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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

ON THE COVER
Yellow warbler
Photograph courtesy of NPS files

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Natural Resource Technical Report NPS/NCCN/NRTR—2009/168

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Summary

In 2006 we conducted our second and final pilot field season to field-test and refine our Draft North Coast and Cascades Network Landbird Monitoring Protocol. The protocol requires annual survey effort consisting of an annual panel (34 transects) plus an alternating panel (another 34 transects) in the large parks—Mount Rainier National Park (MORA), North Cascades National Park Service Complex (NOCA), or Olympic National Park (OLYM) —and the completion of a grid of survey points at either of the smaller parks—San Juan Island National Historical Park (SAJH) or Lewis and Clark National Historical Park (LEWI)—which will be surveyed in alternating years. However, for this pilot year we reduced the effort and surveyed only the annual panel of transects in the large parks as well as the full survey grid at LEWI. Comprehensive results from the LEWI surveys are provided in a separate report (Siegel et al. 2009b). In the three large parks, we completed surveys at 446 point count stations arrayed along 33 transects—one intended transect went unsurveyed because heavy snowpack prevented access to it. Nevertheless, we were generally pleased with the ability of our surveyors to relocate point count stations established during our 2005 pilot field season (Siegel et al. 2006a).

We detected 84 species in NCCN's three large parks during the 2006 field season, and recorded 79 of them during one or more point counts. For 57 species (all species for which we amassed at least five point count detections during 2005 and 2006 combined), we present the total number of detections of each species in each park during both the 2005 and 2006 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 trend analyses in our five-year reports.

We believe the NCCN Landbird Monitoring protocol (Siegel et al. 2006b) is now well-honed (although occasional alterations and updates are to be expected) and should provide for a highly successful long-term monitoring program.

Acknowledgments

We thank the 2006 crew members for their hard work and dedication to the project: M. Holmgren (Field Lead), J. Krumlauf, S. Marek, and J. Shewan. We appreciate the contributions of K. Jenkins (FRESC Olympic Field Station) and the entire NCCN Landbird Monitoring Group for their work on the landbird monitoring protocols that we field tested in this pilot field season. We thank S. Gremel, P. Happe, J. Schaberl, and S. Stonum for assistance and logistical support at the respective parks, N. Antonova and R. Hoffman for GIS support, and J. Boetch for help with data entry and data management. We also thank H. Pedersen for hospitality in Port Angeles. This is Contribution No. 310 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 1999a, 1999b; Sauer et al. 2001). Indeed, Altman (1999a) reported that 30 species exhibit statistically significant, recent and/or long-term declining trends, while only 14 species in the region have significant increasing trends.

Threats to bird populations breeding in Pacific Northwest coniferous forests include outright habitat loss as well as forest management practices that discourage the development of old-growth conditions. 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 1999a).

Pacific Northwest landbirds breeding in habitats other than coniferous forests face substantial threats as well. Species that breed in the subalpine and alpine zones are 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 NPS 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 (OLYM), North Cascades (NOCA), and Mount Rainier (MORA)—range from sea level to nearly 4,400 m and contain huge tracts of late-successional, coniferous forest on the Olympic Peninsula and the west slope of the Cascades, as well as large areas dominated by subalpine and alpine plant communities. North Cascades National Park also includes substantial tracts of coniferous forest typical of the east side of the Cascades, which hosts a somewhat distinct avifauna (Altman 1999b). San Juan Islands National Historical Park, in the rainshadow of the Olympic Mountains, includes small but important examples of coastal prairie and Garry Oak 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. 2009d). Lewis and Clark National Historical Park includes lowland wetlands as well as coastal and upland forests, and extends our program's area of inference substantially southward.

National Parks in the NCCN can fulfill vital roles as both refuges for bird species dependent on late-successional forest conditions, 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 the 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 inform future decisions about important management issues *in the parks*, including visitor impacts, fire management, and the effects of introduced species.

Accordingly, the objectives of this 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 2006 and subsequent annual reports for the landbird monitoring program 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 the program's five-year reports.

Study Area

The study area for the NCCN landbird monitoring program includes areas of MORA, NOCA and OLYM that are accessible by foot and lie within 1 km of a road or trail. The study area also includes all of SAJH (including both American Camp and British Camp) and portions of LEWI (including Cape Disappointment, Clark's Dismal Nitch, Fort Clatsop, and Sunset Beach).

The 2006 field season was a pilot year for the landbird monitoring program, in which our primary purpose was to test and further refine protocols. Accordingly, we did not implement the full sampling scheme, but instead deployed a reduced crew to resurvey the annual panel of transects established in the large parks in 2005 (Figures 1-3), and to establish and survey the systematic grid of points at LEWI (Figure 4). Because this was our first year of extensive work at LEWI and it served the dual purpose of a landbird inventory as part of the National Park Service's five year inventory program, the results of our survey are presented in a separate LEWI Landbird Inventory report (Siegel et al. 2009b).

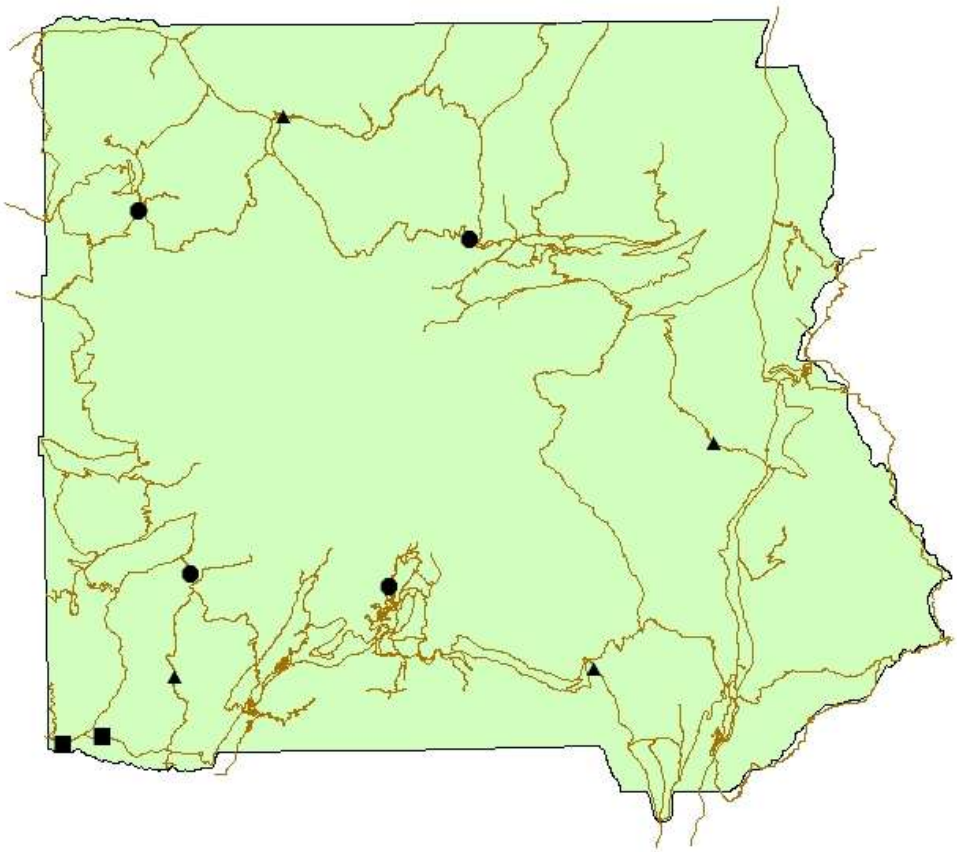


Figure 1. Approximate locations of transects conducted at MORA in 2006. Squares indicate low-elevation transects, triangles indicate mid-elevation transects, and circles indicate high-elevation transects.

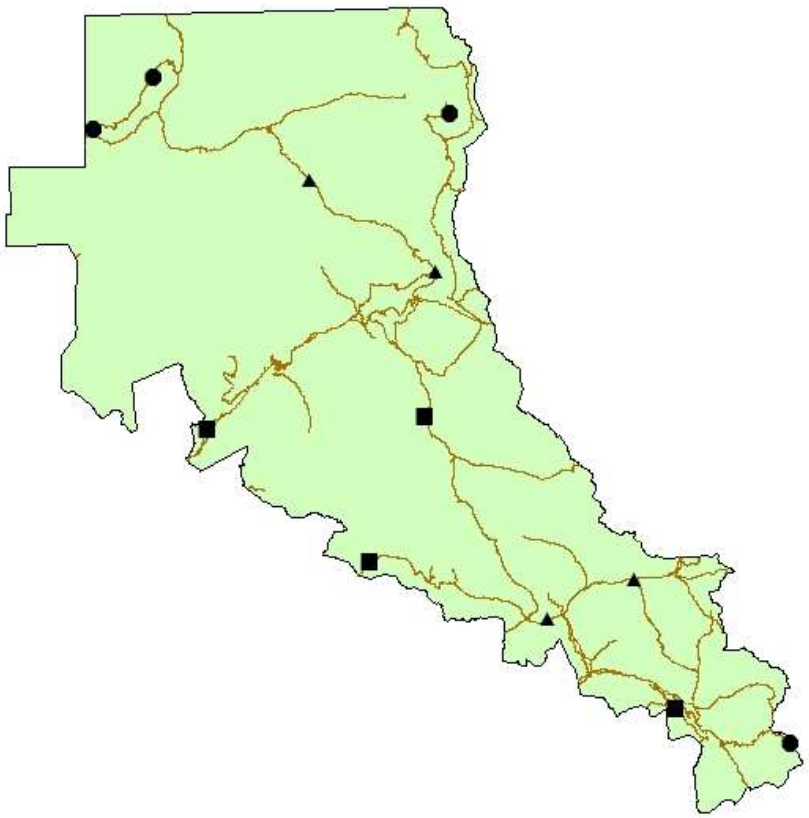


Figure 2. Approximate locations of transects conducted at NOCA in 2006. Squares indicate low-elevation transects, triangles indicate mid-elevation transects, and circles indicate high-elevation transects.

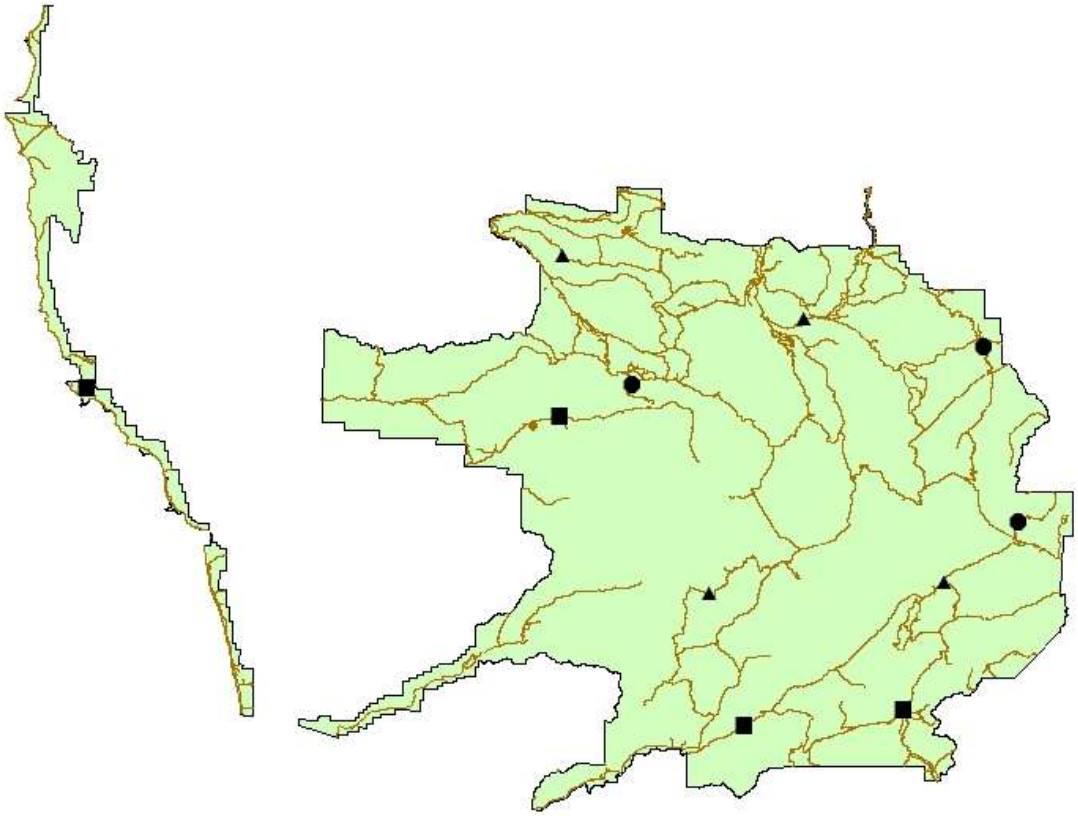


Figure 3. Approximate locations of transects conducted at OLYM in 2006. Squares indicate low-elevation transects, triangles indicate mid-elevation transects (transect no. 3131 which was not surveyed, is indicated by the red circle), and circles indicate high-elevation transects.

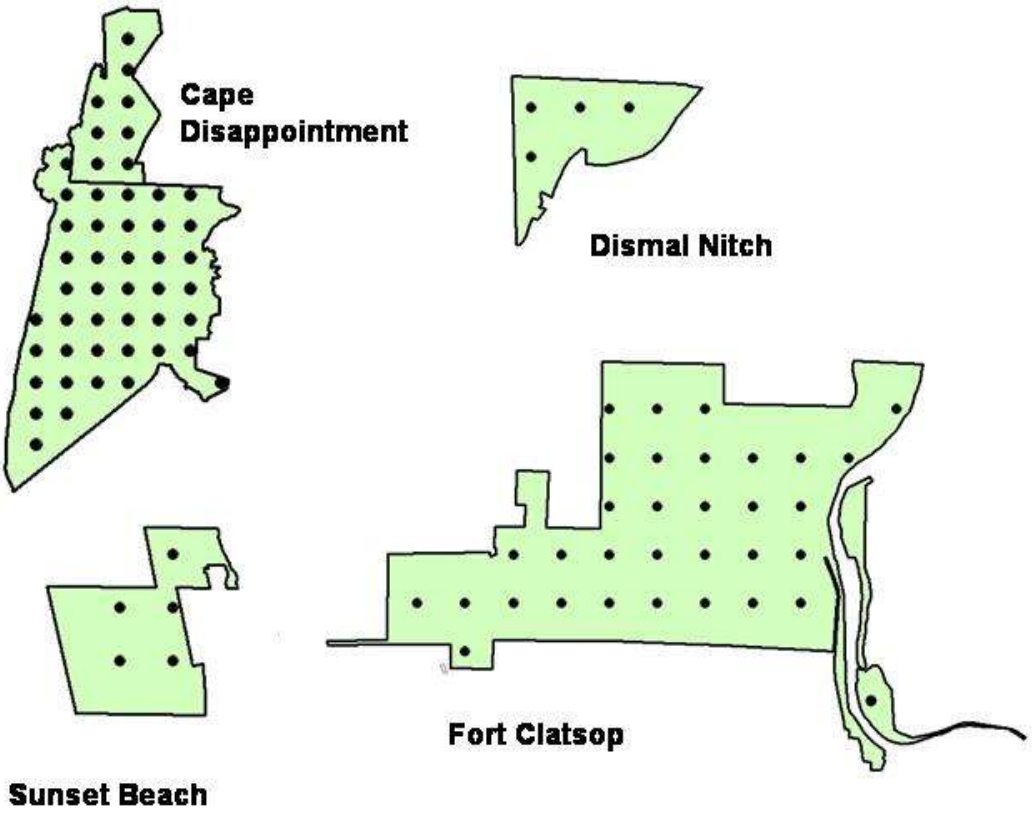


Figure 4. The landbird sampling grid developed for Lewis and Clark National Historical Park (LEWI). Because this was our first year of extensive work at LEWI and it served the dual purpose of a landbird inventory as part of the National Park Service's five year inventory program, the results of our survey are presented in a separate LEWI Landbird Inventory report (Siegel et al. 2009b).

Methods

Sample design

A detailed description of the sample design for the NCCN landbird monitoring program is provided in the NCCN Landbird Monitoring Protocol (Siegel et al. 2006b). 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 point 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, but the transects they define 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 2006 we surveyed the annual panel of transects only.

At the two smaller parks (LEWI and SAJH) the sample design consists of a systematic grid of survey points, with the two parks scheduled to be surveyed in alternating years. In the summer of 2006, we surveyed LEWI (Siegel et al. 2009b).

Crew training and certification

IBP Field Biologist Mandy Holmgren, the 2006 Field Lead, began training the crew on May 1, with assistance from IBP Staff Biologist Bob Wilkerson and NPS Lead Bob Kuntz. Training followed the training guidelines in the NCCN Landbird Monitoring Protocol (Siegel et al. 2006b). By the end of the formal training session on May 19, two of the three Field Technicians had passed the rigorous point count certification exam, and were ready to begin collecting data. A short time later the third Field Technician was also certified. With the exception of NPS Lead Bob Kuntz, all crew members who collected data during the 2006 field season were employees or field biologist interns of The Institute for Bird Populations (IBP) (Table 1).

Table 1. Observers who conducted point counts in the NCCN in 2006.

Observer	Role
Mandy Holmgren	Field Lead
Jeremy Krumlauf	Technician
Robert Kuntz II	NPS Lead
Sarah Marek	Technician
Julia Shewan	Technician
Rodney Siegel	Project Lead

Data collection

All point count data were collected between May 21 and July 30, with the low-elevation transects surveyed first, then the mid-elevation transects, and finally the high-elevation transects.

High-elevation transects at OLYM and NOCA were completed by July 26; the last transect at MORA was surveyed on July 30.

Data collection followed the detailed procedures explained in the NCCN Landbird Monitoring Protocol (Siegel et al. 2006b). Crew members worked in pairs to conduct a single transect each morning. Crew members were provided with a) maps and coordinates indicating the location of transect 'starting points', which lay directly on trails or roads, as well as all point count stations established in 2005, and b) narrative descriptions of point count stations and the travel routes between successive stations. Beginning within 10 min of official sunrise, each observer conducted a point count, and then continued along the transect, conducting another point count every 200 m until 3.5 hours after official local sunrise.

In most cases, crew members used the maps and narrative descriptions to navigate to the same point count stations that were established in 2005. However, in a few instances, transects had to be re-routed because routes chosen in 2005 were deemed overly dangerous or difficult to traverse. In these instances, observers established new routes, following the guidelines in Siegel et al. (2006b).

At each point the 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 five-minute point count. Birds observed in the first three minutes were recorded separately from those observed in the last two minutes, in order to allow comparison with Breeding Bird Survey data, 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.

After completing their last point count each morning, observers retraced their steps back to the starting point. Along the way, they conducted a rapid habitat assessment at each of the survey points. The rapid habitat assessment consisted of characterizing the 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, and where necessary, amended narrative descriptions of the point locations.

Whenever crew members detected species thought to be rare or difficult to sample in the park, 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

At the end of the field season, the Field Lead entered all data into the NCCN landbird monitoring program's Microsoft (MS) Access database, following the guidelines in Siegel et al. (2006b). 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 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 guidelines in Siegel et al. (2006b). For the three large parks, we present results unadjusted for detectability. In conjunction with the first five-year report for this monitoring program, a thorough analysis of factors affecting detectability of birds during point counts will be conducted, allowing for annual results to be adjusted to account for detectability (Buckland et al. 2001). Until that analysis is completed, any results should be viewed as provisional only.

Results

We surveyed 33 of the 34 transects in the annual panel at the large parks, including 10 transects comprising 142 points at MORA, 12 transects comprising 181 points at NOCA, and 11 transects comprising 123 points at OLYM (Tables 2 and 3). A heavy, late-lasting snowpack delayed access to three of the mid-elevation transects at OLYM. One of these (transect no. 3131) was discarded altogether after the crew hiked in 16 miles to survey it late in the season, and still found it inaccessible due to deep snow.

Table 2. NCCN Landbird monitoring transects that were visited in 2006.

Park	Panel	Elevation	Transect	No. of points completed
MORA	Ann1	Low	4001	12
MORA	Ann1	Low	4005	11
MORA	Ann1	Medium	4002	12
MORA	Ann1	Medium	4004	18
MORA	Ann1	Medium	4009	14
MORA	Ann1	Medium	4012	16
MORA	Ann1	High	4003	12
MORA	Ann1	High	4007	20
MORA	Ann1	High	4011	11
MORA	Ann1	High	4014	16
NOCA	Ann1	Low	1013	11
NOCA	Ann1	Low	1017	12
NOCA	Ann1	Low	1020	12
NOCA	Ann1	Low	1023	19
NOCA	Ann1	Medium	1015	16
NOCA	Ann1	Medium	1018	21
NOCA	Ann1	Medium	1022	13
NOCA	Ann1	Medium	1024	10
NOCA	Ann1	High	1014	19
NOCA	Ann1	High	1016	15
NOCA	Ann1	High	1019	12
NOCA	Ann1	High	1021	21
OLYM	Ann1	Low	3001	10
OLYM	Ann1	Low	3121	15
OLYM	Ann1	Low	3126	10
OLYM	Ann1	Low	3134	16
OLYM	Ann1	Medium	3122	12
OLYM	Ann1	Medium	3123	10
OLYM	Ann1	Medium	3130	9
OLYM	Ann1	Medium	3131	0
OLYM	Ann1	High	3124	10
OLYM	Ann1	High	3125	11
OLYM	Ann1	High	3127	9
OLYM	Ann1	High	3128	11

Table 3. Summary history of NCCN landbird monitoring transects completed through 2006.

Park	Elevation stratum	No. of transects completed 2005	2006
MORA	Low	2	2
MORA	Medium	4	4
MORA	High	4	4
MORA	ALL	10	10
NOCA	Low	4	4
NOCA	Medium	4	4
NOCA	High	4	4
NOCA	ALL	12	12
OLYM	Low	4	4
OLYM	Medium	4	3
OLYM	High	4	4
OLYM	ALL	12	11
ALL	Low	10	10
ALL	Medium	12	11
ALL	High	12	12
ALL	ALL	34	33

Across the three large parks, we documented the presence of 84 species; 79 species were detected during point counts, and five species (Barrow's Goldeneye, Northern Goshawk, Marbled Murrelet, Spotted Owl, and Rock Wren) were recorded solely on 'Rare Bird Report' forms (Table 4).

Table 4. All species recorded in the three large parks during the 2006 field season, including species detected during point counts, and species recorded on 'rare bird' detection forms. Asterisks indicate species that were recorded only on 'rare bird' detection forms.

Common Name	Scientific Name
Canada Goose	*Branta Canadensis*
Barrow's Goldeneye*	*Bucephala islandica*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Goshawk*	*Accipiter gentiles*
Red-tailed Hawk	*Buteo jamaicensis*
American Kestrel	*Falco sparverius*
Prairie Falcon	*Falco mexicanus*
Ruffed Grouse	*Bonasa umbellus*
Sooty Grouse	*Dendragapus fuliginosus*
Virginia Rail	*Rallus limicola*
Spotted Sandpiper	*Actitis macularia*
Marbled Murrelet*	*Brachyramphus marmoratus*
Band-tailed Pigeon	*Patagioenas fasciata*
Spotted Owl*	*Strix occidentalis*
Barred Owl	*Strix varia*
Common Nighthawk	*Chordeiles minor*
Vaux's Swift	*Chaetura vauxi*
Calliope Hummingbird	*Stellula calliope*
Rufous Hummingbird	*Selasphorus rufus*
Belted Kingfisher	*Ceryle alcyon*
Red-breasted Sapsucker	*Sphyrapicus rubber*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
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*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta thalassina*
Black-capped Chickadee	*Poecile atricapillus*
Mountain Chickadee	*Poecile gambeli*

Table 4. All species recorded in the three large parks during the 2006 field season, including species detected during point counts, and species recorded on 'rare bird' detection forms. Asterisks indicate species that were recorded only on 'rare bird' detection forms (continued).

Common Name	Scientific Name
Chestnut-backed Chickadee	Poecile rufescens
Red-breasted Nuthatch	Sitta Canadensis
Brown Creeper	Certhia Americana
Rock Wren*	Salpinctes obsoletus
Winter Wren	Troglodytes troglodytes
American Dipper	Cinclus mexicanus
Golden-crowned Kinglet	Regulus satrapa
Ruby-crowned Kinglet	Regulus calendula
Mountain Bluebird	Sialia currucoides
Townsend's Solitaire	Myadestes townsendi
Swainson's Thrush	Catharus ustulatus
Hermit Thrush	Catharus guttatus
American Robin	Turdus migratorius
Varied Thrush	Ixoreus naevius
American Pipit	Anthus rubescens
Cedar Waxwing	Bombycilla cedrorum
Orange-crowned Warbler	Vermivora celata
Nashville Warbler	Vermivora ruficapilla
Yellow Warbler	Dendroica petechia
Yellow-rumped Warbler	Dendroica coronata
Black-throated Gray Warbler	Dendroica nigrescens
Townsend's Warbler	Dendroica townsendi
MacGillivray's Warbler	Oporornis tolmiei
Wilson's Warbler	Wilsonia pusilla
Western Tanager	Piranga ludoviciana
Spotted Towhee	Pipilo maculates
Chipping Sparrow	Spizella passerine
Song Sparrow	Melospiza melodia
White-crowned Sparrow	Zonotrichia leucophrys
Dark-eyed Junco	Junco hyemalis
Black-headed Grosbeak	Pheucticus melanocephalus
Lazuli Bunting	Passerina amoena
Brown-headed Cowbird	Molothrus ater
Gray-crowned Rosy-Finch	Leucosticte tephrocotis
Purple Finch	Carpodacus purpureus
Cassin's Finch	Carpodacus cassinii
Red Crossbill	Loxia curvirostra
Pine Siskin	Carduelis pinus
Evening Grosbeak	Coccothraustes vespertinus

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. We detected 41 bird species during point counts at MORA, 65 species during point counts at NOCA, and 49 species during point counts at OLYM (Table 5). Pooling detections across all species, we amassed 616 individual bird detections (4.34 detections/point) at MORA, 1,541 detections

(8.51 detections/point) at NOCA, and 825 detections (6.70 detections per point) at OLYM (Table 6). These substantial differences in species richness and apparent abundance of birds across the three parks are in line with results from the NCCN avian inventory projects (Siegel et al. 2009a, 2009c; Wilkerson et al. 2009).

Several species that are rare in the parks and/or of conservation interest were detected at times other than during point counts. Such detections were recorded on 'rare bird' detection forms, and are summarized in Table 6.

For 57 species (all species for which we amassed at least five point count detections during 2005 and 2006 combined), we present the total number of detections of each species in each park during both the 2005 and 2006 field seasons (Figure 5). 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 five-year reports.

Table 5. Number of transects with detections and number of individual detections for each species detected during point counts in the three large parks in 2006.

	Number of transects with detections				Number of individual detections			
Species	MORA	NOCA	OLYM	ALL	MORA	NOCA	OLYM	ALL
Canada Goose	0	0	1	1	0	0	1	1
Bald Eagle	0	0	1	1	0	0	1	1
Red-tailed Hawk	0	0	1	1	0	0	2	2
American Kestrel	0	0	1	1	0	0	2	2
Prairie Falcon	1	0	0	1	1	0	0	1
Ruffed Grouse	0	0	1	1	0	0	1	1
Blue Grouse	2	3	7	12	4	8	18	30
Virginia Rail	0	0	1	1	0	0	1	1
Spotted Sandpiper	0	1	2	3	0	1	3	4
Band-tailed Pigeon	1	0	4	5	2	0	5	7
Barred Owl	0	1	0	1	0	1	0	1
Common Nighthawk	0	1	0	1	0	1	0	1
Vaux's Swift	3	2	2	7	4	11	11	26
Calliope Hummingbird	0	1	0	1	0	1	0	1
Rufous Hummingbird	3	8	7	18	3	20	13	36
Belted Kingfisher	0	1	0	1	0	1	0	1
Red-breasted Sapsucker	1	3	1	5	1	14	1	16
Downy Woodpecker	0	1	0	1	0	1	0	1
Hairy Woodpecker	3	5	5	13	4	8	9	21
Northern Flicker	3	6	6	15	4	14	15	33
Pileated Woodpecker	0	4	0	4	0	4	0	4
Olive-sided Flycatcher	1	6	3	10	2	23	13	38
Western Wood-Pewee	0	4	0	4	0	17	0	17
Willow Flycatcher	0	1	0	1	0	2	0	2
Hammond's Flycatcher	2	9	3	14	2	55	5	62
Dusky Flycatcher	0	3	0	3	0	5	0	5
Pacific-slope Flycatcher	5	5	9	19	26	11	74	111
Say's Phoebe	0	1	0	1	0	1	0	1
Cassin's Vireo	0	2	0	2	0	9	0	9
Hutton's Vireo	0	0	2	2	0	0	2	2

Table 5. Number of transects with detections and number of individual detections for each species detected during point counts in the three large parks in 2006 (continued).

	Number of transects with detections				Number of individual detections			
Species	MORA	NOCA	OLYM	ALL	MORA	NOCA	OLYM	ALL
Warbling Vireo	2	7	2	11	6	37	11	54
Red-eyed Vireo	0	1	0	1	0	1	0	1
Gray Jay	6	4	7	17	10	5	12	27
Steller's Jay	3	1	3	7	4	4	3	11
Clark's Nutcracker	2	1	0	3	2	4	0	6
American Crow	0	0	4	4	0	0	7	7
Common Raven	2	2	2	6	5	2	2	9
Tree Swallow	0	1	0	1	0	1	0	1
Violet-green Swallow	1	0	0	1	1	0	0	1
Black-capped Chickadee	1	0	1	2	2	0	2	4
Mountain Chickadee	0	5	0	5	0	46	0	46
Chestnut-backed Chickadee	8	10	10	28	67	83	63	213
Red-breasted Nuthatch	6	9	9	24	17	40	29	86
Brown Creeper	8	6	7	21	12	28	13	53
Winter Wren	8	10	10	28	72	94	83	249
American Dipper	0	0	1	1	0	0	1	1
Golden-crowned Kinglet	8	9	8	25	63	54	34	151
Ruby-crowned Kinglet	0	2	1	3	0	19	3	22
Mountain Bluebird	0	1	0	1	0	2	0	2
Townsend's Solitaire	3	3	1	7	4	6	1	11
Swainson's Thrush	2	7	4	13	9	109	20	138
Hermit Thrush	5	6	8	19	17	69	34	120
American Robin	3	10	7	20	16	81	54	151
Varied Thrush	8	9	10	27	88	88	57	233
American Pipit	2	1	0	3	10	3	0	13
Cedar Waxwing	0	4	1	5	0	11	2	13
Orange-crowned Warbler	0	1	0	1	0	2	0	2
Nashville Warbler	0	1	0	1	0	1	0	1
Yellow Warbler	0	5	1	6	0	56	2	58
Yellow-rumped Warbler	1	9	0	10	1	69	0	70

Table 5. Number of transects with detections and number of individual detections for each species detected during point counts in the three large parks in 2006 (continued).

	Number of transects with detections				Number of individual detections			
Species	MORA	NOCA	OLYM	ALL	MORA	NOCA	OLYM	ALL
Black-throated Gray Warbler	0	2	2	4	0	7	6	13
Townsend's Warbler	6	6	3	15	52	62	9	123
MacGillivray's Warbler	0	8	1	9	0	32	1	33
Wilson's Warbler	3	3	3	9	3	9	11	23
Western Tanager	1	8	2	11	1	47	6	54
Spotted Towhee	0	2	0	2	0	3	0	3
Chipping Sparrow	0	5	0	5	0	19	0	19
Song Sparrow	1	4	1	6	1	13	2	16
White-crowned Sparrow	1	1	1	3	1	1	2	4
Dark-eyed Junco	9	8	9	26	77	143	114	334
Black-headed Grosbeak	0	5	0	5	0	12	0	12
Lazuli Bunting	0	1	0	1	0	2	0	2
Brown-headed Cowbird	0	1	0	1	0	4	0	4
Gray-crowned Rosy-Finch	1	0	0	1	4	0	0	4
Purple Finch	0	2	0	2	0	2	0	2
Cassin's Finch	1	1	0	2	4	9	0	13
Red Crossbill	2	3	8	13	5	3	61	69
Pine Siskin	2	4	2	8	6	38	2	46
Evening Grosbeak	1	4	1	6	3	12	1	16
All species pooled					616	1,541	825	2,982
Detections per point (all Species pooled)					4.34	8.51	6.70	6.69
No. of species detected during point counts					41	65	49	79

Table 6. Numbers of individual birds recorded on 'rare bird' detection forms in each park, excluding individuals that were also detected during point counts. Note that an additional Bald Eagle and an additional Barred Owl were detected during point counts (see Table 5).

	No. of Individuals Detected (Excluding Point Count Detections)		
Species	Mount Rainier	North Cascades	Olympic
Barrow's Goldeneye			1
Bald Eagle			2
Northern Goshawk			3
Marbled Murrelet			1
Spotted Owl		1	1
Barred Owl		2	2
Rock Wren			1

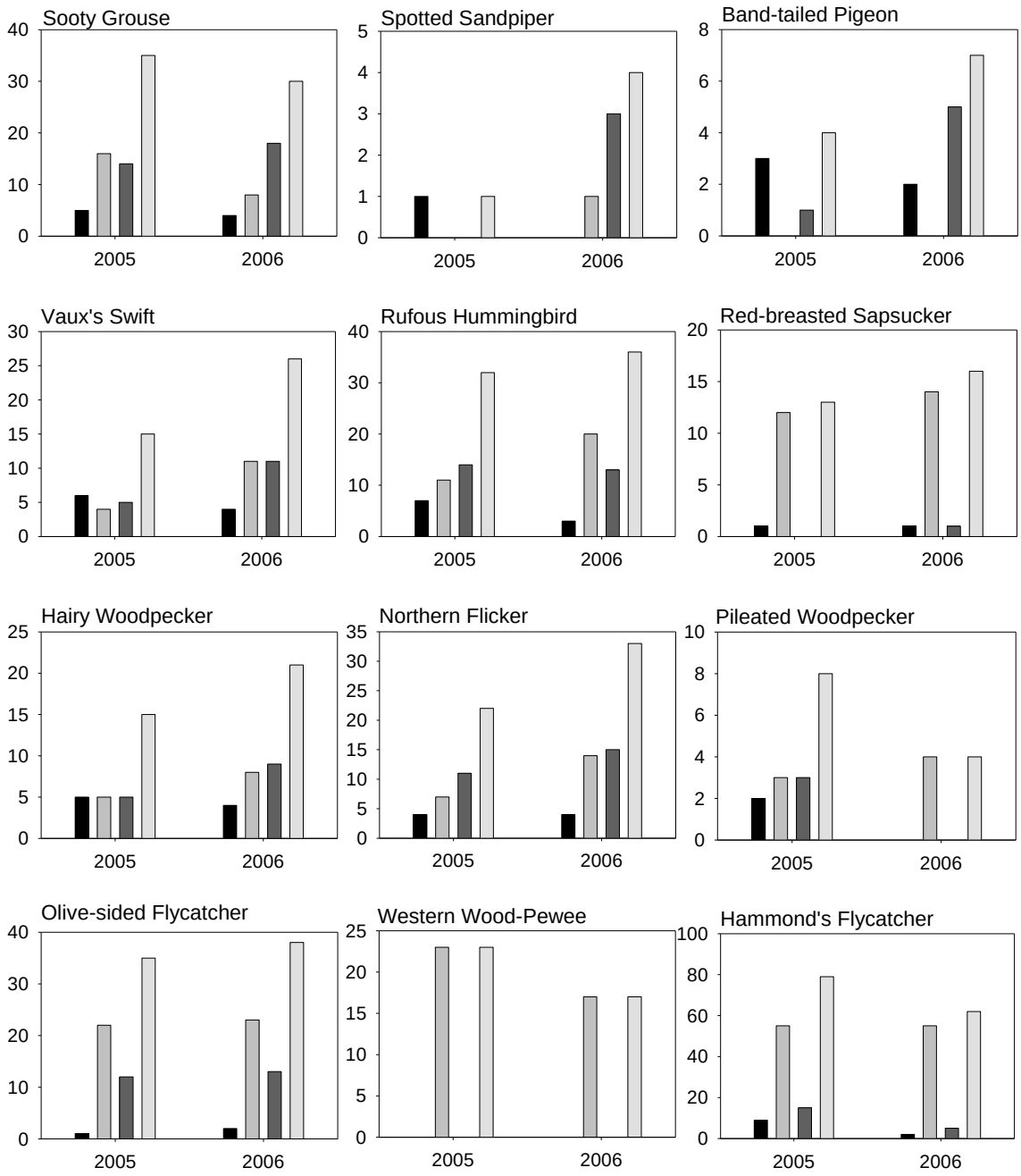


Figure 5. Number of detections of each species at MORA, NOCA, OLYM, and all three parks pooled (always presented in that order) during the 2005 and 2006 field seasons. The figure includes all species for which we amassed at least five point count detections during 2005 and 2006 combined. Numbers of detections are unadjusted for differences in survey effort or potential differences in detectability of birds between years. These adjustments will be made in conjunction with trend analyses in our five-year reports.

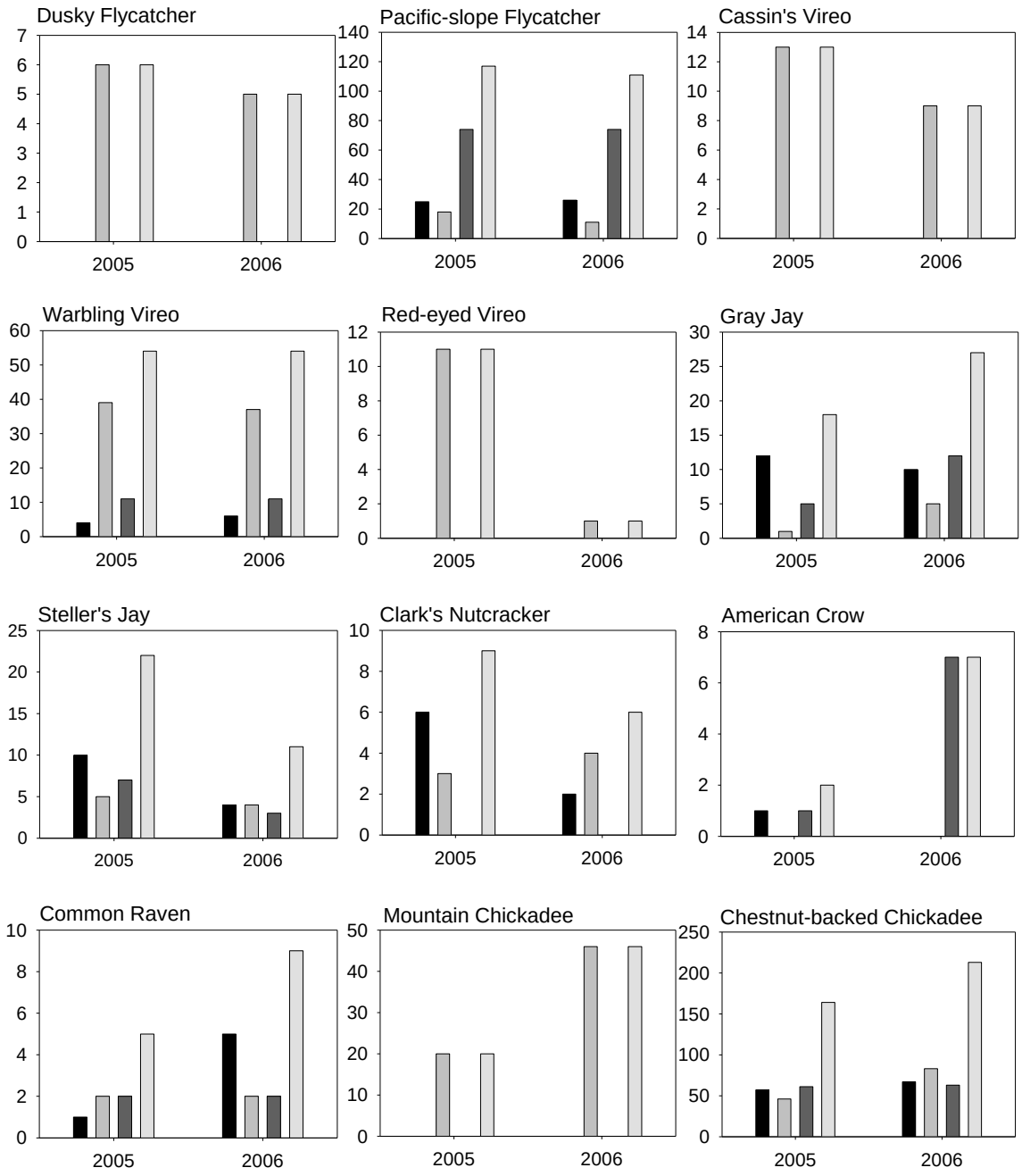
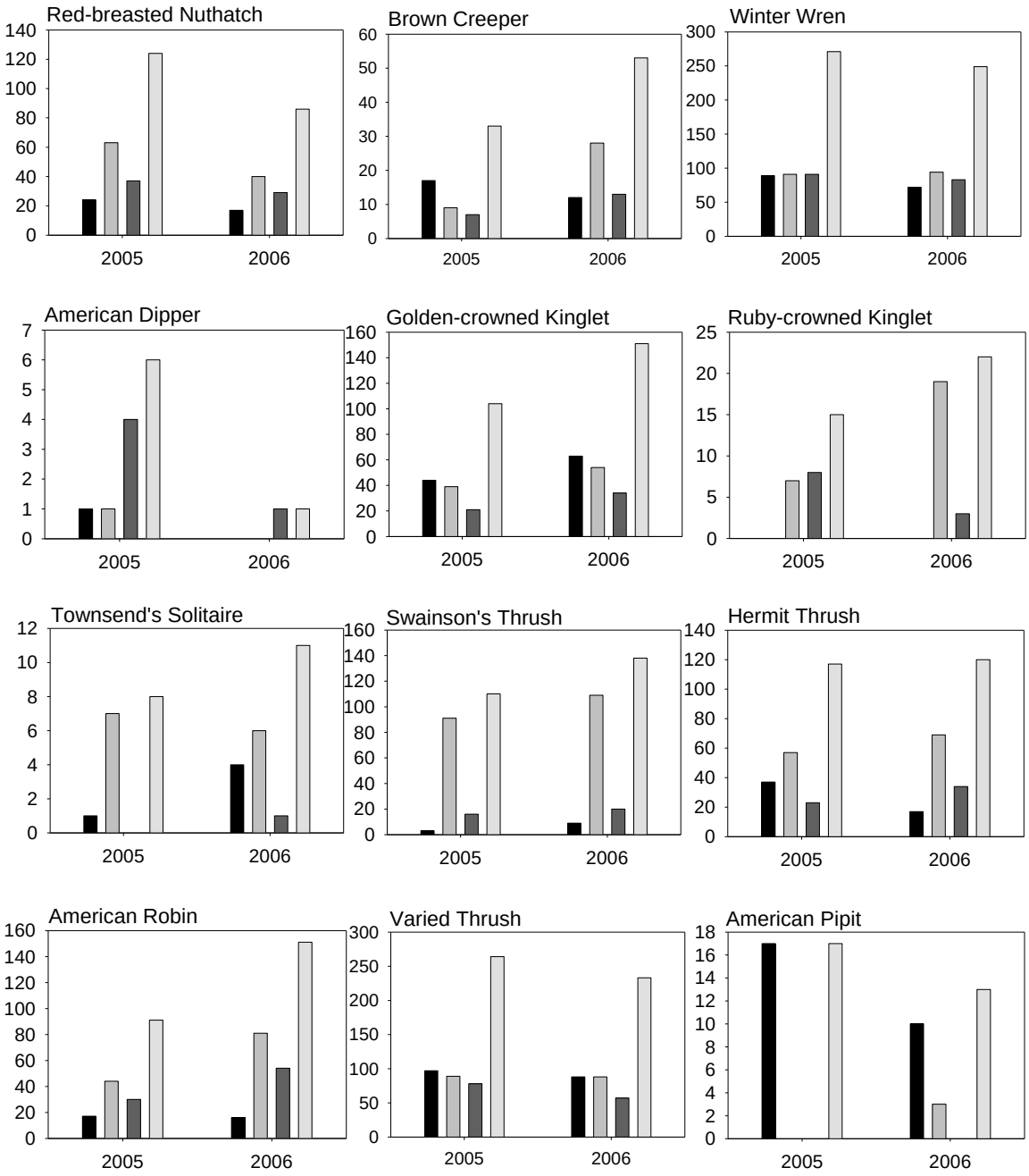


Figure 5. Number of detections of each species at MORA, NOCA, OLYM, and all three parks pooled (always presented in that order) during the 2005 and 2006 field seasons. The figure includes all species for which we amassed at least five point count detections during 2005 and 2006 combined. Numbers of detections are unadjusted for differences in survey effort or potential differences in detectability of birds between years. These adjustments will be made in conjunction with trend analyses in our five-year reports (continued).



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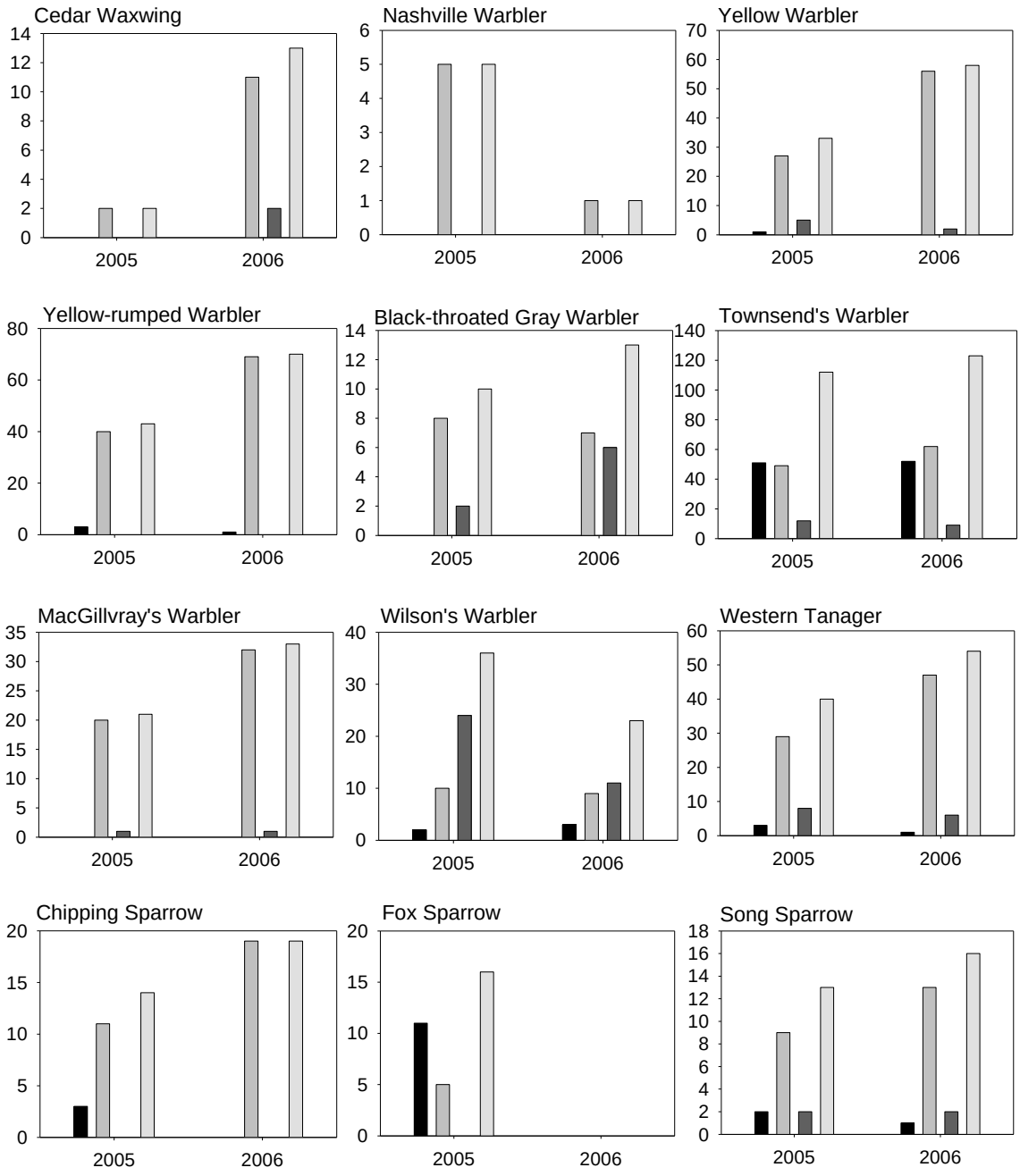
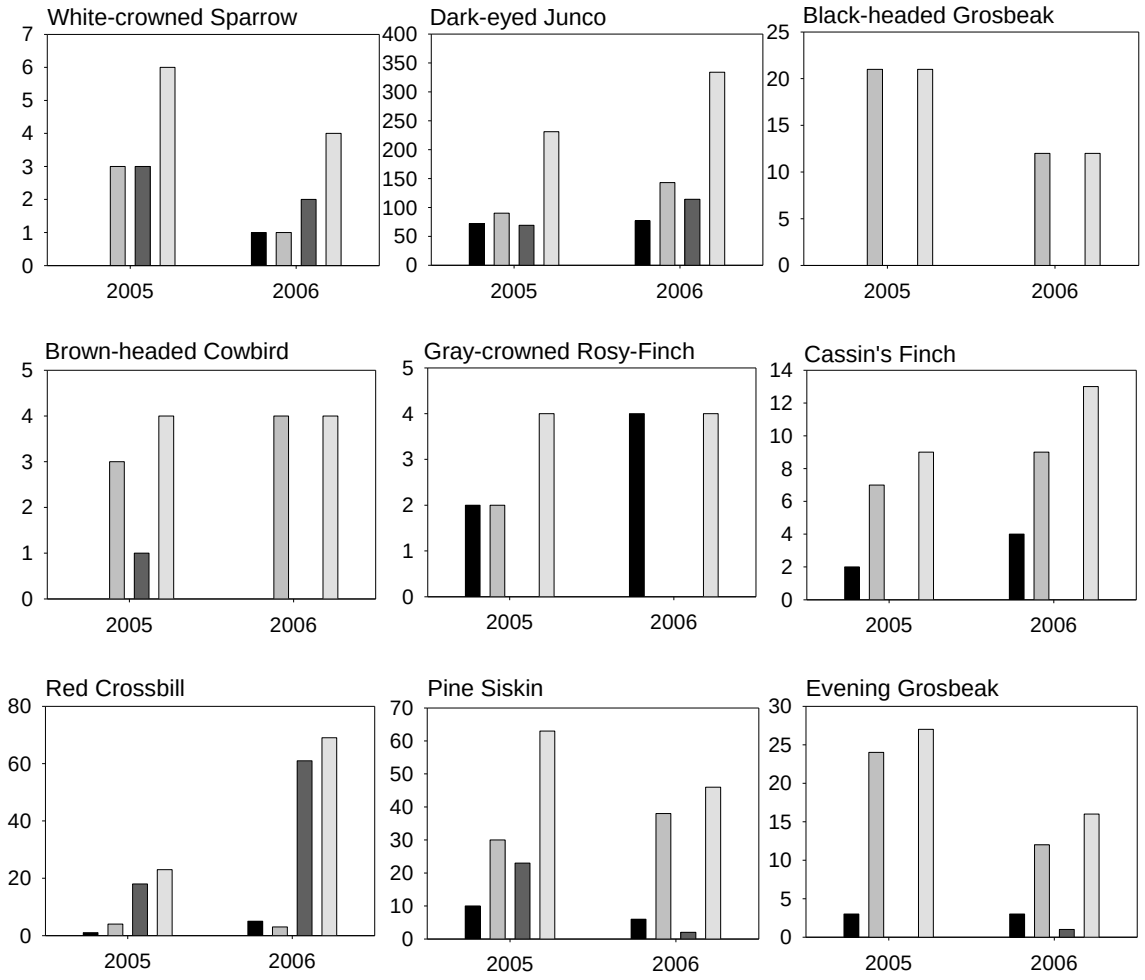


Figure 5. Number of detections of each species at MORA, NOCA, OLYM, and all three parks pooled (always presented in that order) during the 2005 and 2006 field seasons. The figure includes all species for which we amassed at least five point count detections during 2005 and 2006 combined. Numbers of detections are unadjusted for differences in survey effort or potential differences in detectability of birds between years. These adjustments will be made in conjunction with trend analyses in our five-year reports (continued).



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Discussion

Deploying a field crew to resurvey previously established points for the first time helped us greatly in developing and refining the NCCN Landbird Monitoring Protocol, which was under development concurrently with the 2006 field season.

Overall, we believe the 2006 field season indicates the NCCN landbird monitoring program will be very successful. Our crew training program, which we developed largely during the landbird inventory projects that preceded the monitoring program (Siegel et al. 2009d, 2009a, 2009c; Wilkerson et al. 2009), successfully prepared the crew for their work. We were quite pleased with the ability of our surveyors to relocate point count stations established in 2005. Only one marker that was placed in 2005 (markers were placed only at transect origins and at the first point on each half-transect) could not be relocated in the field, and coordinates collected at each point count station revealed that most point counts were conducted within 20 m (frequently less) from where they were conducted in 2005. Data collection proceeded smoothly and as planned throughout the field season, with the exception of few logistical problems, listed below:

- Frequent and heavy rains made completing our surveys at LEWI in the required timeframe difficult. This problem, and potential solutions, are discussed in Siegel et al. (2009b).

- A heavy and late-lasting snowpack at OLYM delayed access to several of the transects, particularly the three highest mid-elevation transects (one of which we were never able to survey). The location and elevation of these three transects may mean that the annual panel at OLYM will somewhat frequently be difficult or impossible to complete. We recommend that the NCCN Landbird Monitoring Group consider revising the sampling design to address this issue.

- Our new NCCN landbird monitoring database was not yet operational at the start of the 2006 field season, such that data entry was delayed until after the end of the field season. The end result was that we incurred the unanticipated expense of having to hire someone to enter data after the field season was completed, and did not experience the quality-control benefits of having the crew enter the data as it was collected throughout the field season.

Despite these relatively minor problems, we are pleased with the 2006 implementation of the NCCN Landbird Monitoring Program, and believe the project protocols (Siegel et al. 2006b) are now well-honed (although occasional alterations and updates are to be expected) and should provide for a highly successful long-term monitoring program.

Literature Cited

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

Altman, B. 1999b. Conservation strategy for landbirds in coniferous forests of the east slope of the Cascades. Version 1.0. American Bird Conservancy and Oregon-Washington Partners in Flight.

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. Oregon-Washington Partners in Flight.

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

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.

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.

DeSante, D.F. and George. 1994. Population trends in the landbirds of western North America. Pages 173-190 *in* Jehl, J.R. Jr. and N.K. Johnson, editors. A century of avifaunal change in western North America. 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., editors. Cumulative effects of forest practices in Oregon: literature and synthesis. Oregon State University, Corvallis.

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 editor. Proceedings of the symposium on management of forest and rangeland habitats for non-game birds. USDA Forest Service General Technical Report WO-1.

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

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, editors. Ecology and management of Neotropical migratory birds. Oxford Press, New York.

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, Oregon.

Sauer, J. R., J. E. Hines, and J. Fallon. 2001. The North American breeding bird survey, results and analysis 1966-2000. Version 2001.2. 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, Colorado.

Siegel, R. B., R. L. Wilkerson, and R. C. Kuntz II. 2006a. Landbird monitoring in the North Coast and Cascades Monitoring 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 inventory for Lewis and Clark National Historical Park (2006). Natural Resource Technical Report NPS/NCCN/NRTR—2009/166. National Park Service, Fort Collins, Colorado.

Siegel, R. B., R. L. Wilkerson, R. C. Kuntz II, and J. McLaughlin. 2009c. 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, Colorado.

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

Siegel, R. B., R. L. Wilkerson, K. Jenkins, R. C. Kuntz II, J. Boetsch, J. Schaberl, and P. Happe. 2006b. Draft landbird monitoring protocol for national parks in the North Coast and Cascades Monitoring Network (NCCN), Version 1.0.

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, editor. Ecosystem Management for Sustainability: Principles and Practices Illustrated by a Regional Biosphere Reserve Cooperative. Lewis Publishers. New York.

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

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