

*2019 Alaska Bird Conference Abstracts. Abstracts for presentations are followed by abstracts from posters and are in alphabetical order by lead author. \* indicates a student author.*

## **ORAL PRESENTATION ABSTRACTS**

### **MARINE ASSOCIATED BIRD AND MAMMAL HABITAT USE AT THE FIVE FINGER LIGHT**

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In summer 2017 I studied the abundance and distribution of marine associated birds and mammals at the Five Finger Lighthouse in Southeast Alaska. My objectives were (1) to identify the areas of highest habitat use by species of conservation concern, (2) to make recommendations for an ecosystem-based management plan for the island, and (3) to initiate a citizen science project. I found higher relative abundance and greater biodiversity of both birds and marine mammals on the south and west facing sectors of the island compared to the north and east facing sectors. I attribute this to the greater habitat complexity on the south and west facing sectors that comprise a near-shore reef, a mixed kelp forest, and a channel between the reef and rocky cliffs, areas used extensively for foraging, nesting, traveling, socializing, and resting by many of the documented species. These findings provided the basis for recommendations to avoid development and to minimize anthropogenic disturbance on the southern and western portions of the island including the adjacent reef and channel. As both the Five Finger Lighthouse ecosystem and management continue to evolve in response to changing environmental conditions and human interests, this study also established a baseline for future study that will inform future adaptive management, document changes over time, and engage community stakeholders in science and conservation.

### **THE ALASKA SWALLOW MONITORING NETWORK: “DISPERSING” ACROSS THE STATE**

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The Alaska Swallow Monitoring Network is a multi-entity effort to collect ecological data on Tree Swallows using artificial nest box colonies throughout Alaska. Using a network approach whereby all sites collect data using the same field methods, we hope to directly compare Tree Swallow breeding phenology, nest success, and banded bird return rates from sites across the state. Although the network is centered around ecological research, we have also integrated a citizen science-based approach at most sites, with data being collected, interpreted, and shared by

students, teachers, researchers, and community members. We report on the benefits and challenges of using this network approach to monitor swallow populations across the state, from comparing basic phenological measures (arrival, nest initiation, and hatch dates) to assessing productivity and survival within and between years using advanced modeling techniques. We will also discuss future plans for the network as well as other efforts to monitor swallows in Alaska: Birds 'n' Bogs in southcentral Alaska and Fairbanks, and the Youth Birding Alaska network recently begun as a collaboration between UAA and K-12 school districts across the state.

## **CONNECTING PEOPLE THROUGHOUT THE EAST ASIAN-AUSTRALASIAN FLYWAY WITH COORDINATED OUTREACH**

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The purpose of the East Asian-Australasian Flyway Partnership (EAAFP) is to provide a flyway-wide framework to promote dialogue, cooperation and collaboration to manage migratory waterbirds and their habitats, considering both people and biodiversity. The EAAFP is made up of national governments, international non-governmental organizations, businesses, and inter-governmental organizations that agree to support the objectives and actions under this partnership. The United States is one of 35 partners and has been active with this group since its establishment in 2006. One priority of EAAFP is outreach through communication, education, participation and awareness (CEPA). The goal of the CEPA working group is to instill stewardship of migratory waterbird conservation and their habitats among people in the flyway. This goal fits well with the management of wildlife and habitat in Alaska, where habitat and species are often managed with subsistence and other human uses in mind. At a recent CEPA workshop, EAAFP partners shared successful existing outreach efforts and planned for multi-country coordinated future efforts. These CEPA efforts will be highlighted in this presentation, with a call to expand coordination with our partners throughout the flyway.

## **INFLUENCE OF WEATHER ON REPRODUCTIVE TIMING AND REPRODUCTIVE SUCCESS IN TWO ARCTIC-BREEDING PASSERINES**

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Global climate change is occurring rapidly, especially in the Arctic. As such, it has become critically important to understand how altered weather patterns associated with global climate change are affecting basic demographic processes such as reproduction in arctic communities. We investigated how factors such as temperature, rain, snow, wind, and food availability affect both timing of reproduction and reproductive success in two migratory arctic-breeding

passerines. We monitored phenology and fledging success of Lapland longspurs (*Calcarius lapponicus*), a circumpolar tundra-nesting species, and Gambel's white-crowned sparrows (*Zonotrichia leucophrys gambelii*), which breed in shrub habitat, across 5 years (2012-2016) at the Toolik Field Station on the North Slope of Alaska. We found that temperature and snow influenced both reproductive timing and reproductive success, with Lapland longspur fledging success being particularly vulnerable to late season snow-storms. We discuss the implications of this study for continued global change in the Alaskan Arctic.

## **BIRDS OF A FEATHER FLOCK TOGETHER... OR DO THEY? REGIONAL AND TEMPORAL PATTERNS OF COMMUNITY COMPOSITION AND ABUNDANCE IN NEARSHORE MARINE BIRDS ACROSS THE GULF OF ALASKA**

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We compiled nearshore marine bird survey data from several long-term monitoring programs conducted across coastal regions within the northern Gulf of Alaska, from Katmai National Park and Preserve on the Alaska Peninsula to Kachemak Bay, Kenai Fjords National Park, Resurrection Bay, and Prince William Sound. We evaluated differences in community composition related to season (summer vs. winter) and location. We also examined temporal trends in a select set of bird species that represent consumers of benthic invertebrates and consumers of forage fish. Overall bird abundance was similar between summer and winter within localized regions but community composition was drastically different between seasons. For example, winter coastal marine communities were characterized by a marked increase in benthic foragers and highlights the importance of nearshore coastal resources to sea ducks that primarily breed in the interior of Alaska but migrate to the coast in winter. Summer marine coastal communities were generally found to support large numbers of forage fish consumers as colonies, absent of marine birds in the winter, were occupied in the summer. We found variation in trends of some species at the regional scale, which suggests that drivers to abundance of marine birds are not coherent across the Gulf of Alaska Large Marine Ecosystem. For other species, however, the lack of variation in trends across regions may indicate Gulf-wide drivers to abundance. Taken holistically, contrasting trends in a variety of species can inform as to the underlying factors driving individual species' abundance and distribution.

## **PILOTING COMMUNITY SCIENCE: MONITORING MURRE REPRODUCTIVE SUCCESS IN SAVOONGA, ALASKA**

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Murres (both thick-billed, *Uria lomvia*, and common, *U. aalge*) are a culturally important food resource for the St. Lawrence Island community of Savoonga, Alaska. Savoonga hunters harvest adult murres in the spring as they return to their breeding colonies and collect their eggs from cliffs during clutch initiation. Murres are internationally recognized as a marine ecosystem indicator species and populations, reproductive success, and migration routes are monitored throughout the Arctic. However, there is only one Arctic murre colony actively monitored in the state of Alaska. In 2018 we piloted a citizen science project to test the feasibility of developing methods to enable community-based monitoring of murre reproductive success using remote time-lapse photography to fill information gaps at the local, state, and international management levels. We found that cost-effective RECONYX cameras provided adequate image resolution to identify breeding murres and track nest fates using open source software and methods described by Merkle et al. 2016. We developed and delivered a two-part lesson for high school students at Hogarth Kingeekuk Sr. Memorial School in Savoonga to test classroom methods of engaging students in the photographic analysis process. Here we discuss the logistics of this project, the successes and failures, and how realistic the expectation is of handing monitoring entirely over to the community.

## **USING THE ALASKA SPECIES RANKING SYSTEM TO IDENTIFY SPECIES OF CONSERVATION CONCERN**

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Several agencies and institutions publish lists of species that are of conservation concern. These lists can influence allocations of funds and research efforts, yet it isn't always clear why some taxa appear on a particular list or why they received a certain rank. The Alaska Species Ranking System (ASRS) is meant to be an objective and defensible way of assessing the conservation status of vertebrate taxa in Alaska. Taxa are evaluated on 16 questions across three categories: 1) Population & Distribution Trends; 2) Biological Characteristics; and 3) Research & Action Needs. Taxa that are in decline, are ecologically specialized, and have not been the focus of any research receive the highest scores. We provide a brief overview of the ranking system and highlight its applicability by comparing scores between two taxonomic groups: waterfowl and small mammals. Population trends were available for 85% of waterfowl taxa, but less than 30% small mammals. Biological Characteristics scores were low but highly variable within groups. Small mammals had higher Research Needs than waterfowl, and this difference was largely driven by a question that evaluated the efficacy of population monitoring programs. Both groups require additional research to identify factors that limit population growth rates. We discuss final

steps in this project and encourage feedback from organizations to make this product most useful to them.

## **LINEAR FEATURES AFFECT MIGRATORY MOVEMENTS OF GOLDEN EAGLES**

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Linear features, including roads and railways, have changed how animals move and use habitat, with effects on predator-prey relationships and population dynamics. In large mammal systems, the effects of linear features on individual animal movement have received considerable attention. However, many birds migrate over landscapes replete with such linear features, but such effects in birds have received minimal attention. To understand how linear features might alter avian movement, we tracked migratory golden eagles with satellite telemetry and implemented a modified step selection function (SSF). Our sample consisted of 32 adult eagles tracked for a total of 84 individual migrations 2014–2017. We found that eagles used and favored areas near roads and railways during migrations but that this effect was stronger during spring migration. We also found that eagles' use of linear features varied based on stopover versus migratory behavior, which itself is driven by meteorology. Linear features present mortality risk to animals, but to some migrants, they could also offer hunting and scavenging opportunities.

## **CHARACTERIZING ARCTIC SHOREBIRD CHICK DIETS WITH DNA METABARCODING**

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Climate change in the Arctic is affecting the emergence timing of arthropods used as food by nesting shorebirds and their young. Determining the diets of shorebird young is a pre-requisite for evaluating whether shifts in arthropod availability may impact shorebird chick growth as a

result of a trophic mismatch. DNA metabarcoding was used to identify arthropod remains in feces collected from wild-caught Red Phalarope (*Phalaropus fulicarius*), Pectoral Sandpiper (*Calidris melanotos*), and Dunlin (*Calidris alpina*), young in Utqiagvik, Alaska. We assessed the ability of two mitochondrial markers (CO1 and 16s) to detect arthropods in the feces of captive young in controlled feeding experiments. The technique detected nearly all prey families documented in historical gut content analyses of wild-caught shorebird young, in addition to novel prey. Changes observed in shorebird chick diets over a summer generally reflected arthropod composition in the environment estimated from collection of arthropods in pitfall traps. Results suggest that the shorebird chicks were able to adjust to intra-seasonal changes in prey availability. We present an application of DNA metabarcoding to characterize prey resource use by shorebird young for assessing the presence and impacts of trophic mismatch.

## **THE BENEFIT OF BIRDS: ECOLOGICAL VALUE AND VULNERABILITY IN THE BERING, CHUKCHI, AND BEAUFORT SEAS**

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An integrative analysis of extensive ecological spatial data can serve to identify areas of disproportionate value to an ecosystem's health. Our assessment of ecological value and vulnerability had two primary objectives: 1) use publicly available scientific mapping of species patterns to identify areas of disproportionately high importance to the function, health, productivity, biodiversity, and resilience of this ecosystem; and 2) to apply a spatial representation of ecosystem stressors to evaluate the vulnerability of these areas to anthropogenic impacts, namely: vessel traffic, commercial fishing, oil and gas, and climate change. Spatial patterns in these data were analyzed to measure value relative to a regional neighborhood, balancing differences in species diversity across the study area and resulting in well-distributed and geographically diverse values for four taxa groups: lower trophic organisms, fishes, birds, and marine mammals, as well as a combined ecosystem assessment. We then combined relative measures of stressor impact with the ecological values as a metric for vulnerability, offering insight into the interface between ecosystems and human activity. For instance, Unimak Pass and Smith and Harrison Bays were the top-ranked ecological units for birds across the entire project area, while also ranking high in vessel traffic (Unimak Pass; 1<sup>st</sup>), oil spill impact probability (Smith and Harrison Bays; 1<sup>st</sup>), and commercial fishing (Unimak Pass; 2<sup>nd</sup>), resulting in high vulnerability values. This analysis quantifies the relationship between ecological value and anthropogenic stressor, which can be applied to a variety of management questions.

## **PATTERNS IN THE BREEDING POPULATION OF STELLER'S EIDERS AT UTQIAGVIK, ALASKA OVER A 28 YEAR PERIOD**

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Federally threatened Steller's eiders are sparsely distributed across the Arctic Coastal Plain of northern Alaska, with the greatest breeding pair density near Utqiagvik. The U.S. Fish and Wildlife Service has monitored the breeding ecology annually since 1991. The abundance of Steller's eiders on the breeding grounds shortly after arrival may not always be indicative of subsequent nesting effort, as the arrival period is a critical time when birds prospect for potential nest sites and assess conditions based on a variety of environmental factors, avian predator numbers, and territorial behavior. Over the years, increased development, roads, and human activity in the Utqiagvik area may have slowly encroached preferred nesting and foraging habitats. Lemmings are the primary food source of pomarine jaegers, snowy owls, and arctic foxes; in years of low lemming abundance, these predators shift diets toward ground nesting birds, eggs, and young, resulting in poor breeding success of Steller's eiders. In the face of these challenges, Steller's eiders may have shifted their annual distribution and breeding effort. Despite many years of monitoring Steller's eiders at Utqiagvik, population size, trends, and vital rates of this small sea duck continue to be challenging to estimate.

## **RECENT TRENDS IN BOREAL WETLAND-ASSOCIATED BIRDS BREEDING IN ALASKA AND BEYOND**

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Population trends are finally available for many avian species breeding in Alaska because of a concerted effort to expand standardized surveys across the state during the past two decades. We used hierarchical models to estimate trends for 84 species in the Northwestern Interior Forest Bird Conservation Region based on the Breeding Bird Survey (BBS) and the Alaska Landbird Monitoring Survey. Long-term trends were estimated from 1993–2015 using BBS data only, and short-term trends were assessed from 2003–2015 using both datasets. We determined whether negative trends in Alaska were mirrored in other Bird Conservation Regions and identified major threats based on the literature. Most species with declining trends are associated with moist or wetland forest habitats, including the Canada Goose, Red-necked Grebe, Lesser Yellowlegs, Olive-sided Flycatcher, Western Wood-Pewee, Alder Flycatcher, Blackpoll Warbler, and five swallow species. Negative trends for many species (e.g., Tree Swallow, Bank Swallow, Olive-sided Flycatcher) are continent-wide; declines of others (e.g., Lesser Yellowlegs, Alder Flycatcher) seem restricted to northwestern North America. Major threats to aerial insectivores and wetland-associated birds include changing insect abundance, shrinking boreal wetlands,

agricultural conversion, pesticide use, and unregulated harvest. In light of multiple stressors, studies that identify the most important threats and strategies to mitigate them are warranted.

## **INFLUENCE OF WETLAND CONTEXT ON THE DISTRIBUTION AND ABUNDANCE OF BOREAL BIRDS**

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Modification of boreal forest for commercial and residential development in southcentral Alaska may be affecting habitat quality and availability for boreal bird species, many of which are already in decline. The purpose of this research is to better understand how development and other human impacts affect the use of wetlands in southcentral Alaska by boreal birds. We are doing this by contrasting the breeding habitat characteristics of five bird species of special concern (Greater and Lesser Yellowlegs, Solitary Sandpiper, and Rusty Blackbirds) in relatively unimpacted wetlands located on military lands on Joint Base Elmendorf-Richardson (JBER) with comparable wetlands within urbanized Anchorage. Bird survey data collected by U.S. Fish and Wildlife Service and trained citizen scientists were compiled into an ArcGIS geodatabase of bird observations from 213 wetlands on JBER and Anchorage between 2014 and 2017. We will describe our ongoing efforts to parameterize a set of occupancy models. The models will examine how habitat characteristics such as wetland size, type, and proximity to manmade infrastructure influence occupancy of wetlands at the local and landscape scales, and how occupancy of specific wetlands has changed during the four years of the study.

## **MARINE PROTECTED AREAS (MPAs) FOR WINTERING ALEUTIAN TERNS? SURVEYS, ASSESSMENTS AND CONCLUSIONS FROM COASTAL CHINA, INDONESIA AND PAPUA NEW GUINEA**

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The Aleutian Tern (*Onychoprion aleuticus*) is well studied in Alaska, and partly in Russia. However, the flyways and wintering grounds are less well known and documented. The literature and recent findings show Aleutian Terns flying to and wintering in Asia; namely coastal Japan, China, Hongkong, Singapore, and the waters north of the Philippines, Indonesia, likely Papua New Guinea. Based on citizen science as well as long-term field work, marine surveys and GIS data analysis in those regions by the author here I will present an overview of the marine habitat conditions in China, Indonesia and Papua New Guinea. I will provide an overview of the habitat attributes and then show a conservation perspective what wintering birds from Alaska encounter along the flyway and tropical wintering grounds. I show current risks that those birds are facing in their non-breeding grounds and how they are managed nationally and internationally. While the Aleutian Tern seems not to be really in 'hot waters' the coastal and ocean wilderness habitat

actually is already heavily modified, and ongoing MPA efforts are not really mitigation this situation with global change further on the rise.

## **SPOON-BILLED SANDPIPER MODEL-PREDICTIONS WITH OPEN ACCESS DATA AND MACHINE LEARNING: WHY, HOW DONE AND WHAT WE KNOW**

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Spoon-billed Sandpipers (*Calidris pygmaea*) are endemic shorebirds that are difficult to detect on the flyway and in the wintering-grounds. The world population is very low and individuals are widely spread out throughout Asia during migration and wintering. In such situations, predictive modeling based on geographic information systems (GIS), best-available algorithms and open source data can present a valuable decision-support system to protect such species, their habitats and for prioritization of effective conservation actions. Here I show the state-of-the-art, how machine learning can be used in such cases, what data are needed, and what the outcomes are. Based on ensemble models and different model projections (Zoeckler et al. 2016), our findings show new as well as confirmed and more spatially-defined stop-over sites and wintering grounds. Implications for the Bering Sea and Alaska are discussed. Also, the use of data sharing, online open access and machine learning are now part of the standard tool set for ornithologists and conservationists working in a truly international setting. The concept and workflow we developed shows a powerful but promising paradigm shift which demands to be embraced more in order to tackle problems of global conservation, which appears to be in crisis-state with a grim outlook while climate change, economic growth, consumption and environmental marginalization are still on the rise.

## **SANDHILL CRANE ROOSTING BEHAVIOR ON THE DELTA RIVER AND DELTA CREEK, FORT WAINWRIGHT ALASKA**

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We investigated Sandhill Crane roosting behavior on the Delta River and Delta Creek in interior Alaska, Fort Wainwright during spring and fall migration. Fort Wainwright agreed to limit disturbance in these areas and consult with wildlife management agencies prior to conducting training activities. These agreements are based upon data collected prior to 1986 and 1997 and warrant updating as crane roosting behavior could have changed both spatially and temporally. We conducted in-person surveys of riverbeds during sunrise via spotting scopes from 6 observation points between 2016 and 2018, and included previously collected data between 2011 and 2015 in part of the analysis. We found Sandhill Cranes were not using the Delta River any longer as a roosting site during spring migration. We did continue to observe cranes using the Delta River and the Delta Creek as roosting sites during fall migration. Overall numbers of

cranes roosting on the riverbed have slowly but steadily decreased since 2012. We found no correlation between absence of cranes roosting on the Delta River and concurrent military training events. We recommend removing training restrictions during spring and implement new management actions to limit possible impacts to roosting Sandhill Cranes and other wildlife, including prioritization of different Impact Areas during spring and fall migration and changes to sensitive habitat areas.

## **MODELING THE WINTER HABITAT USE AND MORTALITY RISKS OF CASSIN'S AUKLETS AND PIGEON GUILLEMOTS IN THE NORTH PACIFIC**

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For seabirds with seasonal reproductive patterns, conditions experienced during the non-breeding winter months can be the most limiting. Reduced prey, severe weather, and an increased risk of oil spill exposure from shipping traffic can all lead to a greater risk of mortality. Advances in animal tracking technologies have revealed much about the winter distribution of marine top predators, allowing researchers to make inferences on habitat use and environmental hazards during this critical period. Using archival light sensing tags, or geolocators, we aim to characterize the non-breeding range of Cassin's auklets and pigeon guillemots from Southeast Farallon Island, two species for which we have limited information on non-breeding movements. A total of 123 tags were deployed on Cassin's auklets from 2015–2018, and 60 tags on pigeon guillemots from 2017–18. Position estimates from raw light-level data were calculated with the R package "FlightR". With these movement data, step selection functions were applied to model habitat use, and identify important environmental covariates that best describe their winter movement patterns. Cassin's auklets dispersed further from the island during periods of warmer than average sea surface temperatures, likely searching for frontal regions with high productivity. Pigeon guillemots, in contrast, migrated north to British Columbia following the breeding season, concentrating inside of Haida Gwaii. In future work, we plan to use this method to model dispersal patterns of Alcids throughout their range, and predict how threats from climate change and potential oil spills will influence future movement patterns and survival rates for these and other species.

## **GYRFALCON DIETARY PLASTICITY IN A CHANGING TUNDRA ECOSYSTEM**

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Phenological shifts occur at different rates across taxa in response to climate change, leading to trophic mismatch. The degree to which specialist predators can adjust their foraging strategy to mitigate the negative effects of trophic mismatch remains unclear. We quantified patterns in reproductive success and diet in response to reproductive phenology in a population of Gyrfalcons (*Falco rusticolus*). We conducted nest camera dietary analysis on Alaska's Seward Peninsula over five years, accumulating 48 nest-years of dietary, morphometric, and phenological data. Gyrfalcon productivity was positively correlated with an earlier hatch date. Concurrently, across the brood-rearing period we observed a dramatic shift in Gyrfalcon diet from ptarmigan and shorebirds to arctic ground squirrels and passerines. Late-hatching nestlings had higher dietary percentages of atypical prey items. Our findings suggest that early breeders are better timed with their peak optimal prey availability (on which they can specialize), whereas late breeders buffer the negative effects of mismatch by increasing diet breadth at no detriment to the body condition of their nestlings. Dietary plasticity may thereby serve as an indicator of resilience to climate change in other populations and species.

## **YELLOW-BILLED LOON OCCUPANCY OF BREEDING TERRITORIES NEAR NEW OIL DEVELOPMENT**

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We conducted surveys for Yellow-billed Loons in 1993, prior to construction of the Alpine oilfield in 1998, continuing after construction through 2008. We used records from 37 breeding territories on 36 lakes in model selection to examine how habitat and disturbance influenced occupancy by nests and broods. Lake type and lake area were most influential on occupancy by nests and broods. Time period (pre-construction, construction, and post-construction) and distance to facilities (1.6 km and 3.2 km zones, and linear distance) were factors in the highest ranked models. However, interaction terms for time period and distance to facilities were not consistent with predicted effects. Occupancy of territories by nests was lower during pre-construction than in the post-construction period and higher near facilities than far from facilities. Occupancy of territories by broods was highest in the post-construction period and

similarly high near and far from facilities. We did not detect displacement from long-standing territories. Rather, the results suggest that territory occupancy by nests and broods of Yellow-billed Loons on the Colville delta was maintained despite the construction of oilfields. We will discuss other disturbance and environmental factors affecting Yellow-billed Loon occupancy and productivity.

## **SPECTACLED EIDERS ON THE COLVILLE DELTA, KUPARUK OILFIELD, AND NE NPR–A**

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We present results of 25 years of surveys for Spectacled Eiders on the Colville delta, Kuparuk oilfield, and NE NPR–A. ABR has conducted aerial surveys in the 3 areas since 1993 over various years to the present. Ground-based nest searches were conducted in specific areas where oilfield development was planned or had occurred. We also studied the effects of construction on breeding Spectacled Eiders of a satellite drill site (CD-3) on the Colville delta. Annual population trends varied from +2 to –3% among the 3 areas. Long-term mean densities of Spectacled Eiders were lowest in ABR’s NE NPRA survey areas (0.03 birds/km<sup>2</sup>), intermediate in the Kuparuk oilfield (0.06 birds/km<sup>2</sup>), and highest on the outer Colville delta (0.22 birds/km<sup>2</sup>). Pre-breeding Spectacled Eiders were significantly closer to oilfield facilities after construction of the Alpine Satellites than before ( $P < 0.04$ ). Successful nests averaged 98–429 m closer to the CD3 drill site than failed nests. However, no significant differences were found in distance to facilities among years or between fates of Spectacled Eider nests ( $P \geq 0.36$ ). Helicopter overflights were significantly longer at successful than at failed nests in 2007 ( $P = 0.02$ ) but not in 2006 ( $P = 0.17$ ). We will present data on incubation behavior, nest predators, and observations of reactions to disturbance.

## **MOVEMENT PATTERNS OF ARCTIC-BREEDING SHOREBIRDS DURING POST-BREEDING AND SOUTHBOUND MIGRATION**

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Shorebirds use coastal regions of the Arctic during post-breeding to acquire resources to migrate. Limited information is available on the inter-connectedness of breeding and stopover sites, as well as residency time and movements among stopover sites. Such information is needed to understand effects of climate change and development. We deployed tracking devices on four shorebird species breeding at four sites in Alaska (Utqiagvik, Colville River, Prudhoe Bay, and Canning River) and one site in Canada (Cambridge Bay, Nunavut). In 2017, we deployed 1.2 g GPS archival tags on 57 Dunlin and 68 Semipalmated Sandpipers – only 6 Dunlin and 1 Semipalmated Sandpiper tags were recovered a year later, perhaps due to an extremely late snow year or detrimental effects of tags. In 2018, we deployed 4 – 5 g GPS satellite tags on 15 Pectoral Sandpipers and 13 American Golden-Plovers. We will describe general patterns and new information on post-breeding movements and southbound migration. In 2019, we will expand the tagging effort to Red Phalarope and add more sites in Canada.

### **THE INTERACTIVE EFFECTS OF INCUBATION TEMPERATURE AND ORGANIC CONTAMINANTS ON EMBRYO DEVELOPMENT IN SHOREBIRDS**

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Nest temperatures during incubation and exposure of embryos to environmental contaminants can both negatively affect avian development *in ovo* and may have interactive effects that are more detrimental than either effect individually (cumulative effects hypothesis). Such interactions may be of particular concern for Arctic-breeding shorebirds, populations of which have declined in recent decades, concomitant with changes in spring temperatures and continued long-range transport of persistent organic pollutants (POPs). To assess levels of POPs in shorebirds and test the cumulative effects hypothesis, we conducted field and lab studies in shorebird models. In the former, we analyzed POPs in semipalmated sandpiper (*Calidris pusilla*) eggs from three Arctic sites and examined relationships between egg POPs, nest-cup temperature, and chick mass. To further evaluate these relationships, in our lab study, we injected killdeer (*Charadrius vociferous*) eggs either with a control (dimethyl sulfoxide) or with environmentally relevant concentrations (44 ppm and 89 ppm) of 3,3',4,4',5-pentachlorobiphenyl (PCB-126) and stratified each treatment group into low (36C), intermediate (37.5C), or high (39C) incubation temperatures. Although preliminary field results indicate low levels of POPs in shorebird eggs (relative to other species), at the nest level, egg POPs and chick mass were negatively correlated. In our lab study, results were consistent with predictions under the cumulative effects hypothesis, with effects of the high PCB-126 dose being observed only under low and high incubation temperatures. These findings suggest that under intermediate incubation temperatures, shorebird embryos may be more tolerant of contaminant exposure than when incubated under low or high temperatures.

## **SHOREBIRD ABUNDANCE ESTIMATES ON MILITARY LANDS IN INTERIOR ALASKA**

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Interior Alaska is the least studied region in Alaska for breeding shorebirds. Currently, no shorebird sites of importance, such as those designated by the Western Hemisphere Shorebird Reserve Network (WHSRN), have been identified in interior Alaska and little is known about associated shorebird distribution and abundance. The Department of Defense (DoD) is a major land manager in interior Alaska and a partner in avian conservation. This study is the first design-based comprehensive shorebird survey to estimate shorebird population sizes on DoD lands in interior Alaska. I modified Arctic PRISM protocol to address the increased diversity of habitat types and low density of shorebirds in the boreal forest. From April 2016 to August 2017, I used a probability-based sampling design to survey 78 and 142 400x400m plots respectively. Each plot was surveyed twice, with two dependent observers walking transects within plots to estimate detection probability and abundance. I estimated abundance using Huggins closed captures models in Program MARK. I estimated shorebird abundance for Lesser Yellowlegs, Wilson's Snipe, all lowland shorebirds, and all upland shorebirds. In 2017, abundances of all lowland shorebirds and all upland shorebirds were 42,239 (SE = 13,431) and 3,523 (SE = 494) respectively. Shorebirds are using military lands in interior Alaska in high abundances (45,762; SE = 13,925). Although densities of shorebirds are low, the military lands in interior Alaska are so large that they contain large numbers of breeding shorebirds as defined by the WHSRN (>20,000 shorebirds annually) and therefore should qualify as a WHSRN regionally important site.

## **DIET AND REPRODUCTIVE SUCCESS OF THE GREAT HORNED OWL AT ITS NORTHERN BREEDING LIMIT**

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We studied the diet and reproductive success of great horned owls (*Bubo virginianus*) at their northern breeding limit during a high in the snowshoe hare (*Lepus americanus*) cycle. Diet analyses were conducted using motion-sensor cameras on nests and through pellet collections. Breeding success was obtained from nest cameras and visual observations. Pellets from 14 nests produced 1277 prey observations, where diet consisted of 65-99% snowshoe hare biomass. Owls ate a total of 18 different prey items, with overall biomass composition consisting of 93%

mammal, 7% bird, and less than 1% insects, frogs, and fish. The mean prey mass of 714g (95% CI  $\pm$  34.26) was between 2 and 25 times the mean prey mass of studies at more southerly latitudes. Camera observations showed that owls delivered an average of 531g (95% CI  $\pm$  84.41) per chick per day throughout nesting. This was significantly ( $P=0.005$ ) higher than observations in similar studies in Alberta, at 328–411g per chick per day. Pellet data showed a strong correlation between the proportion of hares in the diet to breeding success, where owls delivering a higher proportion of hares successfully fledged more chicks ( $R^2 = 0.673$ ,  $P = 0.0006$ ), testifying to the importance of this prey in the population dynamics of the great horned owl.

### **MIGRATORY CONNECTIVITY OF A DECLINING SHOREBIRD: TRACKING TECHNOLOGIES REVEAL MIGRATORY PATHWAYS, PRIMARY STOPOVERS, AND WINTERING LOCATIONS OF ADULT LESSER YELLOWLEGS (*TRINGA FLAVIPES*)**

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The Lesser Yellowlegs (*Tringa flavipes*) is a Neotropical migrant shorebird that breeds across the boreal forest biome of North America from western Alaska to central Quebec. Over the past 40 years, the species has experienced a population decline of approximately 5% per year across North America. During June 2018, we deployed 19 PinPoint GPS-Argos satellite tags on breeding adults in Anchorage, Alaska. Collaborators in Canada deployed one tag in Yellowknife, NT and seven tags in James Bay, ON. Preliminary results indicate that Lesser Yellowlegs population segments experience relatively low migratory connectivity during the non-breeding season. Additionally, timing of departure from breeding sites and total migratory distance to non-breeding locations are correlated. Adults at the western extent of the breeding range begin migration earlier and travel further than birds breeding at the eastern extent. Lesser Yellowlegs are frequently harvested in northeastern South America and the Caribbean, therefore, information on the migratory patterns and breeding origins of birds traveling through harvest regions is imperative for developing and implementing conservation actions.

## **NOT TOO HOT, NOT TOO COLD: HOW ADAPTABLE ARE SHOREBIRDS TO VARIABLE BREEDING CONDITIONS?**

**Rebecca McGuire**<sup>1</sup>, Richard Lanctot<sup>2</sup>, Sarah Saalfeld<sup>2</sup>, Dan Ruthrauff<sup>3</sup>, Chris Latty<sup>4</sup>, and Stephen Brown<sup>5</sup>

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Shorebirds breeding in the Arctic must contend with a very short breeding season and harsh climatic conditions. The Arctic climate is changing rapidly, becoming more variable and unpredictable. The ability of shorebirds to adapt to this change is likely tied to their breeding strategy. We used data from two early and two late summers to investigate how shorebirds respond to the increasing variability of climate conditions in the Arctic. These extreme years provide insight into how species cope with early and late year conditions, and thus are useful for predicting how adaptable species will be in the future. This will help us identify the likely ‘winners’ and ‘losers’ in the climate change race. We will first describe the environmental conditions during two early (2015–2016) and two late (2017–2018) summers at four field sites in northern Alaska. We will then explore how shorebird species vary in terms of their adult body condition and site fidelity, as well as reproductive parameters such as nest initiation and density, clutch volume, and nesting success, during early and late springs.

## **MOVEMENTS OF YOUNGER COHORTS OF PRE-BREEDING GOLDEN EAGLES DURING THE BREEDING SEASON IN ALASKA**

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Effective conservation of Golden Eagles (*Aquila chrysaetos*) requires identifying factors that regulate their abundance, including demographic and environmental processes acting through their annual cycle. This includes identifying areas and resources that both breeders and pre-breeders (i.e. individuals who have not completed natal dispersal) use throughout their annual cycle. Golden Eagles exhibit deferred age at breeding and many probably spend a substantial portion of their lives as pre-breeders. Yet, the natal dispersal process of Golden Eagles is still largely unknown. To address this information gap, we are studying the movements of pre-breeding migratory Golden Eagles throughout their annual cycle. Here, we describe their movements during the breeding season (March–September) in Alaska as revealed by GPS-satellite and GPS-GSM telemetry. Many pre-breeding eagles exhibited nomadic behavior patterns during the breeding season, moving thousands of kilometers and using a variety of habitats ranging from coastal tundra and wetlands to interior alpine areas. Others exhibited nomadic behavior for part of the breeding season, but also settled into specific areas for extended

periods. Overall, our studies suggest that pre-breeding eagles often use resources at a statewide scale during the breeding season. Further, use of the same areas by individual eagles telemetered decades apart suggests that some areas, including tundra and wetlands on Alaska's North Slope, provide essential resources for pre-breeding Golden Eagles.

## **HOW WILL CLIMATE CHANGE AFFECT THE NUTRIENT DYNAMICS OF GOOSE FORAGE IN THE ARCTIC?**

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Goose abundance in Arctic Alaska has increased dramatically since the 1990s, coinciding with a period of particularly rapid warming. Whereas recent warming in the Arctic is associated with an increase in plant primary productivity, there likely exists a temperature-induced threshold beyond which the foliar ratio of carbon to nitrogen exceeds what is suitable for goose digestibility. To predict how nutrient composition and availability of forage plants will be affected by warming temperatures, we used an *in situ* experimental approach to manipulate the temperature of coastal grazing habitats in Arctic Alaska. We paired experimental plots that were warmed via open-top-chamber greenhouses with plots that were cooled by shade fabric that reduced solar radiation. Vegetation samples were collected weekly from experimental plots and analyzed for quality (percent nitrogen) and quantity (biomass). Forage quality decreased with increasing temperature, but these reductions were relatively minor over the range of observed variation in temperature. In contrast, forage quantity showed a strong positive relationship with temperature. Taken together, our results suggest that the availability of high-quality goose forage in Arctic Alaska will increase over the range of predicted climatic conditions within the next 50 years. As such, environmental carrying capacity is increasing along with goose abundance, and the response of forage plants to climate change is not likely to play a role in limiting population growth of Arctic geese.

## **EDNA METABARCODING ANALYSES OF LOON (GAVIA) DISTRIBUTION AND DIET**

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The vast, roadless landscapes characterizing much of Alaska pose logistical challenges when attempting to detect the presence of loon species in waterbodies, necessary information needed to identify habitat use and requirements. As well, a better understanding of the composition of prey items in the diet of loons is hindered by logistical and technical difficulties. We have developed an eDNA metabarcoding system that can detect up to 37 species of fish occupying waterbodies in mainland Alaska, including in the Arctic Coastal Plain, and have recently modified this system

to include markers that can differentiate among the five species of loons inhabiting waterbodies in Alaska. We are currently testing this system on eDNA extracted from loon feces to determine whether the metabarcoding approach will be useful in delineating fish species comprising the diet of loons. If successful, the application of this approach will allow us to simultaneously detect the presence of loons, determine their diet, and describe the fish communities in the waterbodies they inhabit. This will facilitate a greater understanding of habitat use by loons occupying Alaskan habitats.

## **OCCUPANCY AND HABITAT USE OF LOON POPULATIONS IN ARCTIC AND WESTERN ARCTIC ALASKA**

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Understanding how different loon species occupy and use habitats is necessary for loon conservation, particularly when one species is rare. Yellow-billed Loons are a species of concern due to small global population size, habitat limitations and low fecundity. Their entire U.S. population is seasonally located in Alaska and is restricted to tundra lakes that are large, deep, clear, freshwater, and fish-bearing with complex shorelines. Most Yellow-billed Loons in Alaska occur in areas slated for development on the Arctic Coastal Plain in the National Petroleum Reserve-Alaska (NPR-A). However, smaller populations nest in western Alaska on the Seward Peninsula in Bering Land Bridge National Preserve (BELA). Yellow-billed Loons co-occur in these areas with Pacific and Red-throated Loons. Agencies collaboratively conduct aerial surveys on these three loon species in both areas to compare occupancy and habitat use among populations. Preliminary analyses suggest the three species respond similarly to global climate influences across study areas, but may differ in occupancy and habitat use between Arctic and western Arctic habitats. As development progresses, habitat in parklands may become more important for maintaining loon nesting habitat in Alaska.

## **SHOREBIRD SUBSISTENCE HARVEST AND INDIGENOUS KNOWLEDGE IN ALASKA**

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Shorebird population declines worldwide have increased the need for knowledge and collaboration among stakeholders. Shorebird subsistence harvest has occurred in Alaska for millennia. Although this harvest is relatively small, it includes species of conservation concern. Our objectives were to provide Alaska-wide shorebird harvest estimates and to better understand

the importance of shorebirds as food and cultural resources for Alaska's subsistence communities. Harvest estimates were based on surveys conducted in 1990–2015 (n=775 community-years). Indigenous knowledge interviews (n=72) conducted in 2017 focused on ethnotaxonomy and ethnography in the Yukon-Kuskokwim Delta. The Alaska-wide shorebird harvest was 2,783 birds/year and godwits accounted for 1,115 birds/year. The egg harvest was 4,676 eggs/year. We identified 24 Yup'ik shorebird ethnotaxonomic categories. Respondents appreciated shorebirds and other birds as intrinsic and joyful environment components. Traditionally, small birds including shorebirds have been the focus of children learning hunting skills. Cultural items related to shorebirds included stories, songs, worldviews, place names, and wooden masks. However, shorebirds were not primary food and cultural resources. Many respondents reported that numbers of shorebirds have declined. This study provided insights to improve harvest monitoring and management, and culturally relevant approaches to engage subsistence users in shorebird conservation.

## **IS GEOGRAPHICAL PREVALENCE OF BEAK DEFORMITIES RELATED TO PATTERNS OF GENETIC DIVERSITY IN NORTHWESTERN CROWS IN ALASKA?**

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In Alaska, adult Northwestern Crows exhibit a high prevalence (16.9%) of beak deformities associated with avian keratin disorder, the highest rate of gross deformities ever recorded in a wild bird population. Prevalence varies geographically, with sites in southeastern Alaska showing lower prevalence than sites in southcentral Alaska, suggestive of epizootic clusters. We investigated the population structure of Northwestern Crows in Alaska using mitochondrial DNA and microsatellite data to elucidate the relationship of dispersal of individuals relative to disease transmission. Specifically, we aimed to determine if the geographic prevalence of beak deformities was related to patterns of genetic differentiation, and if patterns of population structure along the North Pacific Coast could be explained by past glacial history or current physiographic barriers. We found that populations of Northwestern Crows in Alaska show a subdivision between southcentral and southeastern Alaska. Both nuclear and mitochondrial markers showed significant spatial genetic structure between southcentral and southeastern Alaska, and partitions in the genetic data appear to be influenced by topographic features (e.g., mountain ranges). The prevalence of beak deformities and the pattern of genetic diversity appear to be related, such that genetic diversity is lower in southcentral populations where a higher prevalence of beak deformities is observed. Future research examining the role of dispersal relative to disease transmission and the role of genes regulating beak growth and immune response could help clarify underlying processes producing the pattern of epizootic clusters associated with this disorder.

## **GENETIC DIVERSITY AMONG FOUR LOON SPECIES NESTING IN ARCTIC ALASKA**

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Among five species of loons nesting in high latitude habitats in North America, three — Yellow-billed, Red-throated, and Pacific loons — breed on the Arctic Coastal Plain of Alaska, where rapid physical changes and petroleum exploration and development are occurring. Thus, understanding basic parameters of northern populations of these species is important. In a comparative approach, we assessed levels of genetic diversity as proxy for adaptive capacity, at >50 homologous markers in these three species, and in the more broadly-distributed Common Loon. Our preliminary analyses found the lowest levels of genetic diversity in Yellow-billed Loons, and the second-lowest in Red-throated Loons; Pacific Loons showed the highest levels. The Yellow-billed Loon also showed reverse ascertainment bias at microsatellite markers, a phenomenon described in other avian species that demonstrate relatively low effective population size. This research corroborates independent assessments that Yellow-billed and Red-throated loons may have relatively low adaptive capacity and informs research investigating the response of these species to physical changes in the Arctic.

## **EIDERS AND SEA ICE: SPECTACLED EIDER WINTER SURVEYS PAST, PRESENT, AND FUTURE**

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Since 1995, when the area of the Bering Sea used by Spectacled Eiders during winter was first discovered, the U.S. Fish and Wildlife Service has conducted aerial surveys of wintering Spectacled Eiders eight times during six years (1995–1998, 2009–2010). Individuals from all three primary breeding areas (Yukon-Kuskokwim Delta and Arctic Coastal Plain in Alaska, and the eastern Arctic of Siberia in Russia) winter together, thus abundance estimates from the wintering area are estimates of virtually the entire world population of Spectacled Eiders. Eiders concentrate in open water leads in the sea ice, making them relatively easy to locate and photograph from a fixed-wing aircraft; however, this photo census approach does not work when little or no sea ice is present. The long-term decline of sea ice extent and concentration in the

Bering Sea has raised the question: How should we count Spectacled Eiders in low sea ice conditions? We will review aerial photo sampling methods designed for high and low sea ice conditions, as well as movements of Spectacled Eiders carrying satellite transmitters in relation to sea ice conditions in the Bering Sea during winter 2018–2019.

## **SIMILAR, BUT DIFFERENT: USE OF MARINE RESOURCES BY SYMPATRICALLY BREEDING RED-THOATED AND PACIFIC LOONS**

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Red-throated (*Gavia stellata*) and Pacific (*G. pacifica*) loons breed sympatrically but use different foraging habitats: Red-throated Loons feed in marine habitat, Pacific Loons feed primarily in freshwater habitat. We examined the consequences of partitioning foraging habitat on diet, body condition, and productivity. Stable isotopes and fatty acids indicated Pacific Loon diet included both freshwater and marine prey. The amount of marine prey decreased with increasing lake size, suggesting small lakes were not profitable foraging habitat, but the close proximity of marine habitat enabled their use for nesting. In contrast, Red-throated Loons nested on small lakes and ate only marine fishes. Despite differences in diet, both species had similar body condition. During brood rearing, Pacific Loons had a high brood provisioning rate and fed their chicks mostly freshwater invertebrates with low-lipid content. Red-throated Loons provisioned their chicks large-bodied, energy-dense marine fishes at a low rate. Reproductive success was higher in Red-throated than Pacific loons due to higher chick survival rates. Estimates of maximum energy provisioning rates for broods demonstrated that Red-throated Loons could more easily meet peak brood energy requirements than Pacific Loons. Thus, lower survival of Pacific Loon chicks was associated with lower maximum energy provisioning rates. These results indicate that differential reliance on marine resources was associated with differences in diet, breeding success, and, potentially, adaptive capacity.

## **Nesting Study of Greater White-fronted Geese at a new Drill Site in NPR–A**

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We studied factors influencing nesting densities and nesting success of Greater White-fronted Geese at a new drill site in eastern NPR–A. We conducted 4 years (2013, 2014, 2015, and 2017) of a 5-year study spanning pre- and post-construction of the CD-5 drill site, 7 km west of the Colville River. Each year we searched for nests on 40 10-ha plots randomly placed around the drill site. We recorded standard nest data, floated eggs to estimate egg age, installed temperature-sensing eggs in ~40 nests each year, and counted nest predators on each plot. The density of White-fronted Geese increased yearly from 2013 to 2017, peaking at 38.4 nests/km<sup>2</sup> (mean = 3.8 nests/plot). In 2014 and 2015, geese took  $\leq 1$  recess/day, averaging  $\geq 99\%$  incubation constancy at both successful and failed nests. In 2017, geese took twice as many recesses (1.9 and 2.3

recesses/day at successful and failed nests, respectively) and had lower incubation constancies (96.2% and 95.5% at successful and failed nests, respectively). Successful nests were closer to roads and the drill site than were failed nests in 2014 and 2015, but reversed in 2017. Nesting success increased from 2013 to 2015, then declined in 2017. Apparent nesting success was higher for nests implanted with thermistor eggs than those without. Influences of environmental and disturbance factors are discussed.

## **TIMING, BREEDING PROPENSITY, AND CHICK GROWTH OF SHOREBIRDS AT AN ARCTIC SITE IN ALASKA: DOES INTERANNUAL VARIABILITY IN ENVIRONMENTAL CONDITIONS OVERRIDE POTENTIAL MISMATCHES?**

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We studied the breeding propensity and timing of reproductive events of shorebirds on the Colville River in northern Alaska from 2015–2018. To assess evidence for potential mismatch scenarios, we also monitored the growth of Semipalmated Sandpiper (*Calidris pusilla*) chicks with respect to the availability of invertebrate prey resources. We monitored over 250 nests of 11 shorebird species in both 2015 and 2016, but these values were lower in 2017 (n = 112 nests) and 2018 (n = 91 nests). Nest initiation was also considerably delayed for all shorebird species in both 2017 and 2018, observations that are a consequence of unusually cold spring conditions with extensive and persistent snow cover in both years. Despite these marked environmental differences, hatch in 2017 nonetheless coincided with abundant invertebrate resources, and the growth of Semipalmated Sandpiper chicks was similar to rates in 2015 and 2016. In general, we observed the greatest negative impact to chick growth during stochastic periods of cold. Such results demonstrate the ability of long-distance migrant shorebirds like Semipalmated Sandpipers to align reproductive efforts with the availability of food resources even in the face of strong interannual variability in environmental conditions.

## **MEW GULL NESTING: SPATIAL DISTRIBUTION AND SURVIVAL IN AN URBAN ENVIRONMENT ON FORT WAINWRIGHT, ALASKA**

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Mew Gulls (*Larus canus*) nest on the Main Cantonment of U.S. Army Garrison Fort Wainwright, Alaska. They often place nests on top of buildings and equipment, which can interfere with military operations. Additionally, Mew Gulls that nest near Ladd Army Airfield are strike hazard to aircraft. Our objectives were to i) determine spatial distribution of Mew Gull nests and nest intensity, and ii) determine which factors affect Mew Gull nest survival. In May-July 2016 and 2017, we surveyed the Main Cantonment for Mew Gull nests, surveyed nest

habitat, and monitored nest fates. To model the spatial distribution of nests, we used point process models. We used nest survival models to estimate daily survival probability. Modeled results showed that gulls nested in clusters, near buildings and waterbodies, and away from buildings with dogs. Daily nest survival model indicated that survival was highest when a nest was on a structure, near a neighboring nest, and away from a waterbody. Survival decreased as the nest aged. Our results inform natural resource managers where to manage habitat on Main Cantonment of Fort Wainwright when to discourage Mew Gulls from nesting at problematic sites.

## **SEASONAL SURVIVAL OF YELLOW-BILLED LOONS**

**Joel A. Schmutz**<sup>1</sup>, Jeffrey S. Fair,<sup>2</sup> Kenneth G. Wright,<sup>1</sup> Christopher R. DeSorbo,<sup>3</sup> Daniel M. Mulcahy,<sup>1</sup> Daniel J. Rizzolo,<sup>1</sup> Brian D. Uher-Koch,<sup>1</sup> Barbara J. Pierson,<sup>1</sup> and David C. Douglas<sup>1</sup>

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[Abstract will be added later]

## **RAPTOR STUDIES FOR A PROPOSED HYDROELECTRIC PROJECT IN ALASKA: APPLICATION OF INNOVATIVE TECHNIQUES**

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From 2012–2014, ABR conducted aerial nesting surveys, sightability assessments, and delineated eagle nesting habitats to determine the abundance and distribution of raptor nests, characterize breeding population parameters, and identify alternative nesting habitats for raptors that may be affected by the proposed Susitna-Watana Hydroelectric project. We used GIS to model potential cliff-nesting habitat as a function of slope, elevation, and NDVI to improve the accuracy and efficiency of cliff-nesting surveys over a vast area (5,091 km<sup>2</sup>). We adapted a technique developed for moose population surveys to assess raptor nest sightability. Golden Eagle nests were the most numerous and widely distributed, followed by nests of Bald Eagles, Peregrine Falcons, Gyrfalcons, and other raptors. The density of Golden Eagles was 120–136 km<sup>2</sup>/occupied territory; 204–1,000 km<sup>2</sup>/breeding pair; 14–59% of occupied territories had breeding pairs; and productivity averaged only 0.18–0.61 young/breeding pair (0.05–0.32 young/occupied territory). For a single occupancy survey conducted in spring, our calculated Sightability Correction Factor (a multiplier for located nests) was 2.25 for all Golden Eagle nests; however, the SCF was only 1.29 for occupied nests. With two years of surveys (two full occupancy surveys and revisits for productivity), 94% of the projected nests were located. We delineated 749 areas containing cliffs suitable for Golden Eagle nesting using a combination of visual delineations and our GIS model, which identified potential nesting habitat for impact

assessment. The results of this study have contributed substantially to our ecological knowledge of this area in Alaska.

## **NEOTROPICAL MIGRANT BIRD HABITAT ASSESSMENT, FORT WAINWRIGHT, ALASKA**

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Fort Wainwright is responsible to comply with the Migratory Bird Treaty Act and the Sikes Act, and failure to comply may negatively impact military training operations. Literature reviews can provide insight into which habitats are important to songbirds, but not at a high enough resolution to advise habitat management decisions of specific species on Fort Wainwright training lands. Further, single surveys in specific areas of interest fail to account for annual and seasonal shifts of migrating songbirds. Therefore, we analyzed species richness of songbirds throughout habitats in the Tanana Flats Training Area (TFTA), Yukon Training Area (YTA), and Donnelly Training Area - East (DTA-E), and describe habitat requirements of an Army Species-at-Risk, the Rusty Blackbird (*Euphagus carolinus*). We collected 10-minute independent double observer auditory point count data in May and June of 2016, 2017 and 2018 at 470 randomly selected sites where site-specific habitat characteristics and time-specific conditions were recorded. Occupancy modeling was used to evaluate songbird data across habitat types. We found that areas with persistent annual water, dominated by grass and herbs, near transitional areas (shrub to forests) across both TFTA, YTA, and DTA-E contain the highest richness of species and are important for Rusty Blackbirds. Therefore, large training operations and infrastructure development should be avoided in these areas from late April to early August.

## **IMPLEMENTATION OF ARCTIC PRISM SURVEYS IN WESTERN ALASKA: WHAT WE LEARNED ABOUT SHOREBIRD DISTRIBUTIONS ON THE YUKON-KUSKOKWIM DELTA**

**Kristine M. Sowl**<sup>1</sup>, Stephen C. Brown<sup>2</sup>, James E. Lyons<sup>3</sup>, Richard B. Lanctot<sup>4</sup>, Brad Winn<sup>2</sup>, Sarah T. Saalfeld<sup>4</sup>, James A. Johnson<sup>4</sup>, Brian J. McCaffery<sup>4</sup>, and Brad A. Andres<sup>5</sup>

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The 78,000 km<sup>2</sup> Yukon-Kuskokwim Delta (Delta) in western Alaska supports approximately 3–4 million pairs of breeding shorebirds from 27 species, including populations unique to Beringia. However, previous information available on the distribution of shorebirds in this vast region was limited in scope, with most prior work focused on the central coast. In 2015–16, we conducted surveys at 621 plots distributed randomly across 7 different habitat strata of the Delta to estimate

population size and distribution of breeding shorebirds. We used a well-documented area search procedure from the Arctic Program for Regional and International Shorebird Monitoring to survey birds. Twenty-four species of breeding shorebirds were observed. We will describe the distributions of a subset of the species observed and compare these results with previous descriptions of species distributions. More accurate shorebird distribution information will enable managers to more effectively evaluate and potentially mitigate the impacts of local developments on shorebird populations and to estimate how distributions of breeding shorebirds may respond to climate-mediated habitat change.

## **PERSISTENCE OF BIRD CONCENTRATION AREAS ON ALASKA'S ARCTIC COASTAL PLAIN**

**Benjamin K. Sullender**<sup>1</sup> and Melanie A. Smith<sup>2</sup>

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Alaska's Arctic Coastal Plain is recognized for internationally significant biological values, including key bird nesting, stopover, and molting habitat. At the same time, the Arctic Coastal Plain is being markedly impacted by climate change, and species distributions may shift in response to a rapidly changing environment. Long-term observation data can help identify areas that have provided and will continue to provide important habitat, even in the midst of ecological changes. Our goal with this analysis was to identify areas that support recurring high concentrations of Arctic waterbirds. We analyzed 20 years of aerial survey data from the U.S. Fish & Wildlife Service's Division of Migratory Bird Management. We aggregated these surveys into four five-year time periods: 1996–2000, 2001–2005, 2006–2010, and 2011–2015. We divided survey transects into a series of cells and, for each cell, quantified survey-effort weighted bird observations for 13 bird taxa. For each taxon and each time period, we converted effort-weighted observations into percentiles. We identified cells within the top 90<sup>th</sup> percentile for each species as high concentration areas. We defined high concentration areas for at least three of the four time periods as persistently important areas. All species studied had at least a few persistently important areas, distributed widely from Dease Inlet to the Colville River delta. Although many rapidly progressing impacts of climate change are focused on the coastline and coastal habitats, these same areas have and continue to support high concentration areas for a wide range of birds.

## **REPRODUCTION OF PEREGRINE FALCONS ALONG THE COLVILLE RIVER, ALASKA**

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Peregrine Falcon (*Falco peregrinus*) populations declined globally during the latter half of the twentieth century from widespread use of organochlorine pesticides. The population of cliff-

nesting Arctic Peregrine Falcons (*F. p. tundrius*) on the Colville River reached lows in abundance and productivity in the 1970s. We documented the recovery and stabilization of the population, which followed restrictions on the use of DDT and related compounds, by surveying the same 347 km of the river annually from 1981 to 2002 and intermittently thereafter. The population increased from 23 pairs in 1981 to 61 in 1994, growing at an average rate of about 8% per year, then stabilized around a mean of ~ 57 pairs. Though declining throughout the study period, productivity during the recovery (1981–1994) and post-recovery ( $\geq 1995$ ) periods did not differ. The number of young that pairs produced was positively related to how often nesting territories were occupied and negatively related to location (with pairs downriver producing fewer young than those upriver) and year. The number of young produced was not related to the density of nearby pairs, complicating identification of density-dependent factors that caused population stabilization. We speculate that pairs occupying nesting cliffs along major rivers may poorly represent population-wide fecundity rates.

## **POPULATION GENETICS ANALYSIS OF YELLOW-BILLED LOONS NESTING IN WESTERN ARCTIC NORTH AMERICA**

**Sandra L. Talbot**<sup>1</sup> George K. Sage<sup>1</sup>, Barbara J. Pierson<sup>1</sup>, Meg C. Gravley<sup>1</sup>, Brian Uher-Koch<sup>1</sup>, Joel Schmutz<sup>1</sup>, Angela Matz<sup>2</sup>, Debora Nigro<sup>3</sup>, and Melanie Flamme<sup>4</sup>

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Significant population genetic structure is expected within species that show high levels of philopatry (natal site fidelity), and that signature is exacerbated in migratory species that also demonstrate fidelity to wintering areas. To verify whether these behaviors have resulted in differentiation among Yellow-billed Loon populations, as predicted, we developed a suite of neutral nuclear and mitochondrial markers to investigate levels of population genetic structuring among Yellow-billed Loons nesting on the Seward Peninsula and the Arctic Coastal Plain of Alaska, and two localities in Canada (Daring Lake and Cambridge Bay). Preliminary analyses based on both traditional tests of population differentiation and Bayesian clustering methods suggest that, despite overall low levels of genetic variability in Yellow-billed Loons, the markers uncovered significant population structuring among locales, including between loons breeding on the Seward Peninsula, and the Arctic Coastal Plain, and more regionally, between Alaskan and Canadian locales. The genetic data suggest that Yellow-billed Loons nesting in Alaska and Canada comprise discrete populations, among which gene flow is restricted.

## **TERRITORY RETENTION OF PACIFIC AND YELLOW-BILLED LOONS BREEDING IN NORTHERN ALASKA**

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Pacific and Yellow-billed loons breeding in northern Alaska have contrasting population trajectories; therefore, it is important to quantify retention rates to help understand population dynamics of these species. Loons evaluate breeding territories for potential occupation the following year, and we hypothesized that increased competition for productive territories would result in a decrease in territory retention rates. We used mark-resight data of adult Pacific and Yellow-billed loons on their breeding territories to: 1) quantify territory retention and survival rates for individually marked adult loons; 2) evaluate the factors influencing territory retention; and 3) determine the impact of breeding success on territory retention. We also conducted behavioral observations of brood-rearing adult loons to quantify the frequency of visits by intruders. Overall territory retention rates were high and similar for both species. Territory retention rates the year following successful breeding attempts were only slightly lower than after failed breeding attempts, and few territories were consistently successful across years. High territory retention rates, high frequency of visits by prospectors, and limited habitat for establishing new territories suggests that breeding habitat in northern Alaska is saturated and may be limiting Yellow-billed Loon populations. These results will help inform land management decisions for oil and gas development in areas where loons are present.

## **AUDUBON ALASKA'S WATCHLIST OF DECLINING OR VULNERABLE ALASKA BIRDS**

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Audubon Alaska's WatchList is a report that uses a data-based process to identify Alaska birds that are declining or vulnerable, therefore warranting special conservation attention. We associated each regularly occurring bird species in Alaska (and some subspecies) with a score based on four criteria and their accompanying assumptions: 1) Global population size: small populations are more vulnerable than large populations; 2) Minimum range occupied seasonally: populations concentrated in a small area are more vulnerable than populations spread over large areas; 3) Area importance (percent of global population occurring in Alaska): our stewardship responsibility is greater for species that have a large percentage of their population in Alaska; and 4) Population trend (weighted x3): Declining populations are at greater risk than stable or increasing populations. If a species or subspecies that qualified for the WatchList ( $\geq 20$  points) is either declining or depressed (population trend  $\geq 4$  points), they appear on the Red List. Non-declining, yet vulnerable species scoring at least 20 points appear on the Yellow List. We will review how we evaluate birds for the Watchlist, discuss which birds are on the WatchList,

identify some of the major threats to Alaska's birds, and review some successes in recovery of previously Red Listed birds.

## **MODELING WIND EXPOSURE: IMPLICATIONS FOR COMMON EIDERS NESTING ALONG THE ARCTIC COASTAL PLAIN**

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Along the Arctic Coastal Plain (ACP), storm surge regimes are predicted to change and increase the risk of flooding for common eider (*Somateria mollissima v-nigrum*) nests on low-lying barrier islands. Earlier and more volatile storm surges may render lower elevation nest sites inviable, increasing reliance on higher elevations. However, higher elevation nest sites may experience more wind exposure, potentially increasing the energy demands of incubation. Since common eiders fast during incubation, they are sensitive to increases in energy demands. The goal of this study is to evaluate which components of nest microclimate best predict wind exposure of incubating common eiders along the ACP. In 2018, we recorded wind speed and collected various microclimate parameters at common eider nests across ACP barrier islands. We will present results from a candidate set of mixed effects models for predicting wind exposure of incubating common eiders. We will then assess how physiological parameters (e.g.: heart rate and body condition) vary in relation to wind exposure at nest sites. This information will inform risk assessment and management strategies by increasing our understanding of how changing storm surge regimes may affect common eiders along the ACP.

## **MOVEMENT STRATEGIES AMONG BALD EAGLES IN AN ANADROMOUS FISH SYSTEM**

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While evidence exists regarding variability of movement strategies among different species, evidence is less prevalent for the extent of variability of movement strategies within species. Intraspecific variation in movement strategies may be particularly prevalent in environments in which resources are highly variable. Here, we explore intraspecific variation in movement strategies of a species in a large-scale, heterogeneous environment, using bald eagles in the highly variable anadromous fish system of the north Pacific coast as a case study. We tracked 30 bald eagles using GPS transmitters between 2010 and 2016. We found four movement strategies among bald eagles in southeastern Alaska and western Canada: sedentary breeders who remained

on nesting territories year-round, localized individuals who made predominately short-distance movements among sites, migratory individuals who consistently traveled between distinct summer areas and winter ranges, and nomadic individuals with irregular movement patterns that showed little interannual consistency. The highly variable anadromous fish system of the north Pacific coast likely contributes to behavioral plasticity in bald eagles in this region and results in a range of movement strategies in the population. Effective conservation and management of north Pacific bald eagles will require a framework that recognizes the high variability in movement strategies adopted by individuals in the population.

## **EVALUATING METHODS FOR DETERMINING NEST PREDATORS OF COMMON EIDERS**

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Nest predation is a known limiting factor to the reproductive success of Pacific common eiders (*Somateria mollissima v-nigrum*, COEI). Common eider nests on barrier islands and spits in the Beaufort Sea may be at increasing risk of predation due to changes in predator densities and distributions. Identity of nest predators has traditionally been determined by evaluating qualitative evidence left at the nest. However, using quantitative predator-evidence profiles from observed depredation events has been proposed as a more objective method. During June-July 2015–2017, we used time-lapse cameras to record predator activity at approximately 300 COEI nest sites throughout the incubation period. Glaucous gulls (*Larus hyperboreus*), arctic foxes (*Vulpes lagopus*), polar bears (*Ursus maritimus*), and grizzly bears (*Ursus arctos*) were the most common nest predators. In 2016 and 2017, we used both traditional qualitative methods and quantitative predator profiles for evaluating evidence of nest predators, and compared results to observations from time-lapse camera footage. Both the traditional and quantitative methods were unreliable for determining nest predators. Flooding events, wind erosion, and multiple predators at individual nests led to ambiguous or unclear evidence of nest fate with both methods. These results suggest that use of nest cameras or direct observation of nesting areas is necessary for determining relative importance of specific nest predators to COEI reproductive success in the Beaufort Sea study area.

## **THE DENALI AVIAN YOUTH MENTORING PROGRAM: FOSTERING LIFE-LONG CONNECTIONS WITH ALASKA'S NATIONAL PARKLANDS THROUGH PLACE-BASED SCIENCE LEARNING**

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

## **THE STATE BIRD COLLECTION AT THE UNIVERSITY OF ALASKA MUSEUM: RESEARCH AND DIRECTIONS**

**Kevin Winker**

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I provide an update on several aspects of the bird collection at the University of Alaska Museum. It is an important scientific research resource for people studying birds in Alaska, the U.S., and the world. It is also being used to study the environments the birds lived in. The scientific impact of this collection is remarkably large for its size, but it needs to continue to grow to document the many changes occurring now. I highlight some of the recent research that uses material from the collection, including divergence and species limits in birds, the effects of climate change, and avian transport of pathogens.

## **POSTER ABSTRACTS**

### **MODEL-PREDICTION OF GREAT GRAY OWL DISTRIBUTION IN ALASKA WITH ‘CLOUD COMPUTING’ TOOLS FOR ASSESSMENT OF HABITAT**

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The great gray owl (*Strix nebulosa*, GGOW) is a widely recognized bird in the circumpolar Arctic, but a little understood species in Alaska. Reported public sightings (citizen science) and open access data of environmental variables (data mining) can be used to create a relative index of occurrence (RIO), an advanced type of species distribution modeling. Additionally, remotely-sensed images from landsat-8 scenes with full Alaska coverage are used in the model, incorporating wavelength bands as additional predictors. Maps are created using machine learning, an established but powerful approach for determining potential habitat and distribution of species. These were produced with different machine learning methods in both physical and ‘cloud’ platforms to optimize a single model. Recorded sightings of this owl are collected from online databases such as GBIF and iNaturalist, and relative index values of occurrence are modeled. Because this project is based on public records, the reporting of sightings by the general public is extremely valuable; it envelops more spatial variation than through surveys alone, and increases sampling diversity. A current state-of-the-art map of GGOW distribution in Alaska is presented using all available presence data and multiple environmental and spatial variables in the most up-to-date Alaska distribution map for GGOWs. With this information, an assessment of principal habitat, and hence the effects of changing climate on future habitat supportive of the GGOW. Additional occurrence records are excitedly welcome and will be used in future modeling efforts.

### **SITKA WINTER BIRD OBSERVATION PROJECT**

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We summarize the results of 7 years of color-banding and re-sighting common wintering birds in Sitka Alaska: Chestnut-backed Chickadee, Dark-eyed (Oregon) Junco, and Song Sparrow. Our research interests include: 1) documenting site fidelity of local over-wintering individuals, 2) gaining insight into dispersal patterns of resident individuals throughout the year and 3) population structure of wintering juncos. With this project we also fostered community interest in and knowledge of wintering songbirds by banding at schools and encouraging community-wide citizen-science participation. We will show results from our observation database, which includes summer observations for all three species, records of winter site fidelity for all three species both within and between years, and both short and long-distance dispersal records for Oregon Junco. Banding occurred annually in November and sightings were solicited year-round.

The color-banded sample through November 2017 includes 343 Dark-eyed Juncos, 41 Chestnut-backed Chickadees and 23 Song Sparrows. Capture results from November and December 2018 will be also be shared.

## **HYPEREUMELANISTIC HORNED GREBE OBSERVED IN EASTERN INTERIOR ALASKA**

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On 30 May, 31 May, and 1 June 2017 we observed a melanistic Horned Grebe (*Podiceps auritus*) at Canvasback Lake (66° 23.13' N, 146° 23.18' W) on the Yukon Flats National Wildlife Refuge, situated in eastern interior Alaska, 185 km north of Fairbanks. We photographed it, accompanied by a smaller Horned Grebe in normal breeding plumage, on 30 and 31 May. Noticeably larger than the second bird so presumably a male, the melanistic Horned Grebe had the mantle, back, and rump black. Darker-than-normal plumage is referred to as hypermelanism (also called melanism or nigrism); it is termed hypereumelanism when the plumage is predominantly black. We suspect that the dark-pigmented grebe we observed represents an example of hypereumelanism. So far as we have been able to determine, our observation provides the first report of hypereumelanism in the Horned Grebe.

## **REVISED PRINCIPLES FOR CONDUCTING RESEARCH IN THE ARCTIC**

**Sara Bowden**<sup>1</sup>, Chris Campbell<sup>2</sup>, Renee Crain<sup>3</sup>, Roberto Delgado<sup>3</sup>, Martin Jeffries<sup>4</sup>, Igor Kupnik<sup>4</sup>, Meredith LaValley<sup>5</sup>, Cynthia McOliver<sup>6</sup>, Candace Nachman<sup>7</sup>, John Pearce<sup>8</sup>, Cheryl Rosa<sup>10</sup>, and Amina Schartup<sup>3</sup>

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Researchers working in the Arctic have a responsibility to respect local culture and knowledge and advance stewardship of the Arctic environment. The original principles, released in 1990, have been revised to provide guidelines for the conduct of research, to better align with U.S. Arctic policy, to incorporate the latest advances in research methods, and to reflect expanded

research efforts and disciplinary breadth in a rapidly changing Arctic. A U.S. Interagency Arctic Research Policy Committee (IARPC) Principles Revision Working Group prepared these Principles after seeking and receiving diverse input from Federal, State, and local agency representatives, Alaska Native people and organizations, academic organizations and individual researchers through outreach efforts, listening sessions, and two Federal Register open comment periods. The core Principles for Conducting Research in the Arctic are: Be Accountable, Establish Effective Communication, Respect Indigenous Knowledge and Cultures, Build and Sustain Relationships and Pursue Responsible Environmental Stewardship. This poster presentation will provide more details on the Principles with some examples of best practices.

## **INCREASES IN NUMBERS OF BROOD-REARING AND MOLTING BRANT AND SNOW GEESE ON THE WESTERN BEAUFORT SEA COAST OF ALASKA, 1994–2017**

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In 2017, we conducted the twenty-third year of brood-rearing surveys for Brant (*Branta bernicla*) and Lesser Snow Geese (*Chen caerulescens caerulescens*) in coastal habitats on the Beaufort Sea coast between Utqiagvik and Fish Creek, just west of the Colville River delta. The molting population of Brant in the survey area comprises locally breeding birds and a large contingent of molt migrants. The locally breeding population of Brant appears to have increased from around 1,500 birds to around 4,500 birds between the mid-1990s and 2017, and numbers of Brant without broods (primarily molt migrants) have increased from several thousand prior to 2001 to a peak of 21,853 birds in 2013 (and 21,058 in 2017). Brood-rearing Snow Geese in the survey area nested primarily in the Ikpikpuk River delta colony, where numbers have increased dramatically over the past 24 years. Snow Geese were so uncommon as to not be recorded in 1994 and the first observations of large numbers of Snow Geese comprised 198 adults with 232 goslings in 1995. Numbers of adult Snow Geese have increased to over 35,000 in 2017.

## **USING STABLE ISOTOPES TO INFER MIGRATION ROUTES OF CRESTED AUKLETS**

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Increasing water temperatures and delayed winter sea ice coverage may affect the migratory behavior of Arctic breeding seabirds. Bird-born geolocator loggers (hereafter “gls”) are often used to track migratory behaviors. However, a large number of gls (deployed and recovered) are needed to characterize migratory behavior of individuals breeding in the same location. This can be logistically difficult. We collected feathers of gls-tracked crested auklets *Aethia cristatella* breeding on St. Lawrence I. to evaluate whether stable isotope signatures of feathers molted on wintering grounds may provide an alternative method of inferring migration routes. During

2017-18, gls-tracked crested auklets had two general migratory routes. The gls-birds were seen to travel along Alaska's Aleutian chain or Russia's Kamchatka Peninsula and Kuril Islands. Using feathers grown in the late winter/early spring, we tested whether sulfur, carbon, and nitrogen stable isotope signatures were discernably different between the two overwintering regions. We intend to use these data as a reference to infer the wintering regions for other crested auklets sampled concurrently with gls-birds. This could provide a key insight towards validating the use of stable isotopes as a complimentary tool to monitor effects of climate on the migration of Arctic-breeding seabirds.

### **SHORT TERM CONCENTRATION OF TRIODOTHYRONINE INCREASES AS A RESULT OF COOLING EARLY IN THE LIFE OF *SIALA SIALIS* CHICKS**

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Nest-bound altricial chicks are susceptible to environmental stressors, which can induce long-term physiological and morphological changes. Differing brooding patterns of parents can result in exposure of chicks to cold temperatures. Chicks may adjust their endocrine function to offset negative effects of exposure. In this study, we examined short- and long-term consequences of experimental cooling on thyroid function (reflected in blood plasma levels of triiodothyronine, T3) of eastern bluebird *Siala sialis* chicks. To examine short-term response of chicks to cold, we exposed 4-day-old chicks to a single 18 min cooling event at 28°C, and blood was sampled immediately after cooling. To examine long-term effects of cold exposure, we subjected 4-day-old chicks to 18-min of cooling for four consecutive days, and blood was sampled a week later. Controls were kept at 37°C brooding temperatures throughout both experiments. We observed an immediate increase in T3 concentrations due to experimental cooling. Repeated cooling had no effect on thyroid function or morphological development. These results suggest that shortly after hatching, eastern bluebirds are capable of some thermoregulation, possibly allowing them to ameliorate effects of cooling on their development.

### **WINTERING ASSEMBLAGE OF ARCTIC-TYPE WARBLERS IN THE PHILIPPINES**

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The Arctic Warbler (*Phylloscopus borealis*) is the most abundant Asian migrant to Alaska, making it an integral part of Alaska's ecosystems. Two congeners, the Kamchatka Leaf Warbler (*P. examinandus*) and the Japanese Leaf Warbler (*P. xanthodryas*), have historically been considered conspecific to the Arctic Warbler. These species cannot be reliably separated using external morphology. All three are thought to migrate to Southeast Asia and the Philippines in the winter. We sought to confirm whether or not this was true in the Philippines, and to assess

the wintering assemblage of Arctic-type warblers in the Philippines using DNA sequence data from the mitochondrial gene *cyt b* and reflectance spectrophotometry data from museum study skins. Our results demonstrate that all lineages of Arctic-type warblers do in fact overwinter together in the Philippines.

## **SMALL SCALE BREEDING SITE FIDELITY OF DUSKY CANADA GEESE**

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Dusky Canada geese (*Branta Canadensis occidentalis*; hereafter *dusky geese*) comprise one of the smallest populations of geese in North America. Dusky geese nest primarily on the Copper River Delta (CRD), with fewer birds nesting on Middleton Island (MI) and in Prince William Sound (PWS). The three breeding populations are managed collectively because they are morphologically and genetically similar and winter sympatrically in the Pacific Northwest. Because of slowly occurring habitat changes resulting from the 1964 earthquake, the abundance of dusky geese on the CRD has recently declined. Thus, MI and PWS dusky geese likely comprise a greater proportion of the current total population. Understanding the degree of interchange among the three breeding populations may be important in the long-term conservation of dusky geese nesting on the CRD. We deployed 66 implantable satellite transmitters in nesting females on the CRD, PWS and MI to determine inter-annual fidelity to nesting areas. Preliminary results indicate that dusky geese are highly faithful to their nesting areas

## **RESOLVING THE ANNUAL PELAGIC DISTRIBUTION OF TUFTED PUFFINS IN THE GULF OF ALASKA: PRELIMINARY ISOTOPIC CORRELATES OF WINTER AND SUMMER MARINE HABITAT USE**

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We initiated a two-year, integrative field and laboratory study in 2018 that is examining the at-sea distribution of Tufted Puffins (*Fratercula cirrhata*) in the Gulf of Alaska (GOA) during the non-breeding season. Populations of Tufted Puffins throughout the GOA have historically been considered at least stable or increasing. However, new analysis suggests these populations are now declining and are predicted to do so in the future. While much is known about Tufted Puffin breeding ecology, the species' migratory routes and wintering areas are currently not specifically known, but have been noted as important to resolve for management purposes. The GOA has experienced rapid changes in recent years (since 2014) due to an anomalous marine heatwave, and resolving little known aspects of Tufted Puffin ecology is important for better understanding the species vulnerability to changes in the marine environment. Here, we test the hypothesis that isotopic niche of male and female Tufted Puffins will be similar with adults shifting from a relatively variable, lower trophic level during winter to a more constant, higher trophic level

during summer. We deployed 30 geolocator tags (Migrate Technology) on nesting adult Tufted Puffins at Middleton Island, Alaska during the mid-chick rearing period (late July 2018). Captured adults were measured and weighed, blood (red blood cell fraction) and feather (face patch) samples were collected for carbon ( $^{13}\text{C}/^{12}\text{C}$ ,  $\delta^{13}\text{C}$ ) and nitrogen ( $^{15}\text{N}/^{14}\text{N}$ ,  $\delta^{15}\text{N}$ ) stable isotope values, and blood smears were obtained for molecular sex determination. Our analyses explore sex- and tissue-specific differences in  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values, and relationships with adult Tufted Puffin body size and condition. Once geolocator tags are retrieved in 2019, we will compare isotopic data between 2018 and 2019 at the individual level, and couple the 2019 isotopic data with specific information on at-sea movement patterns and oceanographic variables during the winter of 2018/19.

### **ALASKA SHOREBIRD CONSERVATION PLAN, VERSION III**

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In recognition of declines among perhaps half of Alaska's breeding shorebirds, ongoing or emerging threats to shorebirds and their habitats, and considerable knowledge of Alaska's shorebirds acquired over the past decade, the Alaska Shorebird Group recently revised the Alaska Shorebird Conservation Plan. Similar to Version II (2008), we structured the plan in two parts: Part I describes Alaska's nearly 30 priority species, their conservation threats, and strategies to improve statewide conservation, and Part II considers these three elements for Alaska's five Bird Conservation Regions. In addition to special recognition paid to species of greatest and high conservation concern, we included "Stewardship" species, defined as those species for which Alaska supports at least half of a population during its annual cycle. Climate change and severe weather, pollution, and energy- and mining-related activities ranked highest among conservation concerns in Alaska. Supplementing our tools for implementing conservation (research, inventory/monitoring, habitat management/protection, education/outreach, international collaboration), we introduced an evaluation of conservation progress to increase accountability. Based on considerable advances in tracking technologies largely unavailable prior to Version II, this plan stresses conservation approaches that recognize species' full annual cycles.

## **REMOTE MONITORING OF WATERBIRD NESTS: AN EXAMINATION OF EFFECTIVENESS, PREDATORS, AND APPLICABILITY**

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Cameras and temperature loggers at nests have been used to determine fate, identify predators, monitor incubation behavior, and decrease the need for regular nest visits. In 2018 at the Canning River Delta within the Arctic National Wildlife Refuge, we placed infrared triggered cameras at shorebird nests and time-lapse cameras at waterfowl nests. We also placed temperature loggers in the nest bowl of some camera-monitored shorebird nests. We captured 361 days of video at 74 nests which allowed predator identification of 72% of the depredated nests. Arctic foxes were responsible for most shorebird nest depredation, while avian predators were primarily responsible for waterfowl depredation. The two camera types produced different results. Time-lapse cameras captured predation events more efficiently than triggered cameras, and allowed continuous viewing of larger incubating birds. Temperature loggers allowed constant monitoring of small shorebirds that otherwise could not be seen by cameras, examination of incubation, and provided additional validation of nest fate. On the tundra landscape, we recommend using time-lapse cameras for monitoring waterfowl nests and the combined use of time-lapse cameras and temperature loggers for shorebird nests.

## **MT. EVEREST DOWNHILL: A WATERSHED ANALYSIS DURING CLIMATE CHANGE USING WATERBIRD COUNTS FROM A 30 YEARS CITIZEN SCIENCE SURVEY IN KOSHI RIVER, NEPAL**

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High mountains tend to create vast rivers and wetlands downstream. In the Hindu Kush-Himalaya (HKH) region those features are extreme but allow to show global trends. These wetlands are of massive extent and offer unique habitats for species; birds are flagships of those situations. For instance, downhill from Mt. Everest the Koshi river makes the largest floodplains of all the rivers in Nepal, has the highest silt load and also is considered as the most dynamic river not only in Nepal but the entire south Asia. This unique watershed is fed by rivers that originate in the Tibet Autonomous Region (TAR) of China as well as Nepal. Based on local communities and local knowledge, as well as long-term field work by the author in the wider HKH region, here a citizen science experience is presented how such works can be used effectively for conservation, habitats and people alike. It's the longest running citizen science program in the region. Baral and Poudyal (in press) show that some species fare pretty well, while many others are on the decline (e.g. Baer's Pochard *Aythya baeri*, Black-bellied Tern *Sterna acuticauda*, Eurasian Spoonbill *Platalea leucorodia*, Eurasian Curlew *Numenius arquata*,

Black-necked Stork *Ephippiorhynchus asiaticus*) and with water sheds and water tables on the generic decay, even in protected areas (Huettmann 2012). Those decays of the ecological niche during 'global change' are indicative for crucial problems these days in most alpine down river regions, their water birds and people waiting for better management on a global scale.

## **CONTAMINANTS RESEARCH TAKES FLIGHT: EMERGING CONCERNS FOR YELLOW-BILLED LOONS IN NORTHERN ALASKA**

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The Yellow-Billed Loon (*Gavia adamsii*), an international species of concern, is facing a multifaceted set of threats. One such issue is exposure to environmental contaminants, both on and off their breeding grounds. These birds are particularly susceptible to contaminant biomagnification due to their high trophic level, piscivorous diet, and migration paths that take them through contaminated waters in Asia. The U.S. Fish and Wildlife Service, U. S. Geological Survey, and Bureau of Land Management partner with the National Park Service to monitor the types and levels of environmental contaminants present in Yellow-billed Loons nesting in Alaska. With assistance from a Murie Science and Learning Center and Alaska Geographic grant, six young professionals participated in laboratory training and an environmental internship to learn about contaminants in wildlife. The interns prepared Yellow-Billed Loon eggs from Bering Land Bridge National Preserve and Cape Krusenstern National Monument for contaminant analyses including: methyl mercury, PCBs, PFOS/PFOA, and POPs. Each of these contaminants pose particular biological challenges for the species.

## **MIGRATORY DYNAMICS OF BERINGIAN DUNLIN ALONG THE EAST ASIAN-AUSTRALASIAN FLYWAY**

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Understanding the spatiotemporal dynamics of migratory populations is essential for developing effective flyway conservation plans. Such plans are particularly urgent along the East Asian-Australasian Flyway (EAAF) where extensive degradation of intertidal habitats has been associated with dramatic declines in migratory shorebird populations. Here, we used light-level geolocators to track four subspecies of Dunlin from 8 breeding sites as they migrated along the

EAAF. We evaluated 91 unique migration tracks using FLIGHTR (*actites*  $n=1$ , *arctica*  $n=48$ , *kistchinski*  $n=5$ , *sakhalina*  $n=37$ ), and assessed population-level flyway use by implementing a migratory network model. Preliminary results indicate that subspecies differ in their timing of fall and spring migration and total distances flown, but co-occur in most nonbreeding regions. Network structure for all four subspecies suggests that conserving sites in the Yellow Sea and Sea of Okhotsk is essential for maintaining connectivity among remote flyway regions. We suggest additional work be done to identify and conserve sites that support *C. a. actites* since their small population size (~900 individuals) might make them particularly vulnerable to future habitat loss.

## **RUDDY DUCK BREEDING RANGE EXPANSION IN ALASKA**

**Bryce C. Lake**

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The Ruddy Duck (*Oxyura jamacensis*) is classified as a casual species in Alaska, with a breeding range restricted to a small part of the state's east-central interior. The Alaska breeding distribution is based on two sightings of broods; one in 1959 at Tetlin Lakes, and the other in 1963 at Minto Lakes. Subsequent sightings, during 1987 to 1993, occurred in the former range, while recent sightings of broods have occurred outside the previously described range, to the south (Copper Valley, 2005–2018), and north (Yukon Flats, 2013–2018). These recent observations motivated me to summarize the record of Ruddy Duck breeding in Alaska. I organized records by region and year of sighting. In the Yukon Flats, I also included efforts that produced no sightings to document a record of recent range expansion

## **DOWNY DUST TO BETTER INFORM NEST FATE ASSIGNMENTS**

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Nest survival is a key measure in estimating productivity, but requires accurate assignment of nest fate (hatched or failed). Under field conditions, observing the hatching of chicks often does not occur, so secondary information is generally used to estimate whether a nest has hatched or not. As part of an effort in 2018 to quantify the efficacy of these estimates and standardize procedures for determining nest fate, we implemented an extended search period post-fate for hatch evidence. During these assessments, we found many hatched nests contained what appeared to be substantial amounts of tiny down feather fragments, which should only be present if chicks had been present in the bowl; i.e., a hatched nest. This additional line of evidence could

be a helpful for researchers to look for when estimating nest fate for Arctic shorebirds and contribute to more robust nest survival assessments.

## **ARCTIC REFUGE VIRTUAL BIRD FESTIVAL: 2018 AN INAUGURAL YEAR**

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The first-ever virtual festival of birds celebrated the migratory marvels that nest in the far northern reaches of Arctic National Wildlife Refuge. Arctic National Wildlife Refuge holds a unique position at the intersection of the four North American flyways, as well as the East Asian-Australasian Flyway. Birds that use the Refuge have ranges that reach all 50 states as well as five other continents. From September 24-28, 2018, our team filled the internet flyways with stories, videos, quizzes and interactive content, hosted by several partners across multiple online platforms. Like in-person bird festivals, we targeted activities for broad audiences including families, casual bird watchers and extreme birders, and scientists. Our team focused on four themes: migratory marvels, connectivity, nursery, and discovery. Multimedia content included an event hosted on Arctic Refuge's Facebook, photo essays, Instagram photos and stories, interactive story maps and quizzes, and various presentations. #ArcticBirdFest reached 100k+. Plans are underway for the 2019 bird festival. We are looking for partners and collaborators to grow this virtual event.

## **STATUS AND NEST SURVIVAL OF ALEUTIAN AND ARCTIC TERNS BREEDING IN THE KODIAK ARCHIPELAGO, 2016–2018**

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Aleutian terns (*Onychoprion aleuticus*) are colonial nesting seabirds that breed in coastal Alaska and eastern Russia, often in association with Arctic terns (*Sterna paradisaea*). During the 2016–2018 breeding seasons we surveyed for terns at the 53 known tern colony sites in the Kodiak Archipelago and searched for new colonies. Across the three breeding seasons, Arctic terns were active at 28 colonies, and Aleutian terns were observed at 12 colonies. We monitored nest

survival through hatch by placing digital game cameras at 68 Aleutian tern nests at seven colonies, and 11 Arctic tern nests at five colonies. Only seven camera nests survived to hatch (six Aleutian tern and one Arctic tern nest), and to our knowledge none of these nests successfully fledged chicks. Predation was the leading cause of nest failure, followed by nest abandonment, often associated with flooding of nests at the high tide. Due to high predation rates, variable initiation dates and re-nesting propensity, and frequent colony abandonment it was challenging to determine nest success despite multiple visits to colonies each season.

## **SEX AND ADRENAL STEROID HORMONES IN ALCID FEATHERS**

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Measuring hormone concentrations in feathers is a technique in avian biology which allows researchers to collect information during time periods and at temporal scales not possible with plasma or fecal samples. To date, studies have primarily focused on the concentration of glucocorticoids in feathers as an indicator of exposure to environmental stress. Other steroid hormones may also be informative indicators of a bird's physiological state. It is not known, however, what other steroids are repeatably and reliably detectable across species and among individuals. We used liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS) to analyze primary feathers from 13 species of the family *Alcidae* and two species of the genus *Rissa* for seven different steroid hormones. We detected the sex steroids testosterone, progesterone, and androstenedione in all samples. Using a radioimmunoassay (RIA) we also compared the two methods for detection of corticosterone and cortisol. The radioimmunoassay detected glucocorticoids in more feathers, and had a lower detection limit, than LC-MS/MS. Here we discuss whether sex and feather color (a proxy for melanin content) is associated with differences in steroid concentrations, possible reasons for discrepancies between the two laboratory methods, and how this information may be of use to avian researchers.

## **WHEN THE FREEZER BREAKS: WILL CLIMATE WARMING IMPACT THE PERSISTENCE OF RESIDENT BIRDS IN ALASKA?**

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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 Gray Jay populations rely on cached food for a prolonged winter season. Food spoilage and reduced availability of cached food may negatively affect Canada Jay condition, survival, and fitness. To examine whether Canada Jays at higher latitudes are more susceptible to a changing climate, we studied a sample of territorial Canada Jays in Denali National Park and Preserve, Alaska in 2016–2018. We color-banded 126 individuals belonging to 27 family groups and monitored the fate of 24 nests. Preliminary results indicate high adult survival (~95% raw survival) but lower nest success (~55% raw survival). Ongoing studies quantifying reproductive performance and juvenile and adult survival will help determine the demographic consequences of a warming climate on Gray Jay persistence in Alaska's boreal forests.

### **CAPITALIZING ON A MASS MORTALITY EVENT: ARCHIVING SEABIRD GENETIC SAMPLES, SKINS, AND SKELETONS FROM THE M/V *SELENDANG AYU* OIL SPILL**

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In December 2004 the M/V *Selendang Ayu* ran aground on Unalaska Island in the Aleutian Islands, spilling over 350,000 gallons of fuel oil and resulting in the salvage of over 1,500 seabird carcasses. With funding from the North Pacific Research Board we were able to archive genetic samples, skeletons, and skins (or some combination thereof) from a majority of these remains. The specimen material is available through loans or visits by researchers, and the associated data are available through our online database (Arctos). This material substantially increases existing Alaska sample sizes of alcids, cormorants, gulls, etc. and provides a unique opportunity to retroactively sample a time (15 years ago) that can't be revisited. Archived specimens of seabirds provide a biological record not only of the birds, but also of the ecosystem and factors influencing them—they are excellent marine bioindicators. They can be used to investigate food web dynamics (using stable isotopes), foraging success (though hormone levels deposited in feathers), contaminants levels (e.g., heavy metals), population demography (age and sex structure), genetic diversity and population genetics (germane to issues in conservation), genomics, morphology, impacts of oil spills on species and age/sex groups, and human impacts on Bering Sea nonbreeding bird communities. Preserving and archiving multiple sample types from these animals caters to an increasingly broad variety of researchers. Having the samples to address retrospective and geographic comparative analyses is important for studying the rates and characteristics of natural and anthropogenic changes.