BOREAL
Partners in Flight

2019 Summary of Landbird Projects

February 2020

Contents

Compiler's Note

This year marked the 28th anniversary of Boreal Partners in Flight, which was founded in November 1991 by a small group of ornithologists during the 4th 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 28 project summaries voluntarily contributed by our members. I thank our membership for these contributions and their continued commitment to understand and conserve landbird populations across northwestern North America. Best wishes to you in all with your landbird pursuits in 2020.

Best regards,

Steve Matsuoka, Outgoing 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).

2019 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], Daniel Ruthrauff[1], and Audrey Taylor[2]
[1]U.S. Geological Survey, Alaska Science Center; [2]University of Alaska Anchorage; [3]U.S. Fish and Wildlife Service, Migratory Bird Management; [4]U.S. Fish and Wildlife Service, Alaska Maritime National Wildlife Refuge

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. Given their small population sizes and restricted ranges, we replicated line-transect surveys in 2018 on St. Matthew and Hall Islands with the objective to estimate abundance adjusted for imperfect detection and compare abundances between decadal time periods.

During 2019, population surveys for ROSA were conducted on St. Paul Island from 7 to 11 May resulting in completion of 38 transects totaling 204 km. Additional fieldwork on St. Matthew Island from 24 to 30 July focused primarily on nest searching and productivity monitoring for MCBU. We will finalize surveys for ROSA on St. George Island in early May 2020. Data collected for this study is currently being analyzed to 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. Forthcoming products will include spatial models of abundance and population change and estimates of reproductive success and nest failure rates.

Acknowledgments. Additional field assistance in 2019 was provided by Tony DeGange, Laura McDuffie, and Sarah Tanedo. 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 Tiĝlax̂* for providing hospitality, accommodations, and safe transport to and from St. Matthew and Hall Islands.

Contact. Rachel Richardson, U.S. Geological Survey, Alaska Science Center, 4210 University Drive, Anchorage, AK 99508; Phone: (907) 786-7194; Email: rrichardson@usgs.gov

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(BCR 2) Landbird monitoring on Kodiak Island, Alaska, 2019

Robin Corcoran[1], Cindy Trussell[2], and Rich MacIntosh[3]
[1]U.S. Fish and Wildlife Service, [2]Kodiak College, [3]Biological Consultant

Breeding Bird Survey. Two road-system surveys (Kodiak II (231) and Chiniak (131)) were conducted in June 2019 by Bill Pyle and Rich MacIntosh.

Christmas Bird Count. Two counts will be conducted, the Kodiak count circle (12/14/2019) and the Narrow Cape/Kalsin Bay count circle (12/28/2019). 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. 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 2010–2019, 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 1 June and 31 July. 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 ten years of mist net operation, we captured and banded 2164 birds representing 21 species, and recaptured between years 137 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 18 volunteers each season and over 100 participants across the ten years. A cumulative total of approximately 3200 hours of service was donated to the refuge by volunteer participation in the MAPS program.

Contact. Robin Corcoran, U.S. Fish and Wildlife Service, Kodiak Refuge, 1390 Buskin River Road, Kodiak, AK, 99615. E-mail: robin_corcoran@fws.gov

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 2019.

Species	Year[1]										Total	Recaptures[2]
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019		
Fox Sparrow	46	44	33	48	58	80	80	56	36	34	515	32
Hermit Thrush	52	41	47	30	43	42	41	21	35	28	380	33
Wilson's Warbler	76	26	29	16	29	42	19	30	26	53	346	22
Pacific Wren	16	24	0	1	21	59	62	12	17	30	242	15
Yellow Warbler	29	15	26	23	8	13	11	13	14	5	157	17
Golden-crowned Kinglet	3	27	0	0	4	63	5	8	0	17	127	1
Black-capped Chickadee	13	5	5	10	7	17	7	2	1	9	76	7
Pine Siskin	1	12	3	12	0	30	2	2	1	4	67	
Varied Thrush	3	12	9	12	2	5	5	4	4	1	57	2
Pine Grosbeak	1	5	4	10	2	4	2	2	3	0	33	3
Orange-crowned Warbler	7	3	2	2	4	0	2	8	2	2	32	
Myrtle Warbler	1	0	2	2	0	0	0	2	2	19	28	
Common Redpoll	0	1	0	0	0	14	0	10	0	0	25	
Red-breasted Nuthatch	2	2	2	7	1	5	0	0	1	0	20	1
Brown Creeper	0	0	1	4	2	12	0	0	0	1	20	2
Golden-crowned Sparrow	6	0	1	2	0	0	0	1	3	0	13	
Downy Woodpecker	1	0	0	0	4	1	1	2	0	0	9	1
Red Crossbill	0	0	0	0	1	7	0	0	0	1	9	
Song Sparrow	2	0	0	0	0	1	1	0	1	0	5	
Three-toed Woodpecker	0	0	0	1	0	0	1	0	0	0	2	1
Northern Goshawk	0	0	0	0	0	0	1	0	0	0	1	
TOTALS	**259**	**217**	**164**	**180**	**186**	**395**	**240**	**173**	**146**	**204**	**2164**	**137**
Total Net Hours	*371*	*341*	*358*	*357*	*347*	*355*	*361*	*358*	*355*	*344*		

[1] Yearly totals of numbers of newly banded birds.

[2] Total number of birds recaptured between years.

(BCR 2) The Peregrine Fund's Gyrfalcon and Tundra Conservation Project, Seward Peninsula, Alaska, 2014–2019

Devin Johnson[1,2], Michael Henderson[1], David Anderson[1], Travis Booms[3]

[1]The Peregrine Fund, [2]The University of Alaska Fairbanks, [3]Alaska Department of Fish and Game

The Gyrfalcon (*Falco rusticolus)* is a specialist predator of Arctic and subarctic tundra ecosystems which are undergoing rapid changes in climate and landscape. These changes are characterized by increased temperatures, altered precipitation regimes, landscape reconfiguration and associated species range changes, and shifts in ecosystem phenology. The Gyrfalcon and Tundra Conservation Project is a collaborative effort by The Peregrine Fund and the Alaska Department of Fish and Game with the primary goal of monitoring and researching the biology of Gyrfalcons on Alaska's Seward Peninsula. Gyrfalcons have been identified as a focal ecosystem component by the Arctic Terrestrial Biodiversity Monitoring Program, suggesting the utility of Gyrfalcons as an effective sentinel species of environmental change in Arctic ecosystems. Since 2014, we have applied a comprehensive approach to research biologically relevant factors for breeding Gyrfalcons focusing on the following aspects: occupancy and productivity, prey availability, diet and phenology, and the effects of nest protection on breeding success.

Occupancy & Productivity Survey. From 2015-2019, we have monitored c.a. 500 historic cliff-nesting raptor sites via helicopter surveys conducted twice annually (specific methods/study site in Bente (2011)). May surveys provide the most reasonable measure of nest and territory occupancy, whereas late June surveys indicate the number of young that are old enough to be considered fledged. Surveys document the breeding status of the entire raptor guild (Golden Eagles, Rough-Legged Hawks, Peregrine Falcons, Gyrfalcons, and Common Ravens), providing insight on population dynamics and large-scale interspecific trends within the 7,000-km study area.

Prey Availability Survey. From 2016–2019, we conducted road-based line transects to establish an index of important Gyrfalcon prey items (e.g., Rock and Willow ptarmigan, Arctic Ground Squirrels, and shorebirds) to couple long-term trends in prey availability with Gyrfalcon breeding success. The survey consists of driving a total of 160 km at 16 KPH twice per season. We have recorded a total of 1461 ptarmigan in three years and have yet to complete our analysis on index trends.

In 2019, we implemented a large-scale point count protocol to assess seasonal abundance and availability of Gyrfalcon prey species. We randomly assigned survey points throughout our study area at which two trained technicians performed 468, 10-minute point counts from May-July 2019, documenting 6799 birds (of 90 species) along with small mammal abundance. These methods will be continued in 2020, after which we will create highly detailed rasters representing species-specific prey predictions allowing us to address questions regarding prey selection, territory occupancy, and breeding success.

Diet and Phenology. From 2014–2019, we installed motion-activated trail cameras in 59 occupied Gyrfalcon nests to obtain accurate nestling hatch and fledge dates as well as fine-scale dietary and behavioral data for the duration of the brood rearing period. Methods for the installation, settings, and analysis of these cameras can be found in (Robinson *et al.* 2019). From six years of nest camera data, we have identified 7087 discrete prey deliveries. Although Gyrfalcons are considered a ptarmigan specialist throughout most of their range (Nielsen 1999), nestling diet on the Seward Peninsula consisted of <50% ptarmigan by biomass. We have observed a facultative shift from primarily ptarmigan early in the season to primarily Arctic ground squirrel later in the season, along with a wide degree of individual variability in diet (Robinson *et al.* 2019).

We are also analyzing the relationship between reproductive phenology, diet, and reproductive success. Within our study population, later-breeding Gyrfalcons produce fewer young of lower body condition and consume more atypical prey (i.e. shorebirds, microtines, and passerines) compared to earlier breeding birds. Additionally, we observed an interactive effect wherein early breeding dietary specialists produce young with higher body condition than early breeding dietary generalists, but in late breeders the reverse is true (generalists outperform specialists). Preliminary results indicate that dietary plasticity may partially buffer the reduced availability of primary prey sources associated with late breeding in Gyrfalcons.

Nest Site Protections. To assess how nest site protections impact breeding Gyrfalcons, we measured nesting site exposure in the vertical and horizontal plane, as an indication of the relative amount of protection sites provide against inclement weather. We then compared exposure to reproductive success and time spent brood and shading young. We found that eggs were less likely to hatch and young were less likely to survive in more exposed sites, with horizontal exposure having the greatest effect. We also found that adult Gyrfalcons breeding in more protected sites were able to leave nestlings unattended earlier in the season and more frequently, compared to those birds in more exposed sites. This work highlights the importance of small-scale habitat suitability and suggests that the nest site may be an appropriate level of conservation as Gyrfalcons face increasingly erratic and unfavorable weather during breeding (Henderson 2019). At a broader scale, we have also analyzed the factors influencing site occupancy at the territory level (Anderson *et al.* 2019).

Additional Notes. We banded, measured, and took blood and feather samples from Gyrfalcon nestlings at each monitored nest (n = 190 nestlings 2014–2019). Body measurements provide us with growth rate parameters and body condition estimates. Blood samples were analyzed for hematocrit levels and genetic sexing, along with bulk and compound-specific stable isotopes as another measure of diet. Feathers were analyzed for stress hormones, and saved for a forthcoming genotyping analysis using microsatellite markers which will illuminate multi-year site and pair fidelity of individuals (details in Booms *et al.* 2011).

Future Directions. Our research is ongoing and we are continuing to explore new avenues to understand Gyrfalcon biology. We installed nest cameras over the winters of 2018–2019 to examine winter nest use, nest competition, and courtship behaviors among the raptor guild (n = 28 nest sites). We plan to integrate competitive behavioral observations, nearest-neighbor spatial analyses, and a cross-comparative stable isotope approach to quantify the degree and influence of competition (both inter- and intra-specific) and spatial and dietary niche overlap within the subarctic raptor guild.

Contact. Devin Johnson (dljohnson8@alaska.edu), or Michael Henderson (henderson.michael@peregrinefund.org).

Literature cited

(BCR 2, 4) Alaska Swallow Monitoring Network

Tricia Blake[1], Melissa Cady[2], and Audrey Taylor[3]

[1]Alaska Songbird Institute, [2]Alaska Peninsula/Becharof National Wildlife Refuge, [3]Department of Geography and Environmental Studies, UAA

Overview. The Alaska Swallow Monitoring Network is a multi-entity effort to collect ecological data on the phenology and productivity of Tree Swallows using artificial nest box colonies throughout Alaska. The network has dual research and educational goals, with most sites utilizing a citizen science-based approach. Data are 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. 2019 marks the fourth year of data collection using the full network approach with standardized protocols in use at three main sites (Fairbanks, Anchorage, and King Salmon). Juneau (61 boxes), Bethel/Yukon Delta NWR, and Quartz Lake (10 miles north of Delta Junction, 10 boxes) and McCarthy/Lost Lake also participated in the network. For information on sites and protocols: https://aksongbird.org/alaska- swallow-monitoring-network/. Note: Anchorage experienced high failure rates in 2019 for the second consecutive year due to bear predation.

Table 1. 2019 summary of Tree Swallows nesting in nest boxes in the Alaska Swallow Monitoring Network.

Nesting metric	Fairbanks	Anchorage	King Salmon
# Available Nest Boxes	150	147	50
# Active Boxes	65	77	45
Occupancy Rate[1]	0.43	0.52	0.90
Mean Lay Date	5/24	5/29	5/28
Mean Hatch Date	6/12	6/15	6/16
Mean Fledge Date	7/1	7/13	7/4

Nesting metric	Fairbanks	Anchorage	King Salmon
Total # Eggs Laid	393	417	273
# Eggs Hatched	361	309	243
# Adults Banded New	45	4	42
# Adults Returns[2]	66	unk	34
# Nestlings Banded	315	0	0
# of Nests that Fledged[3]	56	21	42
Nest Success	0.86	0.27	0.93

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

[2]Birds banded in a previous year, returned in 2019

[3]Fledged: fledged at least one nestling

Education and outreach. The Alaska Songbird Institute trained 14 youth and teen volunteers (ages 10-17), one intern, and one apprentice in Fairbanks. Together they contributed at least 820 hours to nest monitoring, banding, and data entry at Creamer's Field Migratory Waterfowl Refuge and on the University of Alaska Fairbanks campus. Ninety students ages 3-16 attended five additional programs on the Fairbanks project, and at least 5,488 people were reached through social media outreach. Public programs about local projects were also held in the communities of Juneau and King Salmon.

King Salmon project leaders recorded at least 50 additional community contacts in the field. It is estimated that many thousands more Alaskans were reached via informal presentations, signage on trails, homes, and nest boxes, through print media (including an article in the Juneau Empire: https://www.juneauempire.com/news/tree-swallow-box-project-seeks-to-understand-the- vanishing-population/) and via an interpretive display in the Creamer's Field Refuge Visitor Center in Fairbanks.

Contact: Tricia Blake, Alaska Songbird Institute, P.O. Box 80235, Fairbanks, AK 99708. Phone: (907) 888-2121; E-mail: Tricia.Blake@aksongbird.org

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

Jeremy Mizel[1], Jared Hughey[3], 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 2019, the National Park Service's Inventory and Monitoring program continued to conduct on- and off-road surveys in the Central Alaska network parks. We took a year off from conducting surveys in Arctic 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 Denali National Park and Preserve. Details about our sampling methods can be found in Schmidt et al. (2013) and Mizel et al. (2018).

Contact. Jeremy Mizel; Phone (907) 455-0638; Email: jeremy_mizel@nps.gov.

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Mizel, J. D., J. H. Schmidt, and M. S. Lindberg. 2018. Accommodating temporary emigration in spatial distance sampling models. Journal of Applied Ecology 55:1456–1464.

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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

These eight projects use bird species diversity and population performance as indicators of ecosystem health. Data bases are maintained tracking key demographic parameters of selected focal species. Some of these studies we now have well over 40 years of data; 2019 was the 22nd 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 (soon to be Yukon University) and the various management authorities and conservation organizations interested in Yukon wildlife.

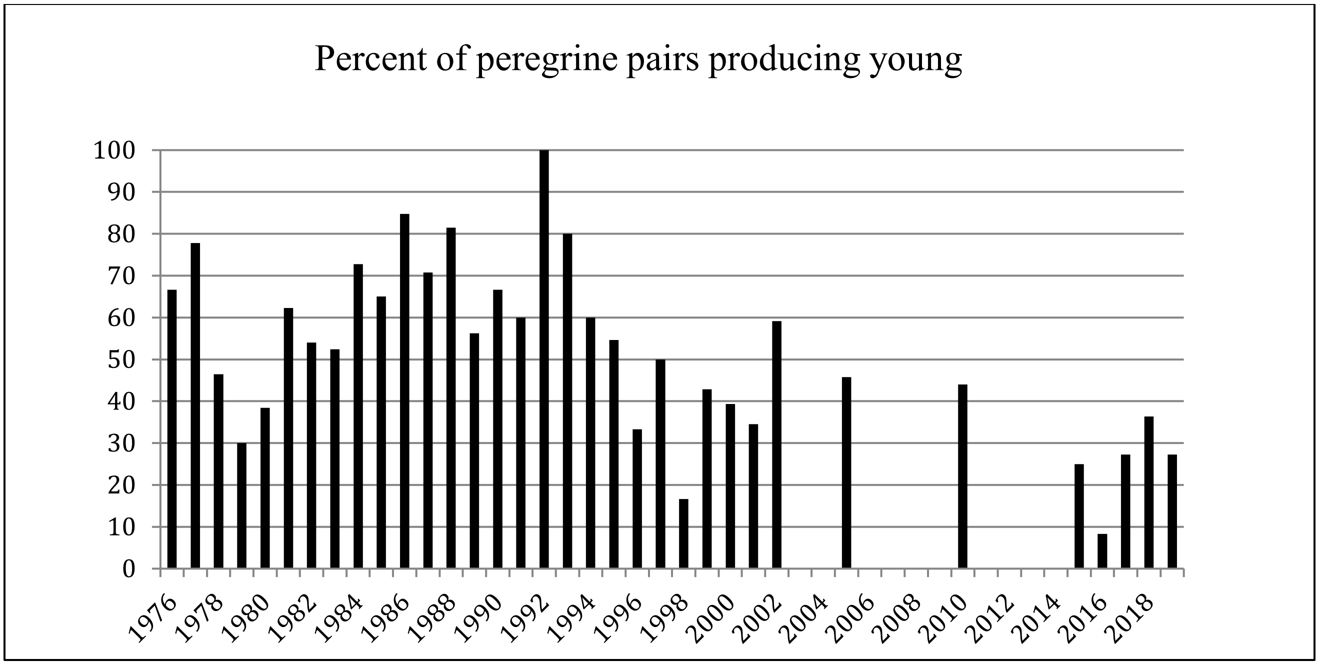
TUNDRA ECOSYSTEM MONITORING

This work is part of a circumpolar partnership feeding into various ecological monitoring groups around the northern hemisphere (i.e., 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 65th 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.

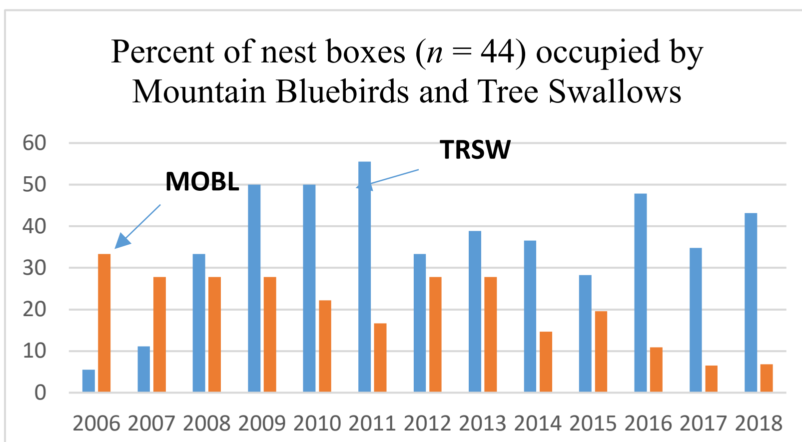
Gyrfalcon/tundra ecosystem monitoring, Yukon wide. This work recognizes gyrfalcon as a top predator in the system. Historically, gyrfalcon productivity in the Coast Range was high from1999 through 2007; in 2008 a significant drop was noted. This accompanied a growing and troubling indication that the 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, since 2017 this survey has not been carried out 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.

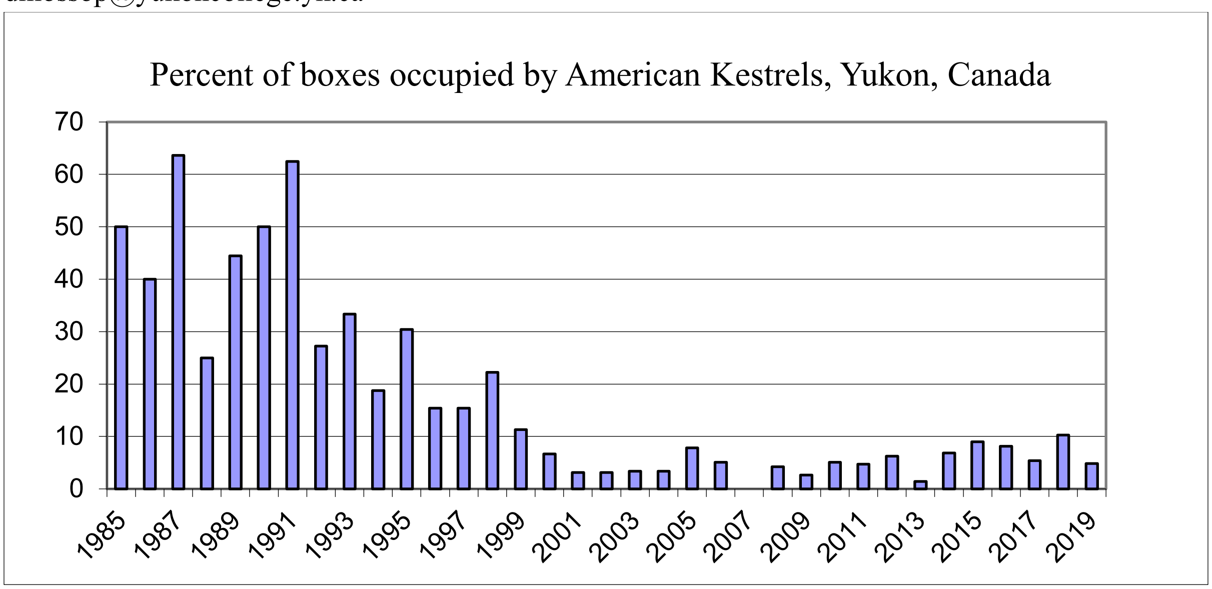


Bird strike potential at a planned wind turbine site, Burwash, Yukon. This study, an initiative of the Kluane First Nation, is designed to track the movements of migrating birds along the shoreline of Kluane Lake where a series of wind turbines are planned. A data-gathering meteorological tower is at 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.

Contact. Dave Mossop, Yukon Research Ctr, Yukon College, Box 2799 Whitehorse, YT Y1A 4H5, dmossop@yukoncollege.yk.ca



(BCR 4) Breeding bird surveys on Joint Base Elmendorf-Richardson, Alaska, 2019 update

Laura McDuffie and Jim Johnson, U.S. Fish and Wildlife Service, Migratory Bird Management

Lowland Wetland Breeding Bird Surveys. Boreal wetland species are among North America's most rapidly declining avifauna. Joint Base Elmendorf-Richardson (JBER) provides vital breeding habitat for species of high conservation concern, including, Solitary Sandpiper *Tringa solitaria*, Lesser Yellowlegs *Tringa flavipes*, Olive-sided Flycatcher *Contopus cooperi*, Rusty Blackbird *Euphagus carolinus* and Blackpoll Warbler *Setophaga striata*. These species have lost an estimated 50–90% of their populations and most are projected to lose an additional 50% within the next 15–25 years (Rosenberg et al. 2016).

In 2019, USFWS conducted the third year of area-based avian surveys across much the low-elevation boreal wetlands of JBER. Surveys were completed during two periods of peak detectability: 15–17 May for waterbirds (e.g., loons, grebes, waterfowl, and shorebirds), year-round residents, and Nearctic passerine migrants, and 3–5 June for Neotropical passerine migrants. In total, observers surveyed 28 plots and detected 65 species comprising of 2,756 individuals. The most commonly detected species within plot boundaries for the first survey period were Lincoln's Sparrow (15% of all individuals, 93% of units), Dark-eyed Junco (11% of all individuals, 67% of units), and Ruby-crowned Kinglet (10% of all individuals, 63% of units). During the second survey period, Lincoln's Sparrow (11% of all individuals, 81% of units), American Robin (10% of all individuals, 67% of units), and Dark-eyed Junco (8% of all individuals, 56% of units) were the most commonly detected species. The 28 plots surveyed in 2019 were also surveyed in 2016 and 2017. Result from these three years show a fluctuation in the total number of detections of both common species and species of special concern, however, additional years of surveys are required to make any conclusions on trend (Figure 1).

Montane Wetland Breeding Bird Surveys. For several years, USFWS and DoD planned to expand low-elevation surveys to also include wetland habitats in the alpine regions of JBER. In 2019, we conducted the first montane surveys during two periods, 28–30 May and 11–13 June. During the first survey, observers "ground truth" survey plots to determine which plots were feasible to survey. Of the 29 selected plots, 15 were surveyed, but only five were identified as wetlands (defined by emergent or shrubby riparian vegetation). Additionally, three plots located in upper Snowhawk Valley were covered 40-100% by snow during both survey periods.

The most frequently detected species on plot were Savannah Sparrow, Wilson's Warbler, and Golden-crowned Sparrow. Other notable species included American Pipit and Rock Ptarmigan. Survey plots along ridgelines proved less diverse; however, three pair of Surfbirds and a Golden Eagle pair were detected (Figure 2). We will continue to survey for breeding activity in future years, with the potential of implementing a migratory movement study of adult Surfbirds. Surfbirds are montane obligate breeders and JBER is one, if not the only active military installation where breeding Surfbirds reside.

Contact. Laura McDuffie, U.S. Fish and Wildlife Service, 1011 East Tudor Road, MS 201, Anchorage, AK 99503. Phone: (907)786-3979, Email: laura_mcduffie@fws.gov.

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Figure 1. Number of individuals detected on plot during two survey periods in 2016, 2017 and 2019, for common species and species of special concern. The most common species detected included American Robin, Dark-eyed Junco, Lincoln's Sparrow, Ruby-crowned Kinglet and Yellow-rumped Warbler. The species of special concern included Blackpoll Warbler, Lesser Yellowlegs, Olive-sided Flycatcher, Rusty Blackbird, and Solitary Sandpiper.

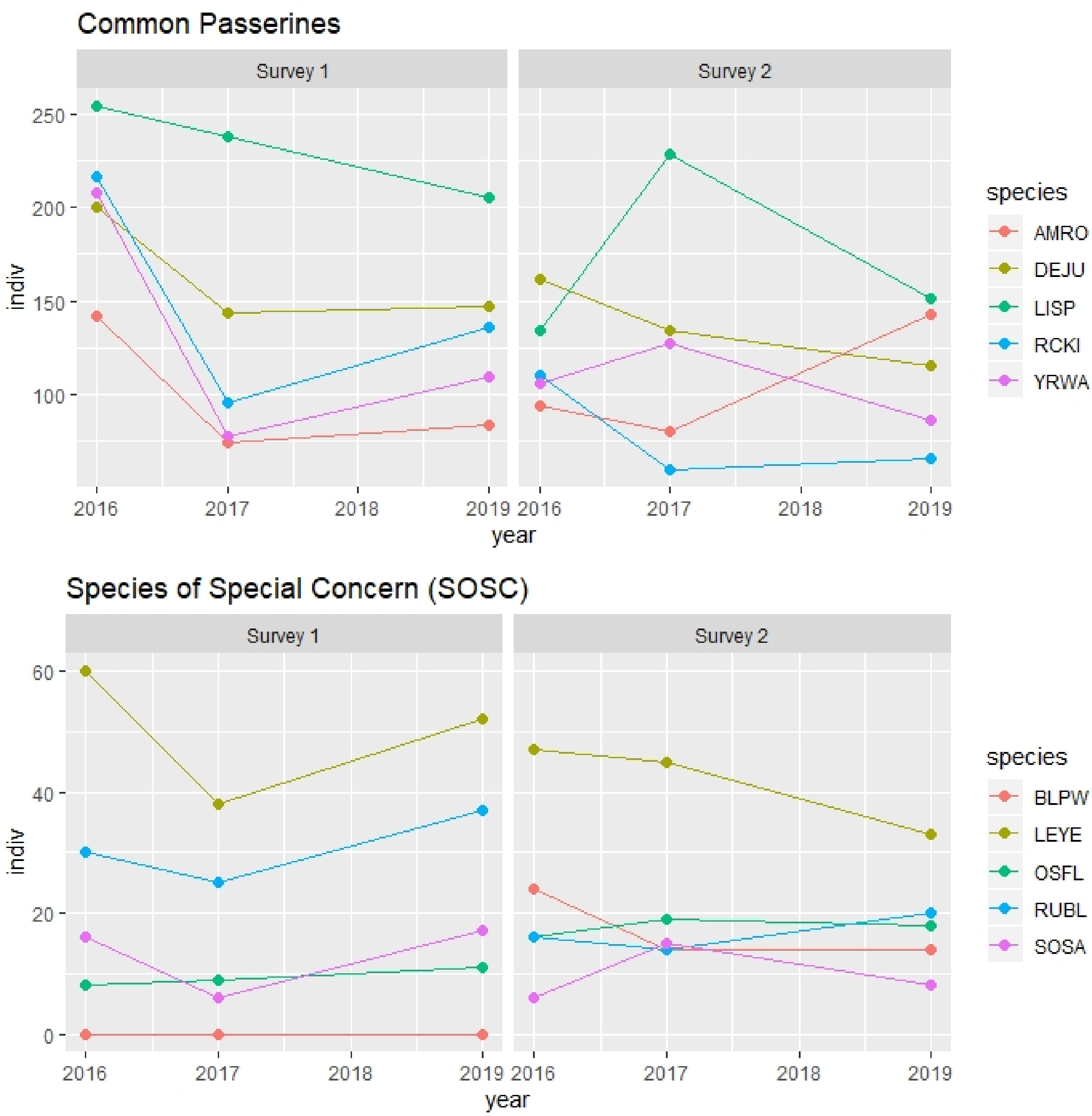

Figure 2. Joint Base Elmendorf-Richardson is comprised of variable habitat types from low-elevation boreal wetlands to alpine ridgelines. The top photo shows Web Pond in northern JBER. The bottom shows the ridgeline above upper Snowhawk Valley (Photos by Laura McDuffie, USFWS).

(BCR 4) Cavity availability and use by over-wintering birds and mammals in southern Yukon and the influence of microclimate on roost-site selection

Jesse Vigliotti[1,2], Kathryn Aitken[1,2], Thomas Jung[3], Fiona Schmiegelow[1,2]
[1]School of Science, Yukon College; [2]Dept. of Renewable Resources, University of Alberta; [3]Yukon Environment

Cavity using birds and mammals are significant components of boreal forest communities, and the availability of tree cavities suitable for roosting and resting may be critical for supporting these communities. Furthermore, cavity availability and habitat suitability may limit populations of over-wintering northern species that use tree cavities as a strategy for coping with extreme cold. Currently, no known research has investigated the potential cavity, tree or habitat requirements of over-wintering, northern boreal species. Therefore, the objectives of this study were 1) to examine winter cavity-use by birds and mammals in relation to cavity availability in southern Yukon, and 2) to examine the influence of cavity microclimate on winter cavity selection.

Four study areas were established throughout southern Yukon, each containing white spruce (*Picea glauca*), lodgepole pine (*Pinus contorta*), mixedwood (white spruce/trembling aspen (*Populus tremuloides*)), and spruce bark beetle (*Dendroctonus rufipennis*) affected spruce forest sites. Tree-cavities were located within each site and surveyed during the day and night to observe cavity use by birds and mammals. Cavity, tree and habitat characteristics were recorded for comparisons among forest types, between healthy and beetle-affected forests, and between used and unused cavities. Densities and proportions of natural and excavated cavities were not significantly different among forest types; however, some cavity characteristics differed among spruce, mixedwood and pine forests (i.e. cavity height, entrance shape and tree appearance), and between healthy and beetle-affected forests (i.e. cavity height, entrance area and tree appearance). Cavity volume, height and live conifer cover best predicted cavity-use for all bird species; however, only live conifer cover was a predictor of cavity-use for American three-toed woodpeckers (*Picoides dorsalis*). Three-toed woodpeckers preferred to roost in relatively healthy spruce forests, while boreal chickadees (*Poecile hudsonicus*), and hairy woodpeckers (*Dryobates villosus*) preferred to roost in pine forests. All species avoided beetle-affected spruce forests. Overall, birds preferred smaller, deeper, east-oriented cavities with relatively small entrances, located within forests with high live conifer cover. Lower, shallower cavities in small-diameter trees were avoided. Surprisingly, mammals were not observed resting in tree-cavities; however, red squirrels (*Tamiasciurus hudsonicus*) and northern flying squirrels (*Glaucomys sabrinus*) did use cavities for caching food and appeared to prey or scavenge on cavity-roosting birds.

The importance of cavity microclimate to roost-site selection was examined by determining which cavity, tree and habitat characteristics affected cavity temperatures, and by exploring the relationships between cavity-site temperatures and cavity use. Average sunset temperature increment (*air temperature – cavity temperature*), along with cavity height, depth, and volume, were predictors of cavity-use for three-toed woodpeckers; however average nightly temperature was not a predictor of cavity-use. Neither nightly nor sunset temperatures were predictors of cavity-use when all species were combined, which suggests that microclimate was a less important consideration in cavity selection by species other than three-toed woodpeckers. Though not a predictor of cavity-use, diameter-at-cavity-height had a significant positive effect on cavity temperatures. Entrance orientation had a significant negative effect on nightly cavity temperatures, with south-facing entrances having lower average nightly temperatures, likely due to wind effects. Smaller and deeper cavities were warmer and were preferred by roosting birds, and both variables were also predictors of cavity-use. Live conifer densities had a positive effect on external air temperatures but were not a predictor of cavity-use when temperatures were included in analyses.

Beetle-affected forests contained more potential roost-sites than did other forest types but were avoided by cavity-users. Though salvage-logging in beetle-affected forests may not affect resident cavity-roosting bird populations, more research is needed to fully understand the importance of these forests to cavity-using birds and mammals. Mature, structurally complex conifer forests were important winter-roost habitat for most cavity-users; therefore, these forests should be preserved to maintain the integrity of the cavity-using boreal forest community.

Contact. Dr. Kathryn Aitken, School of Science, Yukon College, 500 College Drive, P.O. Box 2799, Whitehorse, Yukon, Canada, Y1A 5K4. E-mail: kaitken@yukoncollege.yk.ca

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

Emily Williams[1], Tucker Grigsby[1], Roxan Chicalo[2], Ryan Norris[2], Kaeli Swift[3], John Marzluff [3]
[1]National Park Service, Denali National Park and Preserve, [2]University of Guelph, [3]University of Washington

Food caching, or the storage of food for later use, is a behavior common to many taxa that has important implications for survival and demography. Many animals have adapted this behavior to survive harsh winters where food is scarce. Unlike most hoarding species, Canada Jays (*Perisoreus canadensis*) are unusual in that they store perishable food for long periods of time during the winter. Under a changing climate, growing evidence suggests that perishable food caches are at risk of rotting during increasing warming regimes. This problem is exacerbated at higher latitudes, where Canada Jay populations rely on cached food for prolonged winter seasons. Food spoilage and reduced availability of cached food may negatively impact Canada Jay survival and fitness, as individuals in poorer condition may invest less in reproduction. To examine whether Canada Jays at higher latitudes are more susceptible to a changing climate, we initiated studies on a population of Canada Jays in Denali National Park and Preserve, Alaska in 2017-2019. In 2019, we color-banded 80 Canada Jays (n = 11 adults and first years, 69 nestlings) and found 30 nests in 27 territories. Apparent nest success was 55% (n = 30). To determine how diet, caching, and foraging behavior influence breeding behavior and nest success, we used hand-held cameras to record observations of six focal groups as they foraged and cached food, and used camera traps to record cache recoveries. We recorded 547 food acquisitions and 309 caches and were able to identify the food in ~41% of cases. Of recorded observations, Canada Jays cached snowshoe hare, vole, mushroom, slime mold, moths, caterpillars, beetle larva, slugs, berries, and miscellaneous human food. Interestingly, camera footage revealed cache recoveries by not only the cacher, but also the cacher's mate, an unrelated Canada Jay, and other animals (voles, flying squirrel). In 2020, we plan to continue this work and ongoing studies examining the influence of climate change on Canada Jay behavior, survival, and productivity.

Contact: Emily Williams, National Park Service, Denali National Park and Preserve, PO Box 9, Denali Park, 99755; Phone (907) 683-5758; Email: emily_williams@nps.gov

(BCR 4) Creamer's Field Migration Station, Fairbanks, Alaska 2019

Claire Stuyck and Tricia Blake, Alaska Songbird Institute

The Creamer's Field Migration Station (CFMS) 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 migratory songbird ecology with an emphasis on phenology, productivity, disease, and climate change impacts. CFMS continues to integrate and contribute through new and on-going collaborations; our data have contributed to more than 10 peer-reviewed publications. CFMS is open to the public and facilitates hands-on science learning and observation of scientific methods in action. Educational components consist of: 1) scheduled school field trips for kindergarten through university students, where students learn about migratory ecology, research methods and bird conservation; 2) opportunities for supervised volunteers to help with the daily operation of the project including collecting and recording data; 3) education/research-based internships and apprenticeships; and 4) availability of data for publications and student projects.

SUMMARY OF 2019 SEASON

Research. The spring and fall 2019 season's operated 6-m and 12-m, 30-mm mist nets from April 15–May 15 (n = 21 net arrays), and daily July 29-August 31 and weekdays September 2 – September 25 (n = 29 net arrays), 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 2,195 people. Additionally, over 17,000 views/interactions occurred through Facebook, YouTube, and our station blog (http://creamersfieldbanding.blogspot.com). Direct programs included:

- 73 K-12 classes (1,747 students, teachers, and parent chaperones) from the Fairbanks North Star Borough, Denali Borough, and Delta/Greely School Districts.
- 57 community volunteers of all ages who together contributed over 1,100 hours collecting, editing and proofing data, banding birds, working on station maintenance and assisting with education programs.
- 10 guided walks to the station during fall migration and the Sandhill Crane Festival
- 1 Science Education Internship, 1 Boreal Songbird Internship, and 3 apprenticeships
- 1 Undergraduate Mist netting and Banding Workshop (10 students and teachers)

Acknowledgments. Thank you to the Alaska Department of Fish and Game for allowing us to conduct our research on the 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.

Contact. Claire Stuyck, Alaska Songbird Institute, P.O. Box 80235, Fairbanks, Alaska 99709. Phone: (907) 888-2121; E-mail: ASI.science@aksongbird.org.

Table 1. Spring and fall bandings and returns at the Creamer's Field Migration Station in 2019

	Newly Banded[1]							
Species	U	HY	AHY	Subtotal	Returns[2]	Total[3]	Return Rate[4]	AHY Rate[5]
Alder Flycatcher	0	0	2	2	0	2	0.000	1.000
American Robin	0	24	12	36	0	36	0.000	0.333
American Three-toed Woodpecker	0	1	0	1	0	1	0.000	0.000
American Tree Sparrow	0	9	7	16	0	16	0.000	0.438
Black-capped Chickadee	1	50	0	51	10	61	0.164	0.164
Blackpoll Warbler	0	10	0	10	0	10	0.000	0.000
Boreal Chickadee	0	9	0	9	3	12	0.250	0.250
Brown Creeper	0	2	0	2	0	2	0.000	0.000
Canada Jay	0	1	0	1	0	1	0.000	0.000
Common Redpoll	0	0	19	19	0	19	0.000	1.000
Dark-eyed Junco (slate-colored)	2	145	25	172	3	175	0.017	0.160

Species	Newly Banded[1]				Returns[2]	Total[3]	Return Rate[4]	AHY Rate[5]
	U	HY	AHY	Subtotal				
Downy Woodpecker	0	2	2	4	1	5	0.200	0.600
Fox Sparrow	0	21	6	27	0	27	0.000	0.222
Gamble's White-crowned Sparrow	1	10	4	1	1	16	0.063	0.313
Gray-cheeked Thrush	0	47	6	53	0	53	0.000	0.113
Hairy Woodpecker	0	1	0	1	2	3	0.667	0.667
Hammond's Flycatcher	2	26	8	36	3	39	0.077	0.282
Hermit Thrush	0	7	1	8	0	8	0.000	0.125
Lesser Yellowlegs	0	1	0	1	0	1	0.000	0.000
Lincoln's Sparrow	4	90	3	97	1	98	0.010	0.041
Northern Flicker (Yellow-shafted)	0	1	0	1	0	1	0.000	0.000
Northern Shrike	0	1	0	1	0	1	0.000	0.000
Northern Waterthrush	0	27	0	27	0	27	0.000	0.000
Orange-crowned Warbler	3	314	32	349	0	349	0.000	0.092
Palm Warbler (Western)	0	1	0	1	0	1	0.000	0.000
Ruby-crowned Kinglet	0	30	3	33	0	33	0.000	0.091
Rusty Blackbird	0	6	10	16	0	16	0.000	0.625
Savannah Sparrow	1	23	6	30	1	31	0.032	0.226
Sharp-shinned Hawk	0	3	1	4	0	4	0.000	0.250
Spotted Sandpiper	0	1	0	1	0	1	0.000	0.000
Swainson's Thrush	3	207	17	227	0	227	0.000	0.075
Townsend's Warbler	0	1	0	1	0	1	0.000	0.000
Varied Thrush	0	5	0	5	0	5	0.000	0.000
Wilson's Warbler	0	22	5	27	0	27	0.000	0.185
Yellow Warbler	0	39	2	41	0	41	0.000	0.049
Yellow-rumped Warbler (Myrtle)	2	367	33	402	2	404	0.005	0.087
TOTAL	**19**	**1504**	**204**	**1727**	**27**	**1754**	**0.015**	**0.132**

[1] Numbers of newly banded birds captured in their hatching year (HY), after their hatching year (AHY) or of unknown age (U) in 2019. Subtotal is the total number of newly banded birds in 2019.

[2] Birds banded in a previous calendar year and recaptured in 2019.

[3] Total number of returning and newly banded birds in 2019.

[4] Return Rate = Returns / (Returns + Newly Banded birds).

[5] AHY Rate = (Newly Banded AHYs + Returns) / (Total of Newly Banded Birds + Returns).

(BCR 4) Disease dynamics of migratory birds

Alex Jahn[1], Emily Williams[2], Alan Fecchio[3], Ellen Ketterson[1], Jason Weckstein[4]
[1]Environmental Resilience Institute, Indiana University, [2]National Park Service, Denali National Park and Preserve, [3]Universidade Federal de Mato Grosso, Brazil [4]Academy of Natural Sciences, Drexel University

Environmental changes such as climatic shifts are altering bird migration patterns globally. Because migration can reduce or increase the spread of infectious diseases, changes to migration can have important consequences for host-pathogen interactions, including impacts on the survival of migratory birds themselves. Understanding how changes to the annual cycle of migratory birds may affect infection processes is critical to predicting which bird populations may experience increased infectious disease risks. To investigate these interactions, we blood-sampled the migratory bird community to identify which species in Denali National Park and Preserve are reservoir hosts of avian malaria. Additionally, we began study on the interaction of disease with movement in Dark-eyed Juncos (*Junco hyemalis*) and American Robins (*Turdus migratorius*). For these two species, we sampled birds along a latitudinal gradient across the USA, assessing migratory behavior, breeding phenology, survival, immune defense, and infection status throughout the annual cycle. Pathogens of interest include avian malaria, Borrelia burgdorferi (the tick-borne causative agent of human Lyme disease), as well as avian pox virus and Mycoplasma gallisepticum, which can negatively affect bird populations. At Denali in 2019, we collected 419 blood samples from 23 species and fitted 26 Dark-eyed Juncos and 22 American Robins with light-level geolocators and Pinpoint GPS tags, respectively. Ultimately, we hope to collect preliminary data needed to show how shifts in bird migration affect infectious disease. Our project aims to forecast how environmental change will affect patterns of bird migration and infectious diseases of concern for human and wildlife health across North America.

Contact: Emily Williams, National Park Service, Denali National Park and Preserve, PO Box 9, Denali Park, 99755; Phone (907) 683-5758; Email: emily_williams@nps.gov

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(BCR 4) Grouse and ptarmigan summer brood surveys, Alaska, 2019 update

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

Since 2016, the statewide Small Game Program (SGP) within the ADF&G has completed 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, brood 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 2019, overall brood density was relatively low however brood sizes were up, particularly for 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.

Contact. Richard A. Merizon, Alaska Department of Fish and Game, Division of Wildlife Conservation, 1800 Glenn Hwy, Suite 2, Palmer, AK 99645. Phone: 907.746.6333; e-mail: richard.merizon@alaska.gov. Cameron Carroll, Alaska Department of Fish and Game, Division of Wildlife Conservation, 1300 College road, Fairbanks, AK. 99701. Phone: 907.459.7237; e-mail: cameron.carroll@alaska.gov.

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(BCR 4) Olive-sided Flycatcher migration and breeding biology

Julie C. Hagelin[1], James A. Johnson[2], and Kristin A. DuBour[3]
[1]Alaska Department of Fish and Game; [2] Migratory Bird Management, U.S. Fish and Wildlife Service; [3]National Wildlife Refuge System, U.S. Fish and Wildlife Service.

Overview. In 2013 we began a multi-year study of Olive-sided Flycatchers (*Contopus cooperi*) in Interior and Southcentral Alaska. We deployed light-level geolocators and Pinpoint GPS units to identify key migratory corridors, stopover sites, and wintering areas for conservation efforts. Other research goals included: (1) characterizing nest chronology and success, (2) sampling aerial insects at breeding sites, as food availability is hypothesized to limit reproductive success (Altman and Sallabanks 2012), and (3) re-surveying historical breeding sites from Wright (1997) to document any changes in bird occupancy.

Summary of geolocator/GPS efforts. 61 light-level geolocators and 32 GPS units were deployed between 2013-2017. 28 units were re-sighted and/or recovered for an average return rate of ~25% (annual range 21-38%). Birds were in good condition, paired successfully and most fledged chicks. Two individuals returned with light-level geolocators after two-years away, highlighting the scientific and ethical responsibility to monitor all sites for at least two seasons. We are writing up light-level geolocator data for publication in collaboration with Michael Hallworth at the Smithsonian Migratory Bird Center. Geolocators collected to date have provided data from 14 individuals (12 male, 2 females) and represent 17 round-trip journeys. Three birds in our sample provided two consecutive years of data.

Alaska breeders travelled 20,170 ± 510km annually. Annual movements were indicative of a clockwise, oval-shaped, "looped migration" pattern common to many songbirds in North America (La Sorte et al. 2014a, b). In fall, birds typically migrated inland, down the east side of the Rocky Mountains and then on to wintering areas. In spring, birds moved farther west, along coastal North America back to Alaska. This pattern is thought to be associated with seasonal shifts in the availability of favorable winds (eastern and central flyways) and/or foods (western flyway, La Sorte et al. 2014a, b). Only 43% (6 of 14 birds) crossed the Gulf of Mexico during fall migration. Consequently, eastern coastal and southern Mexico stand-out as key migratory routes in both fall and spring.

Wintering occurred in two general areas: (1) western Columbia/Ecuador/northern Peru, and (2) southern Peru/western Brazil/northern Bolivia. Three birds with two consecutive years of data revealed winter site fidelity, consistent with observations of marked birds (Altman and Sallabanks 2012). Unfortunately, only 1 of 8 GPS tags recovered over the study period functioned properly (a 10pt Pinpoint GPS). This single unit revealed a "cluster" of points (all within 100m) taken over 3.5months in winter (15

Nov-1 Mar), suggestive of a discrete winter territory, and also consistent with published literature (Altman and Sallabanks 2012).

Our data analysis has identified ~10 stop-over areas (where birds stayed 2 or more days) throughout the annual migration route. The Pacific Northwest and southern B.C., for example, stand out as important areas during spring, but not fall. A subset of fall and spring stop-over areas in Latin America also align with important sites for other species (Bayly et al. 2017). We are currently ranking important OSFL stop-over sites relative to a coarse metric of conservation need—the proportion of the stop-over that is considered "protected" by the IUCN World Database of Protected Areas (UNEP-WCMC 2017). If an important stop-over exhibits low levels of protection, it may be worthwhile investigating further whether OSFL habitats are currently at risk (e.g. due to fragmentation, deforestation, etc.), or remain stable.

Seven of our 8 GPS recoveries failed to collect data (n = 5 Lotek Pinpoint-10's and n = 2 Lotek 80-point "Swift fixes" deployed by our teams in Alaska and collaborators in Canada). All were sent to Lotek for examination. However, specific cause(s) of malfunction(s) remain unclear. We understand Lotek's GPS tags have been successful on other songbirds, and our experience may be a species-specific issue. The outcome, however, prompted us to discontinue use.

Nest chronology. Table 1 summarizes data for 82 nests from three Alaska study locations (Anchorage, Fairbanks and Tetlin NWR) over the 2013-2018 seasons. Table 1 may differ from previous BPIF summaries, as we have included Tetlin NWR (2016-17 only), and we have further refined our chick aging and back-dating methods. We used photos of Dusky Flycatcher chicks (*Empidonax oberholseri*) provided in Jongsomjit et al. (2007) to estimate OSFL chick age, which allowed us to back-calculate a subset of nests with unknown hatch dates and/or first egg laid. We pro-rated chick age estimates to account for a 25% longer chick rearing period of OSFL (20 days; Altman and Sallabanks 2012), compared to Dusky Flycatchers (16 days; Pereyra and Sedgwick [2015]). The method aligned quite well with OSFL nests for which onset of laying, hatch and fledge date were known.

OSFL typically laid clutches in early June, hatched in mid-late June, and fledged by mid-July. Late fledging dates (e.g. late July-August) likely represent re-nesting and smaller clutches (2 eggs; Wright 1997). Timing of breeding in Anchorage usually preceded Interior sites (Fairbanks, followed by Tetlin NWR, respectively). The most common clutch size was 4 eggs (n = 59 nests). However, 5-egg clutches were detected in Anchorage (n = 3 nests) and Fairbanks (n = 1 nest), but not Tetlin NWR. Median fledge dates showed significant overlap across the 3 study regions, suggesting that Anchorage may have a longer season than Interior sites. 2015 and 2016 were unusually warm, early springs in Fairbanks, which likely caused birds to lay and hatch at similar times as Anchorage (Table 1). Nest chronology in Fairbanks fell within previously-reported date ranges for central Alaska (Wright 1997) in 2013 and 2014. However, the earliest laying, hatching, fledging dates for Fairbanks during 2015-2017 occurred ~1 week earlier than Wright (1997) detected.

Nest success by location. Our estimates of nest success do not differentiate between primary and second nests. Average success of an OSFL nest fledging 1 or more chicks was 75% (of 67 nests for which fate was known; Table 1). This is significantly greater than success reported for Oregon (52% of 153 nests; Altman 1999, as cited in Altman and Sallabanks 2012; Fisher's exact P[2-tailed] = 0.001) and previous studies in central Alaska (47% of 17 nests; Wright 1997; Fisher's exact P[2-tailed] = 0.035). Fairbanks exhibited the greatest average nest success of 84% (of 31 nests), followed by Anchorage (72% of 18) and Tetlin NWR (63% of 18).

Historical site surveys, and insect data: We completed three consecutive years of song surveys (2013-2016) at nine "historical" breeding sites in the Fairbanks area, previously studied by Wright (1997).

We detected no OSFL occupying any of these sites during breeding months. Our surveys covered a listening area of ~987 hectares per breeding site, each of which included 5 survey points visited 3x per season. The method resulted in a high detection probability (> 90%), using detection distances and singing rates from Wright (1997). Outside the breeding season (spring 2015, fall 2016), a lone, singing male was detected within 1km at each of two historical breeding sites. It is highly unlikely that these birds were active breeders at these locations, given our high detection probability during breeding months. Rather, the males appeared to be prospecting or passing through. Singing occurred during spring and fall migration over 1-3 days.

Analysis of three years of insect sampling indicate different phenological patterns of insect biomass in Anchorage, compared to Interior sites (Fairbanks, Tetlin NWR). Work is ongoing, and patterns should be interpreted cautiously, as there appears to be substantial regional and inter-annual variation. Briefly, insect biomass appears to be greatest at Interior sites, with peak insect biomass occurring earlier in the Interior than in Anchorage and in association with warmer Interior temperatures. The three study areas appear to have similar levels of ordinal richness (number of insect Orders) and Shannon Indices of diversity.

Contact: Julie C. Hagelin, Alaska Department of Fish and Game, 1300 College Rd., Fairbanks, AK 99701. Phone: (907) 459-7239; E-mail: julie.hagelin@alaska.gov

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Table 1. Nest chronology of Olive-sided Flycatchers in Anchorage, Fairbanks (2013-2017) and Tetlin NWR (2016-2018). Each column indicates total nests and sample size by year for each study area. A = Anchorage, F= Fairbanks, T= Tetlin. Rows in bold give mean data and sample size for all sites. Not all nests provided data for each chronology metric (e.g. "All Years" header indicates 82 nests observed in total, but only 66 yielded a date for first egg laid).

Mean (n); data ranges given annually							
	All Years (82) (22A, 38F, 22T)	**2013** (8) (4A, 4F)	**2014** (10) (4A, 6F)	**2015** (15) (5A, 9F, 1T)	**2016** (24) (7A, 8F, 9T)	**2017** (22) (2A, 8F, 12T)	**2018** (3) (3F)
First egg laid	**7 June** (66)	**10 June** (8)	**9 June** (7)	**5 June** (11)	**4 June** (20)	**7 June** (18)	**14 June** (2)
Anchorage	3 June (15)	5 June (4) 28 May–18 June*	1 June (2) 28 May*–5 June	6 June (5) 29 May*–17 June*	30 May (4) 27 May*–8 June*	--	--
Fairbanks	7 June (33)	16 June (4) 7*–22* June	13 June (5) 06*–22* June	4 June (6) 24 May*– 13 June*	1 June (8) 27 May*–30 June*	5 June (8) 24 May*–7 June*	14 June (2) 30 May*–29 June*
Tetlin	9 June (18)	--	--	--	10 June (8) 24 May*–20 June	9 June (10) 28 May*–23 June	--
Clutch size	**3.6** (59)	**3.6** (8)	**3.5** (8)	**3.8** (11)	**3.6** (19)	**3.2** (11)	**4.0** (2)
Anchorage	3.8 (17)	3.8 (4); 2-5eggs	3.7 (3); 3-5eggs	4.0 (5); 3–5eggs	3.8 (5); 3-4eggs	--	--
Fairbanks	3.6 (31)	3.4 (4); 2-4eggs	3.4 (5); 3–4eggs	3.6 (6); 3-4eggs	3.8 (8); 3-4eggs	3.5 (6); 2-4eggs	4.0 (2); 3-5eggs
Tetlin	3.0 (11)	--	--	--	3.2 (6); 3-4eggs	2.8 (5); 2-4eggs	--
Hatch date	**21 June** (66)	**25 June** (8)	**24 June** (7)	**20 June** (11)	**19 June** (20)	**22 June** (18)	**29 June** (2)
Anchorage	18 June (15)	19 June (4) 13 June*–1 July*	17 June (2) 12*–22 June	21 June (5) 12 June*–2 July	14 June (4) 12 June*–23 June*	--	--
Fairbanks	21 June (33)	30 June (4) 22 June*–5 July*	27 June (5) 20 June*–6 July*	19 June (6) 8 June*– 27 June*	17 June (8) 13 June*–21 June*	20 June (8) 10*–25 June*	29 June (2) 15 June*-30 July*
Tetlin	24 June (18)	--	--	--	25 June (8) 7 June*–15 July	23 June (10) 12 June*–7 July*	--
Fledge date**	**9 July** (47)	**16 July** (6)	**10 July** (3)	**6 July** (8)	**7 July** (15)	**10 July** (13)	**11 July** (2)
Anchorage	7 July (11)	11 July (3) 7*–20* July	1 July (1)	9 July (4) 1 July–21 July*	4 July (3) 29 June*–12 July*	--	--
Fairbanks	10 July (25)	22 July (3) 21*–24* July	15 July (2) 9*–25* July	4 July (4) 27 June* –15 July*	4 July (7) 28 June*–14 July*	8 July (7) 30 June*–14 July*	11 July (2) 4 July*-1 Aug*
Tetlin	11 July (11)	--	--	--	11 July (5) 26 June*-3 August*	11 July (6) 1 July*-26 July*	--
Nest Success***	**75%** 51 of 67; 15 unknown	**86%** 6 of 7; 1 unknown	**38%** 3 of 8; 2 unknown	**90%** 9 of 10; 5 unknown	**82%** 18 of 22; 2 unknown	**72%** 13 of 18; 4 unknown	**100%** 2 of 2; 1 unknown
Anchorage	72% 13 of 18; 4 unknown	75% 3 of 4	50% 1 of 2, 2 unknown	80% 4 of 5	71% 5 of 7	-- 2 unknown	--
Fairbanks	84% 26 of 31; 7 unknown	100% 3 of 3, 1 unknown	30% 2 of 6	100% 5 of 5; 4 unknown	87.5% 7 of 8	100% 7 of 7; 1 unknown	100% 2 of 2; 1 unknown
Tetlin	63% 12 of 18; 4 unknown	--	--	-- 1 unknown	86% 6 of 7; 2 unknown	55% 6 of 11; 1 unknown	--

*Back-calculated based on other data, such as number of eggs in nest, onset of incubation, estimated chick age, fledge date, etc. Brood size was a proxy for clutch size in the few instances that nests were discovered post-hatch. **Nests of unknown fate were excluded from calculations of fledge date. These nests, however, often contained other, reliable information (e.g. lay date, clutch size, hatch date), which were included in chronology calculations. ***Successful nests fledged 1 or more chicks. Sample sizes provided for nests of known and unknown fate.

(BCR 4) Simulating avian responses to future changes in climate and fire regime across the northwestern boreal forest

Steve Matsuoka[1], Peter Sólymos[2], Amy Breen[3], Diana Stralberg[2], Colleen Handel[1], Scott Rupp[3], Lisa Mahon[4], and Tom Kurdowski[3]
[1]U.S. Geological Survey, Alaska Science Center; [2]Boreal Avian Modelling Project; [3]University of Alaska Fairbanks, Scenarios Network for Alaska and Arctic Planning; [4]Environment Climate Change Canada, Canadian Wildlife Service

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.

Contact. Steve Matsuoka, USGS Alaska Science Center, 4210 University Drive, Anchorage, Alaska 99508. Phone: (907)786-7075; E-mail: smatsuoka@usgs.gov

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(BCR 4) The Denali Youth Mentoring Program: Fostering life-long connections with Alaska's National Parklands through place-based science learning

Emily Williams, National Park Service, 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. We also launched the first ever school-wide and Healy community Christmas Bird Count (CBC), and worked with the students on creating a personalized handheld bird guide. The CBC will continue this school year and in future years. The Denali youth outreach and education program plans to continue in 2020.

Contact: Emily Williams, National Park Service, Denali National Park and Preserve, PO Box 9, Denali Park, 99755; Phone (907) 683-5758; Email: emily_williams@nps.gov

(BCR 4) Willow and Rock Ptarmigan distribution and movement studies in south-central and interior, Alaska, 2019 update

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 2015-2019 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 was initiated to compare the reproductive 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 nest initiation rates, nest success, chick survival, and movement. Field work will continue through late summer 2020.

Finally, a new pilot study will be initiated for willow ptarmigan on the Yukon-Kuskokwim delta. This study hopes to deploy up to 50 radio necklace collars on adult male and female willow ptarmigan in spring 2020. Those birds will be relocated in late summer in hopes of deploying radio necklace collars on up to 50 juveniles. Radio collared individuals will be closely monitored for 12 months to document movement, mortality, and habitat use.

Contact. Richard A. Merizon, Alaska Department of Fish and Game, Division of Wildlife Conservation, 1800 Glenn Hwy, Suite 2, Palmer, AK 99645. Phone: (907)746-6333; Email: richard.merizon@alaska.gov. Cameron Carroll, Alaska Department of Fish and Game, Division of

Wildlife Conservation, 1300 College Road, Fairbanks, AK. 99701. Phone: (907) 459-7237; Email: cameron.carroll@alaska.gov.

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(BCR 5) Juneau Tree Swallow Nest Watch, 2019 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. Starting in 2018 and 2019 we started to synchronize our data collections with the Alaska Swallow Monitoring Network (https://aksongbird.org/alaska-swallow-monitoring-network). 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 and continent. Community education is also accomplished by public presentation of the results, recruitment of citizen scientists, and involvement of school and scout groups in nest box construction.

This year was a highly successful year for Juneau's box swallows: 61 boxes erected; 40 nests; 218 eggs; 199 eggs hatched; and 194 young fledged. Only one occupied nest completely failed. Two boxes were removed due to vandalism and bear activity. Lay dates ranged from May 20 -29. Fledge dates June 28 to July 8. Swallows were not banded this season at the boxes.

A goal is to continue the program long-term to better understand trends in phenology and changes in nest success and occupancy over time; and to compare results with other cooperators in the network. Nest boxes, once established in productive areas, are re-erected in the same location, when possible, for annual comparison. Since 2015 we have seen an increase in box occupancy, likely in part due to moving boxes to optimal locations, and 'discovery' of existing boxes.

JAS has received support from many people and groups, especially Audubon Alaska and Alaska Songbird Institute. This season we thank Jessica Millsaps and Cody Millsaps, JAS youth volunteers, for substantial work collection data in the field. Nest box openings under permit from Alaska Dept. of Fish and Game. We thank all of the landholders, particularly City and Borough of Juneau, and the Southeast Alaska Land Trust who is conserving valuable wetlands.

Contact. Brenda Wright, Juneau Audubon Society, P.O. Box 21725, Juneau, AK 99802 Email: Programs@juneau-audubon-society.org

(BCR 5) Sitka Winter Bird Observation Project, 2019 update

Gwen Baluss[1], Kitty LaBounty[2], and Matt Goff[3]
[1]Juneau Audubon Society, [2]University of Alaska Southeast, [3]sitkanature.org

Southeast Alaska hosts migratory birds both as a summer breeding ground, and a non-breeding season destination. Few studies in Alaska focus on wintering birds. Since 2012 we have investigated wintering land bird species in Sitka, Alaska, with fall bird -banding. We targeted Dark-eyed (Oregon) Junco, Song Sparrow, and Chestnut-backed Chickadee for color banding. Citizen scientists report sightings of banded birds. Findings are entered into a spatial database for analysis.

Annually, in November, we capture birds by mist net or ground trap and fitted individuals of target species, mostly with unique color band combinations. Additionally, a few opportunistic captures occurred during the winter and spring of 2018 and 2019.
In 2019, 79 Oregon Juncos, 4 Song Sparrows and 8 Chestnut-backed chickadees were added to the pool of color-banded birds.

Since the project's inception we have banded over 500 birds, mostly juncos. We have engaged over 50 citizen observers. Over 400 local school-age students have had the opportunity to learn about hands on science by seeing the bird banding operation on school grounds, design projects around the data, or search for banded birds. There have been over 1075 reports by volunteer observers.

We have recorded a few summer returns for all three species, frequent winter site fidelity for all three species both within and between years, and both short and long-distance dispersal records for Oregon Junco. The population structure of wintering Oregon Juncos in Sitka based on numbers of banded individuals shows males to be more common than females, and young of year more abundant than adults (Table 1).

We are still in the initial phases of data analysis. We offer a few results gleaned from this large data set, focusing on the first 384 color-banded Oregon Juncos banded 2012-2018 and observed through Feb 1, 2019. About 1/3 of all juncos banded through Nov. 2018 have been re-sighted at some point. Re-sighting rates are, as expected, highest for banding sites where there are observers who regularly search for banded birds. Juncos were only occasionally seen outside of the neighborhood in which they were banded, even across years. The maximum distance for a re-sighting within Sitka was 3.75 km. Five individual ORJU were re-sighted during the breeding season (approx. Apr. 15-Aug. 15), each within .3 km of the site it was banded. An additional sighting during the breeding season was likely a sixth individual. Still, this accounts for only about 5% of the juncos that were re-sighted. Many individuals have returned for multiple winters. The longest time between observations to date for this project is 5 years,1 month, and 2 days. Only one junco was re-sighted outside of Sitka. It was photographed the following spring in Juneau.

We plan to continue the project in upcoming seasons. Emphasis will be on increasing outreach in other communities within Alaska and the Pacific Northwest contiguous US in hopes of more distant re-sightings, establishing cameras at banding locations to increase re-sightings, and involving a high school or college level student in a more in-depth project involving the banded birds. Because we found a number of obviously erroneous (*n* = 23) reports in the citizen's database, we are considering only accepting reports for which there is a photograph.

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.

Contact: Gwen Baluss, 10236 Heron Way, Juneau AK 99801 Phone: (907) 500-2771 E-mail: gbaluss@gmail.com

Table 1. Demographics of the first 384 Oregon Juncos. Males accounted for 59%, females 25% and unknown sex 16% of captures.

Class	Number	% of Total
Hatch-year male	143	37
Hatch-year female	61	16
Hatch- year unknown sex	39	10
Hatch- year total	**243**	**63**
After-hatch-year male	45	12
After-hatch-year female	12	3
After-hatch-year unknown sex	0	0
After-hatch-year total	**57**	**15**
Unknown age male	40	10
Unknown age female	22	6
Unknown age or sex	22	6
Unknown age total	**84**	**22**
Total	384	100

(BCR 5) Tongass Hummingbird Project, 2019 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, over 700 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. However, the JOAR site could not be repeated beyond opportunistic visits after 2016. In 2018 banding was initiated at the Shrine of St. Therese (SHRI), .5 miles away from JOAR to opportunistically catch banded birds from the JOAR.

Standard trapping took place about every two weeks between late April and early August. By banding at intervals throughout the season, the effort tracks in general terms the nesting chronology and the emergence dates of hatch-year birds. In 2019 banding was continued with similar effort to previous years at the JCGA, and a limited effort at SHRI that will be repeatable in upcoming seasons.

The 2019 season proved busy with record numbers of both adult males and females captured (Table 1) despite a late spring and slow start to the season with few birds captured in April and May. June and July were warmer and sunnier than the norm. Interpreting variability between days and years is a challenge. Natural food availability is likely a driver of capture numbers. Hummingbirds in Juneau are demonstrating a tendency to "swarm" with groups of adults congregating at the sites, a pattern different from passerines that tend to be distributed more evenly, or tied to a specific territory during the breeding season.

Each bird is normally photographed at banding and upon recapture to record plumage change over time. Soon sample size will be sufficient to quantify plumage change, and get some estimates of survivorship or at least recapture rate. Often birds are reencountered multiple years after banding. Two adult females have been captured up to 5 years after banding. The only significant foreign recapture to date was an adult female captured at JCGA in July 2017 recaptured at a migration station at Lesser Slave Lake, Alberta a week later.

Support for the establishment of Rufous Hummingbird banding stations was provided by the US Forest Service, Region 10, Alaska. Intern help provided by the Tongass National Forest, Student Conservation Association and the Juneau Audubon Society. Sites and logistical support were provided by the Juneau Community Garden Association, the City and Borough of Juneau, and the Catholic Diocese of Juneau. Data collection would not be possible without the approximately 20 volunteer citizen scientists that participate annually.

Contact. Gwen Baluss, 10236 Heron Way, Juneau AK 99801 Phone: (907) 500-2771 E-mail: gbaluss@gmail.com

Table 1. Juneau Community Garden total Rufous Hummingbird standard -effort captures, including both new bands, and recaptures from previous years.

Year	Adult Male	Adult Female	Hatch year Male	Hatch Year Female
2019	58	68	11	8
2018	29	46	20	8
2017	17	23	9	4
2016	25	17	12	2
2015	43	21	4	8
2014	15	13	7	4
2013	12	29	9	1

(BCR 5) Tongass National Forest, 2019 landbird update

Bonnie Bennetsen, Cheryl Carrothers, Gwen Baluss, Susan Oehlers, Joe Delabrue, Toby Bakos, Ben Limle, Ari Cummings, and Erin Lehnert, USDA Forest Service, Alaska Region, Tongass National Forest

INVENTORY & MONITORING

Breeding Bird Survey. The Tongass National Forest (Tongass) personnel counted these routes in 2019: Yakutat (2 routes), Mitkof Island (1 route), Ketchikan (1 route), Prince of Wales Island (2 routes), and Stikine River (1 route). The Tongass also helped coordinate other routes within the zone as needed.

Christmas Bird Counts. Hoonah, Wrangell, Ketchikan, and Petersburg Ranger District personnel continue to help coordinate and participate in the local CBC efforts in their communities.

Alaska Landbird Monitoring Surveys (ALMS). Draft reports summarizing the Tongass ALMS effort 2003-2017 and the Tongass Landbird and Thinning Project 2016-2017 have been compiled. Further analysis and monitoring are planned.

Olive-sided Flycatcher Research. The Hoonah Ranger District provided logistical support for Olive-Sided Flycatcher nesting research by Catherine Pohl of Catherine Pohl Biological Consulting.

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

Southeast Alaska Birding Festivals. The Tongass 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, "Birding 101" taught by the Alaska Sealife Center, 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.

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

Interpreter Training. The 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.

Community Bird Program. The Hoonah Ranger District organized a Community Bird Program, a series of class and field identification sessions for teens and adults.

PARTNERSHIPS AND COOPERATION

Southeast Alaska Birding Trail. The Tongass and Alaska region USFS personnel assisted Audubon Alaska along with Juneau Audubon to develop the Southeast Alaska Birding Trail, with substantial contributions of personnel time, expertise and content. The website will provide independent travelers with detailed information on some of the region's best birding sites, logistics to visiting, and species information. The project seeks to encourage bird-themed ecotourism. Soft roll-out is anticipated in January with a hard roll-out in early spring.

Western Hummingbird Partnership. Tongass and Alaska region USFS personnel continue to participate in the Western Hummingbird Partnership (http://www.westernhummingbird.org) fostering conservation efforts for hummingbirds, including and especially the Rufous Hummingbird. Alaska Region, Juneau, Yakutat, and Cordova Ranger District personnel hosted a visit from Mexican hummingbird researcher and University of Guadalajara professor, Sarahy Contreras as we continue to connect researchers and managers across the Rufous Hummingbird's range.

Student Conservation Association. The Tongass hosted Student Conservation Association Interns who assisted with various bird projects.

Contact. Bonnie Bennetsen, Wildlife Program Manager, Tongass National Forest, 8510 Mendenhall Loop Road, Juneau AK 99801 Phone: (907)789-6298 Email: bonnie.bennetsen@usda.gov

(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 2019. 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 15th year of implementing this point count protocol on the Chugach National Forest. Two ALMS blocks were surveyed in 2019 on the Cordova Ranger District. Locations included Bettles Bay and Kayak Island. The Bettles Bay block was surveyed between June 7 and 8 in 2019. Fifteen points were monitored. A total of 21 species were detected. One new species, Common Merganser, was observed during the 2019 survey which was not detected in previous years. Other species detected between points, included Mallard, Steller's Jay, Barrows Goldeneye, American Wigeon, Northern Shoveler, and Northern Pintail. The Kayak Island block was not surveyed in 2019 due to weather and lack of air support services. One full time 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 Copper River Delta is the largest contiguous wetland on North America's Pacific Coast; and is designated as a site of hemispheric importance by the Western Hemisphere Shorebird Reserve Network. The Copper River Delta Shorebird Festival focuses on educating the public about birds (specifically shorebirds), bird conservation, and bird life cycles and strategies through a variety of activities, classes, crafts, and workshops.

The 29th annual Copper River Delta Shorebird Festival was held on May 2-5, 2019. This year's festival featured a variety of guest speakers. Erin Cooper, from the Chugach National Forest, presented on the landscape and ecology of the Copper River Delta. César Guerrero from Terra Peninsular, in Baja California, Mexico presented on San Quintin Bay and human connections to migratory birds. The keynote speaker was Peter Dunn who is the former Director of the Cape May Bird Observatory and founder of the World Series of Birding. Known as the 'bard of birding' Peter shared his tales of birding gone awry. Denali National Park avian ecologist Emily Williams presented on the Park's long-term study of Canada Jays (formerly known as Gray Jays), examining their resilience against climate change. Visiting artist Zack McLaughlin of Paper & Wood in London, England showcased his incredibly detailed paper bird sculptures in the Cordova Museum and Copper River Gallery. He presented on opening night of the festival and lead 3 paper bird sculpting workshops presented by the Net Loft.

Expert guides led daily field trips to Alaganik Slough as well as high tide birding at Hartney Bay. Alaska Audubon offered a Shorebird Identification class and a Birders' Trivia Night. A two-part workshop occurred with local biologist and photographer, Milo Burcham, on Photographing Bird Life. There were a variety of kid friendly activities hosted by the Prince William Sound Science Center and the Net Loft offered a selection of fiber art workshops.

New this year was a partnership with Lazy Otter Charters out of Whitter, Alaska, who brought festival attendees across Prince William Sound on a round trip cruise to and from the festival. In addition, four charters took attendees out on boats for bird viewing.

The 2019 festival had the second greatest attendance on record for the festival with 165 full festival registrants. Attendees traveled from within Alaska, all over the United States, and abroad. In total 55% of attendees were from Alaska—18% locally from Cordova—and 27% from the contiguous United States.

The Copper River Delta Shorebird Festival is a collaborative event with partners from the Cordova Chamber of Commerce, Chugach National Forest-Cordova Ranger District, Prince William Sound Science Center, and the Net Loft. Additional support occurred from Eyak Corporation, BP Alaska, Alyeska Pipeline Service Company, Alaska Airlines, Camp Denali, Alaska Audubon, local volunteers, and numerous local businesses. Visit https://www.coppershorebird.com/ to view the 2019 schedule and information regarding the 2020 event.

Contact. Erin Cooper, Prince William Sound Zone Terrestrial Program Lead, US Forest Service, PO Box 280, Cordova, AK 99574; Phone: (907) 424-4757; E-mail: erin.cooper@usda.gov. Melissa Gabrielson, Prince William Sound Zone Wildlife Biologist, US Forest Service, PO Box 280, Cordova, AK 99574; Phone: (907) 424-4743; E-mail: melissa.l.gabrielson@usda.gov.

(BCR 6, 10) Landscape simulation of cumulative effects of resource extraction and climate change predicts habitat changes for a steeply declining aerial insectivorous songbird

Andrea Norris[1], Krista De Groot[1], Jeffrey Thomas[1], Leonardo Frid[2], Andrew Robinson[1], Kimberly Dohms[1], Adam Lee[1], Kathleen Moore[1], and Kathy Martin[3,4]

[1]Canadian Wildlife Service, Environment and Climate Change Canada, Delta, British Columbia

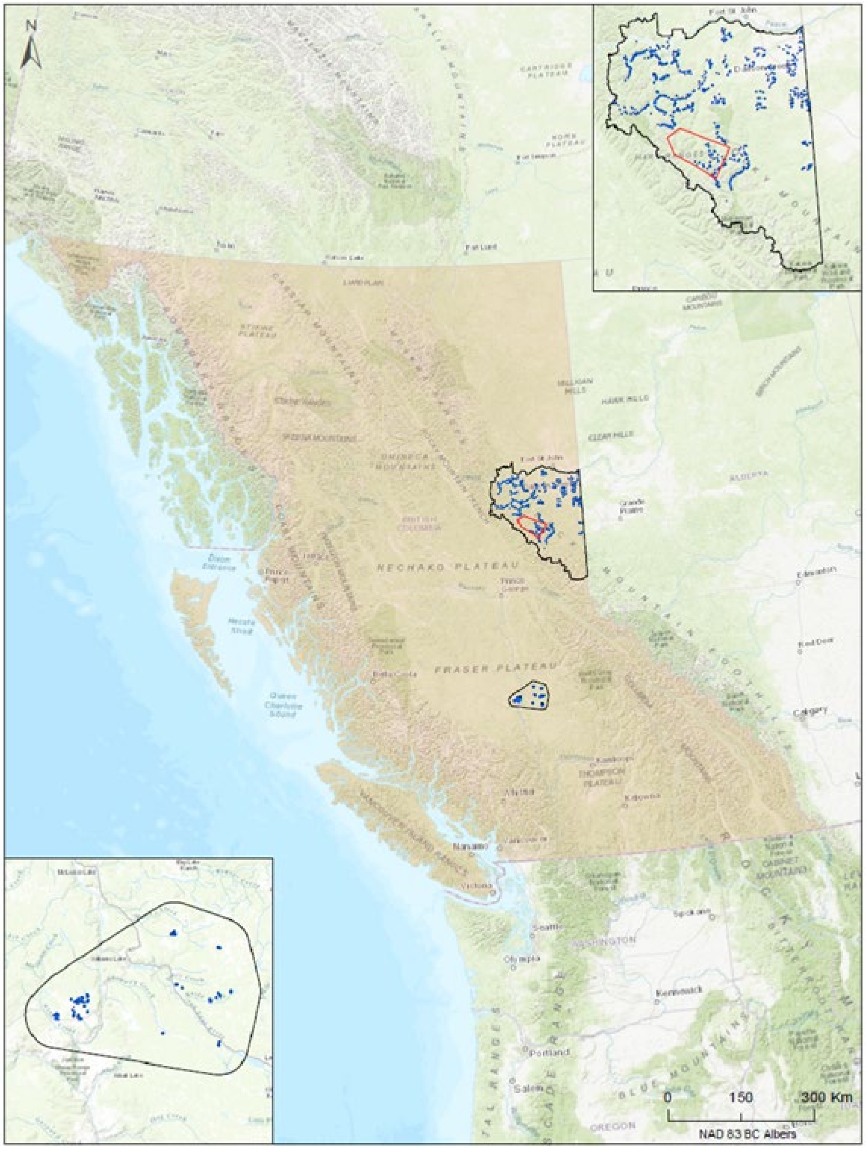
[2]Apex Resource Management Solutions, Ottawa, Ontario

[3]Department of Forest and Conservation Sciences, University of British Columbia, Vancouver, British Columbia

[4]Wildlife Research and Landscape Science, Environment and Climate Change Canada, Delta, British Columbia

Steeply declining terrestrial bird populations require immediate conservation actions that account for the future effects of climate change. We tested the hypothesis that multiple human-induced and natural environmental stressors would influence Olive-sided Flycatcher distribution and abundance, and therefore have cumulative effects on future habitat supply for this aerial insectivorous songbird. We applied pseudo-Bayesian generalized linear mixed-effects models to >2,000 point count surveys with spatially and temporally matched forest inventory data to examine how Olive-sided Flycatcher densities correlated with spatio-temporal changes in stand-level habitat variables in the southern Peace River region of British Columbia, from 1993-2015. We contrasted a suite of additive and interactive models of disturbance effects to evaluate the presence of cumulative effects on flycatcher densities. We then used the parameter estimates from the best-fit habitat models to inform spatially explicit state-and-transition simulation models (STSM) to project change in habitat availability under three landscape management scenarios: business-as-usual, climate change, and conservation. We used historical and current forest stand conditions and harvesting activities to estimate the species composition and stand age, as well as the frequency, size, and distribution of clearcuts within the Dawson Creek timber supply area, a jurisdiction with unique forest stands and management practices in BC. For each scenario, we repeated 40 Monte Carlo simulations of 50 years of bark beetle outbreaks, road development, and forest removal and regrowth due to industrial activities and wildfire to the baseline STSMs. For the conservation scenario, we simulated a jurisdictional transition of 30% of federal and provincial crown stands that were > 60 years old (in 2015) from public to protected areas, in which we prohibited all development. Analyses are in preparation, but preliminary results suggest that Olive-sided Flycatchers were strongly associated with mature forest with high soil moisture, but negatively associated with road networks and clearcuts.

Contact. Andrea Norris, andrea.norris@canada.ca



(Alaska-wide) Alaska Landbird Monitoring Survey, 2019 update

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

The Alaska Landbird Monitoring Survey (ALMS) program uses standardized distance-sampling techniques to survey breeding bird populations and their habitats at 12–25 points within 10 km × 10 km blocks selected through 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). A secondary purpose is to model bird-habitat associations as well as distribution and abundance across the state through analysis of the bird and associated habitat data. Biologists are encouraged to use the ALMS sampling grids and survey protocols to gather systematic inventory data so they can be analyzed in a common framework. This survey is a statewide collaborative program with voluntary participation from governmental agencies and non-governmental organizations, coordinated by the USGS Alaska Science Center.

During 2019, a cadre of biologists from different agencies and organizations conducted surveys at 225 points in 15 sampling blocks statewide during the 17th year of the ALMS program. Survey effort had been declining slightly since its peak in 2010, but in 2019 there was a significant drop in effort relative to that in previous years, which had averaged 506 points across 32 blocks per year since the inception of the program (Fig. 1). The 2019 survey effort was only about 30% of the target monitoring level of 50 blocks per year. This drop occurred across all five Bird Conservation Regions (BCRs) in the state, but was most pronounced in the Northwestern Interior Forest (BCR 4) and the North Pacific Rainforest (BCR 5), the two regions in which sampling had strategically been concentrated because of their high diversity and density of landbirds. The decrease in effort was largely the result of the cessation of ALMS surveys in the Tongass National Forest, which had made significant contributions since the program's inception, and an unexpected reduction in effort on National Wildlife Refuges, due to logistical difficulties. Biologists from the U.S. Fish and Wildlife Service (FWS; Zak Pohlen, Callie Gesmundo, Jim Johnson), in collaboration with the Department of Defense, however, did also implement the ALMS protocol at several U.S. Air Force long-range radar sites across the state.

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 2019, observers have conducted 8,382 ALMS surveys in 110 blocks at 1,986 points, with varying numbers of replications during the 17-year period (Fig. 3). Surveys from ALMS and its predecessor, the Off-road Breeding Bird Survey, have documented over 222,000 detections of birds since 1993.

Scientists from the USGS Alaska Science Center (Colleen Handel, Steve Matsuoka) and FWS (Melissa Cady, Diane Granfors) are currently collaborating on publication of the ALMS protocol for approval as an official FWS survey protocol for the Alaska region. The FWS is currently planning expansion of the ALMS surveys across National Wildlife Refuges in Alaska.

In November 2019, Colleen Handel (USGS) participated in a strategic planning workshop for the North American Breeding Bird Survey (BBS) and is a coauthor of the upcoming 5-year strategic plan. One of the recommendations arising from this workshop was the recommendation to integrate data from the roadside BBS with standardized data collected in off-road areas from large-scale monitoring programs such as ALMS to produce more accurate estimates of regional and continental population trends. An international analytical working group has been established to develop appropriate strategies. The approach will be modeled, in part, on the analysis of population trends for landbirds in Alaska, which was based on a combined analysis of ALMS and BBS data (Handel and Sauer 2017).

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.

Contact. Colleen Handel, USGS Alaska Science Center, 4210 University Drive, Anchorage, AK 99508. Phone: 907-786-7181. E-mail: cmhandel@usgs.gov

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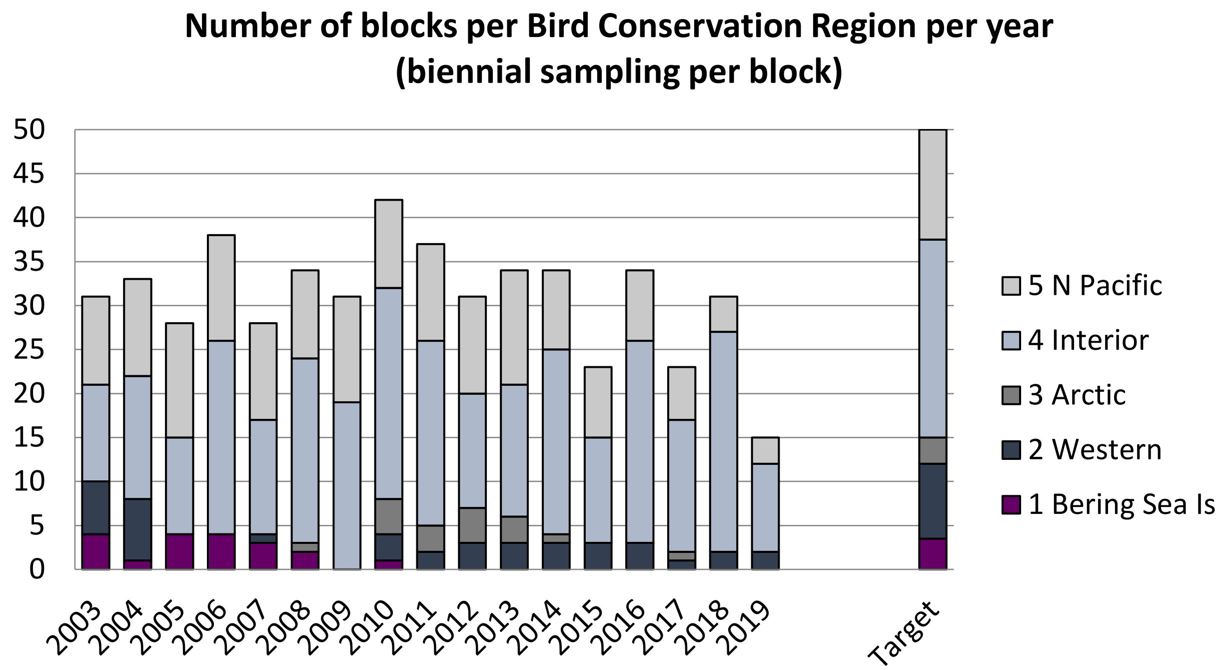

Figure 1. Number of ALMS blocks surveyed each year within the five Bird Conservation Regions in Alaska between 2003 and 2019.

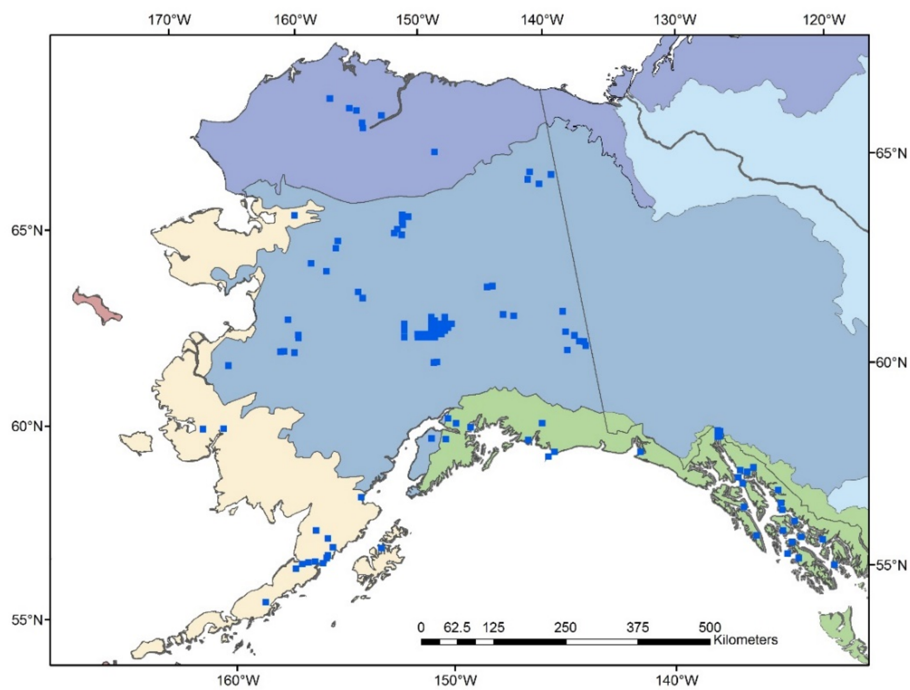

Figure 2. Locations of landbird surveys conducted as part of the Alaska Landbird Monitoring Survey (ALMS) from 2003 to 2019. The five Bird Conservation Regions in Alaska are indicated by color: Arctic Plains and Mountains (purple), Northwestern Interior Forest (blue), Western Alaska (tan), North Pacific Rainforest (green), and Aleutian/Bering Sea Islands (pink).

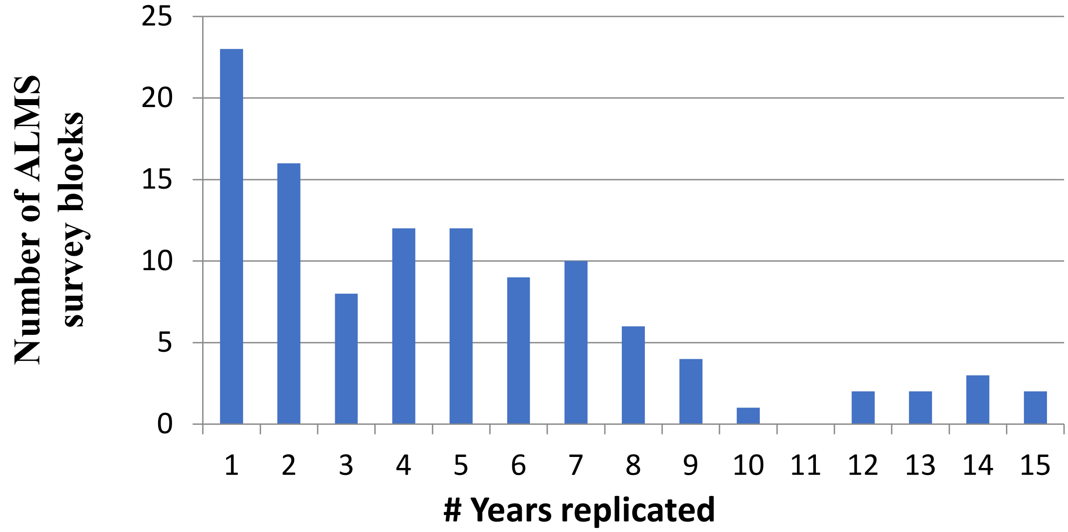

Figure 3. Number of ALMS blocks that have been surveyed for 1–15 years between 2003 and 2019. The standard protocol is to replicate each block biennially (e.g., 5 times over a 10-year period), but some surveys have been replicated annually. Most blocks replicated during a single year represent those surveyed for inventory rather than monitoring purposes.

(Alaska-wide) North American Breeding Bird Survey, Alaska, 2019 update

Laura McDuffie, U.S. Fish and Wildlife Service, Migratory Bird Management

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 to monitor bird populations across large spatial scales. Concerns over pesticide poisoning in birds formed 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 as the direct result of 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 2019, 74 BBS survey routes were completed throughout Alaska, just above the 26-year (1993-2018) average of 72 routes conducted per year. This year participation decreased by 7.5% from the previous year. This decrease is attributed to high turnover rates of observers and reduced funding within participating agencies. However, 2019 was a success and many routes reached the 10, 20 and 30-year milestones for total number of years surveyed (Figure 2). The routes completed at the highest frequencies include: Swan Lake Road (38 years), Little Salcha (36 years), Anchor River and Galena (35 years) and Juneau and Seven Lake (34 years).

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 2020, we anticipate continued widespread participation in surveys as we near the 40th anniversary of BBS in Alaska. Currently, there are 91 active routes throughout Alaska and of those; seven routes are vacant for the 2020 season. The majority of vacant routes are within accessible areas in some of the most beautiful regions of the state. Please consider becoming an observer, if not already, as it is a rewarding experience and contributes to long-term monitoring of avian populations in Alaska. A list of available routes as well as route maps and species lists can be found at (https://www.pwrc.usgs.gov/bbs/).

Contact: Laura McDuffie, U.S. Fish and Wildlife Service, Migratory Bird Management, 1011 E. Tudor Rd., MS 201, Anchorage, AK 99503. Phone: 907-786-3979, Email: laura_mcduffie@fws.gov

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Figure 1. The number of routes completed during the North American Breeding Bird Survey: Alaska (1968–2019). The dashed line refers to the average number of routes completed between 1993–2019 (71.93 routes). *n* = 142 routes (52 discontinued and 91 active routes as of 2019).

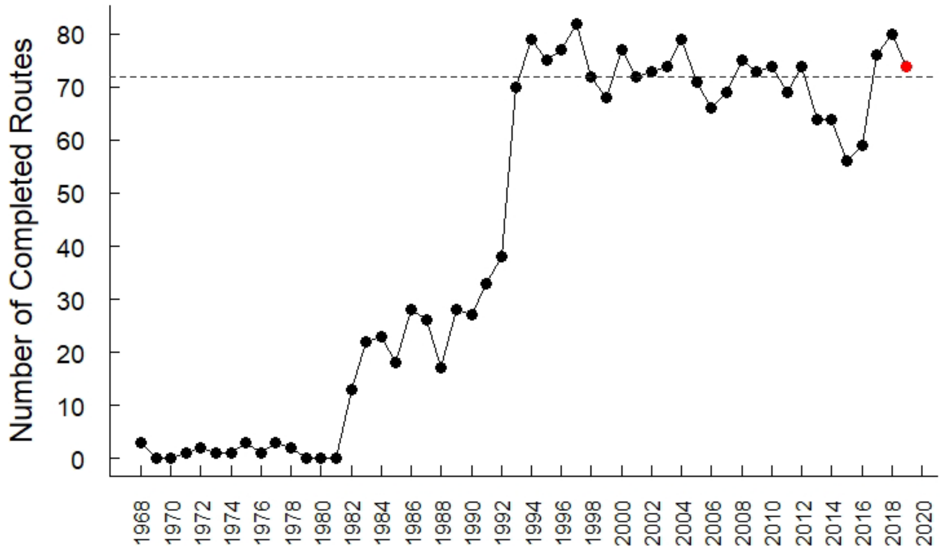

Figure 2. The number of routes assigned to each Bird Conservation Region (BCR) and the total number of routes completed in less than 10 years, between 10 and 19 years, between 20 and 29 years and greater than 30 years. BCR 1 does not currently have any active BBS routes.

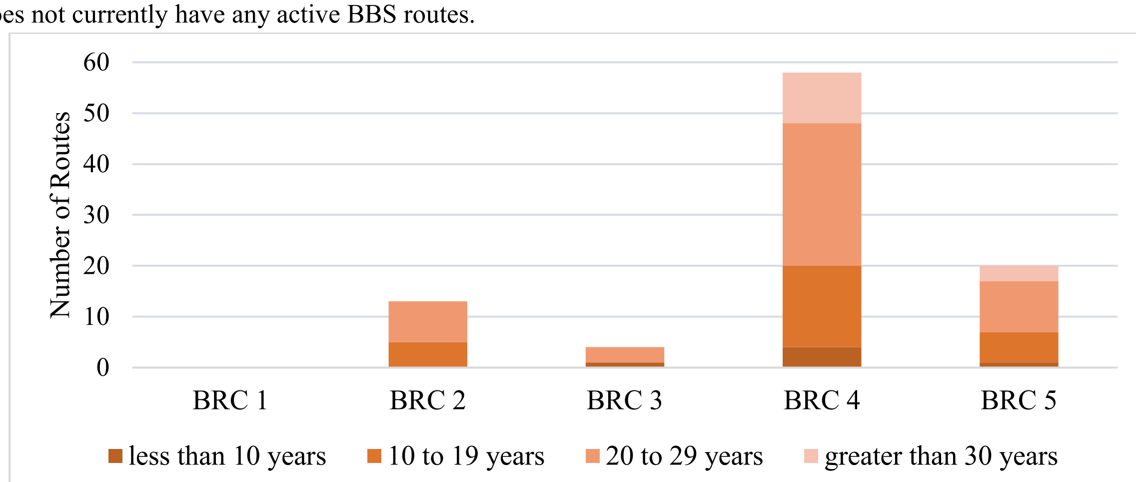

Table 1. Population change estimates for 176 species encountered on Breeding Bird Survey routes in Alaska (1993–2014; table and caption from Sauer et al. 2017: Table S02). The analysis is based on log-linear hierarchical models (Sauer et al. 2013). For each species, the following is presented: sample 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	

Common Name	N	Trend	2.5% CI	97.5% CI	RA	2.5% CI RA	97.5% CI RA	Half-Width	Credibility Score	New
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	
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	*

Common Name	N	Trend	2.5% CI	97.5% CI	RA	2.5% CI RA	97.5% CI RA	Half-Width	Credibility Score	New
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 complex[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	
American 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 complex[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	
Canada 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	

Common Name	N	Trend	2.5% CI	97.5% CI	RA	2.5% CI RA	97.5% CI RA	Half-Width	Credibility Score	New
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	
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 complex results 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
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, 2019 update

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 tail feathers from hunter harvested birds. This is a voluntary program that through 8 hunting seasons (2011/12–2018/19) has resulted in samples from over 330 hunters statewide. During the 2018 regulatory year (RY; July 1, 2018 to June 30, 2019) hunters provided wings from 19 ruffed, 250 spruce, 86 sharp-tailed, and 68 sooty grouse in addition to 335 willow, 58 rock, and 16 white-tailed ptarmigan wings statewide (Merizon and Carroll, *in prep*). Samples were collected from 13 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 component 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. As of October 2019, hunters have provided approximately 400 samples statewide during the 2019-2020 season.

Contact. Richard A. Merizon, Alaska Department of Fish and Game, Division of Wildlife Conservation, 1800 Glenn Hwy, Suite 2, Palmer, AK 99645. Phone: 907.746.6333; e-mail: richard.merizon@alaska.gov. Cameron Carroll, Alaska Department of Fish and Game, Division of Wildlife Conservation, 1300 College road, Fairbanks, AK. 99701. Phone: 907.459.7237; e-mail: cameron.carroll@alaska.gov

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(Boreal North America) 2019 update from the Boreal Avian Modelling Project

Péter Sólymos and Diana Stralberg, University of Alberta

Background. The Boreal Avian Modelling Project (BAM) was initiated in 2004 to address knowledge gaps associated with the management and conservation of boreal birds in North America. BAM is built on the foundation of boreal bird data. The BAM database was created by collating and harmonizing avian data from the Breeding Bird Survey, Breeding Bird Atlases, and individual research, monitoring, and inventory efforts conducted across the Canadian and US boreal and hemi-boreal region. BAM is working to develop rigorous analytical model-based approaches to support the conservation of the boreal forest region and the bird populations and communities that depend upon it. We have developed specialized statistical approaches to harmonize these datasets by correcting for survey methodology and species detectability to estimate density.

Generalized National Density Models. BAM's core research involves the development of national-scale species' density models and population estimates. In 2019 we developed a new spatially explicit, generalized analytical method to model species densities in relation to environmental covariates. The following products from these models will be publicly available on-line in 2020:

1) Maps of species' densities and distributions across Canada;
2) Population size estimates, both regional and national;

3) Short-term trends (by late 2020);
4) Habitat associations (species' densities by landcover type).

Our new density models for Canada used tree biomass, age, land cover types, 30-year climate normal, topography, lake edge density, and roads as predictors. We used boosted regression trees (BRT), with statistical offsets that account for methodological differences and detectability, and applied 10-fold cross validation to optimize the model fit. In creating the new models, we matched samples to vegetation data, using two time periods, and subsequently down-weighted them based on spatial sampling density. Province/BCR spatial units were used to build individual BRT models. The spatial units were buffered to give smooth predictions—at the 1 km^2 pixel level—across the 200-km wide overlap of the regions. We calculated rolled-up population size estimates for the regions, and for Canada, by adding up the pixel level values. The model uses post-hoc binning to calculate regional average densities by land cover type. This approach addresses range edge problems we encountered in the past (i.e. predicting suitable climate space outside of the species' range), it also addresses differential habitat selection across regions. This is also a useful product for regional or national forecasting-based landscape simulations that often need bird densities at the land cover type level.

The next phase in our approach will focus on the US boreal/hemiboreal region, where we will use the available predictor variables to make similar regional models and predictions. Our aim in expanding the scope of these models is to better inform continental scale bird conservation initiatives. We will also look at population size estimates from our approach and compare that to regional estimates from Partners in Flight. Further work will look compare species level and regional characteristics -- to find out how the two estimates differ -- which will help to identify gaps in remote northern areas for future sampling by roadside or off-road surveys.

Additional research updates. BAM's research contributes to conservation and management of boreal birds by leveraging disparate datasets into predictive models, and by advancing ecological modeling methods relevant to conservation and management within the boreal region. For an overview of BAM's work from April 2018 - March 2019 please see our annual report (http://bit.ly/BAM_20108-19). For additional information, please see the publications listed below or contact BAM (borealavianmodellingproject@ualberta.ca). Also, note that we recently updated our website to a more dynamic, social-media-friendly format: https://borealbirds.ualberta.ca/.

Contacts. Péter Sólymos, University of Alberta, solymos@ualberta.ca; Diana Stralberg, University of Alberta, diana.stralberg@ualberta.ca.

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

Clark Rushing[1,2], Steve Matsuoka[3], Luke Powell[2,4] and members of the International Rusty Blackbird Working Group (rustyblackbird.org)
[1]USGS Patuxent Wildlife Research Center, [2]Utah State University, [3]USGS Alaska Science Center, [4]University of Glasgow

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.

Contact. Steve Matsuoka, USGS Alaska Science Center, 4210 University Drive, Anchorage, Alaska 99508. Phone: (907)786-7075; E-mail: smatsuoka@usgs.gov

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

Sarah Sonsthagen[1], Robert Wilson[1], Dean Demarest[2], Jim Johnson[3], Steve Matsuoka[1], Luke Powell[4], and members of the Rusty Blackbird Working Group (rustyblackbird.org)

[1]U.S. Geological Survey, Alaska Science Center; [2]U.S. Fish and Wildlife Service, Migratory Bird Management, Region 4, [3]U.S. Fish and Wildlife Service, Migratory Bird Management, Alaska Region, [4]University of Glasgow

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.

Contact. Sarah Sonsthagen, USGS Alaska Science Center, ssonsthagen@usgs.gov.

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(Range-wide) Lesser Yellowlegs migration, population structure, and demography

Katie Christie[1], Laura McDuffie[2,3], Jim Johnson[3], and Audrey Taylor[2]

[1]Alaska Department of Fish and Game Threatened, Endangered, and Diversity Program, [2]University of Alaska Anchorage, [3]U.S. Fish and Wildlife Service, Migratory Bird Management

The Lesser Yellowlegs is a neotropical migrant that breeds in boreal wetlands across North America. Alaska provides important breeding habitat for this species including vast networks of undisturbed lakes, marshes, and boreal forests. Despite the widespread distribution of Lesser Yellowlegs within Alaska's boreal wetlands, their abundance in the state has been decreasing and concern has been mounting from conservation groups, biologists, and federal and state agencies. This species has declined 5.3% to 9.2% per year in Alaska since 2003 (Handel and Sauer 2017) and 5.3% per year across North America since 1966 (Sauer et al. 2013). Abundance estimates on their South American wintering grounds indicate up to an 80% population decline compared to historic levels (Ottema and Ramcharan 2009). To address knowledge gaps for this species, the US Fish and Wildlife Service, the Alaska Department of Fish and Game, and the University of Alaska Anchorage have initiated a study that seeks to understand the migration, genetics, and vital rates of this species. Canadian collaborators at Environment and Climate Change Canada and Trent University allowed us to expand the geographic scope of this project to include sites in the northern and eastern Canada (BCR 7, 8). During the 2018 and 2019 field seasons, 85 Pinpoint GPS-Argos satellite tags were deployed on adults from Anchorage, AK, Kanuti National Wildlife Refuge, AK, Yellowknife, NWT, Churchill, MB, James Bay, ON, and Mingan, QC. Transmitter data revealed highly variable migratory movements, with most birds migrating through the prairie pothole region and dispersing to wintering grounds across South America (Figure 1). Migration data will be used to quantify the relative exposure of different breeding populations to harvest in the northern Caribbean and to identify important stopover and winter habitats.

In 2018 and 2019, a total of 258 Lesser Yellowlegs were banded with unique alpha-coded leg flags at field sites across Alaska and Canada. We will continue to band and resight adult birds until we have sufficient sample size to produce accurate survival estimates. In addition, we were able to successfully locate 22 nests during incubation in 2018 and 2019. Each nest was monitored until nest fate was determined and habitat characteristics of the surrounding area were described. Cameras were placed on nests in 2019 to determine the cause of nest failure. 45% of nests hatched at least one chick, and two black bear predation events were captured on camera. Lesser Yellowlegs nests are notoriously cryptic and difficult to find and published nest success rates are rare. Therefore, this information will help to fill key knowledge gaps on the nesting ecology of this species.

Contact. Katie Christie, Alaska Department of Fish and Game, 333 Raspberry Road, Anchorage, Alaska 99518; Phone: (907) 267-2332; Email: katie.christie@alaska.gov

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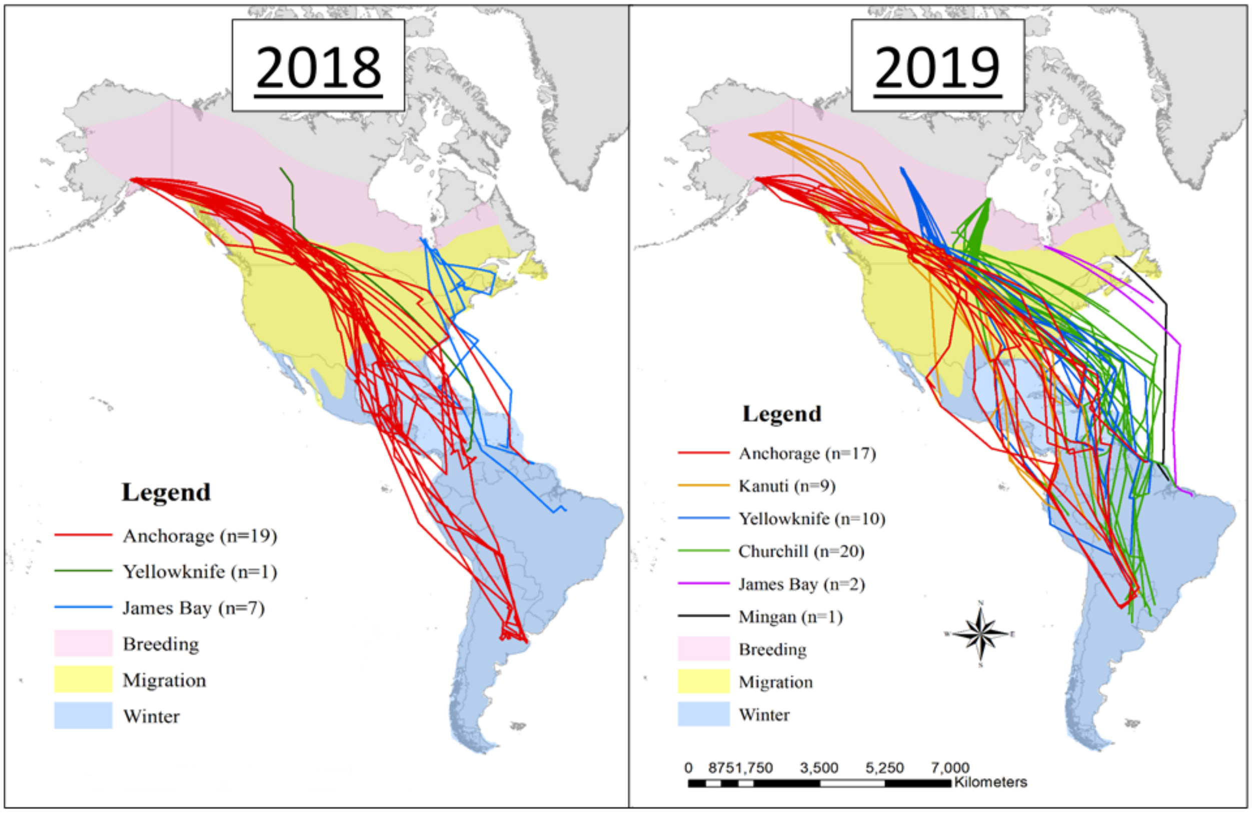
Figure 1. Fall migration routes of satellite-tagged Lesser Yellowlegs.



Appendix. Recent landbird publications (2019) relevant to Alaska and northwestern Canada

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