2010, Holmgren et al. 2011). Periodic trend analyses that adjust for sampling effort and estimate detection probability will allow rigorously assessment of apparent changes like these and will facilitate generating and testing hypotheses about their causes.

Results from SAJH this year indicate that high detection rates of common species will yield robust results for many common breeding species. There was a notable overall increase in detections at SAJH in 2011 (averaging 16.80 detections per point in 2009, compared with 22.52 in 2011). The large number of brown-headed cowbirds (59 individual detections, up from 47 individual detections in 2009 and 30 individual detections in 2007) continues to be a concern at SAJH (Siegel et al. 2009b, Wilkerson et al. 2010) and may warrant consideration of available management options e.g., Siegle and Ahlers 2004).

Interpreting our survey results at this juncture is premature, as they have not yet been adjusted for differences in survey effort or potential differences in detectability of birds between years, analyses which will take place in conjunction with our periodic trend analyses. Nevertheless, our preliminary results indicate that this monitoring project will provide valuable insight into bird populations in NCCN national parks on both an annual and longer-term cycle. The value of data is already becoming apparent not only to park personnel, but also to outside entities, as is evidenced by a recent large data request we fulfilled from a consortium of partners (including Klamath Bird Observatory, American Bird Conservancy, and PRBO Conservation Science) who are modeling the effect of climate change on bird populations throughout the Pacific Northwest.

# Conclusions

The NCCN Landbird Monitoring Project has completed another field season, marking the end of the first five-year rotation, with a comprehensive, field-tested protocol, two years of annual-panel data collected during the protocol development phase (2005 and 2006), and five years of full project implementation (2007, 2008, 2009, 2010, and 2011) that includes data collection on the annual panel as well as all of the five alternating panels. Preliminary results indicate we will have robust sample sizes for many species when we conduct trend analysis of the data, and that we are detecting substantial year-to-year changes in bird populations. These changes, when analyzed in the context of annual weather variation and perhaps other factors, should yield interesting and useful findings about the drivers of population dynamics in birds of Pacific Northwest forests, and are likely to spur additional targeted research and help refine management priorities and needs within the parks.

## Literature Cited


Altman, B. 1999. Conservation strategy for landbirds in coniferous forests of western Oregon and Washington. Version 1.0. Prepared for Oregon-Washington Partners in Flight for American Bird Conservancy, Boring, OR.

Altman, B. 2000. Conservation strategy for landbirds of the east slope of the Cascades. Version 1.0. Prepared for Oregon-Washington Partners in Flight by American Bird Conservancy, Corvallis, OR.

Altman, B., and J. Bart. 2001. Special species monitoring and assessment in Oregon and Washington: Landbird species not adequately monitored by the Breeding Bird Survey. Prepared for Oregon-Washington Partners in Flight by American Bird Conservancy and U.S. Geological Service, Boring, OR.

Andelman, S. J., and A. Stock. 1994a. Management, research, and monitoring priorities for the conservation of Neotropical migratory landbirds that breed in Oregon. Washington Department of Natural Resources, Olympia, WA.

Andelman, S. J., and A. Stock. 1994b. Management, research, and monitoring priorities for the conservation of Neotropical migratory landbirds that breed in Washington. Washington Department of Natural Resources, Olympia, WA.

Atkinson, S., and F. A. Sharpe. 1985. Wild plants of the San Juan Islands. The Mountaineers, Seattle, WA.

Bolsinger, C. L., and K. L. Waddell. 1993. Area of old-growth forests in California, Oregon and Washington. USDA Forest Service Resource Bulletin PNW-RB-197. U.S. Department of Agriculture, U.S. Forest Service, Pacific Northwest Research Station, Portland, OR.

Buckland, S. T., D. R. Anderson, K. P. Burnham, J. L. Laake, D. L. Borchers, and L. Thomas. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, Oxford, England.

Bunnell, F. L., L. L. Kremsater, and R. W. Wells. 1997. Likely consequences of forest management on terrestrial, forest-dwelling vertebrates in Oregon. Report M-7 of the Centre for Applied Conservation Biology, University of British Columbia, Vancouver, Canada.

DeSante, D.F., and T.L. George. 1994. Population trends in the landbirds of western North America. Pages 173-190 *in* J. R. Jehl Jr., and N. K. Johnson (eds.). A century of avifaunal change in western North America. Proceedings of an International Symposium at the Centennial Meeting of the Cooper Ornithological Society, Sacramento, CA, April 1993. Studies in Avian Biology No. 15.

Hagar, J. C., W. C. McComb, and C. C. Chambers. 1995. Effects of forest practices on wildlife. *In* R. P. Beschta et al. (eds). Cumulative effects of forest practices in Oregon: Literature and synthesis. Oregon State University, Corvallis, OR.

Holmgren, A. L., R. L. Wilkerson, R. B. Siegel, and R. C. Kuntz II. 2011. North Coast and Cascades Network landbird monitoring: Report for the 2010 field season. Natural Resource Technical Report NPS/NCCN/NRTR—2011/473. National Park Service, Fort Collins, CO.

Lewis, M. G., and F. A. Sharpe. 1987. Birding in the San Juan Islands. The Mountaineers, Seattle, WA.

Meslow, E. C., and H. M. Wight. 1975. Avifauna and succession in Douglas-fir forests of the Pacific Northwest. Pages 266-271 *in* D. R. Smith (ed.). Proceedings of the symposium on management of forest and rangeland habitats for non-game birds. USDA Forest Service General Technical Report WO-1.

North American Bird Conservation Initiative, U.S. Committee. 2009. The state of the birds, United States of America, 2009. U.S. Department of Interior, Washington, DC.

North American Bird Conservation Initiative, U.S. Committee, 2011. The State of the Birds 2011 Report on Public Lands and Waters. U.S. Department of Interior: Washington, DC.

Pacific Meridian Resources. 1996. Vegetation and landform database development study: Final report. Pacific Meridian Resources, Portland, OR.

Peterjohn, B. G., J. R. Sauer, and C. S. Robbins. 1995. Population trends from North American breeding bird survey. Pages 3-39 *in* T. E. Martin and D. M Finch (eds.). Ecology and management of Neotropical migratory birds. Oxford Press, New York, NY.

Robbins, C. S., J. R. Sauer, R. Greenburg, and S. Droege. 1989. Population declines in North American birds that migrate to the neotropics. Proceedings of the National Academy of Sciences 86:7658-7662.

Saab, V. A., and T. D. Rich. 1997. Large-scale conservation assessment for Neotropical migratory land birds in the interior Columbia River basin. Gen. Tech. Rep. PNW-GTR-285. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Sauer, J. R., J. E. Hines, and J. Fallon. 2008. The North American breeding bird survey, results and analysis 1966-2007. Version 5.15.2008. USGS Patuxent Wildlife Research Center, Laurel, MD.

Sharp, B. E. 1996. Avian population trends in the Pacific Northwest. Bird Populations 3:26-45.

Siegel, R. B., R. L. Wilkerson, and S. Hall. 2009a. Landbird inventory for Olympic National Park (2002-2003). Natural Resource Technical Report NPS/NCCN/NRTR—2009/159. National Park Service, Fort Collins, CO.

Siegel, R. B., R. L. Wilkerson, K. J. Jenkins, R. C. Kuntz II, J. R. Boetsch, J. P. Schaberl, and P. J. Happe. 2007. Landbird monitoring protocol for national parks in the North Coast and Cascades Network. U.S. Geological Survey Techniques and Methods 2-A6. U.S. Geological Survey, Reston, VA.

Siegel, R. B., R. L. Wilkerson, and R. C. Kuntz II. 2006. Landbird monitoring in the North Coast and Cascades Network: report for the 2005 pilot field season. The Institute for Bird Populations, Point Reyes Station, CA.

Siegel, R. B., R. L. Wilkerson, and R. C. Kuntz II. 2009b. Landbird monitoring in the North Coast and Cascades Network. Report for the 2006 Pilot Field Season**.** Natural Resource Technical Report NPS/NCCN/NRTR—2009/168. National Park Service, Fort Collins, CO.

Siegel, R. B., R. L. Wilkerson, and R. C. Kuntz II. 2009c. Landbird inventory for Lewis and Clark National Historical Park (2006)**.** Natural Resource Technical Report NPS/NCCN/NRTR—2009/166. National Park Service, Fort Collins, CO.

Siegel, R. B., R. L. Wilkerson, and R. C. Kuntz II. 2008. North Coast and Cascades Network landbird monitoring report for the 2007 field season. Natural Resource Technical Report NPS/NCCN/NRTR—2008/114. National Park Service, Fort Collins, CO.

Siegel, R. B., R. L. Wilkerson, R. C. Kuntz II, and J. F. McLaughlin. 2009d. Landbird inventory for North Cascades National Park Service Complex (2001-2002). Natural Resource Technical Report NPS/NCCN/NRTR—2009/152. National Park Service, Fort Collins, CO.

Siegel, R. B., R. L. Wilkerson, H. K. Pedersen, and R. C. Kuntz II. 2009e. Landbird inventory of San Juan Island National Historical Park (2002). Natural Resource Technical Report NPS/NCCN/NRTR—2009/156. National Park Service, Fort Collins, CO.

Siegle R., and D. Ahlers. 2004. Brown-headed Cowbird management techniques manual. U.S. Department of the Interior, Denver, CO.

Silsbee, G. G., and D. L. Peterson. 1991. Designing and implementing comprehensive long-term inventory and monitoring programs for National Park System lands. Natural Resources Report NPS/NRUW/NRR-91/04, Denver, CO.

Simons, T. R., K. N. Rabenold, D. A. Buehler, J. A. Collazo, and K. E. Fransreb. 1999. The role of indicator species: Neotropical migratory song birds. Pages 187-208 *in* J. D. Peine, (ed.). Ecosystem Management for Sustainability: Principles and Practices Illustrated by a Regional Biosphere Reserve Cooperative. Lewis Publishers. New York, NY.

Wilkerson, R. L., R. B. Siegel, and J. Schaberl. 2009a. Landbird inventory of Mount Rainier National Park (2003-2004). Natural Resource Technical Report NPS/NCCN/NRTR—2009/164. National Park Service, Fort Collins, CO.

Wilkerson, R.L., R.B. Siegel, and R. C. Kuntz II. 2009b. North Coast and Cascades Network landbird monitoring report for the 2008 field season. Natural Resource Technical Report NPS/NCCN/NRTR—2009/222. National Park Service, Fort Collins, CO.

Wilkerson, R.L., R.B. Siegel, and R. C. Kuntz II. 2010. North Coast and Cascades Network landbird monitoring report for the 2009 field season. Natural Resource Technical Report NPS/NCCN/NRTR—2009/392. National Park Service, Fort Collins, CO.

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

| Park | Panel | Elevation class | Transect | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| MORA | Ann1 | Low | 4001 | 10 | 12 | 12 | 12 | 12 | 10 | 11 |
| MORA | Ann1 | Low | 4005 | 11 | 11 | 11 | 11 | 12 | 9 | 10 |
| MORA | Ann1 | Medium | 4002 | 12 | 12 | 12 | 13 | 11 | 14 | 14 |
| MORA | Ann1 | Medium | 4004 | 18 | 17 | 18 | 18 | 13 | 15 | 10 |
| MORA | Ann1 | Medium | 4009 | 14 | 14 | 15 | 15 | 11 | 13 | 10 |
| MORA | Ann1 | Medium | 4012 | 16 | 16 | 14 | 19 | 19 | 13 | 0 |
| MORA | Ann1 | High | 4003 | 12 | 12 | 12 | 12 | 12 | 10 | 12 |
| MORA | Ann1 | High | 4007 | 20 | 20 | 20 | 20 | 20 | 20 | 0 |
| MORA | Ann1 | High | 4011 | 13 | 11 | 14 | 17 | 17 | 15 | 0 |
| MORA | Ann1 | High | 4014 | 10 | 16 | 14 | 16 | 16 | 15 | 0 |
| MORA | Alt2 | Low | 4006 | 0 | 0 | 10 | 0 | 0 | 0 | 0 |
| MORA | Alt2 | Low | 4008 | 0 | 0 | 9 | 0 | 0 | 0 | 0 |
| MORA | Alt2 | Medium | 4015 | 0 | 0 | 11 | 0 | 0 | 0 | 0 |
| MORA | Alt2 | Medium | 4017 | 0 | 0 | 12 | 0 | 0 | 0 | 0 |
| MORA | Alt2 | Medium | 4020 | 0 | 0 | 9 | 0 | 0 | 0 | 0 |
| MORA | Alt2 | Medium | 4026 | 0 | 0 | 10 | 0 | 0 | 0 | 0 |
| MORA | Alt2 | High | 4016 | 0 | 0 | 19 | 0 | 0 | 0 | 0 |
| MORA | Alt2 | High | 4019 | 0 | 0 | 20 | 0 | 0 | 0 | 0 |
| MORA | Alt2 | High | 4027 | 0 | 0 | 13 | 0 | 0 | 0 | 0 |
| MORA | Alt2 | High | 4075 | 0 | 0 | 14 | 0 | 0 | 0 | 0 |
| MORA | Alt3 | Low | 4010 | 0 | 0 | 0 | 13 | 0 | 0 | 0 |
| MORA | Alt3 | Low | 4018 | 0 | 0 | 0 | 12 | 0 | 0 | 0 |
| MORA | Alt3 | Medium | 4028 | 0 | 0 | 0 | 11 | 0 | 0 | 0 |
| MORA | Alt3 | Medium | 4042 | 0 | 0 | 0 | 12 | 0 | 0 | 0 |
| MORA | Alt3 | Medium | 4044 | 0 | 0 | 0 | 15 | 0 | 0 | 0 |
| MORA | Alt3 | Medium | 4048 | 0 | 0 | 0 | 13 | 0 | 0 | 0 |
| MORA | Alt3 | High | 4029 | 0 | 0 | 0 | 14 | 0 | 0 | 0 |
| MORA | Alt3 | High | 4030 | 0 | 0 | 0 | 12 | 0 | 0 | 0 |
| MORA | Alt3 | High | 4032 | 0 | 0 | 0 | 15 | 0 | 0 | 0 |
| MORA | Alt3 | High | 4033 | 0 | 0 | 0 | 18 | 0 | 0 | 0 |

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

| Park | Panel | Elevation class | Transect | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| MORA | Alt4 | Low | 4021 | 0 | 0 | 0 | 0 | 12 | 0 | 0 |
| MORA | Alt4 | Low | 4022 | 0 | 0 | 0 | 0 | 17 | 0 | 0 |
| MORA | Alt4 | Medium | 4057 | 0 | 0 | 0 | 0 | 10 | 0 | 0 |
| MORA | Alt4 | Medium | 4060 | 0 | 0 | 0 | 0 | 24 | 0 | 0 |
| MORA | Alt4 | Medium | 4061 | 0 | 0 | 0 | 0 | 15 | 0 | 0 |
| MORA | Alt4 | Medium | 4065 | 0 | 0 | 0 | 0 | 13 | 0 | 0 |
| MORA | Alt4 | High | 4035 | 0 | 0 | 0 | 0 | 12 | 0 | 0 |
| MORA | Alt4 | High | 4036 | 0 | 0 | 0 | 0 | 14 | 0 | 0 |
| MORA | Alt4 | High | 4039 | 0 | 0 | 0 | 0 | 11 | 0 | 0 |
| MORA | Alt4 | High | 4043 | 0 | 0 | 0 | 0 | 18 | 0 | 0 |
| MORA | Alt5 | Low | 4024 | 0 | 0 | 0 | 0 | 0 | 25 | 0 |
| MORA | Alt5 | Low | 4025 | 0 | 0 | 0 | 0 | 0 | 9 | 0 |
| MORA | Alt5 | Medium | 4068 | 0 | 0 | 0 | 0 | 0 | 9 | 0 |
| MORA | Alt5 | Medium | 4073 | 0 | 0 | 0 | 0 | 0 | 13 | 0 |
| MORA | Alt5 | Medium | 4074 | 0 | 0 | 0 | 0 | 0 | 13 | 0 |
| MORA | Alt5 | Medium | 4076 | 0 | 0 | 0 | 0 | 0 | 15 | 0 |
| MORA | Alt5 | High | 4045 | 0 | 0 | 0 | 0 | 0 | 12 | 0 |
| MORA | Alt5 | High | 4046 | 0 | 0 | 0 | 0 | 0 | 10 | 0 |
| MORA | Alt5 | High | 4052 | 0 | 0 | 0 | 0 | 0 | 12 | 0 |
| MORA | Alt5 | High | 4055 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MORA | Alt6 | Low | 4031 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| MORA | Alt6 | Low | 4034 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| MORA | Alt6 | Medium | 4077 | 0 | 0 | 0 | 0 | 0 | 0 | 12 |
| MORA | Alt6 | Medium | 4078 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| MORA | Alt6 | Medium | 4081 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| MORA | Alt6 | Medium | 4084 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MORA | Alt6 | High | 4058 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MORA | Alt6 | High | 4062 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MORA | Alt6 | High | 4064 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| MORA | Alt6 | High | 4067 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |

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

| Park | Panel | Elevation class | Transect | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| NOCA | Ann1 | Low | 1013 | 12 | 11 | 14 | 12 | 11 | 9 | 13 |
| NOCA | Ann1 | Low | 1017 | 13 | 12 | 9 | 12 | 12 | 12 | 13 |
| NOCA | Ann1 | Low | 1020 | 15 | 12 | 13 | 15 | 16 | 12 | 16 |
| NOCA | Ann1 | Low | 1023 | 18 | 19 | 19 | 20 | 21 | 20 | 21 |
| NOCA | Ann1 | Medium | 1015 | 12 | 16 | 17 | 17 | 15 | 15 | 17 |
| NOCA | Ann1 | Medium | 1018 | 16 | 21 | 21 | 23 | 22 | 25 | 25 |
| NOCA | Ann1 | Medium | 1022 | 13 | 13 | 11 | 13 | 14 | 13 | 14 |
| NOCA | Ann1 | Medium | 1024 | 9 | 10 | 11 | 12 | 10 | 11 | 10 |
| NOCA | Ann1 | High | 1014 | 15 | 19 | 19 | 0 | 20 | 0 | 0 |
| NOCA | Ann1 | High | 1016 | 14 | 15 | 14 | 16 | 15 | 14 | 15 |
| NOCA | Ann1 | High | 1019 | 12 | 12 | 10 | 12 | 12 | 12 | 12 |
| NOCA | Ann1 | High | 1021 | 18 | 21 | 22 | 23 | 22 | 19 | 17 |
| NOCA | Alt2 | Low | 1001 | 0 | 0 | 11 | 0 | 0 | 0 | 0 |
| NOCA | Alt2 | Low | 1005 | 0 | 0 | 13 | 0 | 0 | 0 | 0 |
| NOCA | Alt2 | Low | 1006 | 0 | 0 | 10 | 0 | 0 | 0 | 0 |
| NOCA | Alt2 | Low | 1010 | 0 | 0 | 12 | 0 | 0 | 0 | 0 |
| NOCA | Alt2 | Medium | 1003 | 0 | 0 | 12 | 0 | 0 | 0 | 0 |
| NOCA | Alt2 | Medium | 1004 | 0 | 0 | 13 | 0 | 0 | 0 | 0 |
| NOCA | Alt2 | Medium | 1009 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOCA | Alt2 | Medium | 1011 | 0 | 0 | 19 | 0 | 0 | 0 | 0 |
| NOCA | Alt2 | High | 1002 | 0 | 0 | 18 | 0 | 0 | 0 | 0 |
| NOCA | Alt2 | High | 1007 | 0 | 0 | 13 | 0 | 0 | 0 | 0 |
| NOCA | Alt2 | High | 1008 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOCA | Alt2 | High | 1012 | 0 | 0 | 15 | 0 | 0 | 0 | 0 |
| NOCA | Alt3 | Low | 1027 | 0 | 0 | 0 | 13 | 0 | 0 | 0 |
| NOCA | Alt3 | Low | 1028 | 0 | 0 | 0 | 13 | 0 | 0 | 0 |
| NOCA | Alt3 | Low | 1029 | 0 | 0 | 0 | 13 | 0 | 0 | 0 |
| NOCA | Alt3 | Low | 1034 | 0 | 0 | 0 | 13 | 0 | 0 | 0 |
| NOCA | Alt3 | Medium | 1025 | 0 | 0 | 0 | 15 | 0 | 0 | 0 |
| NOCA | Alt3 | Medium | 1026 | 0 | 0 | 0 | 14 | 0 | 0 | 0 |
| NOCA | Alt3 | Medium | 1030 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

| Park | Panel | Elevation class | Transect | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| NOCA | Alt3 | Medium | 1031 | 0 | 0 | 0 | 19 | 0 | 0 | 0 |
| NOCA | Alt3 | High | 1032 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOCA | Alt3 | High | 1037 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOCA | Alt3 | High | 1039 | 0 | 0 | 0 | 21 | 0 | 0 | 0 |
| NOCA | Alt3 | High | 1040 | 0 | 0 | 0 | 21 | 0 | 0 | 0 |
| NOCA | Alt4 | Low | 1036 | 0 | 0 | 0 | 0 | 20 | 0 | 0 |
| NOCA | Alt4 | Low | 1046 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOCA | Alt4 | Low | 1054 | 0 | 0 | 0 | 0 | 11 | 0 | 0 |
| NOCA | Alt4 | Low | 1061 | 0 | 0 | 0 | 0 | 10 | 0 | 0 |
| NOCA | Alt4 | Medium | 1033 | 0 | 0 | 0 | 0 | 20 | 0 | 0 |
| NOCA | Alt4 | Medium | 1035 | 0 | 0 | 0 | 0 | 16 | 0 | 0 |
| NOCA | Alt4 | Medium | 1038 | 0 | 0 | 0 | 0 | 13 | 0 | 0 |
| NOCA | Alt4 | Medium | 1041 | 0 | 0 | 0 | 0 | 14 | 0 | 0 |
| NOCA | Alt4 | High | 1048 | 0 | 0 | 0 | 0 | 11 | 0 | 0 |
| NOCA | Alt4 | High | 1049 | 0 | 0 | 0 | 0 | 12 | 0 | 0 |
| NOCA | Alt4 | High | 1050 | 0 | 0 | 0 | 0 | 13 | 0 | 0 |
| NOCA | Alt4 | High | 1052 | 0 | 0 | 0 | 0 | 11 | 0 | 0 |
| NOCA | Alt5 | Low | 1062 | 0 | 0 | 0 | 0 | 0 | 8 | 0 |
| NOCA | Alt5 | Low | 1063 | 0 | 0 | 0 | 0 | 0 | 9 | 0 |
| NOCA | Alt5 | Low | 1065 | 0 | 0 | 0 | 0 | 0 | 11 | 0 |
| NOCA | Alt5 | Low | 1067 | 0 | 0 | 0 | 0 | 0 | 8 | 0 |
| NOCA | Alt5 | Medium | 1042 | 0 | 0 | 0 | 0 | 0 | 15 | 0 |
| NOCA | Alt5 | Medium | 1043 | 0 | 0 | 0 | 0 | 0 | 9 | 0 |
| NOCA | Alt5 | Medium | 1044 | 0 | 0 | 0 | 0 | 0 | 11 | 0 |
| NOCA | Alt5 | Medium | 1045 | 0 | 0 | 0 | 0 | 0 | 10 | 0 |
| NOCA | Alt5 | High | 1055 | 0 | 0 | 0 | 0 | 0 | 13 | 0 |
| NOCA | Alt5 | High | 1058 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOCA | Alt5 | High | 1060 | 0 | 0 | 0 | 0 | 0 | 9 | 0 |
| NOCA | Alt5 | High | 1064 | 0 | 0 | 0 | 0 | 0 | 10 | 0 |
| NOCA | Alt6 | Low | 1068 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| NOCA | Alt6 | Low | 1070 | 0 | 0 | 0 | 0 | 0 | 0 | 12 |

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

| Park | Panel | Elevation class | Transect | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| NOCA | Alt6 | Low | 1074 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| NOCA | Alt6 | Low | 1075 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| NOCA | Alt6 | Medium | 1047 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| NOCA | Alt6 | Medium | 1051 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| NOCA | Alt6 | Medium | 1053 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| NOCA | Alt6 | Medium | 1056 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| NOCA | Alt6 | High | 1072 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOCA | Alt6 | High | 1088 | 0 | 0 | 0 | 0 | 0 | 0 | 12 |
| NOCA | Alt6 | High | 1090 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NOCA | Alt6 | High | 1092 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| | | | | | | | | | | |
| OLYM | Ann1 | Low | 3001 | 11 | 10 | 8 | 10 | 11 | 12 | 12 |
| OLYM | Ann1 | Low | 3121 | 11 | 15 | 17 | 17 | 17 | 14 | 17 |
| OLYM | Ann1 | Low | 3126 | 9 | 10 | 11 | 13 | 13 | 13 | 15 |
| OLYM | Ann1 | Low | 3134 | 16 | 16 | 18 | 18 | 18 | 18 | 19 |
| OLYM | Ann1 | Medium | 3122 | 14 | 12 | 14 | 0 | 16 | 16 | 0 |
| OLYM | Ann1 | Medium | 3123 | 10 | 10 | 12 | 14 | 14 | 15 | 15 |
| OLYM | Ann1 | Medium | 3130 | 9 | 9 | 8 | 9 | 9 | 9 | 9 |
| OLYM | Ann1 | Medium | 3200 | 0 | 0 | 22 | 23 | 21 | 23 | 22 |
| OLYM | Ann1 | High | 3124 | 9 | 10 | 10 | 11 | 11 | 11 | 11 |
| OLYM | Ann1 | High | 3125 | 9 | 11 | 13 | 13 | 14 | 15 | 11 |
| OLYM | Ann1 | High | 3127 | 7 | 9 | 13 | 15 | 14 | 15 | 15 |
| OLYM | Ann1 | High | 3128 | 10 | 11 | 11 | 11 | 10 | 11 | 12 |
| OLYM | Alt2 | Low | 3138 | 0 | 0 | 10 | 0 | 0 | 0 | 0 |
| OLYM | Alt2 | Low | 3142 | 0 | 0 | 14 | 0 | 0 | 0 | 0 |
| OLYM | Alt2 | Low | 3144 | 0 | 0 | 13 | 0 | 0 | 0 | 0 |
| OLYM | Alt2 | Low | 3145 | 0 | 0 | 13 | 0 | 0 | 0 | 0 |
| OLYM | Alt2 | Medium | 3133 | 0 | 0 | 8 | 0 | 0 | 0 | 0 |
| OLYM | Alt2 | Medium | 3135 | 0 | 0 | 11 | 0 | 0 | 0 | 0 |
| OLYM | Alt2 | Medium | 3137 | 0 | 0 | 10 | 0 | 0 | 0 | 0 |
| OLYM | Alt2 | Medium | 3141 | 0 | 0 | 14 | 0 | 0 | 0 | 0 |

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

| Park | Panel | Elevation class | Transect | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| OLYM | Alt2 | High | 3132 | 0 | 0 | 19 | 0 | 0 | 0 | 0 |
| OLYM | Alt2 | High | 3136 | 0 | 0 | 11 | 0 | 0 | 0 | 0 |
| OLYM | Alt2 | High | 3139 | 0 | 0 | 16 | 0 | 0 | 0 | 0 |
| OLYM | Alt2 | High | 3140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| OLYM | Alt3 | Low | 3146 | 0 | 0 | 0 | 15 | 0 | 0 | 0 |
| OLYM | Alt3 | Low | 3149 | 0 | 0 | 0 | 10 | 0 | 0 | 0 |
| OLYM | Alt3 | Low | 3151 | 0 | 0 | 0 | 12 | 0 | 0 | 0 |
| OLYM | Alt3 | Low | 3153 | 0 | 0 | 0 | 11 | 0 | 0 | 0 |
| OLYM | Alt3 | Medium | 3143 | 0 | 0 | 0 | 10 | 0 | 0 | 0 |
| OLYM | Alt3 | Medium | 3150 | 0 | 0 | 0 | 11 | 0 | 0 | 0 |
| OLYM | Alt3 | Medium | 3152 | 0 | 0 | 0 | 11 | 0 | 0 | 0 |
| OLYM | Alt3 | Medium | 3154 | 0 | 0 | 0 | 15 | 0 | 0 | 0 |
| OLYM | Alt3 | High | 3147 | 0 | 0 | 0 | 19 | 0 | 0 | 0 |
| OLYM | Alt3 | High | 3148 | 0 | 0 | 0 | 14 | 0 | 0 | 0 |
| OLYM | Alt3 | High | 3156 | 0 | 0 | 0 | 12 | 0 | 0 | 0 |
| OLYM | Alt3 | High | 3157 | 0 | 0 | 0 | 11 | 0 | 0 | 0 |
| OLYM | Alt4 | Low | 3155 | 0 | 0 | 0 | 0 | 10 | 0 | 0 |
| OLYM | Alt4 | Low | 3159 | 0 | 0 | 0 | 0 | 11 | 0 | 0 |
| OLYM | Alt4 | Low | 3161 | 0 | 0 | 0 | 0 | 11 | 0 | 0 |
| OLYM | Alt4 | Low | 3163 | 0 | 0 | 0 | 0 | 15 | 0 | 0 |
| OLYM | Alt4 | Medium | 3160 | 0 | 0 | 0 | 0 | 10 | 0 | 0 |
| OLYM | Alt4 | Medium | 3167 | 0 | 0 | 0 | 0 | 11 | 0 | 0 |
| OLYM | Alt4 | Medium | 3168 | 0 | 0 | 0 | 0 | 10 | 0 | 0 |
| OLYM | Alt4 | Medium | 3174 | 0 | 0 | 0 | 0 | 14 | 0 | 0 |
| OLYM | Alt4 | High | 3158 | 0 | 0 | 0 | 0 | 14 | 0 | 0 |
| OLYM | Alt4 | High | 3164 | 0 | 0 | 0 | 0 | 14 | 0 | 0 |
| OLYM | Alt4 | High | 3171 | 0 | 0 | 0 | 0 | 12 | 0 | 0 |
| OLYM | Alt4 | High | 3173 | 0 | 0 | 0 | 0 | 10 | 0 | 0 |
| OLYM | Alt5 | High | 3175 | 0 | 0 | 0 | 0 | 0 | 12 | 0 |
| OLYM | Alt5 | High | 3179 | 0 | 0 | 0 | 0 | 0 | 16 | 0 |
| OLYM | Alt5 | High | 3180 | 0 | 0 | 0 | 0 | 0 | 16 | 0 |

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

| Park | Panel | Elevation class | Transect | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|
| OLYM | Alt5 | High | 3188 | 0 | 0 | 0 | 0 | 0 | 12 | 0 |
| OLYM | Alt5 | Low | 3165 | 0 | 0 | 0 | 0 | 0 | 10 | 0 |
| OLYM | Alt5 | Low | 3166 | 0 | 0 | 0 | 0 | 0 | 12 | 0 |
| OLYM | Alt5 | Low | 3169 | 0 | 0 | 0 | 0 | 0 | 8 | 0 |
| OLYM | Alt5 | Low | 3170 | 0 | 0 | 0 | 0 | 0 | 11 | 0 |
| OLYM | Alt5 | Medium | 3178 | 0 | 0 | 0 | 0 | 0 | 11 | 0 |
| OLYM | Alt5 | Medium | 3183 | 0 | 0 | 0 | 0 | 0 | 13 | 0 |
| OLYM | Alt5 | Medium | 3184 | 0 | 0 | 0 | 0 | 0 | 16 | 0 |
| OLYM | Alt5 | Medium | 3185 | 0 | 0 | 0 | 0 | 0 | 9 | 0 |
| OLYM | Alt5 | High | 3175 | 0 | 0 | 0 | 0 | 0 | 12 | 0 |
| OLYM | Alt5 | High | 3179 | 0 | 0 | 0 | 0 | 0 | 16 | 0 |
| OLYM | Alt5 | High | 3180 | 0 | 0 | 0 | 0 | 0 | 16 | 0 |
| OLYM | Alt5 | High | 3188 | 0 | 0 | 0 | 0 | 0 | 12 | 0 |
| OLYM | Alt5 | High | 3175 | 0 | 0 | 0 | 0 | 0 | 12 | 0 |
| OLYM | Alt5 | High | 3179 | 0 | 0 | 0 | 0 | 0 | 16 | 0 |
| OLYM | Alt5 | High | 3180 | 0 | 0 | 0 | 0 | 0 | 16 | 0 |
| OLYM | Alt5 | High | 3188 | 0 | 0 | 0 | 0 | 0 | 12 | 0 |
| OLYM | Alt6 | Low | 3172 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| OLYM | Alt6 | Low | 3177 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| OLYM | Alt6 | Low | 3181 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| OLYM | Alt6 | Low | 3182 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| OLYM | Alt6 | Medium | 3187 | 0 | 0 | 0 | 0 | 0 | 0 | 20 |
| OLYM | Alt6 | Medium | 3190 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| OLYM | Alt6 | Medium | 3195 | 0 | 0 | 0 | 0 | 0 | 0 | 12 |
| OLYM | Alt6 | Medium | 3198 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| OLYM | Alt6 | High | 3189 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| OLYM | Alt6 | High | 3191 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| OLYM | Alt6 | High | 3192 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| OLYM | Alt6 | High | 3196 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |

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NPS 963/115933, July 2012

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**U.S. Department of the Interior**

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