BOREAL
Partners in Flight

2018 Summary of Landbird Projects

January 2019

Contents

Compiler's Note

This year marked the 27th anniversary of Boreal Partners in Flight, which was founded in November 1991 by a small group of ornithologists during the Fourth Alaska Bird Conference. This annual summary showcases a diversity of ongoing inventory, monitoring, research, and outreach programs, and recent publications by a highly skilled and dedicated membership grown across Alaska and northwestern Canada. I have compiled and lightly edited these 31 project summaries voluntarily contributed by our members. I thank our membership for these contributions and for their continued commitment to understand and conserve landbird populations across northwestern North America. Best wishes to you in all with your landbird pursuits in 2019.

Best regards,

Steve Matsuoka, Co-chair of Boreal Partners in Flight

Cover. Logo artwork of Willow Ptarmigan (*Lagopus lagopus*), Northern Goshawk (*Accipiter gentilis*), and McKay's Bunting (*Plectrophenax hyperboreus*) by Bryce W. Robinson (ornithologi.com)

2018 Project summaries by Bird Conservation Region (BCR)

(BCR 1) Estimating population size and nest survival for two endemic birds breeding on Bering Sea Islands

Rachel Richardson[1,2], Steve Matsuoka[1], Jim Johnson[3], Marc Romano[4], and Audrey Taylor[2],
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Monitoring wildlife populations is essential for determining the health and status of species over time. This is especially important for species with heightened vulnerability to ecological disturbances due to small population sizes and restricted geographic ranges. Interannual fluctuations in population numbers are common and can result from widespread breeding success or failure. Thus, identifying factors responsible for these cycles is necessary for understanding potential impacts to breeding populations. If declines are detected in sensitive populations, it becomes critical to identify probable causes of change before appropriate management actions and conservation efforts are developed and implemented.

The McKay's Bunting (*Plectrophenax hyperboreas*; MCBU) and Pribilof Rock Sandpiper (*Calidris p. ptilocnemis*; ROSA) are rare endemic birds in Alaska, identified as priority species for research and monitoring, and designated as birds of high conservation concern (Alaska Shorebird Group 2008, Rosenberg et al. 2016). This important designation is supported by population estimates derived from counts in the early 2000s that suggest both populations have less than 40,000 individuals (Matsuoka and Johnson 2008, Ruthrauff et al. 2012). Breeding ranges are restricted to remote Bering Sea Islands where MCBU breed only on uninhabited St. Matthew and Hall Islands, while ROSA also nest on the two Pribilof Islands of St. Paul and St. George. Only one population estimate currently exists, and monitoring efforts have not been undertaken since 2003 due to the time and expense necessary to reach the islands. Data collected for this study will thereby provide a second population estimate for each species and identify factors potentially influencing breeding populations. Additionally, these data will be used to inform development of a long-term population monitoring plan necessary for assessing future threats and changes. The main objectives that will be addressed include: (1) estimate abundance using line-transect and distance estimation surveys to compare to 2003 population estimates, and (2) search for and monitor nests to quantify nest survival and productivity and to determine the influence of predation and habitat characteristics on reproductive success.

During the 2018 field season, we conducted population surveys from 7 June to 10 June resulting in completion of 34 transects on St. Matthew Island and 12 transects on Hall Island. Additionally, we monitored 71 MCBU nests and 62 ROSA nests from 10 June to 6 July. Of known fate nests, 86% of MCBU nests fledged at least one chick, and 50% of ROSA nests hatched at least one chick. Reasons for nest failures included: (1) predation (MCBU: 5 nests; ROSA: 18 nests), (2) abandonment (ROSA: 1 nest), and (3) human disturbance (ROSA: 1 nest). Finally, we collected data on habitat characteristics to evaluate the use of microhabitats for nesting. Forthcoming products will include spatial models of abundance and population change and estimates of reproductive success and nest failure rates.

Acknowledgments. Additional field assistance for this study was provided by Tony DeGange, Robert Gill, Andy Johnson, Irby Lovette, Bryce Robinson, Stephanie Walden, and Aaron Wells.

Funding and logistical support was provided by the National Fish and Wildlife Foundation, Alaska Maritime National Wildlife Refuge, USFWS Migratory Bird Management, University of Alaska Anchorage, Cornell Lab of Ornithology, and USGS Alaska Science Center. Special thanks to John Faris and the crew of the R/V Tiglax for providing hospitality, accommodations, and safe transport to and from St. Matthew and Hall Islands.

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(BCR 2) A brief note from Togiak National Wildlife Refuge

Kara Hilwig, Togiak National Wildlife Refuge

In consultation with USGS, the Breeding Bird Survey in Dillingham was not conducted this year because of ongoing road construction affecting 22 of 50 stops. The Christmas Bird Count will be conducted in Dillingham on January 5, 2018 and compiled by Kara Hilwig.

(BCR 2) Demographic mechanisms of avian range expansions and contractions along the boreal-arctic transitions zone

Steve Matsuoka, Colleen Handel, Rachel Richardson, and Molly McDermott, U.S. Geological Survey, Alaska Science Center

Arctic and subarctic ecosystems in Alaska are diversifying as the growing season increases in length and tall woody plants invade landscapes previously dominated by low-lying arctic and alpine tundra vegetation. As this shift occurs, much of the initial diversification in terrestrial vertebrates is from boreal forest passerines that are expanding their range margins northwards and higher in elevation (Mizel et al. 2016), with the invading songbirds potentially supplanting tundra-nesting species, particularly shorebirds, along their southern range boundaries (Thompson et al. 2016). We examined the nesting ecology of songbirds and shorebird breeding along tundra-shrub ecotones in upland areas on the Seward Peninsula, Alaska from 2015–2017 to understand the mechanisms driving avian colonization and extirpation as shrubs expand into the Arctic. More specifically we examined patterns in fecundity and nestling growth relative to timing of breeding, weather, habitat, and availability of arthropod prey to gain insight into how Arctic changes in weather and increases in shrubs are altering

the timing of reproduction, availability of preferred nest sites and prey for birds, nest exposure to predators, and competition for resources among species. We are currently compiling and analyzing data collected at over 800 nests of 31 species. Our preliminary results show that apparent nest success is exceptionally high across species (Table 1). This suggests that low rates of nest predation may facilitate range expansions by shrub-nesting songbirds but does not clarify mechanisms of range contractions for obligate tundra-nesting species.

Table 1. Numbers of nests monitored by species and year, Seward Peninsula, Alaska 2015–2017. The proportion of nests with at least one young successfully leaving the nest (*S*) was calculated as the ratio of successful to total nests across the three years combined. Nest numbers were lower for many species in 2017 because we searched half the number of plots searched in the previous 2 years.

Species	2015	2016	2017	Total	*S*
American Golden Plover	5	4	8	17	0.76
American Pipet	1	2	1	4	1.00
American Robin	6	11	6	23	0.61
American Tree Sparrow	14	14	2	30	0.87
Arctic Warbler	1	6	1	8	0.88
Blackpoll Warbler	0	0	1	1	1.00
Bluethroat	3	7	6	16	0.88
Common/Hoary Redpoll	54	13	30	97	0.57
Fox Sparrow	6	8	8	22	0.77
Golden-crowned Sparrow	49	41	16	106	0.76
Gray-cheeked Thrush	27	20	37	84	0.70
Lapland Longspur	44	41	33	118	0.75
Least Sandpiper	0	4	7	11	1.00
Long-tailed Jaeger	0	1	1	2	0.50
Northern Pintail	0	1	1	2	0.50
Northern Waterthrush	1	1	1	3	1.00
Northern Wheatear	0	0	2	2	1.00
Orange-crowned Warbler	12	9	5	26	0.73
Red-breasted Merganser	0	1	0	1	1.00
Savannah Sparrow	28	16	9	53	0.87
Semipalmated Plover	0	0	1	1	1.00
Short-eared Owl	0	3	0	3	0.67
Western Sandpiper	4	15	2	21	0.76
Whimbrel	2	5	0	7	0.71
White Wagtail	0	0	1	1	0.00
White-crowned Sparrow	5	0	1	6	0.83
Willow Ptarmigan	0	1	0	1	0.00
Wilson's Snipe	4	9	3	16	0.69
Wilson's Warbler	6	8	4	18	0.89
Yellow Warbler	24	17	14	55	0.95

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(BCR 2) Landbird Monitoring on Kodiak Island, Alaska, 2018

Robin Corcoran[1], Cindy Trussell[2], and Rich MacIntosh[3]
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Breeding Bird Survey. Two road-system surveys (Kodiak II (231) and Chiniak (131)) were conducted in June 2018 by Cindy Trussell and Rich MacIntosh.

Christmas Bird Count. Two counts will be conducted, the Kodiak count circle (12/15/2018) and the Narrow Cape/Kalsin Bay count circle (12/29/2018). Counts will be organized and data compiled by Rich MacIntosh.

Kodiak Refuge Monitoring Avian Productivity and Survivorship Program (MAPS) Program. The Monitoring Avian Productivity and Survivorship Program (MAPS) Program was established in 1989 to monitor spatial and temporal patterns in adult survival rates and productivity for populations of landbirds across North America. Over 1,000 MAPS stations have been established and operated, a large proportion of them providing many consecutive years of data. The MAPS program currently consists of nearly 500 monitoring stations sampled annually and the program provides estimates of adult apparent survival and recruitment rates and indices of productivity for about 150 landbird species (DeSante et al. 1995, 2004, 2007).

From 2010-2018, we annually operated a MAPS site at the Kodiak National Wildlife Refuge Headquarters on the Buskin River State Recreation Area along the Kodiak road system in Alaska. Following MAPS program guidelines, the station consisted of 10 mist nets distributed over a roughly eight-hectare (20 acre) area. Nets were operated one day during each of six consecutive 10-day periods between 10 June and 8 August. Nets were opened at official local sunrise and were left open exactly six hours. Habitat at the site was primarily mixed alder-willow riparian with some Sitka spruce upland. In nine years of mist net operation, we captured and banded 1960 birds representing 21 species, and recaptured between years 130 individuals representing 13 species (Table 1). The most commonly caught species were Fox Sparrow, Hermit Thrush, Pacific Wrens, and Wilson's and Yellow Warblers. In general, across all seasons, non-migratory and short to medium distance migrants had higher productivity compared to long-distance migrant warblers.

One of the primary goals of the Kodiak MAPS project was communicating science and conservation to the public through bird banding. The core team of trained volunteers consisted of six to eight people, depending on the year, and often included seasonal staff and volunteers with the Kodiak Refuge Biological Program and Visitor's Center. We had approximately 30 volunteers each season and 120 participants across the eight years. A cumulative total of approximately 2400 hours of service was donated to the refuge by volunteer participation in the MAPS program.

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Table 1. Summary of mist net captures of birds on the Kodiak Refuge Monitoring Avian Productivity and Survivorship (MAPS) site on the Buskin River State Recreation Area, Alaska, in summer 2010 to 2018.

	Year[1]										Recaps[2]	Age Ratio[3]
Species	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Total**		
Fox Sparrow	46	44	33	48	58	80	80	56	36	481	32	2.2
Hermit Thrush	52	41	47	30	43	42	41	21	35	352	30	1.9
Wilson's Warbler	76	26	29	16	29	42	19	30	26	293	21	0.4

	Year[1]										Recaps[2]	Age Ratio[3]
Species	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Total**		
Pacific Wren	16	24	0	1	21	59	62	12	17	212	14	1.0
Yellow Warbler	29	15	26	23	8	13	11	13	14	152	16	0.3
Golden-crowned Kinglet	3	27	0	0	4	63	5	8	0	110	1	1.8
Black-capped Chickadee	13	5	5	10	7	17	7	2	1	67	6	1.9
Pine Siskin	1	12	3	12	0	30	2	2	1	63		
Varied Thrush	3	12	9	12	2	5	5	4	4	56	2	1.0
Pine Grosbeak	1	5	4	10	2	4	2	2	3	33	3	
Orange-crowned Warbler	7	3	2	2	4	0	2	8	2	30		
Common Redpoll	0	1	0	0	0	14	0	10	0	25		
Red-breasted Nuthatch	2	2	2	7	1	5	0	0	1	20	1	
Brown Creeper	0	0	1	4	2	12	0	0	0	19	2	
Golden-crowned Sparrow	6	0	1	2	0	0	0	1	3	13		
Downy Woodpecker	1	0	0	0	4	1	1	2	0	9	1	
Myrtle Warbler	1	0	2	2	0	0	0	2	2	9		
Red Crossbill	0	0	0	0	1	7	0	0	0	8		
Song Sparrow	2	0	0	0	0	1	1	0	1	5		
Three-toed Woodpecker	0	0	0	1	0	0	1	0	0	2	1	
Northern Goshawk	0	0	0	0	0	0	1	0	0	1		
TOTALS	**259**	**217**	**164**	**180**	**186**	**395**	**240**	**173**	**146**	**1960**	**130**	
Total Net Hours	*371*	*341*	*358*	*357*	*347*	*355*	*361*	*358*	*355*			

[1] Yearly totals are for newly banded birds only; within- and between-season recaptures are not included.

[2] Number of recaptures between years

[3] Mean hatch year to adult ratio

(BCR 2, 4) Alaska Swallow Monitoring Network

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Overview. The Alaska Swallow Monitoring Network is a multi-entity effort to collect ecological data on climate-change impacts to Tree Swallows using artificial nest box colonies throughout Alaska. Although the network is centered around ecological research, an integral component of the network integrates a citizen science-based approach at most sites, with data being collected and shared by students, researchers, and community members. Another benefit of this network approach, whereby all sites use the same field methods, is our ability to directly compare Tree Swallow breeding phenology, nest success, and banded bird return rates between sites across the state. 2018 marks the third year of data collection using the full network approach with standardized protocols in use at four main sites (Fairbanks, Anchorage, King Salmon, and McCarthy). Juneau and Bethel also participated in the network. Note: Both Fairbanks and Anchorage experienced high than normal failure rates in 2018. Fairbanks was slightly higher due to human disturbance and Anchorage was unusually high to

bear predation. For information on sites and protocols: https://aksongbird.org/alaska-swallow-monitoring-network/.

Monitoring.

Table 1. 2018 Summary of Tree Swallow nesting ecology in artificial nest boxes in the Alaska Swallow Monitoring Network.

	Fairbanks	Anchorage	McCarthy Long Lake
# Available Nest Boxes	150	150	83
# Active Boxes	76	96	31
Occupancy Rate[1]	0.51	0.64	0.39
Mean Julian Lay Date	5/24	5/26	6/1
Mean Julian Hatch date	6/11	6/13	6/22
Mean Julian Fledge Date	--	7/4 (n = 23)	--
Total # Eggs Laid	449	573	181
# Eggs Hatched	378	314	--
# Adults Banded New	50	42	46
# Adults Returns[2]	65	22	13
# Nestlings Banded	347	0	134
# of Nests that Fledged[3]	68	16	27

[1] Occupancy rate: the # of boxes occupied / # of available nest boxes

[2] Birds banded in a previous year, returned in 2018

[3] Fledged: fledged at least one nestling

Education and outreach. ASI trained 17 youth volunteers (ages 10-16) in Fairbanks who together contributed 560 hours to nest monitoring, banding, and data entry. This included 4 high school internships. 147 people attended programs about the project, and at least 6,137 were reached through social media outreach. An additional 9,000 are estimated to have been reached through conventional media. The Anchorage project served at least 70 people through an OLLI (Osher Lifelong Learning Institute) and "Wildlife Wednesday" program in Palmer. It is estimated that many thousands more Alaskans were reached via informal presentations, signage on trails, homes, and nest boxes, and via a new interpretive sign and display in the Creamer's Refuge Visitor Center in Fairbanks.

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(BCR 3, 4) Monitoring landbirds in the NPS Arctic and Central Alaska Inventory and Monitoring Networks

Jeremy Mizel[1], Laura Phillips[2], Emily Williams[2], and Carol McIntyre[2]
[1] National Park Service, Arctic Inventory and Monitoring Network, [2] Denali National Park and Preserve, [3] National Park Service, Central Alaska Inventory and Monitoring Network

In 2018, the National Park Service's Inventory and Monitoring program continued to conduct on- and off-road surveys in Arctic and Central Alaska network parks. We conducted repeat surveys (3 min in duration) at point count stations located along the Denali Park (n = 150), the McCarthy (n = 100), and Nabesna roads (n = 50). Off-road surveys (repeat, line transects) were conducted in Gates of the Arctic National Park and Preserve near Anaktuvuk Pass. Details about our sampling methods can be found in Schmidt et al. (2013) and Mizel et al. (2018).

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(BCR 4) Biodiversity Project, Yukon Research Center, Yukon Territory: summary of landbird research, 2018

Dave Mossop, Yukon Research Center, Yukon College, Whitehorse

These eight projects mostly use bird species diversity and population performance as indicators of ecosystem health. Databases are maintained tracking key demographic parameters of selected focal species. Some of these studies we now have well over 40 years of data; 2018 was the 21st year that this initiative has been based at Yukon College. In part the vision has been to contribute toward Yukon's commitment under the Canadian Biodiversity Strategy (1993), and to foster partnership between the Yukon Research Center at Yukon College and the various management authorities and conservation organizations interested in Yukon wildlife.

TUNDRA ECOSYSTEM MONITORING

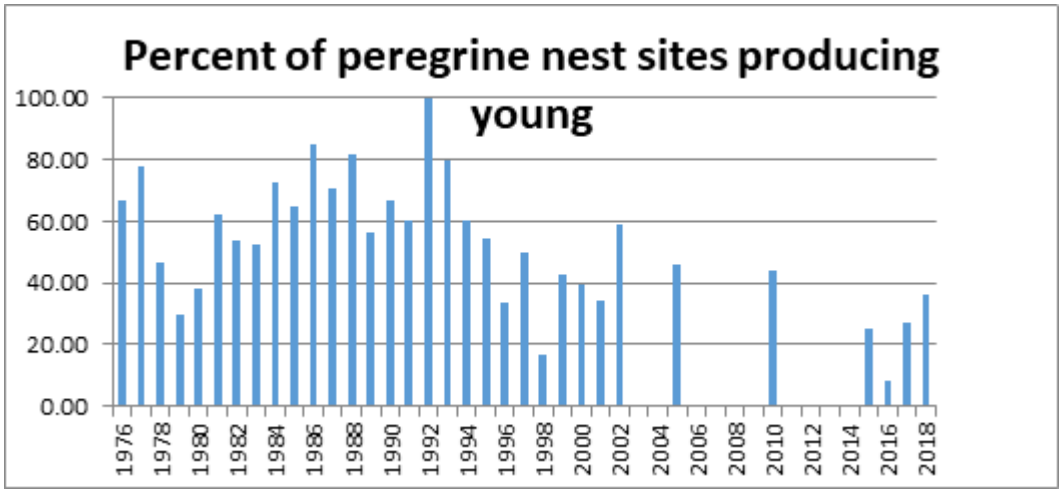
This work is part of a circumpolar partnership feeding into various ecological monitoring groups around the northern hemisphere: (CAFF, POLAR, CBMP). It recognizes willow ptarmigan as a keystone tundra species plus gyrfalcon and peregrine falcons as top predators in the system. Tracking the demographics of these 'sentinel' species gives a sensitive indication of ecological integrity of this key northern natural system.

Willow Ptarmigan annual survey: Ogilvie Mountains, Coast Range, and North Slope. Two of 5 long-term study plots were searched for territorial pairs: the Chilkat pass plot at the 60th parallel, and the North Fork Pass plot at 65 parallel north. In the current year, 13 territories per km^2 were recorded at the southern site, 7 at the mid-Yukon site. This was the 60th year of annual population monitoring by this effort. Interestingly, numbers have continued to fluctuate erratically since 2010–2011. This unexpected result, an obvious disruption of the 10-year cycle well documented in the earlier survey. If this apparent change in the 10-year periodicity of this species' population persists, then it may be signaling one of the most serious disruptions to the Yukon's ecology.

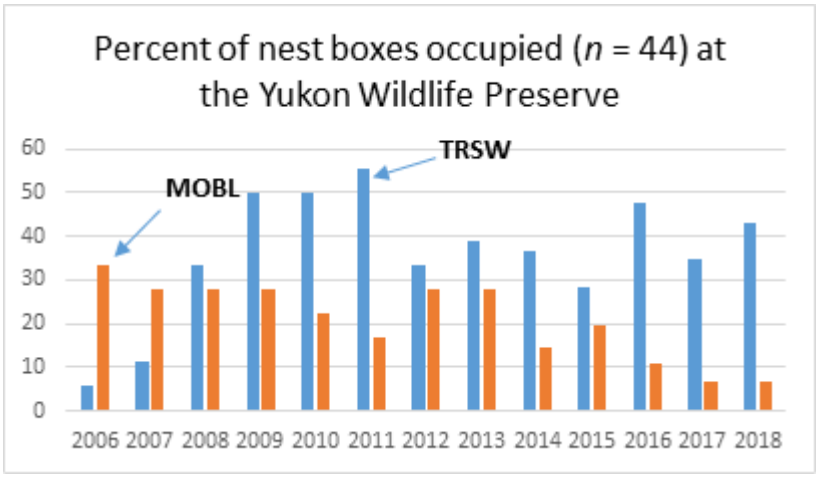
Gyrfalcon/tundra ecosystem monitoring, Yukon wide. This work recognizes gyrfalcon as a top predator in the system. Historically, gyrfalcon productivity in the Coast Range was high from 1999 through 2007; in 2008 a significant drop was noted. This accompanied a growing and troubling indication that the adult breeding population may be declining in correlation with ptarmigan population anomalies (above). In 2012 and 2013 productivity was basically zero. In 2014-2016 productivity improved somewhat to almost 40% of nest sites checked. Unfortunately, in 2017 this survey was only carried out in part due to budget cuts by the Yukon government. The future of this valuable data set will depend on developing stable funding.

Peregrine falcon productivity study, Yukon Wide. Key reporting for the national peregrine falcon survey occurs every 5 years. Troubling, just under 70% of known pairs visited have been producing

no young. In the current year we surveyed a section of the Yukon River that historically hosted 22 pairs. In the sample of sites visited in 2016 and 2017, production was only happening at 10% and 27% of sites. In the current year 86.4% of sites were attended by adults and a slightly improved 36% were producing young.



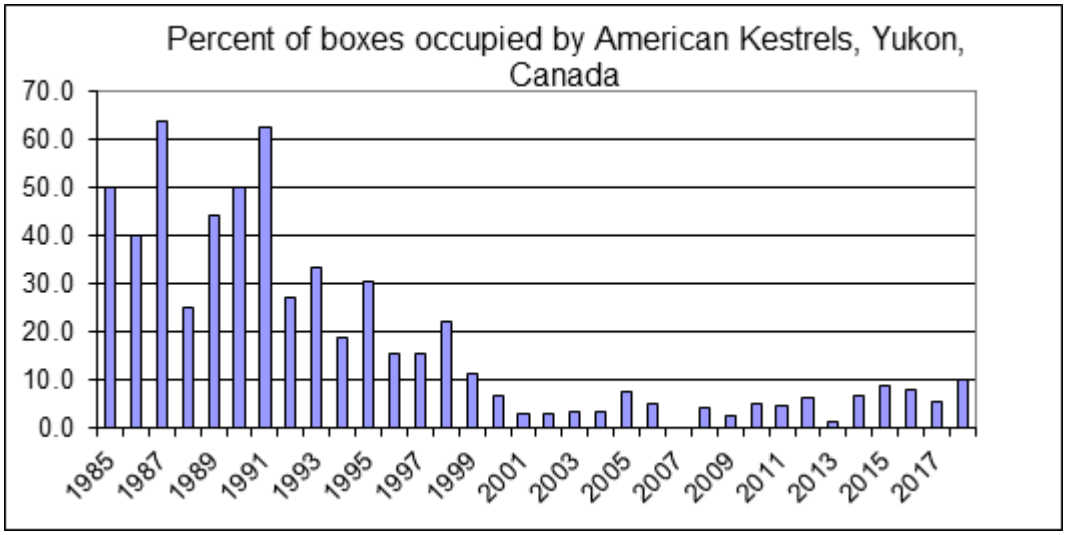
OTHER STUDIES



Tree Swallow and Mountain Bluebird nest box monitoring. This project is an initiative to establish a 'citizen science' suite of data bases that would track the progress of various indicator species at the Yukon Wildlife Preserve near Whitehorse. College students have used Northern Research Institute grants to do most of the field work and used the work for credit in directed studies courses at the college. The monitoring of cavity nesting birds at the preserve has developed as the most valuable over time. 44 artificial cavities are involved. The data set is being maintained at YRC. The apparent decline in bluebird occupancy is significant. Tree swallow occupancy has fluctuated widely. Observations of an alarming number of dead adults in boxes in early spring, are probably a result of unusual swings in spring temperatures. This is being monitored as a possible consequence of climate change in the north.

Bird strike potential at a planned wind turbine site, Burwash, Yukon. This study, an initiative of the Kluane First Nation, is designed to track the movements of migrating birds along the shoreline of Kluane Lake where a series of wind turbines are planned. A data-gathering meteorological tower is at the site. Direct observations are being made of bird movements, counts of birds generally using the area are made and searches for evidence of birds hitting structures are conducted. A large movement (up to 300 per hour) of migrating birds both fall and spring was documented. Their apparent preferred route transiting the site has been identified. Adjustments to the planning of the site are underway. A companion study of the bird population effects at a hydro energy site was initiated. The Aishihik hydro site has been in operation for over two decades; its 'external' costs to the local ecology can make an important comparison with alternate forms of energy production.

Breeding Bird Survey, Eagle Plains, Dempster Highway. Two standard breeding bird surveys were carried out along the Dempster Highway in the Blackstone and Eagle River/Arctic Circle areas. All data were collated and submitted to the National Breeding Bird Survey, Ottawa. 2018 was the 33rd year of the survey.



Breeding status of American Kestrel, Yukon wide. Breeding numbers of American Kestrel collapsed alarmingly across the Yukon in the last decade. This project uses artificial cavities to track the status of the species. The work is part of a larger partnership effort examining the status of American Kestrels across North America. Boreal Owls and other larger cavity nesters also involved with an overall objective of understanding these species' interrelationships with 'true old growth' trees. In the current year we re-checked 109 nest boxes for use, 78 were 'acceptable'. Eight breeding pairs were observed (zero in 2007, one pair in 2013 and 8 pairs last year). Two pairs abandoned fertile clutches before hatch. Occupancy hovers at about a 90% decline from the early 1990's.

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(BCR 4) Climate warming impacts on the persistence of Canada Jays in Alaska

Emily Williams[1], Laura Phillips[1], Ryan Norris[2], John Marzluff [3], and Carol McIntyre[1]
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Many resident birds that inhabit harsh climes at northern latitudes survive by caching food items that they rely on throughout the winter, when available food is scarce. With warming regimes, resident birds may be vulnerable to population declines due to the potential spoilage of food caches. Canada Jays are a relatively common bird of the boreal forest that rely on perishable food items stored in the fall to survive the winter and produce young in early spring. Growing evidence from ongoing research in Algonquin Provincial Park in Canada suggests that Canada Jay populations may be declining due to climate change-induced reduction in overall food availability. In response to the Denali National Park and Preserve's Resource Stewardship Strategy, we initiated the Canada Jay Ecology project to fill critical gaps in knowledge about the year-round requirements of common resident birds of Alaska, and to understand how these species may respond to global climate change. The primary program objectives are to: (1) develop a thorough understanding of the year-round requirements of Canada Jays; (2) use data collected on the movements, foraging ecology, and productivity of Canada Jays to

identify the potential effects of warming temperatures on reproductive success and annual survival, and (3) engage the public by using volunteer citizen scientists to study Canada Jay behavior in accessible areas in and around park lands. In 2018, we color-banded 60 Canada Jays (n =26 adults and first years, 34 nestlings) and found 24 nests in 28 territories. Apparent nest success was 53% (n = 19). In this year, we also began projects that investigated how diet, caching, and foraging behavior influence breeding behavior and nest success. To investigate foraging and caching behavior, we used hand-held cameras to record observations of six focal groups as they foraged and cached food. We recorded 676 food observations and were able to identify the food in ~48% of cases. Of recorded observations, Canada Jays cached snowshoe hare, vole, mushroom, slime mold, moths, caterpillars, beetle larva, slugs, berries, and miscellaneous human food. In 2019, we plan to continue this work and continue ongoing studies examining the influence of climate change on Canada Jay behavior, survival, and productivity.

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(BCR 4) Creamer's Field Migration Station, Fairbanks, Alaska 2018

April Harding Scurr, Tricia Blake, Claire Stuyck, Alaska Songbird Institute, Fairbanks, Alaska

OVERVIEW

The Creamer's Field Migration Station is a long-term avian migration station that was established in 1992 on Creamer's Field Migratory Waterfowl Refuge, Fairbanks, Alaska. The objectives are to study changes in migratory songbird ecology and provide opportunities for hands-on science education. The Creamer's Field Migration Station is open to the public during operational hours. We encourage people to see scientific methods in action, see a bird in-the-hand and ask questions. Educational components of this project consist of: 1) scheduled school field trips for approximately 2,000 kindergarten through university students each year, where students learn about migratory ecology, research methods and bird conservation; 2) opportunities for supervised volunteers to collect and record data and help with daily operation of the project; 3) research and education internships and bird banding apprenticeships; and 4) availability of data for publications and student projects.

SUMMARY OF 2018 SEASON

Research. In 2018 operated 6m and 12m 30mm mist nets, weekdays from April 16 – May 18 (n=22 nets), daily July 31-August 31, and weekdays September 1 – September 26 (n=30 nets), weather permitting. Capture information can be found in Table 1.

Education/outreach. This year's education and outreach efforts at the Creamer's Field Migration Station directly served at least 2,059 people. Many more were reached through public outreach including a large display at the Noel Wien Library (Fairbanks) during migration, media articles, and public service announcements. Direct programs included:

- 51 K-12 classes (1,967 students, teachers, and parent chaperones) from the Fairbanks North Star Borough and Delta/Greely School Districts.
- 48 community volunteers of all ages who together contributed 1,294 hours collecting, editing and proofing data, banding birds, working on station maintenance and assisting with education programs.
- 8 guided walks to the station during fall migration.

- 2 large community events: an open house during the Spring Migration Celebration on Creamer's Refuge (this is the refuge-wide celebration of International Migratory Bird Day); and a Bird Banding Breakfast in August
- 3 bird banding/education internships.

Acknowledgments. Thank you to the Alaska Department of Fish and Game for allowing us to conduct our research on Creamer's Field Migratory Waterfowl Refuge, to our many volunteers for their hard work, and to all our Adopt-a-Net sponsors and ASI members for funding the project.

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Table 1. Spring and Fall Captures of Birds at Creamer's Field Migration Station in 2018

	Newly Banded[1]							
Species	U[2]	HY[3]	AHY[4]	SubTotal[5]	Returns[6]	Total[7]	Return Rate[8]	AHY Rate[9]
Alder Flycatcher	1	5	1	7	0	7	0.00	0.14
American Robin	0	16	8	24	0	24	0.00	0.14
American Three-toed Woodpecker	0	1	0	1	0	1	0.00	0.00
American Tree Sparrow	1	22	6	29	0	29	0.00	0.21
Black-capped Chickadee	1	30	3	34	2	36	0.06	0.14
Blackpoll Warbler	0	27	1	28	0	28	0.00	0.04
Boreal Chickadee	0	7	0	7	0	7	0.00	0.00
Common Redpoll	0	2	1	3	0	3	0.00	0.33
Downy Woodpecker	0	1	0	1	0	1	0.00	0.00
Fox Sparrow	0	32	5	37	0	37	0.00	0.14
Gray-cheeked Thrush	0	26	0	26	0	26	0.00	0.00
Gamble's White-crowned Sparrow	0	25	5	30	0	30	0.00	0.17
Hammond's Flycatcher	2	39	14	55	0	55	0.00	0.25
Hairy Woodpecker	0	0	1	1	0	1	0.00	0.00
Hermit Thrush	0	15	0	15	0	15	0.00	0.00
Lincoln Sparrow	7	159	4	170	0	170	0.00	0.02
Merlin	0	1	0	1	0	1	0.00	0.00
Myrtle Warbler	7	1021	40	1068	5	1073	0.00	0.04
Northern Waterthrush	27	27	2	56	0	56	0.00	0.04
Norther Shrike	1	0	0	1	0	1	0.00	0.00
Orange-crowned Warbler	0	194	19	213	0	213	0.00	0.09
Ruby-crowned Kinglet	3	36	1	40	0	40	0.00	0.03
Rusty Blackbird	0	3	1	4	1	5	0.20	0.40
Savannah Sparrow	3	47	1	51	0	51	0.00	0.02
Slate-colored Junco	2	174	10	186	1	187	0.00	0.06
Solitary Sandpiper	0	0	6	6	0	6	0.00	1.00
Sharp-shinned Hawk	0	2	0	2	0	2	0.00	0.00
Swainson's Thrush	2	107	2	111	1	112	0.01	0.03
Varied Thrush	0	4	0	4	0	4	0.00	0.00
Wilson's Warbler	0	24	11	35	0	35	0.00	0.31
Yellow Warbler	3	59	2	64	0	64	0.00	0.03

	Newly Banded[1]							
Species	U[2]	HY[3]	AHY[4]	SubTotal[5]	Returns[6]	Total[7]	Return Rate[8]	AHY Rate[9]
Total	60	2106	144	2310	10	2320	0.00	0.07

[1] New bands of first time captured birds only
[2] Bird banded during current year of unknown age
[3] Bird born during capture year, Hatch Year
[4] Bird born in a previous calendar year, After Hatch Year
[5] Total = all new banded birds, including both Hatch Years and After Hatch Year birds
[6] Birds banded in a previous calendar year and recaptured in 2017, only recorded once even if multiple recaptures occurred in 2017
[7] Total of all new banded birds + Returns
[8] Returns / (Total of All Banded Birds+Returns)
[9] ((After Hatch Years of Banded Birds + Returns) / (Total of all new banded birds+Returns))

(BCR 4) The Denali Avian Youth Mentoring Program: fostering life-long connections with Alaska's national parklands through placed-based science learning

Emily Williams, Laura Phillips, and Carol McIntyre, Denali National Park and Preserve

National parks are amazing and unique science classrooms that provide many opportunities for nurturing a greater understanding of ecology, biodiversity, and science. Additionally, science projects conducted in national parks serve as a foundation and informational source for classroom activities and other science-based learning experiences. To enhance scientific literacy and to inspire local youth to discover more about national parklands and their own backyards, the Denali National Park and Preserve (Denali) avian program initiated a local youth mentoring program at Tri-Valley school in Healy, Alaska in 2018. Combining field and classroom activities, we expanded our science-education capacity to provide more opportunities for local youth to learn about birds in Denali throughout the year. Using the Denali Canada Jay (*Perisoreus canadensis*) research program as a model, we explored the themes of the scientific method through field-based activities and classroom exercises. Students developed questions and formulated hypotheses and predictions, participated in the capture and color-banding of Canada Jay individuals, aided in nest discovery and monitoring, and learned how to take appropriate field observations and data collection. 47 students belonging to second, fourth, fifth, and tenth grades participated in the program. The Denali youth outreach and education program plans to continue in 2019.

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(BCR 4) Eagle River Flats breeding bird surveys and research efforts on Joint Base Elmendorf-Richardson, Alaska, 2018 update

Laura McDuffie[1], Audrey Taylor[2] and Jim Johnson[1]
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Eagle River Flats Surveys. The U.S. Fish and Wildlife Service Migratory Bird Management program conducted breeding bird surveys along the perimeter of the Eagle River Flats Impact Area (hereafter, the flats) on Joint Base Elmendorf-Richardson (JBER). The surveys consisted of five to eight point counts, however the number of counts completed during each survey period depended on access to military training areas. We completed five surveys on 10 May, eight surveys on 22 May and five surveys on 5 June 2018.

To conduct surveys, we used spotting scopes and range finders to locate and identify all bird species within a 300m buffer of the observer. Birds detected within the buffer and on the flats were counted as "in bounds", while birds detected beyond the buffer and in the forest surrounding the flats were counted as "out-of-bounds". The duration of each count was precisely 20 minutes.

Over the course of the survey period, we detected 46 species and 1,576 individuals. Of those detections, 36 species and 565 individuals were detected "in bounds" and 31 species and 1011 individuals were detected "out-of-bounds". The most abundant species detected "in bounds" during the first survey were Green-winged Teal (n = 52), Lesser Yellowlegs (n = 23), and Northern Pintail (n = 22). During the second survey, Pectoral Sandpiper (n = 59), Lesser Yellowlegs (n = 30), and Sandhill Crane (n = 17) were the most abundant. During the third survey, Lesser Yellowlegs (n = 32), Lincoln's Sparrow (n = 14) and Gadwall (n = 11) were most detected (Table 1).

Passerine Studies. In 2007, ADFG, USFWS, USGS, and DoD began a comprehensive study to understand the breeding ecology and migratory movements of Rusty Blackbirds on JBER. Over the past 10 years, objectives have shifted to include: 1) development of a genoscape model to determine the migratory connectivity of genetically discrete populations, and 2) investigate the effects of methyl-mercury loading on genotypic expression. To assist with the development of a genoscape map, we collected blood and feathers samples from six individuals in 2018. In the lab, DNA is sequenced to identify unique loci that differentiate populations across the breeding range of Alaska and northern Canada. These genetic markers can be used to link biological samples collected on wintering grounds to breeding populations.

During 2018, USFWS Migratory Bird Management in collaboration with Department of Defense (DoD), completed the second year of a study examining site fidelity of Blackpoll Warblers. During 2017, 19 male blackpolls were marked with individualized color leg band combinations. In 2018, we resighted one banded blackpoll and banded six additional males. We will continue our resighting efforts in 2019.

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Table 1. Number of individuals and migratory status of bird species detected during three survey periods on Eagle River Flats (10 May, 22 May and 5 June 2018). Status is specified as *resident* (Res.) for taxa that occur year-round and nest on JBER, *migrant* (Mig.) for species that occur on JBER during migration but do not nest, and *breeder* (Br.) for species that occur on JBER only as breeders. Species of Special Concern are in boldface and focal species are italicized.

Species	Status	# Ind. In-bounds			# Ind. Out-of-Bounds		
		Survey 1 (5 points)	Survey 2 (8 points)	Survey 3 (5 points)	Survey 1 (5 points)	Survey 2 (8 points)	Survey 3 (5 points)
Greater White-fronted Goose	Mig.	0	1	0	0	0	0
Canada Goose	Br.	0	0	0	1	6	0
Trumpeter Swan	Br.	0	0	0	2	7	2
Gadwall	Br.	6	9	11	13	14	2
American Wigeon	Br.	11	8	1	7	0	4
Mallard	Br.	6	10	8	6	17	1

Species	Status	# Ind. In-bounds			# Ind. Out-of-Bounds		
		Survey 1 (5 points)	Survey 2 (8 points)	Survey 3 (5 points)	Survey 1 (5 points)	Survey 2 (8 points)	Survey 3 (5 points)
Northern Shoveler	Br.	0	10	1	9	16	2
Northern Pintail	Br.	22	5	3	14	13	3
Green-winged Teal	Br.	52	16	9	29	5	6
Ring-necked Duck	Br.	0	0	2	0	0	0
Barrow's Goldeneye	Br.	0	0	0	0	0	1
Red-necked Grebe	Br.	0	1	0	0	0	0
Northern Harrier	Br.	1	0	0	1	0	2
Northern Goshawk	Br.	1	0	0	0	0	0
Bald Eagle	Res.	3	0	1	6	6	1
Red-tailed Hawk	Br.	0	0	0	0	1	0
Sandhill Crane	Br.	4	17	5	30	24	18
Semipalmated Plover	Br.	0	2	10	0	2	0
Least Sandpiper	Br.	0	5	0	0	0	0
Pectoral Sandpiper	Mig.	1	59	0	3	3	0
Short-billed Dowitcher	Br.	6	4	2	10	23	4
Long-billed Dowitcher	Mig.	0	4	0	0	2	0
Wilson's Snipe	Br.	3	5	6	2	8	0
Solitary Sandpiper	Br.	2	0	0	0	0	0
Greater Yellowlegs	Br.	0	3	0	6	2	0
Lesser Yellowlegs	Br.	23	30	32	33	16	6
Red-necked Phalarope	Br.	0	4	0	0	1	0
Bonaparte's Gull	Br.	0	0	0	5	1	0
Mew Gull	Br.	6	11	5	29	431	59
Herring Gull	Br.	0	2	0	0	0	0
Arctic Tern	Br.	15	8	4	21	45	13
Merlin	Br.	0	1	0	0	0	0
Western Wood-Pewee	Br.	0	0	2	0	0	0
Alder Flycatcher	Br.	0	0	8	0	0	0
Tree Swallow	Br.	2	0	6	2	0	3
American Robin	Br.	0	4	5	1	1	1
American Pipit	Br.	0	4	0	0	0	0
Northern Waterthrush	Br.	0	1	6	0	0	2
Yellow-rumped Warbler	Br.	0	0	0	0	2	0
Wilson's Warbler	Br.	0	0	0	0	1	0
Savannah Sparrow	Br.	0	6	10	0	2	0
Lincoln's Sparrow	Br.	2	3	14	0	0	0
Dark-eyed Junco	Br.	0	0	0	1	1	0
White-crowned Sparrow	Br.	0	2	4	0	0	0
Rusty Blackbird	Br.	2	1	0	0	0	0
Common Redpoll	Br.	0	2	4	0	0	0

(BCR 4) Grouse and ptarmigan summer brood surveys, Alaska, 2018

Richard Merizon and Cameron Carroll, Alaska Department of Fish and Game

Beginning in summer 2016, the statewide Small Game Program (SGP) within the ADF&G has been completing brood surveys for select populations of grouse and ptarmigan. Brood surveys have been used by numerous state and federal fish and wildlife agencies to monitor population trends and

productivity (brood size and density) of various galliform species (including grouse, quail, turkey, and pheasant) throughout North America. However, limited funding and staff availability can make these surveys difficult to achieve. Often state agencies can partner with other government agencies, conservation organizations, or dog training groups to complete surveys.

A variety of techniques have been used to monitor galliform broods including passive observations of broods while conducting other field work, counting the number of broods annually along set routes, and using trained pointing dogs (Guthery and Mecozzi 2008, Dahlgren et al. 2010, 2012). The use of trained pointing dogs has been found to be one of the most effective and efficient techniques for locating cryptic grouse broods that dwell in open habitats (Dahlgren et al. 2010).

During the last 2 weeks of July since 2016, the SGP has enlisted up to 25 volunteers annually to complete survey transects for sharp-tailed grouse in Delta Junction, and rock, white-tailed, and willow ptarmigan at Eagle Summit, along the Denali Highway, and in Hatchers Pass. These data are used to estimate brood size, density, and to more accurately project what grouse or ptarmigan hunters can expect to encounter during the upcoming hunting season. This information has proven to be incredibly useful for upland bird hunters, state and federal biologists, and for informing Board of Game regulatory decisions.

In 2018, overall brood density and brood size were down for all monitored populations particularly for rock and willow ptarmigan along the Denali Highway. The SGP will continue to complete brood surveys annually and expand our efforts if it is able to enlist additional volunteers.

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(BCR 4) Influence of wetland context on the distribution and abundance of boreal birds

Sabre Hill and Audrey Taylor, University of Alaska Anchorage

The human footprint on boreal forest habitat is constantly increasing, particularly in the Anchorage/ Mat-Su region of Alaska. Modification of boreal forest for commercial and residential development may be affecting habitat quality and availability for boreal bird species, many of which are already in decline. The purpose of this research is to better understand how habitat used by declining boreal bird species may be changing as a result of this human footprint. We plan to accomplish this objective by contrasting the nesting habitat use of migratory boreal bird species on relatively unimpacted wetlands located on Joint Base Elmendorf-Richardson (JBER) with comparable wetlands within the urbanized Anchorage metropolitan area.

To date, ArcGIS has been utilized to create a geodatabase of boreal bird survey data collected on JBER and in Anchorage from 2014 – 2017. This database will be used to quantify habitat characteristics at the wetland and landscape scales and use these variables to predict occupancy of several declining boreal bird species, including Greater and Lesser Yellowlegs, Solitary Sandpiper, and Rusty Blackbirds. Currently, we are in the process of determining habitat and anthropogenic

variables to analyze the probability of occupancy of any given species across various classes of wetlands. The resulting occupancy model will be analyzed to evaluate how manmade structures and ecology are affecting habitat selection by boreal birds. This work began in spring 2017 and will likely be completed by fall of 2019.

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(BCR 4) Monitoring territory occupancy and reproductive success of Golden Eagles and Gyrfalcons in Denali National Park and Preserve, Alaska, 2018

Carol McIntyre, Denali National Park and Preserve

Golden Eagles are a vital sign of the NPS Central Alaska Monitoring Network. We have monitored territory occupancy and reproductive activities of Golden Eagles at over 80 nesting territories in the northern foothills of the Alaska Range in Denali annually since 1988 using two standardized aerial surveys supplemented by additional ground surveys. Please see McIntyre and Schmidt (2012), Schmidt et al. (2018) and Mizel et al. (2018) for more information on survey methods and past results and Steenhof et al. (2017) for details on terminology used in this study.

In 2018, we documented occupancy and reproductive success at 86 Golden Eagle territories in the Denali study area. We detected 81 occupied territories, including 50 containing a nest where eggs were laid and 37 where at least one nestling reached the minimum acceptable age for assessing nest success (51 d of age). We detected 57 fledglings, resulting in a mean brood size of 1.54 and 0.70 fledglings per occupied territory. Golden Eagle reproduction in 2018 was higher than the long-term average and was correlated with an abundance of important prey species including willow ptarmigan, snowshoe hare, and Arctic ground squirrel. In 2018, we also continued to quantify: 1) age structure of the territorial population by documenting age class (adult or subadult) of territory holders, 2) interactions between territorial eagles and apparent conspecific intruders (non-territorial eagles who are actively seeking entry into the breeding population), 3) nest site fidelity and turnover rates, and 4) annual cycle movements (with FWS, USGS, and Conservation Science Global, Inc.; McIntyre and Lewis 2017). We are also collaborating with the FWS Western Golden Eagle Team to assess reproductive trends across western North America and broad-scale movement patterns of Golden Eagles across North America (Brown et al.2017).

We also monitored 12 Gyrfalcon nesting territories in 2018 concurrently with the eagle monitoring work. We detected 11 occupied territories, including 9 with a successful nest. We detected 32 fledglings, resulting in a mean brood size of 3.56 and 2.91 fledglings per occupied territory. Gyrfalcon production in the Denali study area was among the highest recorded in the 31-year study and was correlated with an abundance of their important prey species including willow ptarmigan and Arctic ground squirrel. We are collaborating with the Arctic Falcon Specialist Group of the Conservation of Arctic Flora and Fauna (CAFF), the biodiversity group of the Arctic Council, to identify trends and status of Gyrfalcons across their circumpolar range. Our monitoring studies will continue in 2019.

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(BCR 4) Neotropical Bird Habitat Assessment, Fort Wainwright, Alaska

Justin Smith, Garrett Savory, Kim Jochum, Colorado State University, CEMML, Fort Wainwright

Fort Wainwright is expected to comply with the Migratory Bird Treaty Act (MBTA) and the Sikes Act, and failure to follow appropriate management practices may result in interference or closures to training by wildlife management agencies. Two species of conservation concern (SOCC), the Rusty Blackbird (*Euphagus carolinus*) and the Olive-Sided Flycatcher (*Contopus cooperi*), occur across Fort Wainwright in addition to many other migrating neotropical songbird species. Our study area near Fairbanks, Alaska include the Tanana Flats Training Area, the Yukon Training Area, and Main Cantonment within Fort Wainwright training lands. Literature reviews can provide insight into which habitats are important to songbirds, but not at a high enough resolution to effectively advise habitat management decisions of these species on Fort Wainwright training lands. Further, single surveys in specific areas of interest fail to account for the annual and seasonal shifts of migrating songbirds. For this study, we collected visual and auditory 10-minute songbird point count data in May and June of 2016 and 2017 at 270 randomly selected sites, where site-specific habitat characteristics and time-specific conditions were recorded. Using a single species, single season, occupancy approach we constructed distribution maps for Rusty Blackbirds and Blackpoll Warblers (*Setophaga striata*) across the study area. Blackpoll Warblers are also of interest because of the recent reported trajectory of the species overall population. There were not enough Olive-sided Flycatcher observations for this analysis type, and therefore managers must rely on past literature and local knowledge to inform management decisions. We additionally mapped areas of songbird species richness using a single season, multi-species, occupancy approach, during the nesting and breeding season on the training lands. We found that areas with persistent annual water (fens), dominated by grass and herbs, near transitional areas (shrub to forests) are important habitats for Rusty Blackbirds and Blackpoll Warblers. The amount of shrub cover within a plot was consistently important in each modeling type, particularly for the richness of species on a plot. Shrub composition and how it relates to species diversity will be explored in subsequent analysis in more detail. We recommend large training operations or infrastructure development should avoid these habitats from late April to early August

to prevent negative impacts to nesting songbirds. A report, containing maps, model descriptions, and recommendations, have been provided to Fort Wainwright Environmental Division and can be drawn upon as a reference for management decisions.

Data from an additional 200 points in Donnelly Training Area, Fort Wainwright, near Delta Junction, Alaska were collected in 2017 and 2018 to describe the distribution of ground and tree-nesting songbird species. The goal is to highlight areas where large-scale troop ground movements have the potential to impact nesting songbirds. Results and details will be available in future BPIF annual reports.

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(BCR 4) Road-system grouse and ptarmigan spring breeding surveys, Alaska, 2018

Richard Merizon and Cameron Carroll, Alaska Department of Fish and Game

Springtime breeding behavior of many tetraonids allows a means to index annual abundance and the cyclic nature of grouse and ptarmigan populations. In Alaska, male ruffed, sharp-tailed, and sooty grouse, as well as willow and rock ptarmigan perform conspicuous, springtime, territorial displays. Male spruce grouse and white-tailed ptarmigan also perform a springtime display, but it is one that is not easily located or viewed, making monitoring of population abundance through this behavior more challenging. These 2 species are monitored through wing collections, periodic site visits to areas where fall harvest occurs, and reports from ADF&G biologists, hunters, and outdoor enthusiasts.

The spring breeding season for grouse and ptarmigan in Alaska occurs from late April through early June. Due to the geography of Alaska, limited road system, poor access off the road system in the spring, and staff limitations, the Small Game Program (SGP) is restricted to species and areas in which population abundance can be assessed. Therefore, the SGP has focused on those populations that are either heavily exploited by hunters, within popular outdoor recreational areas, or very close to large urban centers or road-systems, and afford consistent and reliable access from year to year.

Survey methods utilized for ruffed and sharp-tailed grouse and willow and rock ptarmigan are consistent with state and national techniques. For ruffed grouse, roadside and trail transects were established in Anderson (1993), Delta Junction (2008), Fairbanks (2016), Palmer (1992), and Tok (2014) and have been completed annually since their inception. Sharp-tailed grouse lek surveys were established in the Delta Junction Agricultural Project in 2000, and in Tok (2014). Sooty grouse surveys were established in 2015 in and around the communities of Juneau and Petersburg. For willow and rock ptarmigan, we use a broadcasted recording of a territorial male along established transects and record the number of males that respond within ¼ mile. Survey routes have been established along the Denali (1997), Richardson (1997), Parks (2000), Taylor (2015), and Steese (2007) highways, inside Denali National Park (2014), along trails on the Kenai Peninsula (2014), and locations away from road access in Unit 13. These surveys will continue to be monitored annually.

Based on surveys in spring 2018, monitored populations have generally declined but remain relatively abundant and widespread. Interior ruffed grouse populations have declined from their cyclic high in 2016 / 2017. Sharp-tailed grouse populations near Delta Junction and Tok appear to also have declined but remain abundant and widespread throughout the Interior and southern Alaska Range. Sooty grouse densities have also declined in 2018 yet remain abundant throughout remote portions of Southeast Alaska. Monitored willow and rock ptarmigan populations throughout the road-system in

2018 have declined. Populations throughout Southwestern Alaska and the Alaska Peninsula remain very low prompting continued concern from local biologists.

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(BCR 4) Simulating avian responses to climate-mediated changes in future fire regimes across the northwestern boreal forest

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The frequency, intensity, and magnitude of wild fires has increased across the boreal forest in recent decades; an upwards trajectory in fire activity that is predicted to continue through the end of the century. We are coupling (1) simulations of landscape change resulting from climate-mediated alterations in fire behavior to the end of the century (Rupp et al. 2017) with (2) avian density models of habitat suitability (Sólymos et al. 2013) developed from a large database of point-count surveys (Barker et al. 2016) with the goal of forecasting responses by boreal forest birds (≥25 species) to projected landscape changes. The planning area includes the Northwest Interior Forest Region (BCR 4) which spans the boreal forest regions of Alaska, Yukon, British Columbia, and a small portion of the Northwest Territories. We plan to spatially decompose the magnitude of avian population changes relative to public land ownership to demonstrate how agency stewardship responsibilities for regional bird populations will change over the century. We also plan to highlight areas that are forecast to remain relatively stable relative to climate and fire activity. These areas could be managed as climate-change refugia that help species adapt to regional change.

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(BCR 4) The Critical Connections Program: conserving migratory birds in Alaska's National Parks

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Alaska's National Parklands provide millions of acres of nesting, brood-rearing, and foraging habitat for an abundance and diversity of long-distance migratory birds. Many birds that nest in Alaska's National Parklands are international migrants that provide connections between Alaska and the many visitors that travel here from around the world. We initiated the Critical Connections Program in 2014 to provide essential information for conserving migratory bird species in Alaska's parklands by linking research results directly to conservation and education efforts. Our primary objectives are to: (1) develop a thorough understanding of the year-round movements of Alaska's migratory birds; (2) use data collected on the breeding grounds, migration routes, and wintering areas to identify factors driving population trajectories; and (3) expand collaborative efforts to mitigate constraining factors and protect resources used by Alaska's migratory birds. The program is linked to our long-term passerine monitoring program, a vital sign of the NPS Central Alaska Monitoring Network.

From 2015 to 2018, project personnel deployed light-level geolocators of a suite of seven target species including Arctic Warbler, Gray-cheeked, Swainson's and Hermit Thrush, Fox Sparrow, Blackpoll Warbler, and Wilson's Warbler in Denali National Park and Preserve (Denali). In 2018, project personnel also deployed 1.0 g GPS Pinpoint tags on 20 Swainson's Thrush near McCarthy, Alaska, in Wrangell-St. Elias National Park and Preserve. We are currently compiling and analyzing data from geolocators recovered from individuals recaptured on the breeding range. In 2018, we also quantified mercury exposure for 12 species of migratory passerines breeding in Denali including the 7 target species mentioned above and American Tree Sparrow, White-crowned Sparrow, Orange-crowned Warbler, Northern Waterthrush, and Yellow-rumped Warbler. We also collaborated on a range-wide analysis of American Robin and Blackpoll Warbler movements.

In 2018, project personnel also assisted scientists from the Migratory Connectivity Project and deployed lightweight GPS satellite telemetry units on three nesting pairs of Long-Tailed Jaegers in Denali.

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(BCR 4) Willow and Rock Ptarmigan distribution and movement studies in south-central and interior Alaska, 2018

Richard Merizon and Cameron Carroll, Alaska Department of Fish and Game

Since 2013, the statewide Small Game Program (SGP) within ADF&G has initiated four separate ptarmigan research studies in Alaska. Between 2013 and 2016, a willow ptarmigan study documented movement patterns near the proposed Watana Hydroelectric Project site in the upper Susitna River basin (Frye and Merizon 2016). Between 2013 and 2017, a rock ptarmigan study documented distribution, movement, and mortality in Game Management Unit 13B (Merizon et al. 2018).

Currently, there are two ongoing research projects focused on rock ptarmigan. First, beginning in spring 2014, a study began documenting movement, survival, and nesting success of rock ptarmigan within a historical study area (Weeden 1965) near Eagle Summit along the Steese Highway. Female and male rock ptarmigan were captured and radio-collared in May to collect data on movements, survival, and nesting success. In addition, staff has conducted an annual spring survey of breeding male rock ptarmigan. In 2014, observers partially completed an abundance survey following methods described by Weeden (1965). Survey methods were altered for 2015-2017 to include yearly estimates of detection probability in addition to abundance using distance sampling methodology (Buckland et al. 2001). This study is ongoing with field work expected to continue into 2020. Second, beginning in 2018, a study began documenting nesting ecology of rock ptarmigan between Eagle Summit and Denali Highway populations. This project is being led by a Masters of Science graduate student through University of Alaska, Fairbanks. Female rock ptarmigan are radio collared and closely monitored throughout the nesting and brood rearing period (late-May through early August) to document nesting success, chick survival, and movement. Field work will continue through late summer 2020.

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(BCR 5) Juneau Tree Swallow Nest Watch, 2018 Update

Brenda Wright and Gwen Baluss, Juneau Audubon Society

Since 2015 Juneau Audubon Society has erected and monitored over 50 Tree Swallow nest boxes around Juneau. The box design was taken from a standardized program (http://golondrinas.cornell.edu/) and the citizen science observations are collected using Cornell Nestwatch (http://nestwatch.org/) guidelines. Additionally, bi-weekly nests checks included occasional opening of boxes this season. The project goal is to contribute to the knowledge base for this aerial insectivore and collect data that is comparable to other box monitoring projects in the state. Community education is also accomplished by public presentation of the results, recruitment of citizen scientists, and involvement of school groups in nest box construction. Main results from 2018:

- 59 nest boxes were installed at seven sites by April 17
- swallows were first reported by April 18
- nest building occurred through the end of May

- by June 7, 33 boxes had nests and 149 eggs were counted (a few nests were not accessible due to high water).
- on June 22 the age of nestlings ranged from 0-2 days up to about 10 days
- egg laying and incubation occurred in two waves this year: one small group of birds fledged by June 30, but the majority fledged by July 7
- the last birds left the nest boxes by July 10
- in the nest boxes that could be monitored, there were 100 successful fledglings
- losses (cause unknown) were: 1 dead adult, 15 unhatched eggs, and 5 dead fledglings
- several boxes (with eggs) were lost to a black bear raid

This was the first season of banding swallows captured at the nest box areas. JAS contracted licensed bander Catherine Pohl to capture and tag 16 adult females and 10 adult males. JAS has received support from many people and groups. This year we especially thank Alaska Songbird Institute for a grant to start bird banding program, and Field Biologist Intern, Delana Wilks. Nest box openings under permit from Alaska Dept. of Fish and Game.

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(BCR 5) Olive-sided Flycatchers in southeast Alaska: adult survival, migration, and citizen science

Catherine Pohl, Catherine Pohl Biological Consulting

This year was an unusual one, with snow in late May along the coastal migration route and very cold weather in the early breeding season. Perhaps as a result, it was an unusual year for Olive-sided Flycatchers *(Contopus cooperi)* at our northern southeast Alaska study area. Annual apparent survival, approximately .6 from 2014 to 2017, was lower in 2018. Fewer pairs used long-held sites and breeding was spread across the season, with many late nesters or re-nesters.

With an extended season, we captured, banded, and color-banded 12 OSFL in 2018, and initiated research on migration and wintering areas for the southeast AK population. We attached miniature archival light level data loggers with 7 mm light stalks (MigrateTech P65C2-7) to 11 OSFL: 8 on the USFS Tongass National Forest Hoonah Ranger District, and the rest on Sealaska and Huna Totem Corporation land and within the USFS Juneau Ranger District (Douglas Island). The geolocators were attached via leg loop harnesses of 1 mm elastic jewelry cord and weighed less than 1 g including the harness. Blood and body feather samples are currently being analyzed for mercury at the Biodiversity Research Institute. Flight feathers were collected for future genetic and stable isotope analysis. We returned to capture sites, confirming that birds carrying geolocators remained on territory, were successfully foraging, and on territories where nests had been located, were feeding nestlings and fledglings. We plan to retrieve geolocators in 2019 and 2020.

The 5 nests located this year were near the top of mountain and western hemlock trees (up to 80 feet tall). The nest trees were somewhat isolated at the edges of narrow strips of open canopy forest with tall shrub understory near large sloping clearcuts, fens, small streams, and beaver-flooded riparian wetlands. One nest was just a branch away from last year's, likely made by a returning female whose mate was replaced by an unbanded male. Fledge dates ranged from late June to early August. Nest provisioning (including large dragonflies, hornets, and bumblebees) and near-fledging behavior

were documented at several nests. The nests were partially exposed, lichen-lined, and cryptic, particularly from above. Post-fledging, several territories were documented with drone photography.

Volunteers attended pre-season training sessions, found and monitored active territories, and assisted with captures. A citizen science data portal for Olive-sided Flycatcher and Greater Yellowlegs observations is in development (CitSci.org, Raincoast Birdscape) and will be shared with a Juneau/Hoonah winter resident bird study in 2019. Southeast Alaska OSFL research benefited this year from an alliance with the non-profit Discovery Southeast and from extension to Huna Totem and Sealaska Corporation land. Skilled volunteer collaborators were again key. In-kind and other support was provided by the US Fish and Wildlife Service, USFS Hoonah Ranger District, Alaska Department of Fish and Game, Institute for Bird Populations, Biodiversity Research Institute, and the Alaska Conservation Foundation.

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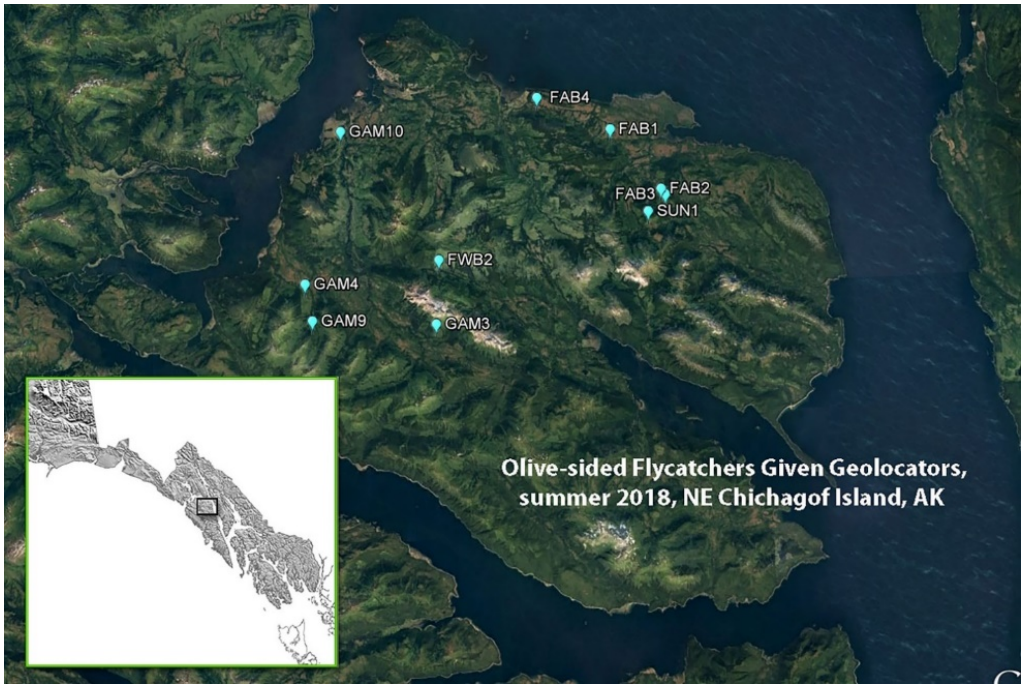
Figure 1. Locations of Olive-sided Flycatchers with geolocators, on NE Chichagof Island, 2018



(BCR 5) Sitka Winter Bird Observation Project, 2018 Season Update

Gwen Baluss, Juneau Audubon Society; Kitty LaBounty, University of Alaska Southeast; Matt Goff, sitkanature.org

Southeast Alaska hosts migratory birds both as a summer breeding ground, and a winter destination. Few studies focus on winter birds. From 2012 to 2018 we investigated wintering land bird species in Sitka, Alaska, with a color-banding. We targeted Dark-eyed (Oregon) Junco, Song Sparrow, and Chestnut-backed Chickadee. We hoped to learn more about 1) site fidelity of local over-wintering individuals, and 2) spatial patterns of local individuals throughout the year. Additional objectives were to 1) increase interest and knowledge of grade-school and high school students about wintering

songbirds, 2) provide a community-wide citizen-science opportunity to study birds and discuss the results, and 3) provide a forum to discuss anthropogenic causes of local bird mortality.

Annually, in November, we captured birds by mist net or ground trap and fitted individuals of target species with unique color band combinations. As of mid -November 2018, 380 Dark-eyed Juncos, 54 Chestnut-backed Chickadees, and 26 Song Sparrows were color-banded in Sitka over the 7 years. Other species captured as "bycatch" were banded simply with USGS numbered metal bands. Citizen scientists report sightings of banded birds. Findings are entered into a spacial database for analysis.

We have recorded summer returns for all three species, winter site fidelity for all three species both within and between years, and both short and long-distance dispersal records for Oregon Junco. Most juncos were re-sighted wintering within .5 km of their late-fall banding location. One junco was seen in the spring in Juneau, about 95 miles to the northeast.

We plan to continue the project in upcoming seasons. To report encounters of color-banded birds in Sitka, see: http://wiki.seaknature.org/Form:SBBP_observation. Observers in other communities please contact the authors if you have seen a color-banded bird of the above species. Any band recovery should be reported to the USGS Bird Banding Laboratory: https://www.pwrc.usgs.gov/bbl

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(BCR 5) Tongass Hummingbird Project, 2018 Update

Gwen Baluss, Juneau Audubon Society

The Rufous Hummingbird (*Selasphorus rufus*, RUHU) has been identified as a priority for monitoring, research and management in BCR 5. Since 2013, 641 RUHU have been banded for a mark-recapture study near Juneau, AK, following data collection protocols adapted from those used by Rocky Point Bird Observatory (http://www.rpbo.org/hummingbirds.php) and the Hummingbird Monitoring Network (http://hummonnet.org). From 2013 through 2016 hummingbirds were banded at two sites, Jensen-Olson Arboretum (JOAR) and Juneau Community Garden (JCGA). Annually, effort was repeated as close as possible to the dates and times in previous years for JCGA. However, the JOAR site could not be repeated beyond opportunistic visits after 2016.

Standard-effort trapping took place about every two weeks between late April and early August. However, varying weather, efficiency of trappers and the unpredictable timing of birds complicates true between-year comparisons. Throughout the season, hummingbirds will nearly disappear from a site, or be present in "swarms". This is likely due to fluctuations in natural food sources. There is also an apparent annual variability in phenology, most likely corresponding to springtime temperatures.

In 2018, banding was continued with similar effort to previous years at the JCGA. It was a normal to cool spring and bird captures peaked weeks later than most years. However, the overall capture rate was good with a record number of adult females and young of year males captured. This season a pilot site was tested about half mile from the JOAR, near the National Shrine of St. Therese. Monitoring is planned to begin at the new site in 2019. Recaptures have also been recorded and each bird is normally photographed to record plumage change over time. The oldest recapture to date was a female caught in 2018 at the Shrine, originally banded as an adult in 2013 at nearby JOAR (thus an after fifth year bird) This, however, is far off from the standing record for the species at over 8 years.

Support for the establishment of Rufous Hummingbird banding stations was provided by the US Forest Service, Region 10, Alaska. Sites and logistical support were provided by the Juneau Audubon Society, the Juneau Community Garden Association, the City and Borough of Juneau, and the Catholic Diocese of Juneau. This project is entirely dependent on the help of community volunteers and interns. This season Interns Allan Saylor and Delana Wilks provided excellent and consistent assistance. Student volunteer Jessica Millsaps, along with her family, have helped with nearly every banding day since the project beginning.

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Table 1. Total Rufous Hummingbird standard-effort only captures, including both new bands, and recaptures from previous years. (Recaptures within the same year and opportunistic banding at the stations not shown). Regular effort at JOAR stopped in 2017.

Year/Age and Sex	JOAR	JCGA	Year/Age and Sex	JOAR	JCGA
2018			**2015**		
Adult Male		29	Adult Male	22	43
Adult Female		46	Adult Female	71	21
Hatch Year Male		20	Hatch Year Male	2	4
Hatch Year Female		8	Hatch Year Female	2	8
2017			**2014**		
Adult Male		17	Adult Male	27	15
Adult Female		23	Adult Female	49	13
Hatch Year Male		9	Hatch Year Male	14	7
Hatch Year Female		4	Hatch Year Female	7	4
2016			**2013**		
Adult Male	3	25	Adult Male	28	12
Adult Female	17	17	Adult Female	36	29
Hatch Year Male	0	12	Hatch Year Male	8	9
Hatch Year Female	0	2	Hatch Year Female	9	1

Table 2. Number of same-site recaptures from previous years by location and gender. () denotes limited effort.

	JCGA		JOAR	
	Males	Females	Males	Females
2014	0	1	2	3
2015	2	0	3	12
2016	11	2	0	6
2017	2	1	0	(1)
2018	1	2	(0)	(0)

(BCR 5) Tongass National Forest, 2018 update

Bonnie Bennetsen, Cheryl Carrothers, Gwen Baluss, Susan Oehlers, Joe Delabrue, Toby Bakos, Ben Limle Luke Decker, and Marlene Duvall of the USDA Forest Service, Alaska Region, Tongass National Forest

INVENTORY & MONITORING

Breeding Bird Survey Routes. USFS personnel counted these routes in 2018: Yakutat (2 routes), Haines (1 route), Mitkof Island (1 route), Ketchikan (1 route), Prince of Wales Island (3 routes), and Stikine River (1 route). USFS also helped coordinate other routes within the zone as needed.

Alaska Landbird Monitoring Survey (ALMS). No surveys were done this year to focus instead on two upcoming reports, one on the Tongass Landbirds and Thinning Study below, and the other to assess general habitat relationships.

Tongass Landbirds and Thinning Study. Study of landbird densities and composition within pre-commercially thinned and un-thinned young-growth stands on the Tongass sampled during 2016-2017. A modified version of the ALMS point count survey protocol was used, with the addition of timber and deer habitat measures, to assess 10 stands (5 pairs) during the two study years. Young growth was 40+ year old and the un-thinned stands were treated 20+ years prior. Grids were on Mitkof, Vank, Prince of Wales, and Chichagof islands.

Northern Goshawk Surveys. The Tongass continues to conduct surveys annually for occupancy by breeding Northern Goshawks in areas where uses such as timber sales, roads, mining, hydroelectric, recreational trails, or other activities are likely to affect suitable forest habitat. Wildlife personnel catalog all surveys— including those by USFS or contractors, anecdotal observations, and checks of known nests— in the agency's spatial database Natural Resource Information Systems (NRIS).

ENVIRONMENTAL EDUCATION AND CITIZEN SCIENCE

Christmas Bird Count. Hoonah, Wrangell, and Petersburg Ranger Districts (HRD, WRD & PRD) personnel continue to help coordinate the local CBC efforts in their communities.

International Migratory Bird Day. Juneau Ranger District (JRD) offered a songbird banding demonstration in partnership with the Juneau Audubon Society and the Juneau Community Garden Association.

Birding festivals. The USFS is a key partner for three Southeast Alaska birding festivals.

- The Yakutat Tern Festival is enjoyed annually in June in Yakutat. Educational activities include field trips for all types of birds, passerine banding, art and photography, cultural celebration and kid's programs.
- The Stikine River Birding Festival is celebrated in April in Wrangell at the peak of spring migration. Activities include field trips which included all types of birds, and passerine banding.
- The Alaska Hummingbird Festival is held in April in Ketchikan. The USFS Southeast Alaska Discovery Center helps host this annual, month-long celebration with bird-themed activities that include guided bird hikes, a juried art contest, film presentations, arts and crafts workshops, and kids' programs.

Juneau Ranger District continues to provide training in local bird identification and conservation to the Mendenhall Glacier Visitor Center Interpreters, who in turn share their knowledge with over 500,000 annual visitors and local schools. The Mendenhall Glacier Visitor Center also developed the Tongass Family Field Guide in 2018, a fun-filled discovery guide that includes cool facts about birds.

Several ranger districts conducted bird-themed elementary school presentations in their respective communities. HRD organized a Community Bird Program, a series of class and field identification sessions for teens and adults. PRD provided hummingbird information during National Pollinator Week. Ketchikan and Misty Fjords Ranger District provided owl and other bird-themed programs for the Friday Night Insight series.

PARTNERSHIPS AND COOPERATION

Tongass and Alaska region USFS continue to participate in the Western Hummingbird Partnership (http://www.westernhummingbird.org) fostering conservation efforts for the Rufous Hummingbird. The Tongass NF hosted Student Conservation Association Interns who assisted with various bird projects.

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(BCR 5) Update from the Prince William Sound Zone, Chugach National Forest

Erin Cooper and Melissa Gabrielson, USDA Forest Service, Chugach National Forest, Prince William Sound Zone, Cordova Ranger District

Breeding Bird Surveys (BBS). Cordova has two 24.5 km routes, however, only one route is currently accessible due to the bridge closure at mile 37 of the Copper River Highway. Breeding Bird Survey route #050 was completed by the Cordova Ranger District in June 2018. The data collected from the survey was entered into the database managed by the Cornell Ornithology Lab for inclusion in the National Database.

Alaska Landbird Monitoring Survey (ALMS). This was the 14th year of implementing this point count protocol on the Chugach National Forest. Two ALMS blocks were surveyed in 2018 on the Cordova Ranger District. Locations included Alaganik and Okalee. All grids were successfully accessed and surveyed. One full-time technician, one SCA, and one biologist from the Cordova Ranger District contributed. All GPS points are stored in a database to assist with re-locating points in future years. Point count data was compiled, entered into a database, and sent to the USGS Alaska Science Center for further data management and analysis.

Copper River Delta Shorebird Festival. The 28th annual shorebird festival was held on May 3-6, 2018. The Copper River Delta Shorebird Festival is a collaborative event with partners from the Cordova Chamber of Commerce and the USDA Forest Service, Cordova Ranger District. The Festival focuses on educating the public about birds, bird conservation, and bird life cycles and strategies through a variety of activities, classes, crafts, and workshops. This year's festival featured guest speakers from Central & South America, as well as western coastal Alaska. Yenifer Díaz of Panama Audubon and Diana Eusse from Aso-ciacion Calidris (Cali, Colombia) presented on the importance of wetlands along the Pacific Flyway as birds migrate north and south across continents, without concept of borders. Kristine Sowl joined the festival from the Yukon Delta National Wildlife Refuge in western Alaska, where many shorebirds are headed after their integral stopover on the rich mudflats of the Copper River Delta. This year's keynote speaker was Dr. Stephen Kress, Vice-President for Bird Conservation for the National Audubon Society and Director of the Audubon Seabird Restoration Program, as well as Hog Island Audubon Camp. Dr. Kress is the founder of Project Puffin and manages nesting sites for over 43,000 colonial seabirds on the coast of Maine. He presented on seabird conservation and highlighted lessons learned from puffins applicable to bird conservation worldwide. Maya the western sandpiper was able to make an appearance at the 2018 Festival. She provided excitement within the community about the Festival and helped educate the public about the interconnectivity of shorebirds and their international ties. Copper River Delta Birds by Hand, was an exciting new addition to the festival. The Net Loft Traditional Handcrafts, invited makers of all kinds to craft their own birds and send it on a "migration" to Cordova to be displayed on exhibit during the festival. A Cocktail Hour Cruise with Major Marine Tours and a guided field trip to Alaganik Slough were also part of the Festival weekend.

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(Alaska-wide) Alaska Landbird Monitoring Survey, 2018 update

Colleen M. Handel, USGS Alaska Science Center, and multiple collaborators from Boreal Partners in Flight

During 2018, biologists conducted surveys at 428 points in 29 sampling blocks statewide during the 16th year of the Alaska Landbird Monitoring Survey (ALMS) program. Survey effort has been consistent over the years, with a mean annual effort of 506 points across 32 blocks since the inception of the program (Fig. 1). The current survey effort, however, is about 60% of the target monitoring level of 50 blocks per year, or a total of 100 blocks repeated biennially. The ALMS program uses standardized distance-sampling techniques to survey breeding bird populations at 12–25 points within 10-km x 10-km blocks selected using a stratified random design of accessible areas across Alaska. The main purpose of the survey is to monitor long-term population trends of birds (primarily landbirds) in off-road areas as a complement to the roadside North American Breeding Bird Survey (BBS). Biologists are also encouraged to use the same sampling grids and standardized survey techniques to gather systematic inventory data.

Surveys conducted through ALMS now provide an impressive compilation of quantitative data on the abundance and distribution of birds throughout Alaska (Fig. 2). As of 2018, observers have conducted 8,098 ALMS surveys in 110 blocks at 1,984 points, with varying numbers of replications during the 16-year period (Fig. 3). Surveys from ALMS and its predecessor, the Off-road Breeding Bird Survey, have documented about 220,300 detections of birds since 1993.

ALMS data have been collected in a time series that is now of sufficient duration to detect population trends. Using a combination of ALMS and BBS data, Handel and Sauer (2017) published the first significant analysis of population trends for landbirds in Alaska. They used hierarchical models to estimate rates of population change in two forested Bird Conservation Regions (BCRs) in Alaska, the Northwestern Interior Forest and the North Pacific Rainforest. Their results highlighted the need for research on and conservation of aerial insectivores and wetland-associated species, many of which showed negative population trends concordant with those found elsewhere in North America. Another important finding was that population trends for several species differed between the two regions, which are separated by rugged, glaciated mountain ranges. In addition, although population trends were broadly concordant between the roadside BBS and off-road ALMS surveys, they were sometimes discordant. Both findings emphasize the need for continued broad spatial coverage, both on-road and off-road, to understand the population trends of landbird species in northern biomes.

Additional analyses of ALMS data are planned to model the current distribution of landbirds across the state relative to habitat characteristics, and to project changes in distribution relative to future projected changes in climate and vegetation.

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Figure 1. Number of ALMS blocks surveyed each year within the five Bird Conservation Regions in Alaska between 2003 and 2018.

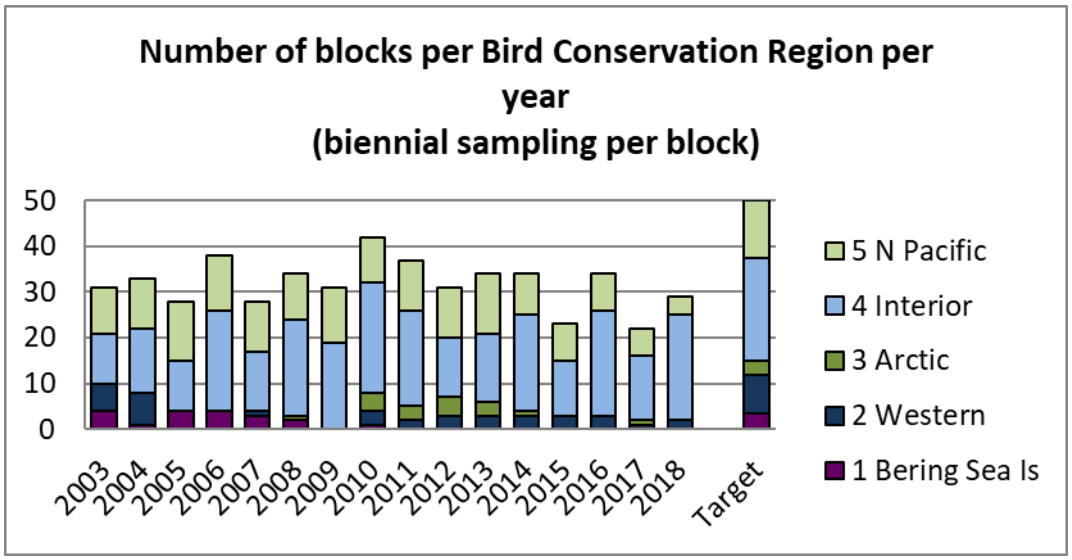


Figure 2. Locations of landbird surveys conducted as part of the Alaska Landbird Monitoring Survey (ALMS) from 2003 to 2018. The five Bird Conservation Regions in Alaska are indicated by color: Arctic Plains and Mountains (purple), Northwestern Interior Forest (blue), Western Alaska (tan), North Pacific Rainforest (green), and Aleutian/Bering Sea Islands (pink).

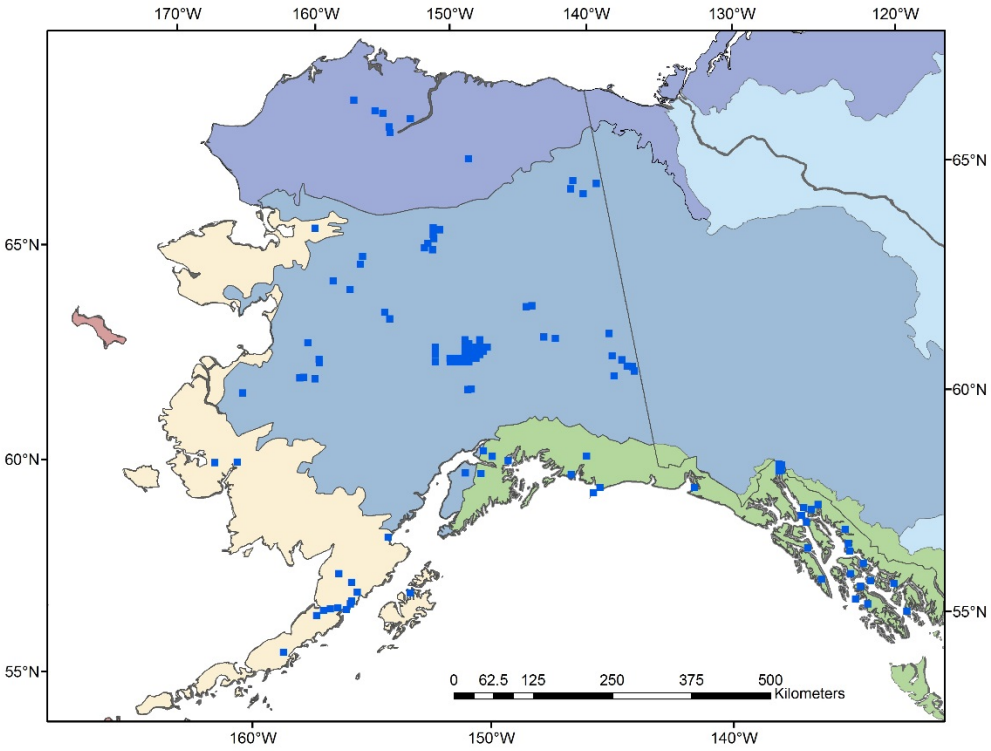
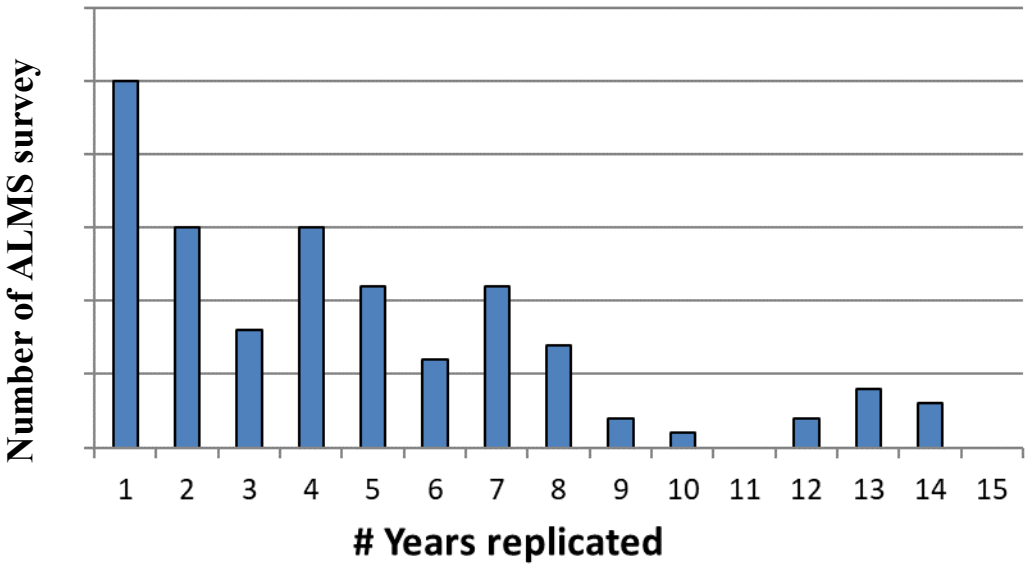


Figure 3. Number of ALMS blocks that have been surveyed 1–14 years between 2003 and 2018. The standard protocol is to replicate each block biennially (e.g., 5 times over a 10-year period), but some surveys have been replicated annually. Most blocks replicated during a single year represent those surveyed for inventory rather than monitoring purposes.



(Alaska-wide) North American Breeding Bird Survey, Alaska, 2018 update

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Overview of the Breeding Bird Survey. The North American Breeding Bird Survey (BBS) is the continent's most widespread breeding bird monitoring program and the longest running survey of breeding bird populations in Alaska. The program was developed in 1966 as a means to monitor bird populations across large spatial scales. Concerns over pesticide poisoning in birds built the foundation of the program and today the focus remains the same, as environmental threats persist.

The BBS program became operational in Alaska in 1982; 14 years after the first "test" routes were completed by Chan Robbins. Prior to 1982, the program lacked a regional coordinator and resulted in inconsistent data collection and few established routes. In 1993, the program expanded considerably due to participation by members of Boreal Partners in Flight (Figure 1). Today the Alaska BBS program is almost exclusively comprised of road-based surveys, although, river routes are common.

In 2018, 80 BBS survey routes were completed throughout Alaska, which was above the 25-year (1993-2018) average of 72 routes conducted per year. This year received the 2nd highest year of participation since 1993 and produced the greatest number of routes completed since 1997. Through the dedication of many observers, 85 routes have been completed in ≥10 years, 58 routes in ≥20 years and 10 routes have been completed in ≥30 years. The routes completed at the highest frequencies include: Hatcher Pass (30 years), Toklat (31 years), Zimovia Strait (31 years), Kachemak (32 years), Seven Lakes (33 years), Juneau (33 years), Anchor River (34 years), Galena (34 Years), Little Salcha (35 years) and Swan Lake Road (37 years). Variation in the number of individuals detected per year is evident in frequently observed routes (Figure 2).

Since 1968, 142 survey routes have been completed in Alaska. Of the 142 routes, 51 have been discontinued due to a lack of participation, accessibility concerns and or the route did not follow the primary objectives of the BBS program. However, not all routes were discontinued without replacement. Of the 91 currently active routes, 11 are replacements of discontinued routes.

Filling the gap with the Alaska Landbird Monitoring Survey. The Alaska Landbird Monitoring Survey (ALMS) was developed in 2003 to supplement the road-based BBS surveys (Handel and Sauer 2017). The concern was that most northern avian populations were inadequately monitored due to the scarcity of roads in Alaska. The ALMS program was implemented exclusively as a collection of off-road, 25-point grid surveys, which could be completed in conjunction with BBS routes (USGS 2016). As of 2016, 65 ALMS grids have been established across the 5 Bird Conservation Regions (BRC) in Alaska (USGS 2016). By regularly conducting both ALMS and BBS surveys and comparing population-level results, researchers are able to gain a better understanding of not only Alaska's long-term avian population trends but also the habitat structures northern breeding species depend on (Handel and Sauer 2017).

Trend Overview. The consistency and continual effort of BBS has produced trends in abundance for more than 170 species breeding in Alaska (Table 1). In addition, recent population trends for 31 species of shorebirds and passerines in the Northwestern Interior Forest BCR (Bird Conservation Region) and Northern Pacific Rainforest BCR of Alaska have been derived from BBS and ALMS surveys between 2003–2015 (Handel and Sauer 2017). Notably, 5 Neotropical migrants' species showed populations declines for BBS routes in the Northwestern Interior Forest BRC: Lesser Yellowlegs (–5.3% /yr), Olive-sided Flycatcher (–2.8%/yr), Tree Swallow (–4.6% /yr), Blackpoll Warbler (–5.4% /yr), and Wilson's Warbler (–4.5% /yr). In the Northern Pacific Rainforest BCR, one Neotropical migrant in particular, the Olive-sided Flycatcher, showed a decline for BBS routes (–3.4% /yr; Table 2).

Future Objectives. In 2019, we hope to continue widespread participation in the Alaska BBS by filling vacancies with knowledgeable and enthusiastic participants. Currently, there are 91 active routes throughout Alaska and of those, 6 routes are vacant for the 2019 season. The majority of the vacant routes are located in remote areas, which require more extensive planning and logistical support than routes in more populous regions of the state. BBS relies heavily on locals with proficient bird knowledge or those individuals willing and able to travel long distances. A list of available routes as well as route maps and species lists can be found at: (https://www.pwrc.usgs.gov/bbS/).

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Figure 1. The number of routes completed during the North American Breeding Bird Survey: Alaska (1968-2018). The dashed line refers to the average number of routes completed between 1993–2018 (71.88 routes). *n*= 142 routes (52 discontinued and 90 active routes as of 2018).

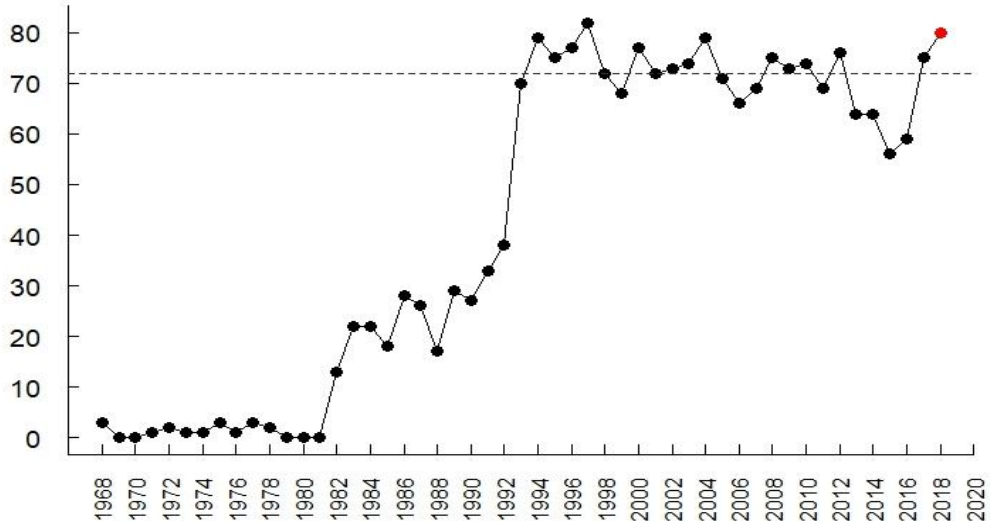

Figure 2. Number of individuals detected for three BRC 4 routes: Anchor River, Little Salcha and Swan Lake Road (1983-2018).

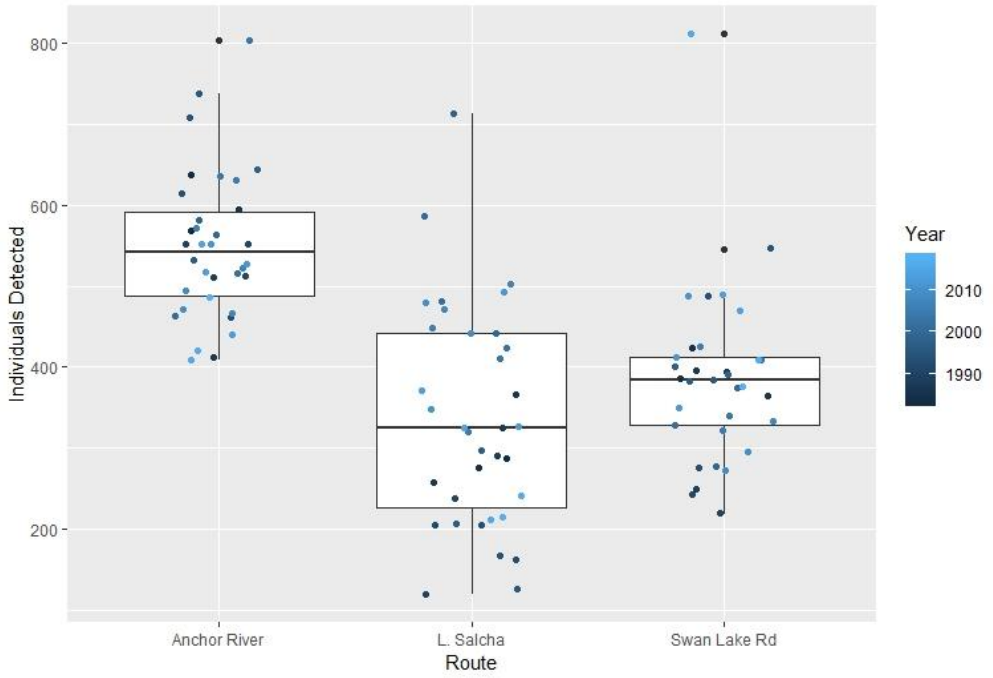

Table 1. Population change estimates for 176 species encountered on Breeding Bird Survey routes in Alaska (1993–2014; table and caption from Sauer et al. 2017: Table S02). The analysis is based on log-linear hierarchical models (Sauer et al. 2013). For each species, the following is presented: sample size (number of routes, *N*), trend estimate (% change/year), 2.5% and 97.5% credible intervals (CI) for trend, relative abundance (RA, defined as the annual index in the midyear of the interval) and 2.5% and 97.5% CIs for relative abundance, half-width of the CIs for trend, and a credibility score (R = reasonably monitored, Q = questionably monitored [estimates have ≥1 deficiency]), and P = poorly monitored (Sauer et al. 2014). Values <0.1 are indicated as 0.0. Species not included in previous BBS analyses are indicated with an asterisk (*) in column "New". Trends in blue are significant increases; trends in red are significant decreases.

Common Name	N	Trend	2.5% CI	97.5% CI	RA	2.5% CI RA	97.5% CI RA	Half-Width	Credibility Score	New
Greater White-fronted Goose	17	9.6	0.3	21.7	12.0	2.3	206.1	21.3	P	*
Canada Goose	54	4.8	-0.2	10.5	19.0	10.9	42.0	10.7	P	
Trumpeter Swan	29	5.6	0.9	11.2	0.9	0.4	2.0	10.4	P	*
Tundra Swan	24	-2.5	-9.2	5.4	1.2	0.4	6.6	14.7	P	*
Gadwall	2	1.5	-21.0	37.3	0.0	0.0	0.3	58.3	P	
American Wigeon	56	1.5	-1.7	5.2	2.8	1.7	5.0	7.0	P	
Mallard	65	0.3	-3.0	4.6	1.3	0.9	2.2	7.5	P	
Northern Shoveler	24	0.8	-4.8	7.2	0.4	0.1	0.9	11.9	P	
Northern Pintail	41	-2.8	-6.7	1.4	1.5	0.8	2.8	8.1	P	
Green-winged Teal	55	-0.1	-2.8	3.2	1.0	0.7	1.6	6.0	P	
Ring-necked Duck	21	3.6	-3.4	8.6	0.3	0.2	0.9	12.0	P	
Greater Scaup	37	2.4	-4.1	9.5	5.9	2.1	24.9	13.6	P	*
Lesser Scaup	29	-9.8	-20.3	-1.7	1.6	0.7	8.5	18.6	P	
Common Eider	3	1.3	-9.7	14.1	505.2	17.6	0.0	23.7	P	*
Harlequin Duck	27	-3.2	-9.4	4.0	1.3	0.4	5.2	13.4	P	*
Surf Scoter	12	3.4	-12.1	26.0	36.2	0.7	0.0	38.1	P	*
White-winged Scoter	15	-7.4	-16.5	2.5	0.5	0.1	13.7	18.9	P	*
Black Scoter	12	11.1	0.1	24.5	1.3	0.2	65.7	24.4	P	*
Long-tailed Duck	14	-6.7	-12.4	0.0	0.5	0.2	1.9	12.4	P	*
Bufflehead	23	0.8	-3.4	5.7	0.6	0.4	1.4	9.2	P	
Common Goldeneye	32	2.2	-1.0	6.2	0.3	0.2	0.6	7.2	P	
Barrow's Goldeneye	20	-0.1	-3.9	4.2	0.3	0.1	0.6	8.2	P	
Hooded Merganser	3	5.2	-4.6	14.2	0.0	0.0	0.1	18.8	P	
Common Merganser	39	1.8	-2.5	8.1	0.3	0.2	0.7	10.6	P	
Red-breasted Merganser	29	-3.0	-7.1	1.3	3.2	1.5	7.1	8.4	P	
Ruffed Grouse	20	0.1	-4.8	5.9	0.2	0.1	0.4	10.7	P	
Spruce Grouse	8	2.2	-6.9	12.2	0.0	0.0	0.1	19.1	P	*
Willow Ptarmigan	30	0.4	-6.4	7.7	7.0	2.1	38.6	14.1	P	*
Rock Ptarmigan	6	14.5	-0.1	29.3	0.4	0.1	14.2	29.4	P	*
Sooty Grouse	9	3.9	0.9	8.0	2.1	1.1	4.3	7.1	P	
Sharp-tailed Grouse	4	0.6	-7.7	12.0	0.0	0.0	0.1	19.7	P	
Red-throated Loon	39	0.5	-3.1	4.4	0.4	0.2	0.8	7.5	P	*
Pacific Loon	37	-0.9	-5.6	4.0	0.2	0.1	0.4	9.6	P	*
Common Loon	47	0.4	-1.5	2.3	0.4	0.3	0.7	3.8	Q	
Horned Grebe	13	-3.3	-8.2	0.9	0.1	0.0	0.1	9.1	P	
Red-necked Grebe	23	-3.5	-6.5	0.0	0.3	0.2	0.6	6.5	P	
Double-crested Cormorant	2	4.9	-9.5	20.8	0.1	0.0	2.2	30.3	P	
Pelagic Cormorant	4	-4.8	-16.2	4.6	0.8	0.1	8.0	20.9	P	
Great Blue Heron	13	-3.9	-9.0	1.1	0.3	0.2	0.8	10.1	P	
Osprey	11	4.6	0.4	8.8	1.5	0.8	2.8	8.4	P	
Bald Eagle	62	2.5	0.9	4.3	1.5	1.1	1.9	3.4	Q	
Northern Harrier	38	0.1	-2.3	2.7	0.1	0.1	0.1	5.1	P	
Sharp-shinned Hawk	18	2.0	-1.0	6.4	0.0	0.0	0.0	7.4	P	
Northern Goshawk	28	2.1	-2.4	5.7	0.0	0.0	0.0	8.1	P	
Red-tailed Hawk	37	1.5	-1.2	4.8	0.2	0.1	0.2	5.9	P	
Rough-legged Hawk	18	-0.5	-5.6	6.5	0.1	0.1	0.2	12.1	P	*
Golden Eagle	10	-0.3	-4.2	3.2	0.0	0.0	0.1	7.4	P	
Sora	3	-0.3	-9.5	4.5	0.0	0.0	0.0	14.0	P	
Sandhill Crane	50	2.8	0.0	5.9	2.3	1.5	3.9	5.8	P	
Black Oystercatcher	2	-4.2	-15.0	6.3	0.5	0.0	6.1	21.3	P	*
American Golden-Plover	11	-1.9	-10.1	4.8	0.3	0.1	0.7	14.9	P	*
Pacific Golden-Plover	9	-0.6	-7.9	7.9	1.9	0.6	21.9	15.8	P	*
Semipalmated Plover	37	-3.7	-8.2	0.6	0.7	0.4	1.8	8.8	P	*
Killdeer	4	-0.1	-5.1	4.7	0.0	0.0	0.1	9.8	P	
Spotted Sandpiper	59	-0.5	-2.3	1.3	0.9	0.7	1.3	3.6	Q	

Common Name	N	Trend	2.5% CI	97.5% CI	RA	2.5% CI RA	97.5% CI RA	Half-Width	Credibility Score	New
Solitary Sandpiper	28	-2.3	-5.1	0.8	0.4	0.2	0.6	5.9	P	
Wandering Tattler	7	3.2	-8.5	15.7	0.1	0.0	1.3	24.1	P	*
Greater Yellowlegs	42	1.9	-0.7	4.8	1.9	1.1	3.5	5.5	P	
Lesser Yellowlegs	56	-3.4	-5.7	-1.3	2.5	1.7	3.6	4.3	Q	
Upland Sandpiper	6	-6.9	-13.4	-1.1	0.0	0.0	0.1	12.4	P	
Whimbrel	17	2.5	-3.8	10.7	1.6	0.6	6.9	14.5	P	*
Bar-tailed Godwit	4	-6.1	-24.5	14.3	0.5	0.1	45.7	38.8	P	*
Ruddy Turnstone	5	-7.7	-17.5	4.2	0.1	0.0	0.6	21.7	P	*
Least Sandpiper	23	-2.3	-6.5	2.2	0.5	0.2	1.4	8.6	P	*
Western Sandpiper	11	-7.9	-18.0	2.0	16.3	2.9	998.2	20.1	P	*
Short-billed Dowitcher	9	0.9	-5.6	7.4	0.7	0.1	35.5	13.0	P	*
Wilson's Snipe	83	0.8	-0.6	2.2	13.8	10.5	18.6	2.8	R	
Red-necked Phalarope	18	-4.4	-11.6	2.4	0.4	0.2	1.3	14.0	P	*
Parasitic Jaeger	8	-0.3	-9.2	8.7	0.4	0.1	2.4	17.9	P	*
Long-tailed Jaeger	17	-2.9	-7.5	1.8	2.7	1.4	5.8	9.3	P	*
Pigeon Guillemot	7	5.3	-2.1	14.2	1.5	0.4	7.9	16.3	P	*
Marbled Murrelet	16	4.5	0.4	9.0	21.1	8.0	75.8	8.6	P	*
Black-legged Kittiwake	9	2.1	-11.0	16.5	68.5	4.1	7124.3	27.5	P	*
Bonaparte's Gull	36	-0.1	-4.5	4.7	0.7	0.3	1.7	9.2	P	*
Mew Gull	79	-4.2	-6.9	-1.6	9.5	6.1	16.7	5.3	P	*
Herring Gull	34	-1.4	-4.7	2.3	3.7	2.0	7.4	7.0	P	
Glaucous-winged Gull	42	-3.9	-8.2	0.5	31.9	12.4	98.7	8.8	P	
Glaucous Gull	15	4.9	-3.0	14.8	6.7	1.7	64.7	17.8	P	*
Aleutian Tern	5	-4.8	-16.0	9.1	10.9	0.8	0.0	25.2	P	*
Arctic Tern	51	-2.5	-5.7	0.8	2.9	1.7	5.5	6.5	P	*
Rock Pigeon	4	0.5	-3.6	4.6	0.5	0.2	1.2	8.2	P	
Eurasian Collared-Dove	4	51.1	32.4	76.5	0.0	0.0	0.1	44.2	P	
Great Horned Owl	30	-0.7	-3.8	2.1	0.1	0.1	0.2	5.9	P	
Northern Hawk Owl	22	4.3	-0.9	10.9	0.0	0.0	0.1	11.8	P	*
Northern Pygmy-Owl	5	0.8	-6.3	7.8	0.0	0.0	0.0	14.1	P	
Great Gray Owl	6	2.9	-4.0	10.0	0.0	0.0	0.0	14.1	P	*
Short-eared Owl	27	-1.2	-6.3	5.5	0.2	0.1	0.4	11.8	P	
Boreal Owl	7	-6.5	-18.0	8.1	0.0	0.0	0.0	26.1	P	*
Northern Saw-whet Owl	5	-1.5	-23.1	9.7	0.0	0.0	0.3	32.8	P	*
Vaux's Swift	3	1.7	-5.0	40.9	0.0	0.0	0.3	45.9	P	
Rufous Hummingbird	18	1.0	-0.8	2.8	2.2	1.6	3.2	3.6	Q	
Belted Kingfisher	57	-1.4	-3.2	0.3	0.3	0.3	0.4	3.6	Q	
Red-breasted Sapsucker	16	1.6	-1.5	4.6	8.0	4.7	14.0	6.1	P	
"Yellow-bellied" Sapsucker[a]	16	2.9	-1.8	7.7	7.5	4.5	12.3	9.5	P	
Downy Woodpecker	33	-0.7	-4.8	3.3	0.1	0.1	0.3	8.1	P	
Hairy Woodpecker	45	0.0	-2.5	2.9	0.2	0.2	0.4	5.4	P	
Am.Three-toed Woodpecker	30	-1.4	-6.7	3.3	0.1	0.1	0.3	10.0	P	
Black-backed Woodpecker	6	3.7	-6.3	13.7	0.0	0.0	0.0	20.1	P	
American Kestrel	12	-2.0	-6.8	2.4	0.0	0.0	0.1	9.2	P	
Merlin	40	3.7	-0.2	7.1	0.1	0.0	0.1	7.4	P	
Gyrfalcon	6	8.2	0.1	24.5	0.1	0.0	0.2	24.5	P	*
Peregrine Falcon	12	7.8	0.1	13.8	0.0	0.0	0.0	13.7	P	
Olive-sided Flycatcher	62	-2.2	-3.5	-0.8	3.0	2.3	3.9	2.7	R	
Western Wood-Pewee	38	-3.2	-5.3	-0.9	0.7	0.4	1.1	4.4	Q	
Yellow-bellied Flycatcher	10	10.1	4.2	17.7	0.1	0.0	0.3	13.5	P	
Alder Flycatcher	85	-1.5	-2.7	-0.4	24.9	19.3	32.2	2.3	R	
Least Flycatcher	8	-3.3	-13.4	3.7	0.0	0.0	0.0	17.2	P	
Hammond's Flycatcher	31	1.2	-1.5	3.8	1.7	1.1	2.7	5.3	P	
"Western" Flycatcher[a]	16	1.6	-0.2	3.6	21.5	12.5	36.3	3.7	Q	
Say's Phoebe	21	0.6	-3.5	4.7	0.1	0.1	0.3	8.2	P	
Northern Shrike	14	-2.1	-6.7	3.3	0.0	0.0	0.0	10.0	P	*
Warbling Vireo	6	4.3	0.9	8.0	0.5	0.2	0.9	7.1	P	
Gray Jay	58	1.4	-0.3	3.4	9.3	6.9	12.6	3.6	Q	
Steller's Jay	19	-1.9	-3.7	-0.4	1.1	0.8	1.7	3.3	Q	
Black-billed Magpie	38	1.2	-1.2	3.8	2.0	1.3	3.3	4.9	Q	
Northwestern Crow	23	2.0	0.1	4.3	4.2	2.5	8.1	4.2	Q	
Common Raven	92	1.9	0.4	3.6	4.5	3.6	5.7	3.2	Q	
Horned Lark	3	-7.6	-21.6	7.4	0.0	0.0	0.1	29.0	P	
Tree Swallow	73	-2.9	-5.0	-0.6	2.3	1.6	3.3	4.3	Q	
Violet-green Swallow	53	-3.9	-6.7	-1.5	2.3	1.4	3.9	5.3	P	
Bank Swallow	60	-5.9	-9.3	-2.5	27.4	16.0	49.6	6.8	P	
Cliff Swallow	40	-7.0	-10.6	-3.2	11.2	6.0	20.9	7.4	P	
Barn Swallow	14	-6.1	-9.2	-3.2	0.5	0.3	0.9	6.0	P	

Common Name	N	Trend	2.5% CI	97.5% CI	RA	2.5% CI RA	97.5% CI RA	Half-Width	Credibility Score	New
Black-capped Chickadee	59	-0.5	-2.3	1.8	1.3	1.0	1.8	4.1	Q	
Chestnut-backed Chickadee	18	0.1	-1.7	2.1	24.1	14.9	41.0	3.8	Q	
Boreal Chickadee	54	1.4	-0.7	4.0	1.3	0.9	1.8	4.7	Q	
Red-breasted Nuthatch	29	1.5	-2.4	5.5	0.1	0.1	0.2	7.9	P	
Brown Creeper	27	-0.1	-3.6	3.7	0.1	0.1	0.2	7.2	P	
Pacific Wren	19	0.5	-1.8	3.9	19.9	12.5	58.6	5.7	P	
American Dipper	11	-1.3	-5.4	3.9	0.1	0.0	0.1	9.3	P	
Golden-crowned Kinglet	36	-0.8	-3.4	1.8	3.5	2.0	10.1	5.2	P	
Ruby-crowned Kinglet	74	0.9	-0.5	2.3	21.4	16.1	29.1	2.8	R	
Arctic Warbler	28	-5.0	-8.5	-1.1	12.3	4.7	53.6	7.5	P	*
Bluethroat	7	-6.7	-16.0	5.6	0.2	0.1	0.9	21.5	P	*
Northern Wheatear	4	3.3	-5.2	12.5	0.2	0.0	0.3	17.7	P	*
Townsend's Solitaire	15	1.7	-1.8	5.7	0.2	0.1	0.3	7.5	P	
Gray-cheeked Thrush	71	-2.6	-4.6	-0.5	13.3	8.6	22.9	4.2	Q	*
Swainson's Thrush	76	0.7	-0.2	1.7	74.1	58.7	95.6	1.9	R	
Hermit Thrush	73	0.9	-0.2	2.0	15.0	11.2	19.9	2.2	R	
American Robin	90	1.0	0.3	1.7	19.3	16.9	22.0	1.4	R	
Varied Thrush	81	-0.7	-1.7	0.3	47.6	35.8	66.2	1.9	R	
European Starling	4	-2.5	-10.5	5.3	0.1	0.0	0.6	15.8	P	
Eastern Yellow Wagtail	12	-4.8	-9.0	-0.7	6.3	3.0	20.4	8.2	P	*
American Pipit	12	1.0	-7.8	10.6	0.6	0.2	3.3	18.3	P	*
Bohemian Waxwing	40	-0.6	-4.5	4.5	1.0	0.5	1.9	9.0	P	*
Cedar Waxwing	5	4.6	-16.0	29.4	1.5	0.4	6.3	45.4	P	
Lapland Longspur	19	0.0	-4.3	4.2	39.6	12.5	241.5	8.5	P	*
Northern Waterthrush	71	0.2	-1.2	1.7	5.3	4.1	7.0	2.9	R	
Tennessee Warbler	6	-0.2	-6.6	8.1	0.0	0.0	0.1	14.7	P	
Orange-crowned Warbler	85	-0.2	-1.4	1.1	33.2	25.8	43.4	2.5	R	
MacGillivray's Warbler	9	-3.6	-11.0	3.2	0.5	0.2	1.3	14.1	P	
Common Yellowthroat	18	1.7	-0.9	5.1	0.1	0.1	0.1	6.0	P	
American Redstart	3	5.2	-2.2	19.2	0.3	0.1	1.0	21.5	P	
Yellow Warbler	91	1.5	0.0	3.2	8.5	6.3	12.0	3.2	Q	
Blackpoll Warbler	60	-3.6	-5.3	-1.9	6.3	4.2	9.9	3.4	Q	
Yellow-rumped Warbler	76	1.8	0.1	3.8	31.6	24.1	42.0	3.7	Q	
Townsend's Warbler	47	2.8	1.2	4.4	12.5	7.7	20.9	3.2	Q	
Wilson's Warbler	90	-0.3	-1.5	1.2	21.3	16.0	30.3	2.8	R	
American Tree Sparrow	47	-0.7	-3.3	2.4	57.2	24.4	209.1	5.7	P	*
Chipping Sparrow	27	7.7	3.7	12.0	0.2	0.1	0.3	8.3	P	
Savannah Sparrow	83	-0.6	-2.2	0.9	30.5	19.4	49.2	3.1	Q	
Fox Sparrow	92	2.5	1.2	3.7	39.1	28.9	55.4	2.5	R	
Song Sparrow	37	-0.8	-3.1	1.8	0.5	0.4	0.7	4.9	Q	
Lincoln's Sparrow	73	1.7	0.1	3.4	6.4	4.8	8.8	3.3	Q	
White-crowned Sparrow	75	-0.7	-2.3	1.2	94.2	64.7	145.3	3.5	Q	
Golden-crowned Sparrow	35	-1.6	-3.2	0.3	42.7	18.1	98.9	3.5	Q	*
Dark-eyed Junco	76	-0.2	-1.4	1.0	55.0	43.5	70.4	2.4	R	
Western Tanager	7	1.3	-2.3	5.9	0.3	0.2	0.8	8.2	P	
Red-winged Blackbird	13	-1.7	-4.9	1.2	0.1	0.1	0.3	6.1	P	
Rusty Blackbird	37	-0.8	-3.9	3.0	0.7	0.4	1.1	6.9	P	
Pine Grosbeak	54	-0.9	-3.6	2.5	0.8	0.5	1.2	6.0	P	
Red Crossbill	20	9.5	0.9	19.8	4.1	1.3	15.9	18.9	P	
White-winged Crossbill	61	9.9	3.2	17.1	13.8	5.2	37.7	13.9	P	
Common Redpoll	76	-2.6	-4.8	-0.2	32.1	22.6	48.1	4.6	Q	*
Hoary Redpoll	6	25.2	8.3	51.7	0.2	0.1	10.0	43.4	P	*
Pine Siskin	46	-3.2	-6.8	0.6	7.2	4.1	13.0	7.3	P	

[a]The "Yellow-breasted" Sapsucker and “Western” Flycatcher complexes result from the lumping of data from currently recognized species, that overlap in distribution, that were not recognized as distinct species when the BBS survey began.

Table 2. Comparisons of annual percent change (% yr^{-1}) in populations of 31 species of shorebirds and landbirds from roadside Breeding Bird Surveys and off-road Alaska Landbird Monitoring Surveys in 2 Bird Conservation Regions (BCRs) of Alaska, USA (2003–2015), based on independent hierarchical models (caption and table taken from Handel and Sauer 2017:Table 1). For each species, the following is presented: sample size (number of routes surveyed n) and the median and 95% credible intervals (CIs) for the annual percent change; boldface font indicates those values for which 95% CIs did not overlap zero (red=decline, blue=increase). Trends are presented only for species recorded on ≥14 routes in a region, unless 95% CIs were precise enough to detect trend of 5% yr^{-1} (Sauer et al. 2003). Species noted with an asterisk (*) are represented by different subspecies in the 2 BCRs in Alaska (Gibson and Withrow 2015), but not all had samples sufficient for comparative analysis.

	Northwestern Interior Forest BCR								Northern Pacific Rainforest BCR							
	Roadside				Off-road				Roadside				Off-road			
Species	n	median	2.5%	97.5%	n	median	2.5%	97.5%	n	median	2.5%	97.5%	n	median	2.5%	97.5%
Rufous Hummingbird									19	0.8	-2.2	3.3	24	**-7.5**	**-13.5**	**-3.2**
Wilson's Snipe	44	-0.6	-3.1	1.6	24	-6.5	-12.6	1.8								
Lesser Yellowlegs	32	**-5.3**	**-8.5**	**-2.2**	17	**-9.2**	**-15.0**	**-0.6**								
Red-breasted Sapsucker									16	3.3	-3.0	10.3	18	**10.2**	**6.6**	**14.4**
Olive-sided Flycatcher	39	**-2.8**	**-5.3**	**-0.3**	19	**-17.9**	**-25.1**	**-8.8**	16	**-3.4**	**-7.4**	**-0.7**				
Western Wood-pewee*	24	-3.8	-7.6	2.3	17	8.5	-4.0	26.4								
Alder Flycatcher	46	-1.8	-3.9	0.1	35	2.1	-2.1	6.2	19	-0.7	-5.3	4.0				
Pacific-slope Flycatcher									15	**2.7**	**0.3**	**6.1**	19	0.3	-1.8	3.0
Tree Swallow	35	-4.6	-10.3	1.6	14	-0.5	-10.9	22.1								
Black-capped Chickadee	37	-1.5	-5.6	2.9	20	1.6	-4.3	7.9								
Chestnut-backed Chickadee									19	-0.4	-4.2	2.8	24	2.4	-1.9	7.1
Boreal Chickadee	42	0.2	-4.2	4.7	27	-1.6	-8.1	4.9								
Pacific Wren									18	-0.5	-3.1	2.4	24	-0.7	-2.7	1.5
Golden-crowned Kinglet*									22	-1.9	-7.5	4.1	21	**-5.4**	**-9.2**	**-1.5**
Ruby-crowned Kinglet*	45	**-3.6**	**-6.7**	**-0.6**	34	1.4	-2.9	4.4	22	-3.0	-6.8	0.3	22	-2.1	-4.4	0.8
Swainson's Thrush*	45	**1.7**	**0.0**	**3.7**	36	**3.1**	**0.5**	**5.5**	22	1.3	-0.9	3.5	13	-2.2	-6.0	2.1
Hermit Thrush*	37	2.7	-1.5	7.0	31	-5.3	-10.7	0.7	23	0.4	-1.4	2.3	28	**2.9**	**0.7**	**5.4**
American Robin*	46	1.3	-0.2	2.9	38	**3.1**	**0.9**	**5.4**	23	**3.1**	**0.8**	**5.6**	22	-3.5	-7.9	0.5
Varied Thrush*	45	0.6	-2.4	3.6	26	3.0	-2.5	8.6	23	-0.4	-2.8	2.1	27	0.5	-1.6	2.4
Orange-crowned Warbler*	44	**-2.9**	**-5.4**	**-0.3**	43	1.8	-1.1	5.1	23	-1.1	-3.2	2.2	28	**6.0**	**3.5**	**8.9**
Yellow Warbler*	45	**6.6**	**2.8**	**10.8**	31	**7.5**	**2.3**	**15.8**	23	0.4	-3.0	3.0	15	3.2	-5.6	11.0
Blackpoll Warbler	35	**-5.4**	**-9.3**	**-0.5**	14	10.4	-8.9	23.3								
Yellow-rumped Warbler*	46	-0.7	-3.0	1.7	36	-0.3	-3.0	2.5	20	0.5	-2.0	2.7	15	**-6.2**	**-11.0**	**-1.3**
Townsend's Warbler	23	-2.3	-7.0	2.1					21	**4.2**	**1.3**	**7.2**	20	**5.3**	**3.0**	**8.5**
Wilson's Warbler	46	**-4.5**	**-6.6**	**-2.4**	39	-3.7	-8.2	0.1	22	0.3	-2.5	3.4	26	2.0	-0.4	4.9

	Northwestern Interior Forest BCR								Northern Pacific Rainforest BCR							
	Roadside				Off-road				Roadside				Off-road			
Species	n	median	2.5%	97.5%	n	median	2.5%	97.5%	n	median	2.5%	97.5%	n	median	2.5%	97.5%
Savannah Sparrow	38	**-5.0**	**-7.6**	**-2.5**	33	4.0	-0.8	8.7								
Fox Sparrow*	46	-0.6	-3.3	1.7	35	**7.6**	**3.2**	**11.7**	23	**2.0**	**0.2**	**3.9**	13	-2.0	-6.2	2.3
Lincoln's Sparrow*	43	**3.8**	**0.6**	**7.2**	32	**5.8**	**2.4**	**10.5**	21	0.0	-2.7	4.0	18	2.1	-0.4	4.8
White-crowned Sparrow*	46	**-3.0**	**-5.2**	**-0.7**	38	-2.2	-5.0	0.7								
Dark-eyed Junco*	46	0.3	-1.6	2.3	41	0.6	-1.4	2.8	23	-0.2	-2.6	2.4	24	**3.6**	**0.2**	**7.3**
Rusty Blackbird	20	1.3	-3.9	8.9	14	6.5	-1.6	16.5								

(Alaska-wide) Statewide hunter harvested grouse and ptarmigan wing collection program, Alaska, 2018

Richard Merizon and Cameron Carroll, Alaska Department of Fish and Game

Since 2011, the statewide Small Game Program (SGP) within the ADF&G has been collecting grouse and ptarmigan wings and tails from hunter harvested birds. This is a voluntary program that through 7 hunting seasons (2011/12 - 2017/18) has received samples from over 300 hunters statewide. During the 2017 regulatory year (RY; July 1, 2017 to June 30, 2018) hunters provided wings from 165 ruffed, 347 spruce, 175 sharp-tailed, and 42 sooty grouse in addition to 419 willow, 38 rock, and 23 white-tailed ptarmigan wings statewide (Merizon and Carroll, *In Prep*). Samples were collected from 14 of the 26 game management units statewide including the Alaska Peninsula, Northwest, Southwest, and Southeast Alaska, and most of the road system from the Dalton Highway to Homer. These samples allow managers to better understand the harvest composition of exploited populations of tetraonids. Specifically, they allow an estimation of harvest composition, harvest distribution and timing, and juvenile production.

This program will continue and is a permanent portion of the ADF&G SGP. The SGP provides free wing envelopes and free return options to encourage participation. Envelopes are available either through direct mailing or at all ADF&G offices. Through October 2018, hunters have provided approximately 450 samples statewide during the 2018-2019 season.

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(Boreal North America) Update from the Boreal Avian Modelling Project

Nicole Barker, Boreal Avian Modelling Project

BACKGROUND

The Boreal Avian Modelling (BAM) Project was founded in 2005 to address critical knowledge gaps challenging the management and conservation of boreal birds in Canada (Cumming et al. 2010). BAM develops, distributes, and applies statistical models of avian populations and the impacts of human activity on boreal bird species. Our work draws upon a powerful database created through a large initial investment in assembling and harmonizing data from individual research and monitoring efforts conducted in the Canadian and US boreal & hemi-boreal forest (Sólymos et al. 2013, Barker et al. 2015). BAM's Avian Database includes point-count data from over 250,000 locations across North America's boreal and hemiboreal region.

The BAM Project Team is made up of academic researchers, government scientists, project staff, and graduate students. BAM collaborates with federal and provincial governments, academics, industry, and non-governmental organizations with interests in the development and application of science for bird conservation and management. Our research products are applied to many aspects of boreal bird management and conservation, including migratory bird monitoring, population estimation, determination of habitat requirements, population assessment and recovery planning for species at risk, environmental assessment, identification of priority wildlife areas, protected areas design, and land-use planning.

BAM's research primarily contributes to conservation and management of boreal birds in two ways: 1) by providing the best available information; and 2) by advancing the theoretical foundations of research underpinning conservation and management within the boreal region.

- *Provision of information*: Conservation of species is often reactive and opportunistic. Managers must respond, assess, and triage based on available information. BAM strives to produce and distribute the best information possible to facilitate reactive decision-making.
- *Theoretical foundations*: Simultaneously, BAM also proactively conducts research on species ecology, habitats, and human impacts, with intent to continually improve the intellectual standard, theoretical basis, and rigour of our products and advice.

2018 RESEARCH UPDATE

Throughout 2018, BAM led or contributed to projects that aimed to:

- Quantify how species' detectability is constrained by phylogeny or affected by species' traits (Sólymos et al. 2018b).
- Evaluate time-removal methods for correcting for species' detectability in terms of data needs and model complexity (Sólymos et al. 2018a).
- Systematically evaluate contributions of roadside bias, habitat sampling bias, and species' detectability on population estimation through a comparison between BAM approaches and PIF approaches (Sólymos et al. *In preparation*).
- Build regional-scale species distribution models for BCR4, Northwestern North America (Olive-sided Flycatcher and Western Wood-pewee), British Columbia (all species combined), the Moose Cree First Nation homelands in Ontario (Canada Warbler, Olive-sided Flycatcher, Common Nighthawk, Rusty Blackbird), southern Québec (50 species), Alberta (Canada Warbler), and Nova Scotia (Canada Warbler);
- Inform critical habitat identification through the creation of a conceptual framework and testing of the first few steps of the approach - this involved model-based delineation of management units, regional-scale models, and initiation of landscape simulations (Dénes et al. *In preparation*, *In preparation*b, *In preparation*c, *In preparation*d).
- Develop and start testing a new generalized approach to build national models; these will yield a next round of density and population size data products for distribution.
- Synthesize existing knowledge about environmental factors affecting North American breeding duck distribution (Adde et al. *In preparation*a) and build new national waterfowl models to improve on previously-published ones (Adde et al. *In preparation*b); collaboration with Ducks Unlimited Canada).
- Systematically quantify how habitat associations vary regionally for 6 boreal songbird species (Canada Warbler, Black-throated Green Warbler, Brown Creeper, Connecticut Warbler, Blackburnian Warbler, and Cape May Warbler; (Crosby et al. *In review*).
- Develop national-scale models that quantify habitat selection conditional on habitat availability to facilitate better out-of-sample prediction and forecasting (Crosby et al. *In preparation*).

- Evaluate occupancy of Canada Warbler (CAWA), Yellow-rumped Warbler (YRWA), and Philadelphia Vireo (PHVI) using LiDAR-derived structural metrics and compare to models built with coarser habitat metrics (Casey and Bayne *In preparation*a).
- Carefully compare trends for Canada Warbler based on off- or on-road data using BAM's approach compared to equivalent trends using Breeding Bird Survey methods (Haché et al. *In preparation*).
- Understand how boreal birds at Calling Lake respond to changes in yearly variables aside from long-term forest fragmentation.
- Compare sources of interannual variability and evaluate migratory connectivity in long-distance migrant species (Stralberg et al. *In preparation*).
- Project potential Olive-sided Flycatcher and Western Wood-pewee densities under future climate scenarios (Stehelin et al. *in preparation*) and investigate the role of insect abundance, diversity, and emergence time on breeding phenology and relative breeding success for these species (Stehelin and Schmiegelow *in preparation*).
- Hindcast current national models of forestry impacts on birds to historical landscapes to quantify potential cumulative consequences of forestry over 1985-2011 (Micheletti et al. *In preparation*).
- Evaluate the impact of caribou conservation spatial forest harvest scenarios on bird populations in the Alberta Pacific Forest Management Area (Leston et al. *In preparation*).
- Quantity the influence of patterns and levels post-harvest residual tree retention on bird communities in Alberta (Casey and Bayne *In preparation*b).
- Forecast population responses to climate change in northeastern Alberta and central Québec based on spatial-explicit simulations from forest landscape models considering natural and human disturbances (Tremblay et al. *In preparation*).
- Develop strategies for identifying priority areas for songbird conservation in Canada's boreal forest and highlight some key areas (Stralberg et al. 2018).
- Develop a framework for conserving boreal birds given climate change impacts (Stralberg et al. *In review*).
- Quantify avian refugia potential based on backward velocity (Stralberg 2018).
- Describe the importance of climatic refugia for boreal songbirds: areas of Canada's boreal forest that could maintain relatively stable environmental conditions in the face of climate change (Wells et al. 2018).
- Inform conservation and sustainable resources management within the Northwest Boreal Landscape Conservation Cooperative, in partnership with the Boreal Ecosystems Analysis for Conservation networks (BEACONs) Project (Lisgo et al. 2017).

THE BAM TEAM

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(Range-wide) A full-annual cycle model to understand factors limiting Rusty Blackbird populations

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The Rusty Blackbird has lost 90% of its global population since 1970 and is projected to lose another 50% in the next 19 years (Rosenberg et al. 2016). Since 2005, researchers with the International Rusty Blackbird Working Group (Working Group, rustyblackbird.org) have collaborated on a variety of studies on breeding and wintering populations to understand the species' resource requirements, limiting factors, and population flyway structure. This collective effort has filled major information gaps on Rusty Blackbird ecology and natural history requirements; however, identifying the causes of its steep decline has remained elusive. A review of the existing information on the species recommended that the various demographic data collected across the annual cycle should be integrated into a population matrix model of annual population growth to (1) better understand when and where populations are most limited and (2) identify environmental drivers of these limitations (Greenberg and Matsuoka 2010).

In 2016, the Working Group began working in earnest on a full-annual cycle model. We compiled into a centralized database all of the existing data on the species' abundance, fecundity, and survival (mark-recapture and telemetry) and then successfully fit these data to a preliminary Bayesian integrated population model (IPM, Schaub and Abadi 2011, Kéry and Schaub 2012) adapted from a model developed for declining Wood Thrush (Rushing et al. 2017). We are now finalizing this model which:

- Estimates demographic rates (fecundity, season- and age-specific survival) separately for western versus eastern flyways, the former linking breeding and wintering data between Alaska and Mississippi, the latter New England to South Carolina/Georgia.
- Partitions first year and adult annual survival into breeding, winter, and latent spring and autumn migration periods.
- Compares the proportional contributions of the individual demographic parameters (n = 10 parameters) to population growth, thereby identifying demographic drivers of population limitation separately for each flyway.

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(Range-wide) Evaluating migratory connectivity in Rusty Blackbirds using high resolution genome sequencing

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Rusty Blackbird (*Euphagus carolinus*) has lost 90% of its global population since 1970, with the decline likely ongoing for more than a century (Greenberg and Droege 1999). The species breeds across the boreal biome from Alaska to Newfoundland and northern New England, and winters in the eastern half of the U.S. Isotopes and band recoveries indicate a general migratory divide. Birds breeding in the eastern boreal generally migrate along an Atlantic flyway to wintering areas along the Atlantic Coastal Plain, while breeders from the western and central boreal migrate down the Mississippi flyway to the lower Mississippi Alluvial Valley (Hamel et al. 2009, Hobson et al. 2010). However, more specific information on connectivity is now needed to (1) link data across the full-annual cycle in population models that determine when and where population are most limited, (2) test different hypothesis about the causes of the species' steep decline, and (3) strategically link conservation efforts across the annual cycle for regional populations that are most vulnerable to extirpation (Greenberg and Matsuoka 2010). The latter includes a distinct subspecies that breeds on Newfoundland whose population has been reduced by 50% over the past decade (Burleigh and Peters 1948, Environment Canada 2014).

The main objective of this project is to develop a baseline genoscape across the breeding range of Rusty Blackbirds, and then cross reference genetic samples collected from birds on migration routes and wintering areas against the genoscape to trace them back to their breeding origins. This involves a 3-stage laboratory process of (1) assembling reduced representation genome information (ddRADSeq) for the species, (2) scanning the genomic data to identify loci that are unique to each breeding population, and (3) linking migrating and wintering birds back to their breeding origins based on their genetic signatures (Ruegg et al. 2014). In 2017 and 2018 and we obtained blood samples from the field or from archives for over 300 birds from nearly all states and provinces across the species' breeding range. These breeding samples are currently being analyzed as part of stages 1 and 2 of the project at the USGS Alaska Science Center's Molecular Ecology Laboratory. We have also identified over 500 samples of feathers or blood collected on wintering and migration stopover sites, which we will later analyze as part of stage 3 of the project.

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Appendix. Recent landbird publications (2018) relevant to Alaska and northwestern Canada

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