Monitoring Trends of Passerine Birds in Denali National Park and Preserve, Alaska:

2005 Progress Report

Central Alaska Network, Vital Signs Monitoring Program

Climbing out of Arctic Warbler habitat, Igloo minigrid, Denali National Park and Preserve, 23 June 2005.

Carol McIntyre,
Denali National Park and Preserve,
201 1st Ave.,
Fairbanks, AK 99701
Carol_McIntyre@nps.gov

EXECUTIVE SUMMARY

We sampled 261 points on 11 minigrids using 10-minute point transect surveys during the CAKN passerine monitoring project in Denali National Park and Preserve, Alaska, in 2005. All surveys were conducted between 1 and 27 June between 0300 and 0930 hours. We detected 4,149 birds, including 219 to 573 birds per minigrid and 10.4 to 22.9 birds per point. We detected 17 to 32 species per minigrid and 4.5 to 9.4 species per point. The most species (n = 32) were detected on the Birch Lower minigrid and the least species (n = 17) on the Muldrow minigrid.

Most detections were of singing (75.7%) or calling (8.7%) birds. Less than 1% of all detections were made in the 0 - 10 meter distance interval. Approximately 54% of all detections were $\leq$100 meters from the observer and 26% of detections were >150 meters from the observer.

We detected 86 species on minigrids including 63 species on the 10-minute counts and 23 species on the minigrids but not during the counts. Passerine birds were the most commonly detected species group and made up 94.7% of all detections. White-crowned Sparrow was the most commonly detected species (n = 781 detections). We detected White-crowned Sparrows on 82% of all points ($\bar{x}$ = 19.4 points per minigrid, SD = 7.9) including 7 to 135 White-crowned Sparrows per minigrid ($\bar{x}$ = 70.8, SD = 42.7) and 1 to 10 White-crowned Sparrows per point ($\bar{x}$ = 2.98, SD = 2.38).

We'll conduct 10-minute point transect surveys on eight foot accessible minigrids in 2006. We'll also conduct two weekly roadside surveys using Breeding Bird Survey methodology (3-minute counts with no distance sampling) from late April through early July to monitor phenology of singing.

INTRODUCTION

The Central Alaska Network (CAKN) adopted a holistic view of network ecosystems (MacCluskie and Oakley 2005) and through the Vital Signs monitoring program, CAKN will track the major physical drivers of ecosystem change and responses of the two major components of the biota: plants and animals. CAKN identified *Fauna Distribution and Abundance* as one of its top three Vital Signs. In general, we want to know the distribution of fauna across the landscape and track changes in both their distribution and abundance in CAKN. The *Fauna Distribution and Abundance* Vital Sign includes monitoring efforts for a suite of vertebrate species including birds.

Birds make up >75% of the terrestrial vertebrates in CAKN and are an important component of it's' ecosystems. Birds exhibit numerous characteristics that suggest their potential as ecological indicators at large scales (O'Connell et al. 2000); their high body temperature, rapid metabolism, and high ecological position in most food webs make them good indicators of the effects of local and regional changes in ecosystems (Fancy and Sauer 2000, Peitz et al. 2002).

Landbirds make up >70% of the bird species in CAKN and the landbird monitoring effort in CAKN will focus on the Passeriformes. Of all the landbirds that occur in CAKN, Passeriformes (or passerines) are relatively easy and economical to detect and a single survey can cover many common species. The order *Passeriformes* includes well-known songbirds such as kinglets, flycatchers, thrushes, warblers, and sparrows. Historic work has provided some information on passerine populations in CAKN, however, we know remarkably little about their community structure, population size, and distribution in CAKN.

The passerine bird monitoring component of the CAKN Vital Signs monitoring program has four objectives in Denali:

1. Detect linear trends in the density of as many passerines as possible during the breeding season.
2. Track changes in the breeding season composition and distribution of passerines.
3. Develop and update habitat models for common passerine species and for species of conservation concern and assess response of passerine communities (composition, abundance, distribution) to changes in vegetation structure and composition.
4. Track changes in arrival dates and phenology of singing of passerine birds.

The purpose of this annual report is to describe fieldwork conducted in 2005, provide a brief data summary, and describe work to be completed in 2006 and beyond.

METHODS

Survey team. - The 2005 survey team consisted of four highly experienced bird surveyors: Sally Andersen (National Park Service, NPS), Ryan Drum – team leader (NPS), Peter Elstner (Alaska Bird Observatory; ABO) and Tim Walker (ABO). Ryan Drum and Tim Walker worked on this project since 2002, Sally Andersen worked on this project in 2002 and 2003, and Peter Elstner worked on this project in 2004. All team members were proficient at identifying all birds that occur, or were expected to occur, in Denali by sight and sound (calls and songs). All team members completed an intensive two-week distance sampling and bird identification training program conducted by ABO

personnel during late May and were experienced using distance sampling in the study area.

Survey schedule.- We specifically selected three neighboring minigrids west of Kantishna, four neighboring minigrids in the Wonder Lake area, and four neighboring minigrids in the eastern region of Denali for sampling in 2005 (Figure 1). We selected seven minigrids (Wonder Lake area and eastern region) that were foot accessible. We sampled all accessible points once in 2005. Photographs of some of the minigrids are provided in Appendix A.

We sampled remote minigrids that required helicopter access in early June to take advantage of the schedule for the park's contract helicopter (Hughes 500). The remote minigrids including Birch Lower, Birch Middle, and Hult Creek were sampled between 2 and 7 June 2005 (Table 1). The helicopter transported the survey teams to remote minigrids from the Kantishna airstrip. The team arrived at each minigrid the day before the surveys and established a spike camp near or within the minigrid, but at least 200 meters from a sampling point.

We sampled minigrids that were accessible by foot travel from the Denali park road from 9 June to 27 June 1005 (Table 1). Teams based out of the Gallop Cabin near the Kantishna airstrip when sampling the McKinley Bar, Muldrow, Moose Creek, and Wonder minigrids and out of the East Fork Research Cabin when sampling the Teklanika Middle, Igloo, and Polychrome minigrids. The team hiked into the Savage Upper minigrid the day before the surveys and established a spike camp just west of the minigrid.

Survey methods. - Each two-person field crew consisted of one observer, who conducted the survey, and one recorder, who recorded the detections of the observer and environmental data on standardized data sheets. Surveys started at 0300 and ended before 0930. We used point transect sampling (Buckland et al. 2001) for all surveys. All birds seen or heard at each sampling point were recorded during a 10-minute sampling period. Bird observations were separated into four time segments:

- 0 - 3 minutes to allow comparisons with BBS data,
- $> 3 \leq 5$ minutes to allow comparisons with other state-based point counts,
- $> 5 \leq 8$ minutes to allow comparisons with historical point counts, and
- $> 8 \leq 10$ minutes to allow comparison with the Alaska Landbird Monitoring System and other North American point counts.

All birds detected were recorded at 10-m intervals up to 100 m, then at 25 m intervals to 150-m, and then at >150-m. For most species, each individual bird was recorded as a separate observation. For species that occurred in clusters or flocks, we recorded the distance to the cluster or flock, not the individual bird.

When we conducted a 10-minute point transect survey, we attempted to get an "instantaneous count" of birds present. The survey method takes into account the fact that birds close to the observer have a higher probability of detection (if they are not flushed) than birds far from the observer and that different species have different detection functions (i.e., the probability of detecting a bird at different distances from the observer).

After completing a 10-minute count and filling in the field data forms, the observers used a map, compass, and hand-held Global Positioning System (GPS) to navigate to the next sample point. Team members recorded all species observed between points on standardized data sheets. All team members remained on a minigrid until all the survey points were completed.

After the field season, Sally Andersen and Ryan Drum proofed all data sheets and entered the data into the CAKN passerine monitoring database. Scientific names of species mentioned in this report are listed in Appendix B and incorporate changes made in the 42nd, 43rd, 44th, 45th, and 46th Supplements to the Check-list, as published in *The Auk* 117: 847-858 (2000); 119:897-906 (2002); 120:923-932 (2003); 121:985-995 (2004); 122:1026-1031 (2005).

RESULTS

Sampling schedule. - Our sampling target for 2005 was 11 minigrids (n = 275 points). We sampled 261 points on 11 minigrids (95% sampling success in 2005) but could not sample 14 points because of unstable terrain or river-crossings. All sampling occurred from 1 June 2005 to 27 June 2005, between the hours of 0300 and 0915. Sampling required 21 days (Table 1). Two days were required to sample all accessible points on each minigrid. At all but one minigrid, the team sampled more points on the first day of sampling (mean = 16.5 points) than on the second day of sampling (mean = 7.2 points) (Table 1).

Survey results.- We detected 4,149 birds on 11 minigrids in 2005, including 219 to 573 birds per minigrid and 10.4 to 22.9 birds per point (Table 2). We detected 17 to 32 species per minigrid and 4.5 to 9.4 species per point (Table 2). We detected the most species (n = 32) on the Birch Lower minigrid and the fewest species (n = 17) on the Muldrow minigrid (Table 2).

Most detections were of singing (75.7%) or calling (8.7%) birds. Less than 1% of all detections were made in the 0 - 10 meter distance interval (Figure 2). Approximately 54% of all detections were made $\leq$ 100 meters of the observer and 26% of detections were made >150 meters from the observer (Figure 2).

We detected 86 species on minigrids including 63 species on the 10-minute point counts and 23 species on the minigrids but not during the point counts (Table 3). Passerine birds were the most commonly detected species group (Figure 3) and members of three families, *Emberizidae* (Sparrows), *Turdidae* (Thrushes), and *Parulidea* (Warblers) made up nearly 75% of all detections (Table 3). Sparrows and Juncos made up 45% of all detections and, as in all other years, White-crowned Sparrow (*Zonotrichia leucophrys*) was the most commonly detected species on the 10-minute counts (n = 781 detections, 18% of all detections in 2005). In 2005, White-crowned Sparrows were detected on all grids and on 82% of all points ($\bar{x}$ = 19.4 points per minigrid, SD = 7.9). Overall, we detected 7 to 135 White-crowned Sparrows per minigrid ($\bar{x}$ = 70.8, SD = 42.7) and 1 to 10 White-crowned Sparrows per point ($\bar{x}$ = 2.98, SD = 2.38). White-crowned Sparrows made up 2.2 to 36.1% of the total detections on individual minigrids in 2005.

DISCUSSION

Summary of 2005 fieldwork. - The 2006 field season was successful with high sampling efficacy and no problems with fieldwork, personnel, or logistics. The distance sampling and bird identification training course was successful, and the Alaska Bird Observatory produced a manual detailing how to conduct this course (Walker 2006). The weather conditions in June 2005 were very favorable for sampling, with no days lost to rain or wind.

We detected more than two times more White-crowned Sparrows than any other species. Overall, seven species of sparrows (including Dark-eyed Junco) made up 45% of all detections, indicating that this family of birds are found across a wide-range of habitats in the northern section of Denali.

We were surprised that we did not detect any Downy Woodpeckers, Hairy Woodpeckers, Northern Flickers, or Black-capped Chickadees in 2005. The low number of detections of Blackpoll Warblers also surprised us, particularly since we sampled many points in tall willow shrubs.

Interesting detections in 2005 include several observations of Greater Yellowlegs, a nesting Great Gray Owl, and high numbers of Arctic Warblers. Results from our study were very helpful for selecting study sites for the new U. S. Fish and Wildlife Service surveillance program of Arctic Warblers, a species that winters in southeast Asia, for Asian H5N1 avian influenza.

Summary of minigrid sampling approach. - We conducted 8-minute point transect surveys (2001 and 2002) or 10-minute point transect surveys (>2002) on 23 minigrids in

the northern region of Denali since 2001. We sampled all 25 points on 16 minigrids (70%) and 525 of 575 available points (91%). The main obstacles for sampling at all minigrid points include steep, unstable terrain (13 points on Gorge Creek, 1 point on Upper Savage, and 5 points on Tributary Creek minigrids) and river crossings (14 points on Cabin Creek, 5 points on Wonder Lake, 2 points on Hult Creek, and 6 points on Lower Birch minigrids). Problems with river crossings can be reduced or eliminated by equipping the crew with a backpack style raft.

Concerns with data analysis and timing of surveys.-While the field aspects of this project remain relatively simple, the distance sampling and data analysis aspects of the project present a host of challenges. For instance, one of the assumptions when using distance sampling is that all birds at zero distance (center of point count) are detected (i.e., the probability of detecting a bird at zero distance is 100%). However, our analysis of the data collected on the Toklat Basin minigrids in 2002 and 2003 suggest that some birds may be either moving away from the center of the point during the survey or that they may be singing less when the observer is present. This presents a problem in meeting a major assumption of distance sampling.

Further, much of the data from the Toklat Basin minigrids exhibited "heaping" characteristics (Buckland et al. 2001) and we may need to reduce the number of distance intervals to avoid problems of heaping and improve estimates of density. The principal investigator is working with other scientists using distance sampling to overcome some of these issues.

Another issue to confront is the timing of the surveys, particularly for nesting species that are residents, early returning migrants, and montane nesting species. Currently, we conduct all surveys between 1 and 30 June, the peak singing time for many species of breeding passerine in Denali, following recommendations by Swanson and Nigro (2003). However, we may be conducting the surveys too late in the breeding season to detect many singing males of several species including Black-capped Chickadee, Boreal Chickadee, and Gray Jay (resident species), Ruby-crowned Kinglet, Varied Thrush, and Yellow-rumped Warbler (early returning migratory species), and Horned Lark, Townsend's Solitaire, Northern Wheatear, American Pipit, and Lapland Longspur (montane nesting species). For instance, the USGS surveyed for montane nesting birds in the Brooks Range in late May and early June (Tibbits et al. 2005) and is currently surveying for montane nesting birds in the SW Alaska Network in May and early June. We need to address the issue of timing of surveys and decide if our current survey schedule adequately meets our monitoring objectives. One potential solution to this concern is to conduct multiple surveys at each sampling point across the breeding season (e.g., early, middle, and late).

PLANS FOR 2006 AND 2007

Completing the monitoring protocol, revising the sampling frame, and concerns with data analysis. - Colleen Handel, USGS, and Bill Thompson, NPS, reviewed version 1.0 of the CAKN passerine monitoring protocol. The majority of their comments focused on the data analysis section of the protocol. Plans for completing the monitor protocol

include revising the sampling frame and revising the data analysis standard operating procedure (SOP) to address monitoring objectives.

Following recommendations from the North Cascades Landbird Monitoring Program, I have restricted our sampling frame to accessible areas on the north side of Denali within 15 km of a road. I have defined the more remote portions of Denali as a separate stratum that will not be sampled as part of the monitoring project. If funds are available, we will sample minigrids in the remote stratum as part of our inventory efforts. By focusing our long-term monitoring efforts on accessible area, we enhance safety and sample size (hence power), and minimize logistical and expense problems associated with helicopters. This strategy should enhance the likelihood that this project will persist over of generations rather than years (Siegel et al. 2005).

The complexity of generating density estimates (the parameter used for detecting trends over time) is substantial, particularly during the model selection process (developing and fitting distance functions). There are long-term consequences for using poor fitting models for generating density estimates. Although some NPS networks are using customized software for estimating densities using program Distance, I believe that the complexity in fitting detection functions and model selection among species and among habitats in CAKN requires us to complete more modeling exercises, including adding habitat covariables to the analysis process, before we can use custom-designed software programs to conduct routine analyses. Additionally, it is apparent that the principal investigator of this project should acquire the training necessary to use program Distance.

Fieldwork in 2006. - The 2006 survey team will consist of the NPS principal investigator or a GS-07 seasonal biological technician and three field biologists from ABO. The distance sampling and bird identification training will occur from 15 May to 19 May 2006 in Fairbanks, Alaska, and from 22 May to 25 May 2006 in Denali. Unlike the last four years, NPS personnel will conduct the training instead of ABO personnel. Bird surveys will occur in Denali between 1 and 30 June 2006. We are implementing our three-year sampling rotation in 2006. We will survey 8 unique minigrids each year for the next three years (n = 24 minigrids) and then repeat this rotation over time.

In addition to the 10-minute point transect surveys, we'll repeat a series of weekly bird surveys using Breeding Bird Survey methods (3-minute point counts with no distance estimation) on two to three 50-point survey routes along the Denali Park Road. The surveys will be conducted from late April to early July. We will compare results from these surveys with results from surveys conducted in 1995 to determine if peak singing times have changed for several species in the last decade. We plan to conduct this sampling for the next three years (2006-2008) and again from 2012-2014.

Fieldwork in 2007 and beyond. - We need to start discussing plans for implementing passerine monitoring in Wrangell-St. Elias National Park and Preserve and Yukon-Charley Rivers National Preserve. I suggest that we establish two stratum (accessible and inaccessible) in each of those NPS units, implement the minigrid sampling system (Roland et al. 2003), and use 10-minute point transect on a random sample of minigrids to start monitoring passerines in these areas.

Data analysis in 2006 and 2007. – It was difficult to find time to complete the data analysis associated with this project. I also did not schedule any time to work with Ed Debevec on getting the dataset onto StatServer. My inability to address these data is rather unsettling for me, and in the next year, I hope to obtain the training necessary to use MS Access, ArcGIS, and program Distance to conduct a thorough analysis of this ever-growing data set. Additionally, I need to become familiar with the CAKN vegetation monitoring database and understand how to use that data in program Distance as a habitat covariable and for developing broad-scale habitat models for passerine birds in Denali.

ACKNOWLEDGMENTS

Thanks to Ryan Drum, Sally Anderson, Tim Walker, and Peter Elstner for conducting the fieldwork in 2005, Kristen Bartecchi for assisting with the training course, Charlie Reynar for helping with field logistics, and George Hook for safe flying. Thanks to the Alaska Bird Observatory for additional support and Nikki Demers for helping with logistics in Denali.

LITERATURE CITED

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.

Fancy, S. G. and J. R. Sauer. 2000. Recommended methods for inventorying and monitoring landbirds in the National Parks. http://science.nature.nps.gov/im/monitor/protocols/ npsbird.doc

MacCluskie, M., and K. Oakley. 2005. Vital Signs Monitoring Plan, Central Alaska Network, Vital Signs Monitoring Plan. August 2005. Unpublished report. U.S. National Park Service. Fairbanks, Alaska.

O'Connell, T.J., L.E. Jackson, and R.P. Brooks. 2000. Bird guilds as indicators of ecological condition in the Central Appalachians. Ecological Applications 10:1706-1721.

Peitz, D. G., S. G. Fancy, L. P. Thomas, and B. Witcher. 2002. Bird monitoring protocol for Agate Fossil Beds National Monument, Nebraska and Tallgrass Prairie National Preserve, Kansas. Prairie Cluster Prototype Monitoring Program, National Park Service, U.S. Department of the Interior.

Roland, C., K.Oakley, and C. McIntyre. 2003. Long-term ecological monitoring program: Evaluation of a study design for detecting ecological change in Denali National Park and Preserve at Multiple Scales. Volume I and II. Internal Review Draft, September 2003. Denali National Park and Preserve, Denali Park, Alaska.

Siegel, R.B., R.L. Wilkerson, K. J. Jenkins, R. C. Kuntz II, J. Schaberl, P. Happe, and J. Boetsch. 2005.Study Plan for Establishing a Landbird Monitoring Program for National Parks in the North Coast and Cascades Monitoring Network. A report in partial fulfillment of USGS Cooperative Agreement 03WRAG0040. Unpublished report, The Institute for Bird Populations, Point Reyes Station, California.

Swanson, S.A., and D.A. Nigro. 2003. A breeding landbird inventory of Yukon-Charley Rivers National Preserve, Alaska, June 1999 and 2000. Unpublished final report. YUCH-03-001, February 2003. Yukon-Charley Rivers National Preserve, Fairbanks, Alaska.

Tibbitts, T.L., D.R. Ruthrauff, R.E. Gill, Jr., and C.M. Handel. 2005. Inventory of montane-nesting birds in the Arctic Network of National Parks, Alaska. Unpublished report. U.S. Geological Survey, Alaska Science Center, Anchorage, Alaska.

Walker. T. 2006. Recommendations for Conducting a Training Program in Passerine Identification and Distance Estimation. Unpublished report. National Park Service, Central Alaska Network, Fairbanks, Alaska.

Table 1. Sampling schedule for CAKN passerine monitoring project, Denali National Park and Preserve, Alaska, 2005.

			# points sampled	
Minigrid name	Access type	Sample dates	Day 1	Day 2
Birch Lower	Helicopter	2 to 3 June	16	3
Birch Middle	Helicopter	4 to 5 June	19	6
Hult Creek	Helicopter	6 to 7 June	17	6
Wonder Lake	Foot travel	8 to 9 June	18	2
Moose Creek	Foot travel	11 to 12 June	12	13
McKinley Bar	Foot travel	13 to 14 June	15	10
Muldrow	Foot travel	15 to 16 June	15	10
Polychrome	Foot travel	17 to 18 June	20	5
Igloo	Foot travel	22 to 23 June	16	9
Teklanika Middle	Foot travel	24 to 25 June	18	7
Savage Upper	Foot travel	26 to 27 June	16	8

Table 2. Summary statistics for birds detected on 10-minute point transect surveys by minigrid, Denali National Park and Preserve, Alaska, 2005.

Minigrid name	Points surveyed	# birds	# species	Mean number of birds per point	Mean number of species per point
Birch Lower	19	219	32	11.5	7.9
Birch Middle	25	372	28	14.9	7.8
Hult Creek	23	360	28	15.6	8.1
Wonder Lake	20	386	25	19.3	6.8
Moose Creek	25	573	25	22.9	9.4
McKinley Bar	25	420	20	16.8	6.8
Muldrow	25	425	17	17.0	5.6
Polychrome	25	375	18	15.0	6.5
Igloo	25	261	18	10.4	4.5
Teklanika Middle	25	372	23	14.8	7.2
Savage Upper	24	386	17	16.1	7.2

Table 3. Summary of species detected on 11 minigrids, Denali National Park and Preserve, Alaska, 2005. Species detected on the 10-minute counts appear in bold.

Common name	n	# minigrids	# points	% of points	% of total detections
Greater White-fronted Goose	3	1	-	-	-
Canada Goose	5	2	2	0.77	0.12
Trumpeter Swan	17	2	8	3.07	0.41
American Wigeon	1	1	-	-	-
Mallard	1	1	1	0.38	0.02
Blue-winged Teal	2	1	1	0.38	0.05
Northern Pintail	1	1	-	-	-
Green-winged Teal	2	2	-	-	-
Ring-necked Duck	1	1	-	-	-
Scaup sp.	2	2	2	0.77	0.05
Harlequin Duck	2	1	-	-	-
Surf Scoter	1	1	-	-	-
Long-tailed Duck	3	1	-	-	-
Bufflehead	4	1	1	0.38	0.10
Ruffed Grouse	1	1	-	-	-
Spruce Grouse	1	1	1	0.38	0.02
Willow Ptarmigan	5	2	4	1.53	0.12
Common Loon	1	1	1	0.38	0.02
Horned Grebe	1	1	-	-	-
Osprey	1	1	-	-	-
Northern Harrier	1	1	1	0.38	0.02
Red-tailed Hawk	1	1	-	-	-
Golden Eagle	1	1	-	-	-
American Kestrel	1	1	1	0.38	0.02
Merlin	5	4	5	1.92	0.12
Gyrfalcon	1	1	-	-	-
Sandhill Crane	4	2	4	1.53	0.10
American Golden Plover	4	2	3	1.15	0.10
Semipalmated Plover	1	1	-	-	-
Greater Yellowlegs	3	2	3	1.15	0.07
Lesser Yellowlegs	36	4	29	11.11	0.87
Spotted Sandpiper	5	3	3	1.15	0.12
Upland Sandpiper	13	2	6	2.30	0.31
Surfbird	24	2	6	2.30	0.58
Least Sandpiper	1	1	-	-	-

Table 3 (cont'd). Summary of species detected on 11 minigrids, Denali National Park and Preserve, Alaska, 2005. Species detected on the 10-minute counts appear in bold.

Common name	n	# minigrids	# points	% of points	% of total detections
Wilson's Snipe	44	6	36	13.79	1.06
Red-necked Phalarope	1	1	-	-	-
Mew Gull	7	4	6	2.30	0.17
Herring Gull	1	1	-	-	-
Northern Hawk Owl	1	1	1	0.38	0.02
Great Gray Owl	1	1	-	-	-
Short-eared Owl	3	3	-	-	0.07
Belted Kingfisher	2	2	-	-	-
Three-toed Woodpecker	6	5	6	2.30	0.14
Olive-sided Flycatcher	25	6	25	9.58	0.60
Western Wood-Pewee	1	1	-	-	-
Alder Flycatcher	34	5	25	9.58	0.82
Hammond's Flycatcher	3	1	3	1.15	0.07
Say's Phoebe	1	1	-	-	-
Northern Shrike	2	2	2	0.77	0.05
Gray Jay	55	6	43	16.48	1.33
Black-billed Magpie	7	2	6	2.30	0.17
Common Raven	4	3	3	1.15	0.10
Horned Lark	21	3	11	4.21	0.51
Tree Swallow	1	1	1	0.38	0.02
Violet-green Swallow	3	1	3	1.15	0.07
Boreal Chickadee	4	2	4	1.53	0.10
Ruby-crowned Kinglet	60	5	41	15.71	1.45
Arctic Warbler	107	3	42	16.09	2.58
Northern Wheatear	1	1	-	-	-
Townsend's Solitaire	4	3	4	1.53	0.10
Gray-cheeked Thrush	143	9	74	28.35	3.45
Swainson's Thrush	256	7	114	43.68	6.17
Hermit Thrush	67	7	35	13.41	1.61
American Robin	102	8	74	28.35	2.46
Varied Thrush	81	5	47	18.01	1.95
American Pipit	26	3	15	5.75	0.63
Bohemian Waxwing	8	6	8	3.07	0.19
Orange-crowned Warbler	189	8	98	37.55	4.56
Yellow Warbler	3	2	3	1.15	0.07

Table 3 (cont'd). Summary of species detected on 11 minigrids, Denali National Park and Preserve, Alaska, 2005. Species detected on the 10-minute counts appear in bold.

Common name	n	# minigrids	# points	% of points	% of total detections
Yellow-rumped Warbler	74	5	51	19.54	1.78
Blackpoll Warbler	3	2	2	0.77	0.07
Northern Waterthrush	43	3	23	8.81	1.04
Wilson's Warbler	253	10	121	46.36	6.10
American Tree Sparrow	302	8	117	44.83	7.28
Savannah Sparrow	238	10	87	33.33	5.74
Fox Sparrow	254	10	131	50.19	6.12
Lincoln's Sparrow	50	6	33	12.64	1.21
White-crowned Sparrow	781	11	214	81.99	18.82
Golden-crowned Sparrow	9	3	8	3.07	0.22
Dark-eyed Junco	217	8	97	37.16	5.23
Rusty Blackbird	7	2	5	1.92	0.17
Gray-crowned Rosy Finch	1	1	1	0.38	0.02
Pine Grosbeak	1	1	1	0.38	0.02
White-winged Crossbill	308	6	43	16.48	7.42
Redpoll spp.[a]	205	11	89	34.10	4.94

[a] All redpoll detections are recorded as Redpoll spp. since we cannot distinguish between Common Redpoll and Hoary Redpoll.

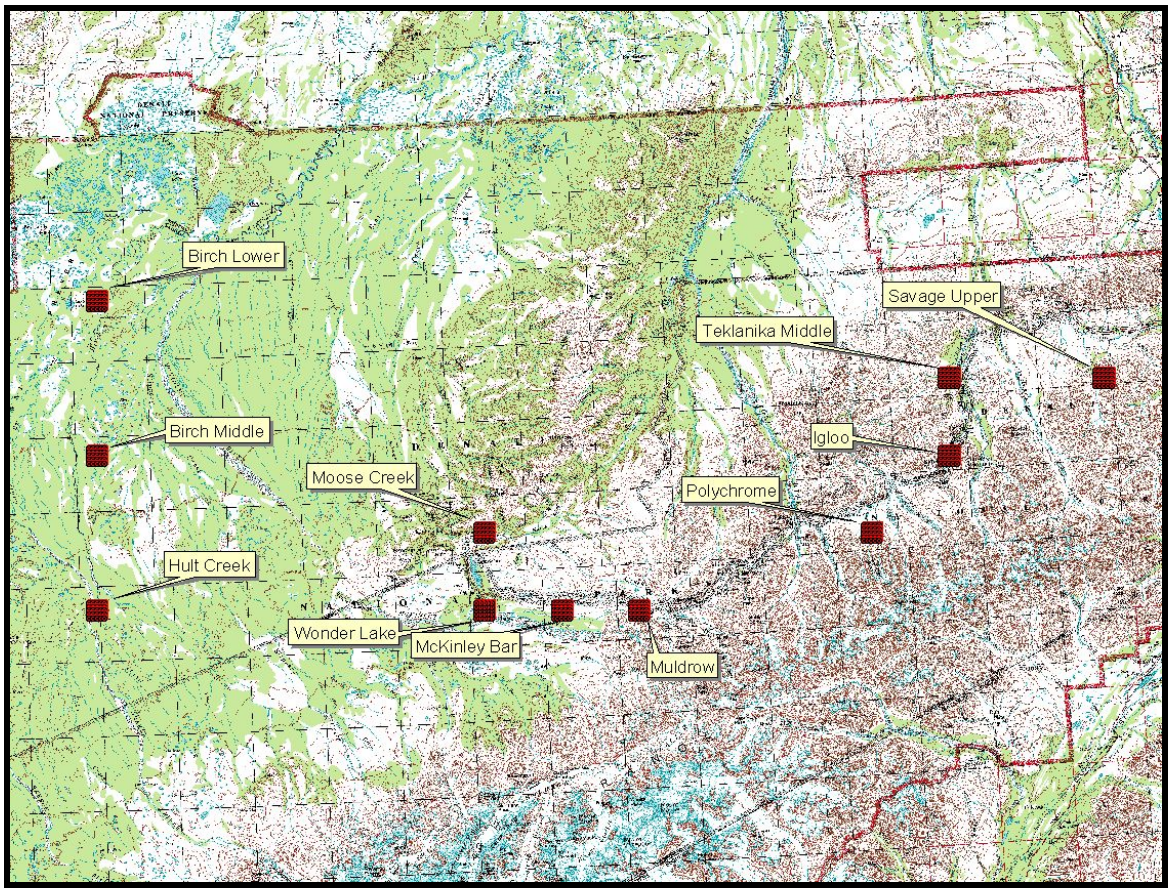

Figure 1. Location of minigrids sampled for CAKN passerine monitoring project, Denali National Park and Preserve, Alaska, 2005. The minigrids are located in the northeast region of Denali, north of the Alaska Range, and were selected from a subset of 41 minigrids located 10-km and 20-km apart.

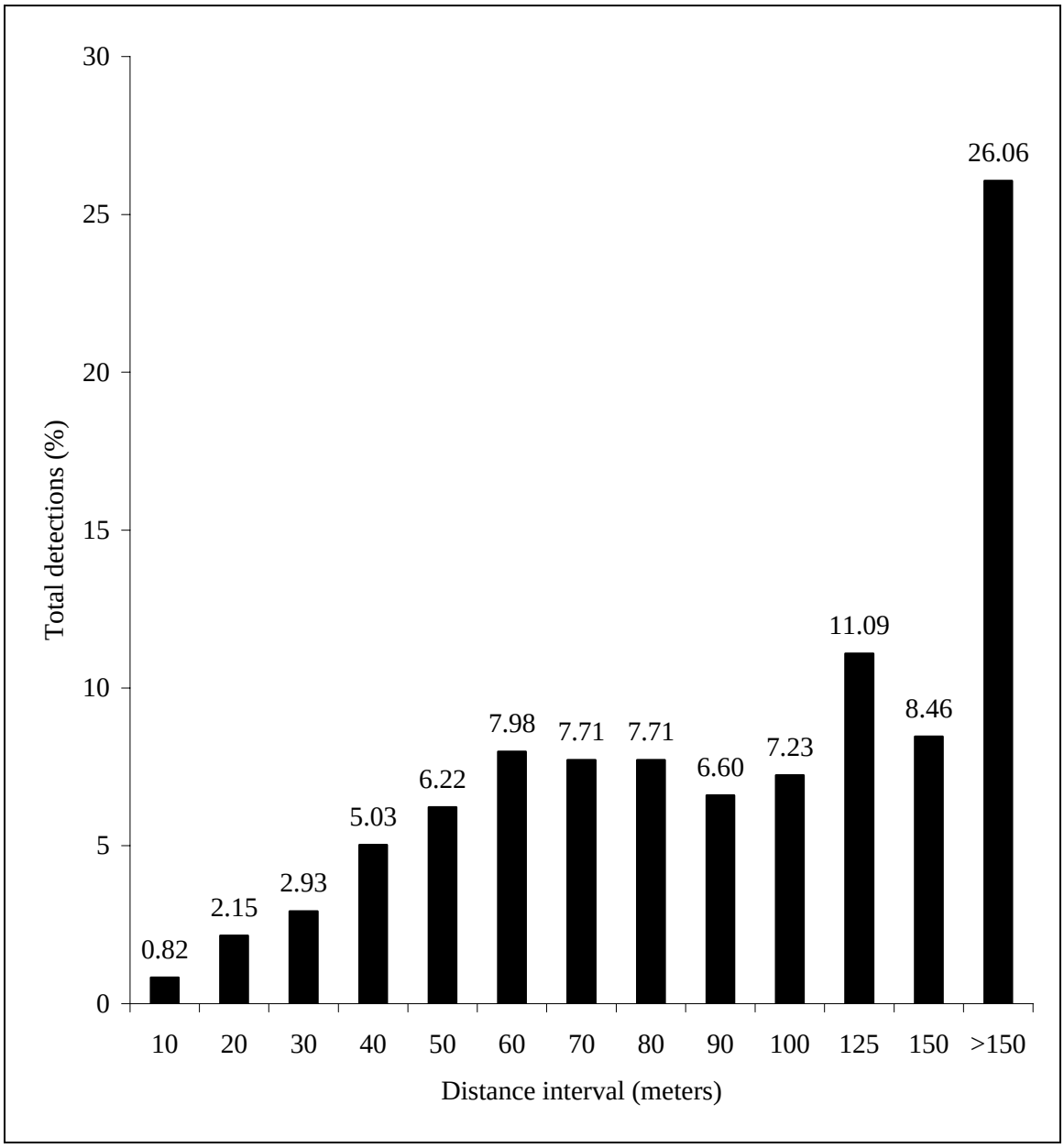

Figure 2. Distribution of detections of birds at different distance intervals, CAKN passerine monitoring program, Denali National Park and Preserve, Alaska. Percent of total detections for each distance interval is shown above each bar.

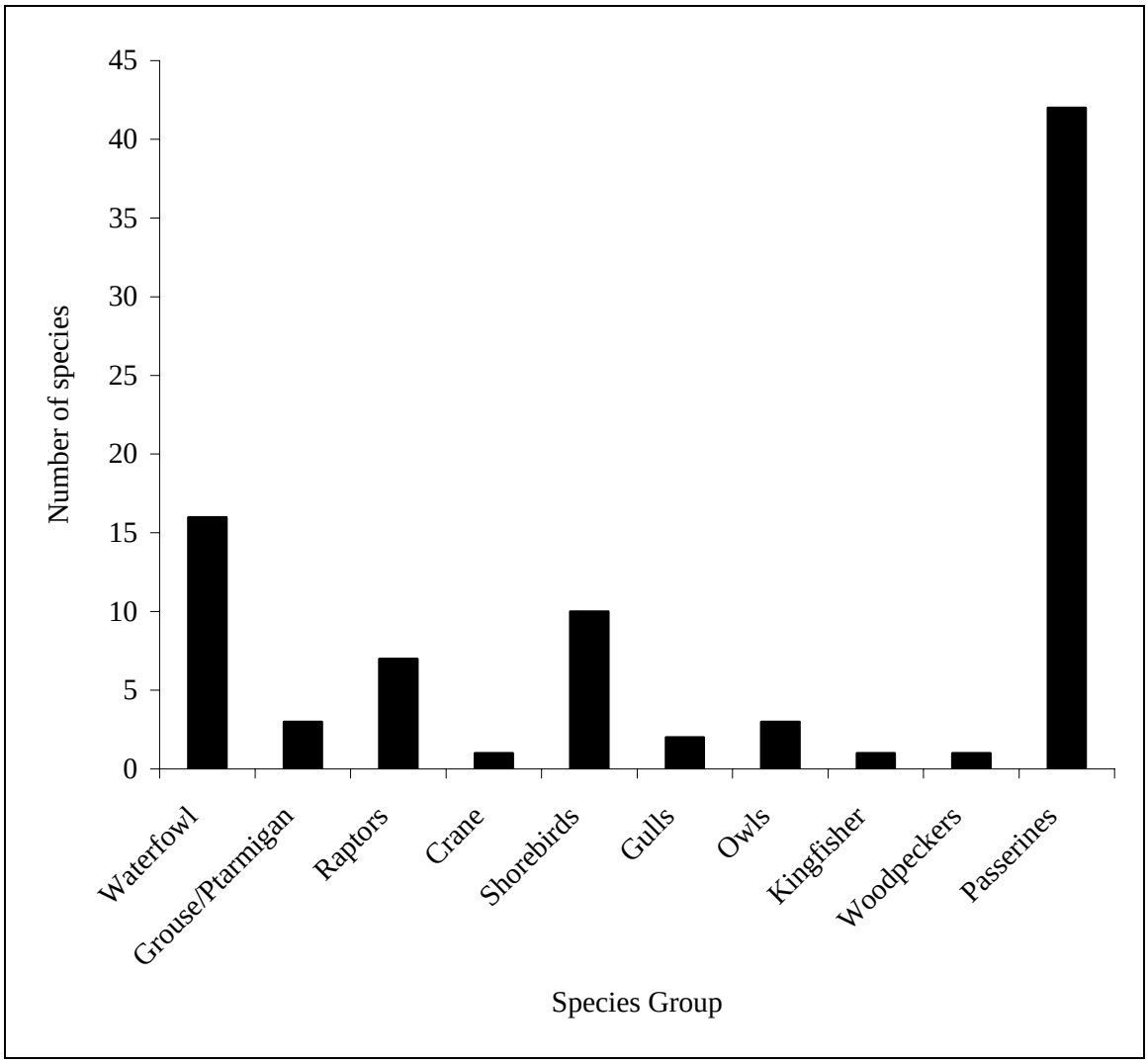

Figure 3. Number of species within each species group detected on 11 minigrids during CAKN passerine monitoring project, Denali National Park and Preserve, Alaska, 2005.

Appendix A. Photographs of some of the minigrids sampled for the CAKN passerine monitoring project, Denali National Park and Preserve, Alaska, 2005.

Figure A-1. Aerial view looking northwest near Birch Lower minigrid, 3 June 2005. NPS photograph by Ryan Drum.

Figure A-2. Spike camp on Birch Middle minigrid, 4 June 2005. NPS photograph by Ryan Drum.

Figure A-3. View of Alaska Range from Hult Creek minigrid, 6 June 2005. NPS photograph by Ryan Drum.

Figure A-4. Mosquitoes swarming observer during early morning survey, Wonder Lake minigrid, 8 June 2005. NPS photograph by Ryan Drum.

Figure A-5. Tim Walker, Ryan Drum, and Peter Elstner waiting for sunrise on Moose Creek minigrid, 12 June 2005. NPS photograph by Sally Andersen.

Figure A-6. Looking south from McKinley Bar minigrid, 13 June 2005. NPS photograph by Sally Andersen.

Figure A-7. Thorofare River transecting Muldrow minigrid, 15 June 2005. NPS photograph by Ryan Drum.

Figure A-8. Ryan Drum hiking to point #21 on Polychrome minigrid, 18 June 2005. NPS photograph by Sally Andersen.

Appendix B. Common and scientific names of species mentioned in this report.

Common name	Genus species
Greater White-fronted Goose	*Anser albifrons*
Canada Goose	*Branta canadensis*
Trumpeter Swan	*Cygnus buccinator*
American Wigeon	*Anas americana*
Mallard	*Anas platyrhynchos*
Blue-winged Teal	*Anas discors*
Northern Pintail	*Anas acuta*
Green-winged Teal	*Anas crecca*
Ring-necked Duck	*Aythya collaris*
Scaup spp.	*Aythya spp.*
Harlequin Duck	*Histrionicus histrionicus*
Surf Scoter	*Melanitta perspicillata*
Long-tailed Duck	*Clangula hyemalis*
Bufflehead	*Bucephala albeola*
Ruffed Grouse	*Bonasa umbellus*
Spruce Grouse	*Falcipennis canadensis*
Willow Ptarmigan	*Lagopus lagopus*
Common Loon	*Gavia immer*
Horned Grebe	*Podiceps auritus*
Osprey	*Pandion haliaetus*
Northern Harrier	*Circus cyaneus*
Red-tailed Hawk	*Buteo jamaicensis*
Golden Eagle	*Aquila chrysaetos*
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Gyrfalcon	*Falco rusticolus*
Sandhill Crane	*Grus canadensis*
American Golden-Plover	*Pluvialis dominica*
Semipalmated Plover	*Charadrius semipalmatus*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Spotted Sandpiper	*Actitis macularius*
Upland Sandpiper	*Bartramia longicauda*
Surfbird	*Aphriza virgata*
Least Sandpiper	*Calidris minutilla*
Wilson’s Snipe	*Gallinago delicata*
Red-necked Phalarope	*Phalaropus lobatus*
Mew Gull	*Larus canus*
Herring Gull	*Larus argentatus*
Northern Hawk Owl	*Surnia ulula*
Great Gray Owl	*Strix nebulosa*
Short-eared Owl	*Asio flammeus*

Appendix B (cont'd). Common and scientific names of species mentioned in this report.

Common name	Genus species
Belted Kingfisher	*Ceryle alcyon*
American Three-toed Woodpecker	*Picoides dorsalis*
Olive-sided Flycatcher	*Contopus cooperi*
Western Wood-Pewee	*Contopus sordidulus*
Alder Flycatcher	*Empidonax alnorum*
Hammond's Flycatcher	*Empidonax hammondii*
Say's Phoebe	*Sayornis saya*
Northern Shrike	*Lanius excubitor*
Gray Jay	*Perisoreus canadensis*
Black-billed Magpie	*Pica hudsonia*
Common Raven	*Corvus corax*
Horned Lark	*Eremophila alpestris*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta thalassina*
Boreal Chickadee	*Poecile hudsonica*
Ruby-crowned Kinglet	*Regulus calendula*
Arctic Warbler	*Phylloscopus borealis*
Northern Wheatear	*Oenanthe oenanthe*
Townsend's Solitaire	*Myadestes townsendi*
Gray-cheeked Thrush	*Catharus minimus*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
American Robin	*Turdus migratorius*
Varied Thrush	*Ixoreus naevius*
American Pipit	*Anthus rubescens*
Bohemian Waxwing	*Bombycilla garrulus*
Orange-crowned Warbler	*Vermivora celata*
Yellow Warbler	*Dendroica petechia*
Yellow-rumped Warbler	*Dendroica coronata*
Blackpoll Warbler	*Dendroica striata*
Northern Waterthrush	*Seiurus noveboracensis*
Wilson's Warbler	*Wilsonia pusilla*
American Tree Sparrow	*Spizella arborea*
Savannah Sparrow	*Passerculus sandwichensis*
Fox Sparrow	*Passerella iliaca*
Lincoln's Sparrow	*Melospiza lincolnii*
White-crowned Sparrow	*Zonotrichia leucophrys*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Dark-eyed Junco	*Junco hyemalis*
Rusty Blackbird	*Euphagus carolinus*
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*
Pine Grosbeak	*Pinicola enucleator*

Appendix B (cont'd). Common and scientific names of species mentioned in this report.

Common name	Genus species
White-winged Crossbill	*Loxia leucoptera*
Redpoll spp.	*Carduelis spp.*