Alaska Shorebird Group

Annual Summary Compilation:

New and Ongoing Studies or Initiatives Focused on Alaska Shorebirds

November 2022

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Cover: Breeding adult female Red Phalarope (*Phalaropus fulicarius*) on a pond in the Willow Project Area, National Petroleum Reserve-Alaska. Photo by Andy Banker

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DEDICATION

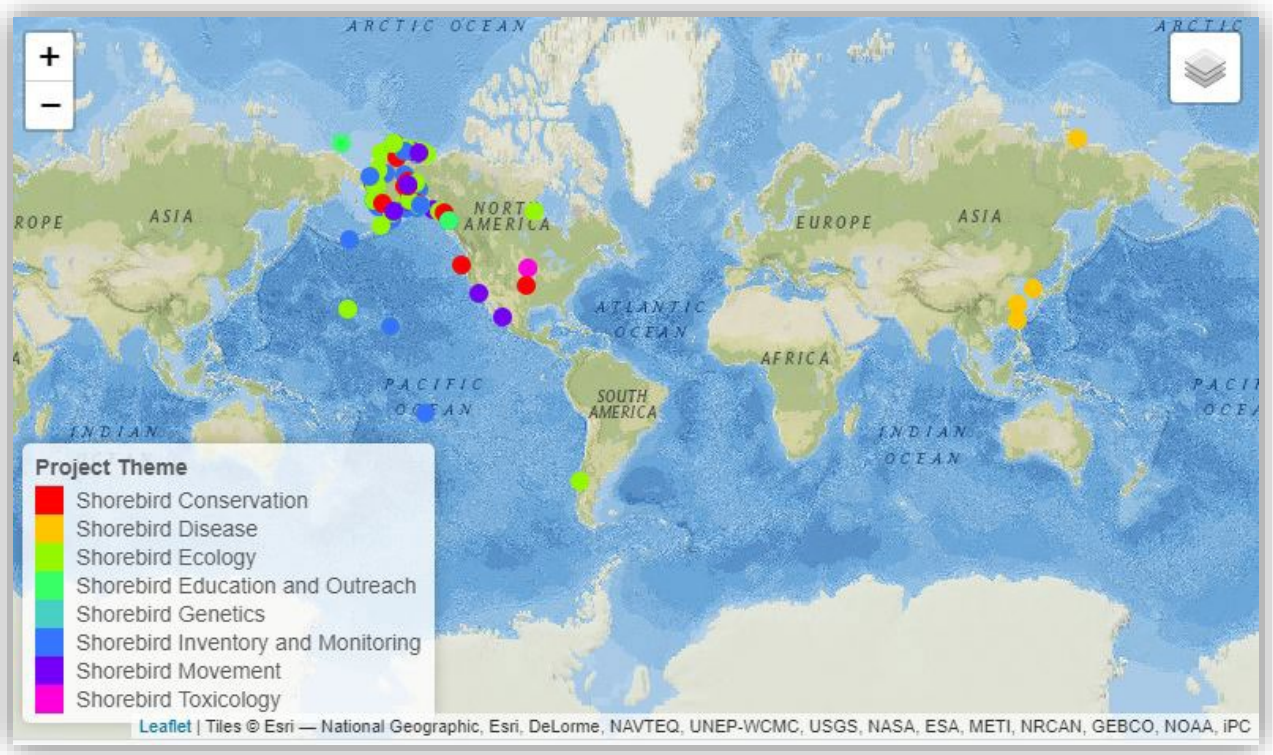
The Alaska Shorebird Group suffered a sad loss last summer when a charming Tahitian lady passed away. After a long and incapacitating illness, Andrea Bruner bid us a final goodbye on 13 August, 2022. She died peacefully at home in Kahuku, Oahu. For many years, Andrea participated in her husband's (Phillip) ongoing studies of shorebirds nesting near Nome. She also was much involved in my work on Pacific Golden-Plovers in Alaska and elsewhere in the Pacific. Andrea's scientific contributions are especially evident in the golden-plover literature where her name is among the authors of numerous papers. Aside from being a wonderful companion in the field, Andrea was a keen observer of nature around her, and I often marveled at her remarkable ability to spot birds before anyone else saw them. Near the end of life, she defined a fitting linkage by requesting that her ashes be scattered partly in Tahiti and partly at certain nest sites near Nome that were very special to her.

~written by Wally Johnson

INTERACTIVE MAP

To visualize where projects have occurred since the Alaska Shorebird Group's inception in 1997, please check out the "ASG Leaflet Map". This interactive map allows for filtering projects by species and provides a baseline for identifying which species and topics have been researched in the past. This visualization also allows members to easily determine which Alaska Shorebird Plan objectives have been reached and where additional research may be needed, especially for Priority Species. Finally, this map is an excellent resource for graduate students, early-career professionals, and scientists who are new to the realm of Alaskan shorebirds.

[Alaska Shorebird Group Projects 1997-2022 Leaflet Map]



EXECUTIVE SUMMARY

Welcome to the Alaska Shorebird Group (ASG) 2022 annual summary. This is the 23rd annual summary to document new and ongoing studies and initiatives focused on Alaska shorebirds. This document includes annual summaries for 28 studies/initiatives and highlights 11 recent publications and one data release. This year marked the third year of the Coronavirus pandemic, however, with transmission levels declining, fieldwork was given the "green light" for most Alaska-based shorebird projects.

The Alaska Shorebird Group continues to be a highly collaborative organization with a large membership of productive principal investigators, early-professionals, and students both within and outside of Alaska. This annual compilation is the only written record that acknowledges the shorebird projects occurring in Alaska and provides a valuable timeline of shorebird activities in the state.

Thank you to all the principal investigators, graduate students, research technicians, and amateur photographers that contributed to this report. I am aware of the long hours, tricky logistics, and dedication that goes into the research that occurs within Alaska and beyond. I am honored to be part of a group with such a strong passion for shorebird conservation and management, especially as we continue to face challenges regarding population declines of many Arctic and sub-Arctic breeding shorebirds.

Laura McDuffie

~Secretary, Alaska Shorebird Group (2019-2022)

ANNUAL SUMMARIES

BIRD CONSERVATION REGION 1

Aleutian and Bering Sea Islands-Includes portions of Western and Southwestern Alaska. Included in this region are the Aleutian Islands, that extend westward from the Alaskan mainland for 1,100 miles (1,800 km), and the Bering Sea islands (that include the Pribilofs, St. Matthew, Hall, St. Lawrence, and Little Diomede). The Aleutian chain is volcanic in origin. The climate is maritime and wind is ever present. Sea ice does not extend to the Aleutians and permafrost is generally absent; however, sea ice is an important feature of the Bering Sea. Vegetation at higher elevations consists of dwarf shrub communities, mainly willow and crowberry. Meadows and marshes of herbs, sedges, and grasses are plentiful, and some islands have ericaceous bogs. Seabirds are a dominant component of this region's avifauna, and several species breed only in this region (e.g., Red-legged Kittiwake, Least Auklet, Whiskered Anklet). Southern Hemisphere procellariforms occur regularly in the offshore waters of the southern Bering Sea and northern Gulf of Alaska during Alaskan summers. Although breeding diversity of passerines (mainly Lapland Longspur, Snow Bunting, and Gray-crowned Rosy-Finch), and shorebirds (e.g., Black Oystercatcher, Dunlin, Ruddy Turnstone, Rock Sandpiper) is low, numerous Old-World species are regular migrants and visitants. Some of these species regularly breed in the region (e.g., Common Ringed Plover, Wood Sandpiper, Eurasian Skylark). Rock Sandpipers have differentiated into three races among islands within the region and the only endemic Alaskan passerine (McKay's Bunting) is found here. *Information derived from Boreal Partners in Flight* Bird Conservation Areas | U.S. Geological Survey (usgs.gov).

#1 (BCRs 1-5): Atlas of migratory connectivity for the birds of North America (part of Migratory Connectivity Project)

Study Species: All shorebird species of North America; In Alaska: American Golden-Plover, Black-bellied Plover, Pacific Golden-Plover, Semipalmated Plover, Bar-tailed Godwit, Black Turnstone, Bristle-thighed Curlew, Buff-breasted Sandpiper, Dunlin, Greater Yellowlegs, Hudsonian Godwit, Least Sandpiper, Lesser Yellowlegs, Long-billed Dowitcher, Marbled Godwit, Pectoral Sandpiper, Red Knot, Red Phalarope, Red-necked Phalarope, Rock Sandpiper, Ruddy Turnstone, Sanderling, Semipalmated Sandpiper, Short-billed Dowitcher, Solitary Sandpiper, Spotted Sandpiper, Stilt Sandpiper, Surfbird, Upland Sandpiper, Wandering Tattler, Western Sandpiper, Whimbrel, White-rumped Sandpiper, Wilson's Snipe

Study Location: Sites across Alaska

Principal Investigators: Autumn-Lynn Harrison, Amy Scarpignato, Allison Huysman (Smithsonian Migratory Bird Center), Richard Lanctot (USFWS), Peter Marra (Georgetown University). Additionally, connectivity data were contributed by many researchers and the USGS Bird Banding Laboratory. All contributors will be credited in the published volume.

Primary Contact: Autumn-Lynn Harrison 3001 Connecticut Ave NW Washington DC 20008 Smithsonian Migratory Bird Center HarrisonAL@si.edu

Study Objectives

- Identify and summarize all existing connectivity data for migratory birds of North America.
- Produce species and group-level summaries of migratory connectivity.

Preliminary Results

- We have acquired 54 unique tracking datasets for the shorebird species listed above, which include GPS, PTT, Geolocator, and Motus tracks, in addition to band encounters for 17 species from the USGS Bird Banding Lab.
- 19 species had enough data to estimate patterns and/or strength of migratory connectivity.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Determine migratory timing, routes, and site use of shorebirds.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.
- Develop shorebird-related outreach and media materials.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.

American Golden-Plover on the Arctic National Wildlife Refuge. Photo Shiloh Schulte.

ANNUAL SUMMARIES

BIRD CONSERVATION REGION 2

Western Alaska-Includes portions of Western and Southwestern Alaska: This region consists of the coastal plain and mountains of western and southwestern mainland Alaska. Sub-regions include A) Subarctic Coastal Plain and Seward Peninsula, B) Ahklun and Kilbuck Mountains and Bristol Bay-Nushagak Lowlands, and C) Alaska Peninsula Mountains. Permafrost is continuous except in southern parts of the region. Sea cliffs are present as are mountains that exceed 3,300 feet (1,000 m) in elevation. Volcanic peaks up to 8,500 feet (2,600 m) are found along the Alaska Peninsula. Wet and mesic graminoid herbaceous communities dominate the lowlands and numerous ponds, lakes, and rivers dot the landscape. Tall shrub communities are found along rivers and streams and low shrub communities occupy uplands; forests of spruce and hardwoods penetrate the region on the eastern edge. High densities of breeding waterfowl and shorebirds are found on the coastal plain of the Yukon and Kuskokwim rivers. Intertidal areas here and lagoons of the north side of the Alaska Peninsula supports millions of shorebirds during migration (e.g., Dunlins, Western Sandpipers, Red Knots, Bar-tailed Godwits). The coast of the Alaska Peninsula supports high concentrations of wintering sea ducks that include the: Steller's Eider, Harlequin, Oldsquaw, Surf Scoter, and Black Scoter. Western Alaska includes a unique Beringian breeding avifaunal element (e.g., Black Turnstone, Bristle-thighed Curlew) and several Old-World species are regular breeders or migrants in this region (e.g., Sharp-tailed Sandpiper, Red-throated Pipit, White Wagtail). Passerine diversity is greatest in tall, riparian shrub habitats (e.g., Arctic Warbler, Gray-cheeked Thrush, Blackpoll Warbler) and raptors (e.g., Gyrfalcon, Rough-legged Hawk) nest along the riverine cliffs. Mainland sea cliffs contain nesting colonies of, largely, Black-legged Kittiwakes, Common Murres, and Pelagic Cormorants. *Information derived from Boreal Partners in Flight* Bird Conservation Areas | U.S. Geological Survey (usgs.gov).

#2 (BCR 2): Survival, growth, and migratory movements of juvenile Bar-tailed Godwits

Study Species: Bar-tailed Godwit

Study Location: Sites around Nome (64.74 N, 165.94 W)

Principal Investigators: Jesse Conklin (Max Planck Institute), Dan Ruthrauff (U.S. Geological Survey), Jim Johnson (US Fish and Wildlife Service), Bart Kempenaers (Max Planck Institute)

Primary Contact: Dan Ruthrauff, U.S. Geological Survey, 4210 University Drive, Anchorage AK 99508, druthrauff@usgs.gov

Study Objectives

- Access growth, survival, and movements of Bar-tailed godwit chicks
- Access post-fledging movements of Bar-tailed Godwits

Results

- We monitored the growth, survival, and movements of 10 Bar-tailed Godwit chicks from 6 broods
- We tracked the migration of one juvenile Bar-tailed Godwit from it breeding site near Nome, Alaska to its nonbreeding site in Tasmania, Australia
- Bar-tailed Godwit, 'B6', based on its alphanumeric flag identity, departed the Seward Peninsula for the Yukon-Kuskokwim Delta on 6 August. It staged on the lower Kuskokwim Delta until 13 October, at which time it departed on its first southbound migration. It arrived in Tasmania on 24 October.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle. Determine migratory timing, routes, and site use of shorebirds.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species ranges.

Bar-tailed Godwit chick 'B6' banded on the Alaska Peninsula in 2022. Photo Dan Ruthrauff.

#3 (BCRs 2-4): Tracking the fall movement of six shorebird species breeding near DoD sites in Alaska

Study Species: Greater Yellowlegs, Lesser Yellowlegs, American Golden-Plover, Pacific Golden-Plover, Short-billed Dowitcher, Long-billed Dowitcher

Study Locations: King Salmon (58.70 N, 156.67 W), Beluga (61.21 N, 151.02 W), Nome (64.54 N, 165.36 W), Utqiagvik (71.26 N, 156.77 W)

Principal Investigators: Rozy Bathrick (University of Massachusetts Amherst), Nathan Senner (University of Massachusetts Amherst), Jim Johnson (US Fish and Wildlife Service), Dan Ruthrauff (U.S. Geological Survey)

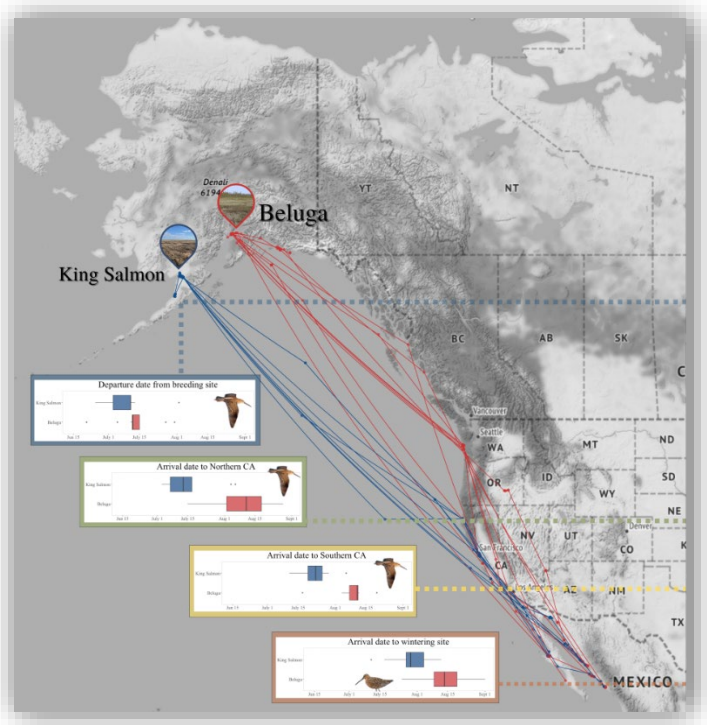
Primary Contact: Rozy Bathrick, Organismic and Evolutionary Biology PhD student, University of Massachusetts Amherst, rebathrick@umass.edu

Study Objectives

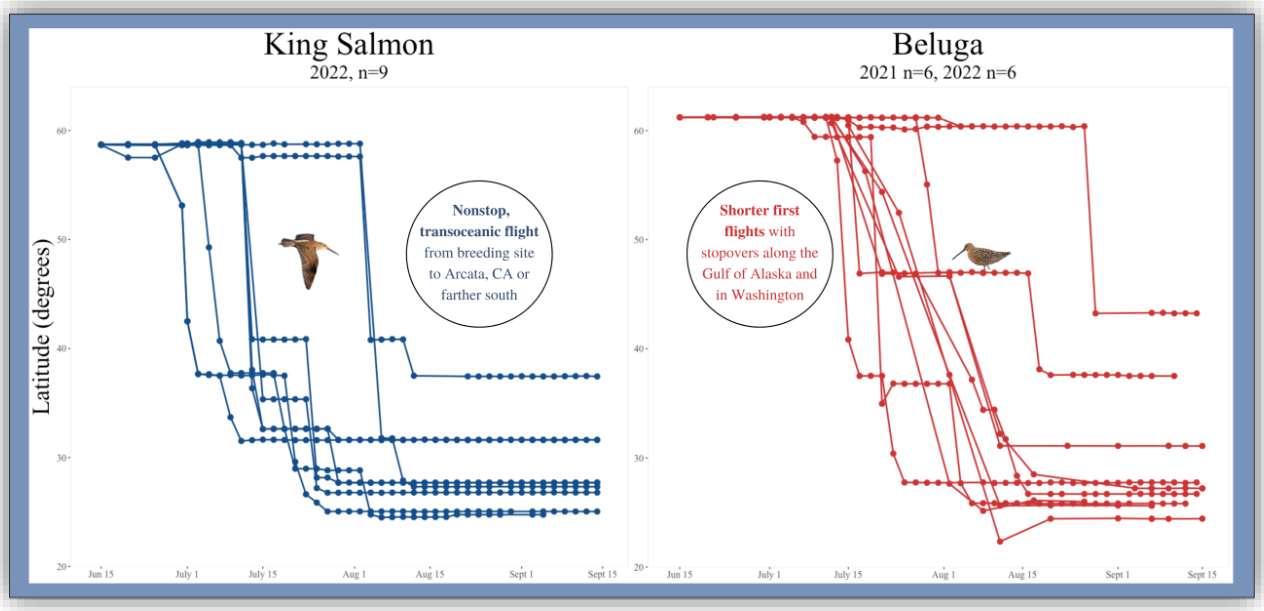
- Deploy PinPoint GPS transmitters on six shorebird species breeding in AK to track fall migration. Each species will be tracked from two breeding sites at Long Range Radar Sites (project is DoD funded). A total of 20 individuals in each species will be tracked (10 from each site). Field work will be conducted 2022 – 2024.
- Preliminary questions: (1) How do the structures of stopover sites differ among populations and species, especially those using different migratory flyways? (2) Do different populations and species use different cues to time their fall migrations? (3) Do migratory strategies differ among populations and species?

Results

- Transmitters deployed on Short-billed Dowitchers in 2022 at King Salmon and Upper Cook Inlet reveal southbound tracks along the Pacific Flyway. Birds departed Alaska at the same time but birds from King Salmon arrived in Mexico, in Baja and along the Sea of Cortez coast, 19 days earlier than Cook Inlet birds.
- Transmitters deployed on American Golden-Plovers in Nome and Utqiagvik reveal heavy stopover/staging use of Canadian Arctic before using the Atlantic Flyway to arrive to South America on the Guyana Coastline.



Map showing track lines of Short-billed Dowitchers captured at breeding sites in King Salmon and the Upper Cook Inlet.



Graphic showing the change in latitude of migrating Short-billed Dowitcher from June 15 to September 15, 2022.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.
- Determine migratory timing, routes, and site use of shorebirds.
- Assess the effects of climate change on shorebird demography.
- Identify and delineate potentially distinct populations of shorebirds breeding in Alaska.
- Develop habitat-based models to predict the abundance and distribution of shorebirds and assess the adaptability of shorebirds to habitat changes.

HABITAT MANAGEMENT AND PROTECTION:

- Support land acquisitions, easements, restoration efforts, and conservation designations (e.g., the Western Hemisphere Shorebird Reserve Network, East Asian–Australasian Shorebird Reserve Network, Ramsar Convention on Wetlands, and Important Bird Areas Programs) for key shorebird sites.
- Model the potential effects of climate change on shorebird habitats and identify future potential regions of habitat refugia.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.
- Develop shorebird-related outreach and media materials.
- Host workshops and outreach events to engage the diverse communities of Alaska in shorebird conservation.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.
- Incorporate principles of good governance in research and outreach efforts.

INTERNATIONAL COLLABORATIONS:

- Participate in partnerships to conserve migratory shorebirds and their habitats in the circumpolar Arctic.
- Coordinate and participate in international, national, and other regional shorebird conservation planning efforts (e.g., Pacific Americas Shorebird Conservation Strategy, Atlantic Flyway Shorebird Initiative).

Successful capture of an American Golden-Plover. Photo Rozy Bathrick.

#4 (BCRs 2, 4): Long-term monitoring of Black Oystercatchers in the Gulf of Alaska

Study Species: Black Oystercatcher

Study Locations: Kachemak Bay (59.60 N, 151.34 W), Katmai National Park and Preserve (58.59 N, 154.69 W), Kenai Fjords National Park (60.04 N, 149.81 W), western Prince William Sound (61.60 N, 147.16 W)

Principal Investigators: Brian Robinson (U.S. Geological Survey), Daniel Esler (U.S. Geological Survey), Heather Coletti (National Park Service).

Primary Contact: Brian Robinson, U.S. Geological Survey, 4210 University Dr. Anchorage, AK 99508, brobinson@usgs.gov

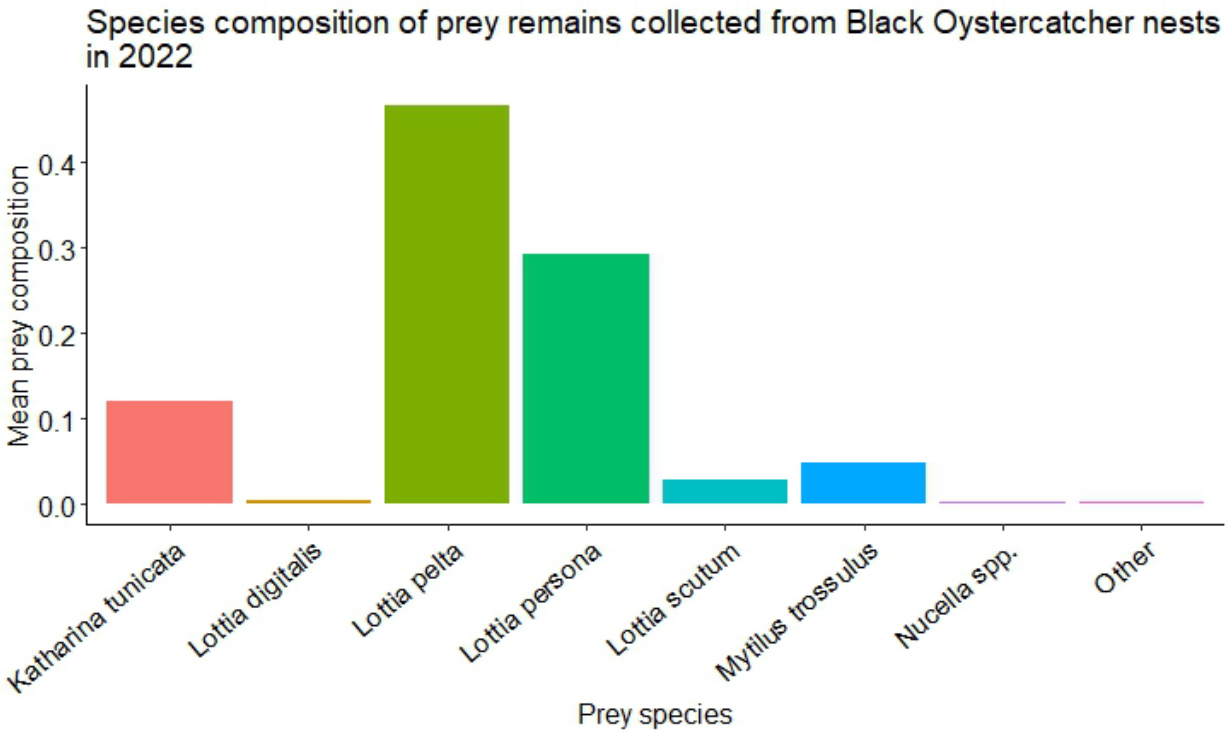
Study Objectives

- In each sampling block, survey along four or five transects up to 20 km in length.
- Measure Black Oystercatcher nest density, productivity (number of eggs or chicks), float eggs to determine hatch date, and quantify chick diet.
- Quantify species composition and size distributions of prey fed to chicks by collecting and measuring all prey remains found near a nest, indicative of adults provisioning their offspring.

Results

- In 2022, we located a total of 39 nests in all four sampling blocks. Nest density varied by sampling block.
- Productivity (number of eggs + chicks / nest) was highest (2.36 ± 0.10; mean ± SE, n = 17) in Katmai and lowest (1.75 ± 0.20; n = 12) in western Prince William Sound.
- We collected 1704 prey items from 19 nests, representing 20 different taxa.
- While chick diet varied by block and transect, overall, it was dominated by three species of limpets (Lottia pelta, L. persona. L. scutum); together they made up 79 % of the diet in 2022 (see Figure below) and have dominated diet throughout the 17 years of sampling. The Pacific blue mussel (Mytilus trossulus) and black katy chiton (Katharina tunicata) represented much smaller proportions in the diet (5 % and 12 %, respectively).
- Long-term monitoring of Black Oystercatchers provides an opportunity to understand how a top-level predator in the intertidal food web may respond to changes in a highly dynamic ecosystem.

- We completed the fourth year of a Black Oystercatcher migration study that complements our long-term monitoring. See the summary entitled "Black Oystercatcher Movement Ecology" for more details.



Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.
- Assess the effects of climate change on shorebird demography.

POPULATION INVENTORY AND MONITORING:

- Conduct long-term population monitoring efforts (e.g., PRISM).

INTERNATIONAL COLLABORATIONS:

- Coordinate and participate in international, national, and other regional shorebird conservation planning efforts (e.g., Pacific Americas Shorebird Conservation Strategy, Atlantic Flyway Shorebird Initiative).

Banding a Black Oystercatcher during the height of the Covid-19 pandemic in 2020.

#5 (BCRs 2, 4, 5): Movement ecology of Black Oystercatchers

Study Species: Black Oystercatcher

Study Locations: Western Prince William Sound (60.60 N, 147.16 W), Kenai Fjords National Park (60.04 N, 149.81 W), Kachemak Bay (59.60 N, 151.34 W), Katmai National Park (58.59 N, 154.69 W)

Principal Investigators: David Green, Cole Rankin, Lena Ware (Simon Fraser University), Dan Esler, Brian Robinson, (USGS Alaska Science Center), Heather Coletti (National Park Service)

Primary Contact: David Green, Simon Fraser University, djgreen@sfu.ca

Study Objectives

- Track annual cycle movements of Black Oystercatchers that breed in the northern Gulf of Alaska.
- Identify wintering locations of breeding individuals.
- Examine roles of body size, dominance, territory quality and diet on whether Black Oystercatchers migrate long distances and over-winter in British Columbia or remain resident in Alaska year-round.
- Examine migration routes, stop-over sites, and habitat use of migrants and residents.
- Determine how migration influences condition, survival and subsequent reproduction of a subarctic partial migrant shorebird.

Preliminary Results

- We attached Ecotone solar GPS tags (7g, ~1% of body weight) with leg-loop harnesses to 18 individuals in Kenai Fjords National Park and Katmai National Park and Preserve in 2022 and plan to retrieve them in 2023.
- We've retrieved and obtained tracks from a total of 20 tags previously deployed across all four study locations from 2019-2021.
- Preliminary results suggest heavier birds (adjusted for body size and capture date) are more likely to migrate than lighter birds.
- 10 birds remained in Southcentral Alaska and 10 migrated to an area around Prince Rupert, British Columbia after the breeding season.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Determine migratory timing, routes, and site use of shorebirds.

HABITAT MANAGEMENT AND PROTECTION:

- Apply abundance and distribution information to identify key shorebird habitats and sites.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).

Surveying for banded Black Oystercatchers near Port Graham at the Kachemak Bay study site. Photo Laura McDuffie.

#6 (BCR 2-4): Shorebird Science and Conservation Collective

Study Species: All shorebird species of North America; In Alaska: American Golden-Plover, Black-bellied Plover, Black Turnstone, Dunlin, Long-billed Dowitcher, Lesser Yellowlegs, Marbled Godwit, Pectoral Sandpiper, Red Knot, Red Phalarope, Semipalmated Sandpiper, Solitary Sandpiper, Upland Sandpiper, Western Sandpiper, Whimbrel

Study Locations: Multiple locations throughout Alaska

Principal Investigators: Autumn-Lynn Harrison, Ph.D., Allie Anderson, Ph.D., and Candace Stenzel (Smithsonian Migratory Bird Center), Rick Lanctot, Ph.D. (Migratory Bird Program USFWS)

Primary Contact: Autumn-Lynn Harrison, Smithsonian Migratory Bird Center 3001 Connecticut Ave NW Washington DC 20008 harrisonal@si.edu

Study Objectives

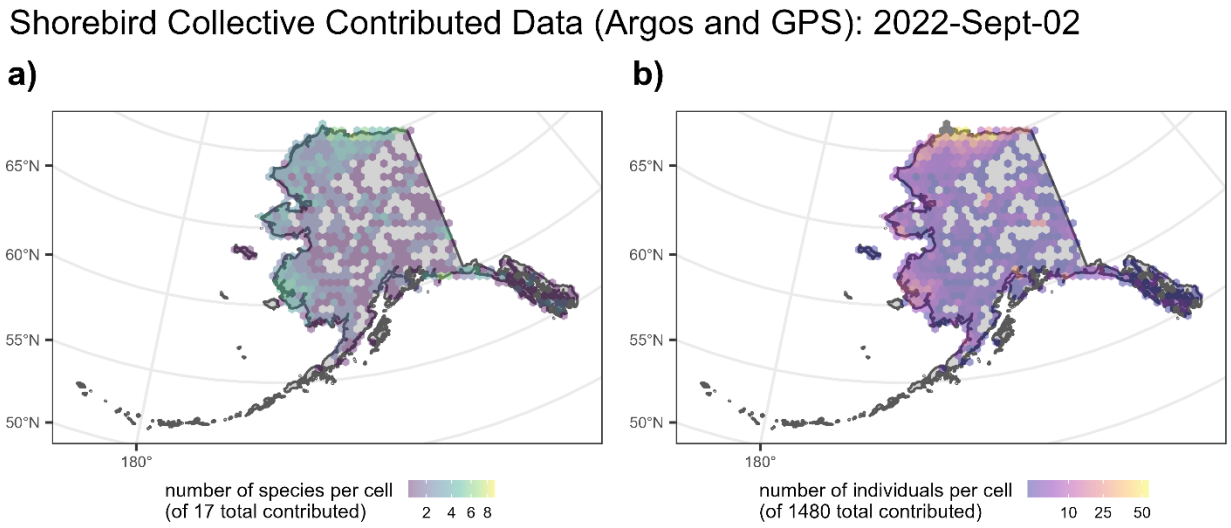
- Translate the collective findings of shorebird tracking and community science data into on-the-ground conservation to help reverse the decline of shorebirds in the Western Hemisphere.
- Provide hemispheric-scale analyses that can be down-scaled to identify important shorebird sites and gaps in knowledge.
- Provide scientific support to regional-scale initiatives focused on shorebird conservation in North America, with a focus on the Midcontinent flyway.
- Provide scientific support to 3-5 conservation initiatives. These may include on-the-ground conservation projects, education, and outreach initiatives, and/or analyses needed for management decision-making.

Preliminary Results

As of September 2022, the Shorebird Collective has received from Alaska:

- 20 contributed shorebird studies. Note that we defined a study as tracking data from a data contributor for a single species and originally hosted in a unique data repository.
- 631 contributed shorebird tracks from 15 species.

Figure 1. Contributions to the Collection within Alaska.



Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Determine migratory timing, routes, and site use of shorebirds.
- Identify and delineate potentially distinct populations of shorebirds breeding in Alaska.

POPULATION INVENTORY AND MONITORING:

- Assess the utility of new technologies (e.g., Automated Recording Units, aerial drones, eBird) to determine shorebird presence and abundance.

HABITAT MANAGEMENT AND PROTECTION:

- Support land acquisitions, easements, restoration efforts, and conservation designations (e.g., the Western Hemisphere Shorebird Reserve Network, East Asian–Australasian Shorebird Reserve Network, Ramsar Convention on Wetlands, and Important Bird Areas Programs) for key shorebird sites.
- Minimize loss and degradation of critical shorebird habitats by participating in natural resource planning and management.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.
- Develop shorebird-related outreach and media materials.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).
- Participate in partnerships to conserve migratory shorebirds and their habitats in the circumpolar Arctic (e.g., the Arctic Council's Conservation of Arctic Flora and Fauna working group and initiatives therein), North America (e.g., landscape conservation cooperatives, joint ventures, flyway councils), Western Hemisphere (e.g., Western Hemisphere Shorebird Reserve Network, Western Hemisphere Shorebird Group), Asia (e.g., East Asian-Australasian Flyway Partnership), and other partnerships as they arise.
- Coordinate and participate in international, national, and other regional shorebird conservation planning efforts (e.g., Pacific Americas Shorebird Conservation Strategy, Atlantic Flyway Shorebird Initiative).

#7 (BCR 2): Determining vital rates of Red Knots (Calidris canutus roselaari) breeding in Alaska

Study Species: Red Knot

Study Locations: Nome, Alaska (64.92 N, 164.84 W)

Principal Investigators: Zak Pohlen, Callie Gesmundo, and Jim Johnson (USFWS Migratory Bird Program), Daniel Catlin, Ph.D. and Kelsi Hunt (Virginia Polytechnic Institute and State University, Department of Fish and Wildlife Conservation), Jan van Gils. Ph.D., (Royal Netherlands Institute for Sea Research)

Primary Contact: Jim Johnson, USFWS, Migratory Bird Management, 1011 East Tudor Road, Anchorage, AK 99503. Phone: 907-786-3423; E-mail: jim_a_johnson@fws.gov

Study Objectives

- Continue to monitor the marked population to estimate adult survival.
- Determine how temperature, precipitation, and prey availability impact chick growth and survival.
- Collect information on nest initiation and survival.

Results

- Observers arrived May 23 and departed July 15 for the entire nest initiation and brood rearing period for the 11th year (no 2020 or 2021) of studies at the site.
- We found five nests: two found using a thermal spotting scope and three found by tracking adults, attached with VHF radios, to their nests.
- We captured 17 new adults: nine captures used whoosh nets, chick calls, and adult calls, and eight captures using with a mist net and chick calls during brood rearing.
- We attached 16 VHF radios to adults to find nests and monitor broods.
- We resighted seven adults from previous years (lowest on record; range 11-19).
- We monitored nine total broods (27 chicks) of which five failed, three fledged (≥ 21 days old), and one had an unknown fate.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Assess the effects of climate change on shorebird demography.

- Conduct breeding ecology studies on species occupying alpine, boreal, or other rare or difficult-to-access habitats.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).

Red Knot nest on the Alaska Peninsula. Photo Zak Pohlen.

ANNUAL SUMMARIES

BIRD CONSERVATION REGION 3

Northern Alaska-Arctic Coastal Plain/Foothills: This region includes low-lying, coastal tundra and drier uplands of the Arctic Foothills of the Brooks Range. Sub-regions include A) Arctic Coastal Plain, and B) Arctic Foothills and north slope of the Brooks Range. It extends from the Alaska-Canada border at Demarcation Point westward, and southward, to the mouth of the Noatak River. Because of thick, continuous permafrost, surface water dominates the landscape (20-50% of the land surface on the coastal plain). Freezing and thawing form a patterned mosaic of polygonal ridges and ponds. Several rivers (e.g., Colville River) bisect the plain and flow into the Arctic Ocean. Barrow/Utqiaġvik, lying near the Arctic Ocean, experiences 67 days of darkness in the winter and 84 days of continuous sunlight in the summer. The ocean surface, except for leads, is frozen 9 to 10 months a year, and the ice pack is never far from shore. Because of the wetness, waterfowl and shorebirds dominate the breeding avian community and passerines are scarce. The most abundant breeding birds on the coastal plain include the: Northern Pintail, King Eider, Oldsquaw, American Golden-Plover, Semipalmated Sandpiper, Pectoral Sandpiper, Red-necked Phalarope, and Lapland Longspur. Few bird species winter in the region. Several Old-World species penetrate the region from the west (e.g., Arctic Warbler, Bluethroat), and species regularly breeding in the Canadian arctic penetrate from the east (e.g., White-rumped Sandpiper, Black Guillemot). Taiga passerines (e.g., Gray-cheeked Thrush, Yellow Warbler) reach the region along drainage systems from the Brooks Range and raptors nest commonly along major rivers (e.g., Gyrfalcon, Rough-legged Hawk). *Information derived from Boreal Partners in Flight* Bird Conservation Areas | U.S. Geological Survey (usgs.gov).

#8 (BCR 3): Using high-frequency GPS transmitters to infer nesting and breeding behavior of Dunlin

Study Species: Dunlin (arcticola subspecies)

Study Location: Utqiagvik, Alaska (71.29 N, 156.64 W)

Principal Investigators: Sarah Hoepfner, Stephen Dinsmore (Iowa State University); Richard Lanctot (Migratory Bird Program, USFWS)

Primary Contact: Sarah Hoepfner, Iowa State University, 2310 Pammel Dr. Science II Rm 339, Ames, IA 50010, hoepfner@iastate.edu

Study Objectives

- Monitor nesting Dunlin remotely using high-frequency GPS transmitters.
- Determine the first true estimates of Dunlin nest survival away from human disturbance.
- Compare nest survival estimates of GPS-monitored nests to human-monitored nests on USFWS plots to better understand the effects of human disturbance on nest survival.
- Better understand the movements and inferred behavior of breeding shorebirds during pre-breeding, egg-laying, incubation, and post-breeding.

Results

- During the first two years of this study human-monitored nests have lower apparent nest survival than temperature logger and GPS-monitored nests (Table 1; below).
- Male Dunlin spend a larger proportion of their time at the nest (ave=0.25, SD=0.12) during egg-laying than females (ave=0.12, SD=0.09).
- Early spring human altered areas with open water/ground are important feeding areas for birds during pre-breeding.
- Dunlin visit their territory many times while it is still completely snow-covered during pre-breeding, and all Dunlin monitored into late June attempted nesting.

Table 1. Nest survival

	2021	2022
Human-monitored	0.23 (n=39)	0.05 (n=44)
Temperature monitored	N/A	0.20 (n=18)
GPS-monitored	0.52 (n=23)	0.40 (n=10)

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.
- Identify effects associated with energy production, mining, disturbance, and other anthropogenic activities on shorebirds.

POPULATION INVENTORY AND MONITORING:

- Evaluate the efficacy of existing programs (e.g., the Alaska Landbird Monitoring Survey [ALMS], Breeding Bird Survey [BBS] program) to monitor shorebird populations.
- Assess the utility of new technologies (e.g., Automated Recording Units, aerial drones, eBird) to determine shorebird presence and abundance.

Commuting across the tundra of Utqiagvik, Alaska. Photos Sarah Hoepfner.

#9 (BCR 3): Long-term shorebird monitoring in the Willow Project area, NPR-A, Alaska

Study Species: Pectoral Sandpiper, Long-billed Dowitcher, Red Phalarope, Red-necked Phalarope (most common species in the study area)

Study Location: Willow Project area, National Petroleum Reserve-Alaska (70.13 N, 152.06 W)

Principal Investigators: Lauren B. Attanas, Andy R. Bankert, and Rebecca L. McGuire (ABR, Inc.- Environmental Research & Services)

Primary Contact: Lauren B. Attanas, ABR, Inc.—Environmental Research & Services, PO Box 80410 Fairbanks, AK 99708, lattanas@abrinc.com

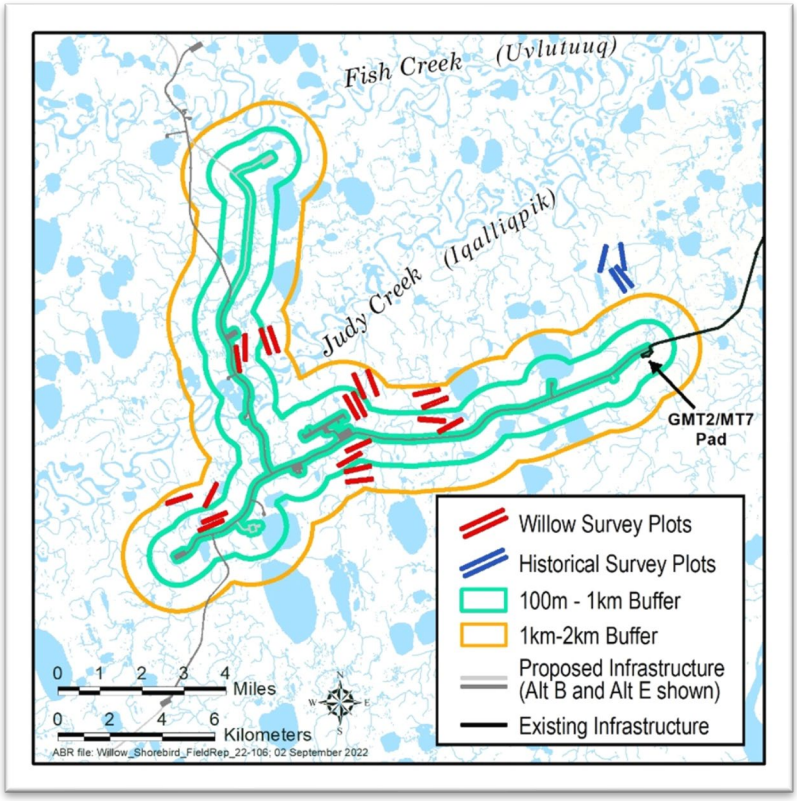
Study Objectives

- Document the distribution, abundance, habitat associations, and nesting success of breeding shorebirds in the Willow project area.
- Determine whether there are changes in the metrics from the baseline pre-construction period to the construction and post-construction (production) periods.
- Measure the effects, if any, of development and environmental factors on breeding shorebird densities and breeding success during construction and production.

Results

- During 2 June-16 July 2022, we found 217 nests of 19 species, including 116 nests of 9 shorebird species, on and off plot.
- Overall nest density for shorebird species across all plots was 40.4 nests/km^2, higher than in 2021 (27.1 nests/km^2).
- The shorebird species with the highest nest densities were Pectoral Sandpiper (17.5 nests/km^2), Long-billed Dowitcher (10.0 nests/km^2), and Red-necked Phalaropes (3.3 nests/km^2).
- In 2022, we monitored nest temperature at 20 shorebird nests of 4 shorebird species (Pectoral Sandpipers, Long-billed Dowitchers, Red-necked Phalaropes, and Red Phalaropes) using Gemini TinyTag data loggers (model TGP-4020) attached to thermistor probes (PB5009-0M6). Nineteen of the 20 data loggers successfully collected data which is being used to calculate incubation parameters (recess frequency and duration, incubation start and end dates) and will be included in Daily Survival Rate (DSR) analysis (in progress).

- Snow cover was more extensive in 2022 than in 2021 and persisted until the second week of June.
- Jaegers (Parasitic and Long-tailed) were the most commonly-observed predator during predator counts in 2022.
- Microtine/arvicoline abundance, as measured by the presence of sign and live animals, was low at all plots in 2022.



Map of Willow Project Area, NPR-A. Provided by Lauren Attanas.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify effects associated with energy production, mining, disturbance, and other anthropogenic activities on shorebirds.

POPULATION INVENTORY AND MONITORING:

- Conduct long-term population monitoring efforts (e.g., PRISM).

HABITAT MANAGEMENT AND PROTECTION:

- Apply abundance and distribution information to identify key shorebird habitats and sites.

"Come to Alaska they said, it will be fun they said…". Photo Lauren Attanas.

#10 (BCR 3): Reproductive output of shorebirds at the Colville River, Alaska

Study Species: Semipalmated Sandpiper, Dunlin, Red Phalarope, Red-necked Phalarope, Pectoral Sandpiper

Study Location: Colville River Delta (70.44 N, 150.67 W)

Principal Investigators: Dan Ruthrauff (USGS Alaska Science Center), Vijay Patil (USGS Alaska Science Center)

Primary Contact: Dan Ruthrauff, US Geological Survey, 4210 University Drive, Anchorage AK 99508, druthrauff@usgs.gov

Study Objectives

- Assess climate-moderated effects on reproduction of shorebirds.
- Assess effects on breeding shorebirds of habitat degradation caused by a rapidly expanding population of snow geese.

Results

- Due to logistical constraints, we were only present at the study site from 17-30 June.
- We found and monitored 89 nests of 7 shorebird species.
- Nest initiation dates were significantly delayed compared to long-term averages due to unseasonably cold spring conditions.
    - For example, Semipalmated Sandpipers constituted the majority (80%) of nests at our site in 2022. The mean initiation date for Semipalmated Sandpipers in 2022 was 15 June, compared to a long-term average of 10 June from 2011-2018.
- We established grazing transects at our site in 2016 to document goose-driven habitat changes. The population of snow geese on the Colville River Delta has increased from ~4,500 adults to ~35,000 adults between 2016 and 2021, and this population increase is reflected by a strong decrease in the cover of graminoid plants at vegetation plots.
- Analyses are ongoing to determine the direct (i.e., predator-prey dynamics of expanding goose colonies) and indirect (i.e., changes in habitat composition, nest concealment) effects of increasing goose populations on shorebird nest survival

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.
- Assess the effects of climate change on shorebird demography.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).

Bugs, ice and weather on the Colville River Delta. Photo Dan Ruthrauff.

#11 (BCR 3): Reproductive ecology of shorebirds at Utqiaġvik, Alaska in 2022

Study Species: Dunlin, American Golden-Plover, Semipalmated Sandpiper, Long-billed Dowitcher, Red Phalarope, Red-necked Phalarope, Baird's Sandpiper, Pectoral Sandpiper, Western Sandpiper, Buff-breasted Sandpiper, White-rumped Sandpiper, Ruddy Turnstone

Study Location: Utquaġvik (71.29 N, 156.64 W)

Principal Investigators: Richard Lanctot (U.S. Fish and Wildlife Service), Sarah Saalfeld (U.S. Fish and Wildlife Service)

Primary Contact: Richard Lanctot, U.S. Fish and Wildlife Service, 1011 East Tudor Rd, MS 201, Anchorage, AK, 99503; richard_lanctot@fws.gov

Study Objectives

- Collect baseline data on temporal and spatial variability of shorebird diversity and abundance,
- Collect information on nest initiation and effort, replacement clutch laying, clutch and egg size, nest and chick survival, and other demographic traits of Arctic-breeding shorebirds,
- Establish a marked population of as many shorebird species as possible that will allow us to estimate adult survival, mate and site fidelity, and natal philopatry,
- Relate weather, food availability, and predator and prey abundances to shorebird productivity,
- Collaborate with others to support Arctic-wide data collection and graduate student work**.**

Results

- In 2022, we conducted the 20th year of a long-term shorebird study at Utqiaġvik (formerly Barrow), Alaska.
- We monitored 377 nests and captured and banded 172 adult shorebirds and 88 chicks to estimate nest and adult survival rates.
- We continue to collect annual data on timing of snow melt, lemming, and predator abundances.
- We continue to collect data for other Arctic-wide collaborations including the "Interaction Working Group" and a Bird Vocalization project which used automated recording units to assess shorebird abundance.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.
- Determine migratory timing, routes, and site use of shorebirds.
- Assess the effects of climate change on shorebird demography.

POPULATION INVENTORY AND MONITORING:

- Conduct long-term population monitoring efforts (e.g., PRISM).
- Assess the utility of new technologies (e.g., Automated Recording Units, aerial drones, eBird) to determine shorebird presence and abundance.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).

Commuting to the field site along the Arctic Ocean. Photo Sarah Saalfeld.

#12 (BCR 3): Shorebird population monitoring and nest survival on the Arctic National Wildlife Refuge

Study Species: Pectoral Sandpiper, Semipalmated Sandpiper, Red-necked Phalarope, Red Phalarope, American Golden-Plover, Dunlin, Stilt Sandpiper, Long-billed Dowitcher, Buff-breasted Sandpiper, Semipalmated Plover, Ruddy Turnstone, Whimbrel, Baird's Sandpiper, Western Sandpiper, Wilson's Snipe, Black-bellied Plover, Least Sandpiper

Study Location: Arctic National Wildlife Refuge, 1002 Area, base camp at Katakturuk River (N 69.81 N, 145.34 W)

Principal Investigators: Richard Lanctot and Sarah Saalfeld (USFWS, Migratory Bird Management), Stephen Brown and Shiloh Schulte (Manomet Inc.), Chris Latty (USFWS, Arctic NWR)

Primary Contact: Richard Lanctot, U.S. Fish and Wildlife Service, 1011 East Tudor Rd, MS 201, Anchorage, AK, 99503; richard_lanctot@fws.gov

Study Objectives

- Gather information prior to proposed oil and gas development on the 1002 Area of the Arctic NWR, including:
    - To determine population size and distribution of shorebirds (and trend by comparing to prior surveys in 2002/2004) using Program for Regional and International Shorebird Monitoring (PRISM) techniques.
    - To estimate nest survival at a landscape level in areas northwest of the Marsh Creek Anticline A secondary objective was to relate sound recordings from automated recording devices with visual observations of birds collected during PRISM surveys.

Results

PRISM Surveys:

- In 2019, we surveyed 108 plots of which 54 were previously sampled in 2002 and 2004. Within these plots, we counted 681 individual shorebirds and waterfowl, representing 26 species. Population estimates were derived for 12 shorebird species, many of which were lower than estimates from 2002 and 2004. The early spring in 2019 may have biased our counts low.
- In 2022, we surveyed 89 plots, of which 42 were previously sampled. We counted 1145 shorebirds and waterfowl, representing 31 species. Audiomoths were

deployed and later retrieved from 78 plots. Population estimates are being derived now. The spring was extremely late in 2022, which resulted in some surveys being conducted slightly sooner than we would have wanted. This might also lead to lower population estimates.

Nest Survival:

- In 2019, we searched 27 plots and found 75 shorebird and 7 nests of other species (e.g., geese, eiders, scaup, pintail, longspur). Sixty-four nests received temperature sensors and 26 received cameras. We were able to determine the fate of 53 nests (excluding those found at hatch). Of those nests, 43 were successful (81%). Of the failed nests, 1 failed to hatch and the rest were likely predated. From the camera footage, we documented 3 predator species including arctic fox, wolverine, and sandhill crane.
- In 2022, we searched 17 plots for nests and located nests during PRISM surveys. We found 58 shorebird nests and were able to determine the fate of 55 of these nests. Of those nests, 33 were successful (60%). Of the failed nests, 2 were abandoned right after they were found, and the rest were likely predated. From the camera data, we determined the predator of 11 nests, 10 were eaten by arctic foxes and 1 by a parasitic jaeger. In 2022, 3 LALO nests were also monitored, 2 were predated and 1 hatched.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify effects associated with energy production, mining, disturbance, and other anthropogenic activities on shorebirds.

POPULATION INVENTORY AND MONITORING:

- Conduct long-term population monitoring efforts (e.g., PRISM).
- Assess the utility of new technologies (e.g., Automated Recording Units, aerial drones, eBird) to determine shorebird presence and abundance.

HABITAT MANAGEMENT AND PROTECTION:

- Minimize loss and degradation of critical shorebird habitats by participating in natural resource planning and management.

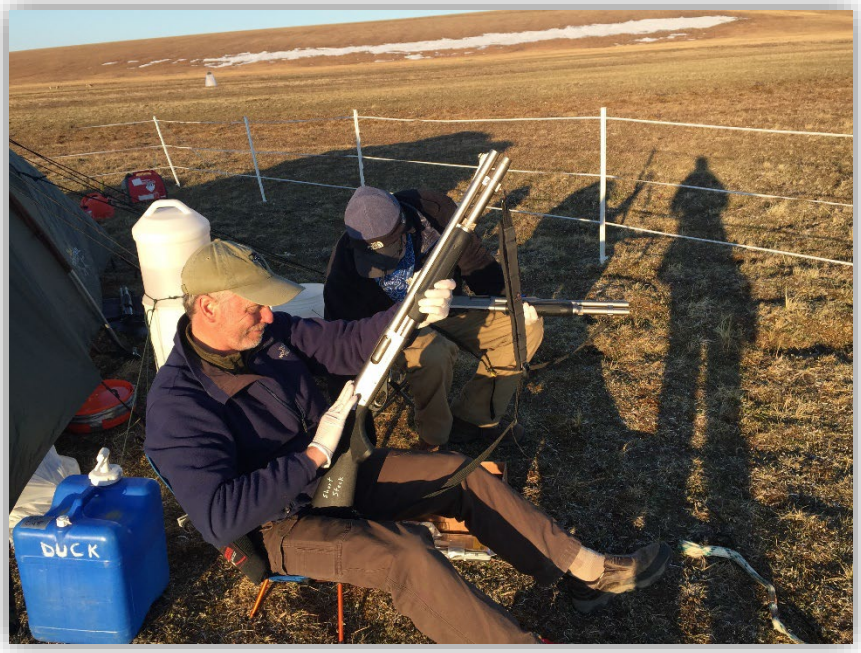
ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).

Surveying for shorebird nests within Arctic National Wildlife Refuge and the 1002 Area. Photo Richard Lanctot.



Cleaning firearms at camp within Arctic National Wildlife Refuge. Photo Richard Lanctot.

#13 (BCR 3): Calidris alpina arcticola annual adult survival

Study Species: Dunlin (Calidris alpina arcticola)

Study Location: Utqiagvik (71.29 N, 156.78 W)

Principal Investigators: Lindsay Hermanns, Dr. Jim Fraser, Virginia Tech, Dr. Daniel Catlin, and Dr. Sarah Karpanty (Virginia Tech), Richard Lanctot (USFWS, Migratory Bird Management)

Primary Contact: Lindsay Hermanns 142 High Street, Fayetteville, WV, lindfh89@vt.edu

Study Objectives

- To enhance previous research detailing annual adult survival rate of C.a.arcticola, and, to examine potential factors influencing survival on the breeding grounds and wintering areas.

Results

- By using a newer modeling approach for a long-term study, we found that C.a.arcticola adult survival rates are higher than previously predicted, at: (0.69 (95 % C.I. 0.41–0.87).
- Breeding site conditions (date of 20% snow melt across the study site, and, days below the seasonal minimum temperature) influence survivorship, with more cold days negatively influencing survival, and later snow melt negatively influencing survival.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.
- Determine migratory timing, routes, and site use of shorebirds.
- Assess the effects of climate change on shorebird demography.
- Conduct breeding ecology studies on species occupying alpine, boreal, or other rare or difficult-to-access habitats.
- Identify effects associated with energy production, mining, disturbance, and other anthropogenic activities on shorebirds.

POPULATION INVENTORY AND MONITORING:

- Conduct long-term population monitoring efforts (e.g., PRISM).

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.
- Develop shorebird-related outreach and media materials.
- Host workshops and outreach events to engage the diverse communities of Alaska in shorebird conservation.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.
- Identify and support ways to involve citizen scientists in shorebird monitoring programs.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).

Brood of Dunlin chicks at a nesting nest near Utqiagvik. Photo Lindsay Hermanns.

Shorebird field crew at Utqiagvik. Photo Lindsay Hermanns.

#14 (BCR 3): Breeding ecology of tundra-nesting birds at the Canning River Delta on Arctic National Wildlife Refuge

Study Species: Black-bellied Plover, American Golden-Plover, Semipalmated Sandpiper, Pectoral Sandpiper, Dunlin, Stilt Sandpiper, Red-necked Phalarope, Red Phalarope

Study Location: Canning River Delta, Arctic National Wildlife Refuge (70.11 N, 145.84 W)

Principal Investigators: Sadie E.G. Ulman and Christopher Latty, Arctic National Wildlife Refuge, U.S. Fish and Wildlife Service

Primary Contact: Sadie E.G. Ulman Arctic National Wildlife Refuge, U.S. Fish and Wildlife Service 101 12th Ave, Room 236 Fairbanks, AK, 99701 sadie_ulman@fws.gov

Study Objectives

- Locate and monitor tundra nesting bird nests to determine key vital rates, daily nest survival rates, and nest density.
- Determine limiting factors of shorebird nest survival.
- Assess the effects and effectiveness of remote sensing devices (temperature loggers and nest cameras) on shorebird nest survival.

Preliminary Results

- It was a late spring, with nearly complete snow cover on the tundra when crew arrived June 6.
- In general, there were fewer birds nesting at the Canning River Delta this summer compared to prior years.
- We located 122 nests, of which, 50 were shorebirds from 8 species.
- This was the second year of deploying a new style of cryptic camera placed directly at the nest bowl (Figure 2). Previously, cameras were placed ~10 m from the nest, but this new design, using a modified Brinno camera with an external lens, was placed ~30 cm from the bowl and angled to peer into nests. This allowed us to easily visualize the behavior of the incubating adult, hatch of individual eggs, and loss of eggs to both large and small predators (such as ermine). In most cases, the incubation information we recorded would have been missed by a camera set at a further distance.
- After a pilot effort in 2021, we moved all of our nest discovery effort from plot-based surveys to line-transect distance sampling. By using transect sampling, we can expand our study area and minimize disturbance to any one area.

Moving to this new model was only possible by embracing remote monitoring, including the use of temperature loggers and cameras.
- Most nests were only visited once at discovery, and again post-fate to collect devices.
- By moving towards this new system of line-transect distance sampling and remote monitoring devices, we expect to increase our sample size of nests encountered and monitored, increase our accuracy and precision for derived parameters like fate and fate timing, reduce our impact to the local study area, and increase our area of coverage.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.
- Assess the effects of climate change on shorebird demography.
- Conduct breeding ecology studies on species occupying alpine, boreal, or other rare or difficult-to-access habitats.
- Identify effects associated with energy production, mining, disturbance, and other anthropogenic activities on shorebirds.
- Develop habitat-based models to predict the abundance and distribution of shorebirds and assess the adaptability of shorebirds to habitat changes.

POPULATION INVENTORY AND MONITORING:

- Inventory alpine, boreal, and other poorly studied shorebird species.
- Conduct long-term population monitoring efforts (e.g., PRISM).
- Assess the utility of new technologies (e.g., Automated Recording Units, aerial drones, eBird) to determine shorebird presence and abundance.

HABITAT MANAGEMENT AND PROTECTION:

- Apply abundance and distribution information to identify key shorebird habitats and sites.
- Support land acquisitions, easements, restoration efforts, and conservation designations (e.g., the Western Hemisphere Shorebird Reserve Network, East Asian–Australasian Shorebird Reserve Network, Ramsar Convention on Wetlands, and Important Bird Areas Programs) for key shorebird sites.
- Minimize loss and degradation of critical shorebird habitats by participating in natural resource planning and management.

- Model the potential effects of climate change on shorebird habitats and identify future potential regions of habitat refugia.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.
- Develop shorebird-related outreach and media materials.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.
- Incorporate principles of good governance in research and outreach efforts.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).
- Participate in partnerships to conserve migratory shorebirds and their habitats in the circumpolar Arctic (e.g., the Arctic Council's Conservation of Arctic Flora and Fauna working group and initiatives therein), North America (e.g., landscape conservation cooperatives, joint ventures, flyway councils), Western Hemisphere (e.g., Western Hemisphere Shorebird Reserve Network, Western Hemisphere Shorebird Group), Asia (e.g., East Asian-Australasian Flyway Partnership), and other partnerships as they arise.

Figure 1. Remote-lens nest bowl camera at a stilt sandpiper nest. Except for this lens board and ribbon cable, the battery and all other electronics are buried and hidden from sight. With a small amount of added vegetation placed on the setup to break up the silhouette, the cameras are quite camouflaged on the landscape.

Snow present at the Canning River Delta study site on June 8, 2022. Photo Sadie Ulman.

#15 (BCR 3): Predator–prey relationships and the influence of humans on shorebird nest survival

Study Species: Pomarine Jaeger

Study Location: Utqiagvik, Alaska (71.29 N, 156.78 W)

Principal Investigators: John Myles (Hamilton College), Richard Lanctot (USFWS)

Primary Contact: John Myles; Hamilton College; 198 College Hill Rd, Clinton, NY 13323 Mailbox 1309; jmyles@hamilton.edu

Study Objectives

- How much time are jaegers spending foraging? Does this differ for sexes?
- Do jaegers spend time hunting on/near the plots?
- Do jaegers spend more time near the plots when people are around (i.e., nest searching in the middle of day?
- Where are they foraging? Go to sea at all?
- Differences between day and night movements?
- What is their incubation constancy?
- Are there differences in foraging behavior based on sex?

Results

- Due to a collapse in prey populations, little data was collected and therefore very little could be concluded.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.
- Conduct breeding ecology studies on species occupying alpine, boreal, or other rare or difficult-to-access habitats.

POPULATION INVENTORY AND MONITORING:

- Evaluate the efficacy of existing programs (e.g., the Alaska Landbird Monitoring Survey [ALMS], Breeding Bird Survey [BBS] program) to monitor shorebird populations.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).
- Participate in partnerships to conserve migratory shorebirds and their habitats in the circumpolar Arctic (e.g., the Arctic Council's Conservation of Arctic Flora and Fauna working group and initiatives therein), North America (e.g., landscape conservation cooperatives, joint ventures, flyway councils), Western Hemisphere (e.g., Western Hemisphere Shorebird Reserve Network, Western Hemisphere Shorebird Group), Asia (e.g., East Asian-Australasian Flyway Partnership), and other partnerships as they arise.

John Myles posing with a Pomarine Jaeger near Utqiagvik, Alaska.

#16 (BCR 3): Habitat use and migration pathways for Whimbrel and American Golden-plover

Study Species: Whimbrel and American Golden-plover

Study Location: Arctic National Wildlife Refuge (69.81 N, 145.32 W)

Principal Investigators: Shiloh Schulte and Stephen Brown (Manomet), Richard Lanctot (USFWS Migratory Birds Program), and Chris Latty (USFWS Arctic National Wildlife Refuge)

Primary Contact: Shiloh Schulte, Manomet, 18 Park Street, Kennebunk, Maine 04043, sschulte@manomet.org

Study Objectives

- Identify post-breeding habitats on the Arctic Coastal plain for Whimbrel and American Golden-Plovers breeding on the Refuge.
- Document migration routes, stopover sites, and wintering locations of Whimbrel and American Golden-Plovers breeding on the Refuge.
- Establish general connectivity among wintering, migration, and breeding locations.
- Using information from #1 and #2, assess threats to survival along their migratory routes, particularly in response to hurricanes/tropical storms in the Atlantic Flyway, harvest in the Caribbean and South America, and the location of current and planned wind turbine and solar farms.
- Share habitat use and stopover site information with local, regional and national entities to educate and inform conservation decisions regarding where to conduct conservation actions and designate WHSRN and IBA areas.

Results

- Identified breeding habitat characteristics for Whimbrel (WHIM) and American Golden-plover (AMGP) in the Arctic National Wildlife Refuge.
- Successfully fitted 12 WHIM and 6 AMGP with Argos-GPS tags. • Tracked tagged individuals from breeding to wintering sites.
- Tracked WHIM from the Arctic National Wildlife Refuge migrating down both the Atlantic and Pacific flyways.
- Identified short-term and long-term stopover migration sites and associated foraging habitat and roosting sites.
- Initiated threat assessment based on migration routes and stopover sites.

- Creating and sharing material on habitat use, migration routes, and initial threats to a general audience.

Southbound migratory track lines of Whimbrel from 2021 and 2022.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.
- Determine migratory timing, routes, and site use of shorebirds.
- Conduct breeding ecology studies on species occupying alpine, boreal, or other rare or difficult-to-access habitats.
- Identify effects associated with energy production, mining, disturbance, and other anthropogenic activities on shorebirds.
- Identify and delineate potentially distinct populations of shorebirds breeding in Alaska.

HABITAT MANAGEMENT AND PROTECTION:

- Apply abundance and distribution information to identify key shorebird habitats and sites.
- Support land acquisitions, easements, restoration efforts, and conservation designations (e.g., the Western Hemisphere Shorebird Reserve Network, East Asian–Australasian Shorebird Reserve Network, Ramsar Convention on Wetlands, and Important Bird Areas Programs) for key shorebird sites.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.
- Develop shorebird-related outreach and media materials.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).
- Participate in partnerships to conserve migratory shorebirds and their habitats in the circumpolar Arctic, Western Hemisphere, Asia, and other partnerships as they arise.
- Coordinate and participate in international, national, and other regional shorebird conservation planning efforts (e.g., Pacific Americas Shorebird Conservation Strategy, Atlantic Flyway Shorebird Initiative).

Whimbrel carrying a GPS tracking device. Photo Shiloh Schulte.

Field camp on the Arctic National Wildlife Refuge, Photo Shiloh Schulte.

#17 (BCR 3): The impact of anthropogenic disturbance on Dunlin and Arctic Fox space-use on the breeding grounds

Study Species: Dunlin and Arctic Fox

Study Location: Utqiagvik, Alaska (71.27 N, 156.60 W)

Principal Investigators: Aaron Yappert, Stephen Dinsmore (Iowa State University), Anna Tucker (USGS Cooperative Unit, Iowa State University), Richard Lanctot (USFWS Migratory Bird Program)

Primary Contact: Aaron Yappert, Iowa State University, 2310 Pammel Drive, Ames, IA 50014, ayappert@iastate.edu

Study Objectives

- Determine which environmental factors drive daily Dunlin movements on the breeding grounds.
- Evaluate space-use patterns and associated habitats of Dunlin on the breeding grounds.
- Assess how traditional shorebird nest monitoring protocols influence Arctic Fox predation of shorebird nests.
- Determine if Arctic Fox near human-monitored shorebird plots preferentially hunt on these plots.

Results

- We collected >127,000 Arctic Fox GPS locations in the summer of 2022.
- We identified five active fox dens within the study area.
- We collected >85,000 Dunlin GPS locations in the summer of 2022.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.
- Assess the effects of climate change on shorebird demography.
- Identify effects associated with energy production, mining, disturbance, and other anthropogenic activities on shorebirds.

POPULATION INVENTORY AND MONITORING:

- Assess the utility of new technologies (e.g., Automated Recording Units, aerial drones, eBird) to determine shorebird presence and abundance.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).

Collared Arctic Fox at one of the monitoring plots near Utqiagvik. Video image Aaron Yappert.

ANNUAL SUMMARIES

BIRD CONSERVATION REGION 4

Northwestern Interior Forest - Formerly Central Alaska with Cook Inlet included from Southcoastal Alaska: This region is an extensive (278,800 square-miles; 722,000 km 2) patchwork of ecological types. Sub-regions include A) Interior Highlands and Ogilvie Mountains, B) Interior Forested Lowlands and Uplands, Interior Bottomlands, and Yukon Flats, C) Alaska Range, Wrangell Mountains, and Copper Plateau, and D) Cook Inlet. In the interior, winters are cold (average minimums -1 0 F to -31 0 F; -18 0 C to -35 0 C) and summers are warm (average maximum 63 0 F to 72 0 F; 17 0 C to 22 0 C). The Cook Inlet region has both maritime and continental influences and the state's most populous region, two-thirds of Alaska's population reside here, enjoys a mild year-round climate. A mosaic of vegetation communities arise from the interplay of elevation, permafrost, surface water, fire, and aspect. All forest types (needleleaf, deciduous, and mixed) are found in the region and are dominated by white spruce, black spruce, poplars, and paper birch. Tall shrub communities occur along rivers, drainages, and near treeline. Bogs, consisting of low shrubs and shrub-graminoid communities, are common in the lowlands. Alpine dwarf scrub communities are common in Interior Highlands and throughout mountainous regions; highest elevations are generally devoid of vegetation. Despite the varied ecoregions, many bird species are shared among the regions. Lowlands, bottomlands and flats harbor many species of migrating and breeding waterfowl (e.g., Northern Pintail, Northern Shoveler, Green-winged Teal) and swans. These ecoregions, combined with forested lowlands and uplands support breeding shorebirds such as Greater and Lesser Yellowlegs, Solitary and Spotted Sandpipers, and Common Snipe. American Golden-Plovers and Surfbirds are found in alpine habitats in Interior Highland and mountainous ecoregions. The unvegetated intertidal area of Cook Inlet has recently been identified, not only as a major spring stopover site for Western Sandpipers and Dunlins, but also as the primary wintering site for the nominate form of Rock Sandpiper (C. *p. ptilocnemis*). Significant numbers of Long- and Short-billed Dowitchers and Hudsonian Godwits stop in upper Cook Inlet during migration as do Wrangel Island Snow Geese during the spring. A suite of passerines inhabit forest, scrub, and graminoid communities in the region. Black-capped and Boreal Chickadees, Ruby-crowned Kinglets, Swainson's Thrushes, Yellow-rumped Warblers and Dark-eyed Juncos are common forest species. Tall shrub communities host White-crowned, American Tree, and Fox Sparrows, Wilson's and Yellow Warblers, Gray-cheeked Thrushes, and Common Redpolls, among others. At high elevations, Horned Lark and Lapland Longspur are common breeders. *Information derived from Boreal Partners in Flight* Bird Conservation Areas | U.S. Geological Survey (usgs.gov).

#18 (BCR 4): Kachemak Bay shorebird monitoring project

Study Species: All bird species with a focus on shorebirds

Study Location: Kachemak Bay (mostly the Homer Spit; 59.61 N, 151.45 W), and the mouths of the Anchor (59.79 N, 151.85 W) and Kasilof Rivers (60.38 N, 151.30 W).

Principal Investigators: George Matz (Kachemak Bay Birders)

Primary Contact: George Matz, Kachemak Bay Birders, geomatz41@gmail.com

Study Objectives

- The long-term objective for this citizen science project is to attain a better understanding of the status of shorebird populations in Kachemak Bay as well as the intertidal areas of the Anchor and Kasilof Rivers, particularly during spring migration.
- Secondary objectives are:
    - Contribute information that might be useful to others assessing shorebird populations across the entire Pacific Flyway.
    - Use the monitoring data to help protect shorebird populations and habitat on the western side of the Kenai Peninsula.
    - Provide local birders with more opportunity to observe and enjoy shorebirds.

Results

- This year, the Kachemak Bay Birders (based in Homer, Alaska) completed its fourteenth consecutive year of shorebird monitoring. Between April 15 and May 25, we had nine monitoring sessions occurring simultaneously using a protocol that has been consistent from the start. Sessions lasted two hours, once every five days and began when the outgoing tide reached 15.0 feet (or at high tide if less). These tide conditions provide consistency and optimized shorebird viewing conditions. All observations, including all species of birds we counted, were entered in eBird using the ISS portal. We also recorded the weather conditions for each session using data from the National Weather Service located at Homer Airport. In Kachemak Bay a total of 57 volunteers participated in one or more sessions, monitoring four sites on the Homer Spit, the Beluga Slough and by boat (weather permitting) the islands and islets on the south side of Kachemak Bay.

Table 1. 2022 Kachemak Bay observations

		April				May					
#	SPECIES	15	20	25	30	5	10	15	20	25	Total
1	Western Sandpiper	-	-	-	-	616	3,284	5,709	275	5	9,889
2	LESA/WESA/SESA (peeps)	-	-	-	-	128	405	842	129	-	1,504
3	Dunlin	-	-	-	1	216	163	332	30	1	743
4	Surfbird	-	-	-	35	101	42	255	57	1	491
4	Least Sandpiper	-	-	-	-	113	146	65	26	-	350
5	Semipalmated Plover	-	-	-	-	18	32	73	41	25	189
	Dowitcher sp.	-	-	-	-	74	4	52	-	-	130
6	Pacific Golden Plover	-	1	8	2	65	14	1	-	-	91
7	Short-billed Dowitcher	-	-	-	-	3	9	57	9	-	78
8	Greater Yellowlegs	-	6	23	8	23	2	6	3	3	74
9	Black-bellied Plover	-	-	-	11	28	11	10	-	1	61
10	Black Oystercatcher	6	2	2	1	-	-	3	1	3	18
11	Whimbrel	-	-	-	-	-	1	7	8	1	17
12	Black Turnstone	-	-	-	-	13	-	3	-	-	16
13	Red-necked Phalarope	-	-	-	15	-	-	1	-	-	16
14	Pectoral Sandpiper	-	-	-	-	-	-	8	7	-	15
15	Marbled Godwit	-	-	-	3	6	-	4	-	1	14
16	Wandering Tattler	-	-	-	-	-	1	7	3	1	12
17	Wilson's Snipe	-	-	-	-	-	-	6	3	3	12
	Yellowlegs sp.	-	6	-	2	-	-	-	-	-	8
18	Hudsonian Godwit	-	-	-	-	2	-	6	-	-	8
19	Long-billed Dowitcher	-	-	-	-	-	2	1	4	-	7
20	Ruddy Turnstone	-	-	-	-	3	2	-	-	-	5
21	Semipalmated Sandpiper	-	-	-	-	-	-	4	1	-	5
22	Rock Sandpiper	-	2	-	-	1	-	-	1	-	4
23	Bar-tailed Godwit	-	-	-	-	1	-	1	-	-	2
24	Rare; Solitary Sandpiper							2			2
	Total	6	17	33	78	1,411	4,118	7,455	598	45	13,761

Table 2. 2022 Anchor River observations

		April				May					
#	SPECIES	14	19	24	29	4	9	14	19	24	Total
1	Western Sandpiper					4	15	400	16	1	436
	LESA/WESA/SESA (peeps)		2			8	109	200			319
2	Greater Yellowlegs	3	30	18	10	13	11	7	15	1	108
	Dowitcher sp.						2	39	1	3	45
3	Whimbrel				4	2	11		12		29
4	Black-bellied Plover				6	11		2	1		20
5	Short-billed Dowitcher				2	2	4	6	5		19
6	Black Turnstone						17				17
7	Semipalmated Plover					1	4	9	1	1	16
8	Dunlin					2	5		5		12
9	Pacific Golden Plover				5			5			10
10	Spotted Sandpiper							1	5	2	8
11	Lesser Yellowlegs				2	1		2			5
12	Semipalmated Sandpiper								5		5
13	Least Sandpiper					1			3		4
14	Rock Sandpiper	4									4
15	Hudsonian Godwit						3				3
15	Marbled Godwit					3					3
27	Wandering Tattler					1		1	1		3
28	Ruddy Turnstone								3		3
19	Sanderling					2					2
	godwit sp.								1		1
20	Wilson's Snipe	1									1
		8	32	18	29	51	181	672	74	8	1,073

Table 3. 2022 Kasilof River observations

	April				May					
SPECIES	14	19	24	29	4	9	14	19	24	**Total**
Western Sandpiper					60	200	5,500			5,760
Dunlin					25	35	900	8		968
Short-billed Dowitcher					8	52	138		2	200
Greater Yellowlegs		3	28	3	2	2	2	1	2	43
Least Sandpiper						20	3			23
Hudsonian Godwit					2	6	6	1		15
Lesser Yellowlegs						3	4	2	3	12
Pacific Golden Plover				3	5			2	1	11
Black-bellied Plover			3	7			1			11
Whimbrel					2	2	2	1		7
Wilson's Snipe			1			2	2		2	7
Pectoral Sandpiper							2	4		6
Semipalmated Plover					2		2			4
Bar-tailed Godwit							3			3
American Golden-Plover								2		2
Marbled Godwit				1						1
Totals	-	3	32	14	106	322	6,565	21	10	7,073

Table 4. 2009-2022 Kachemak Bay observations

# of Sp.	Species	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Average
1	Western Sandpiper	3,229	4,996	4,100	16,375	7,964	4,000	2,267	1,403	7,225	14,508	2,941	14,011	4,638	9,889	6,968
	LESA/WESA/SESA (peeps)	104	803	3,336	844	5,305	987	306	6,269	360	404	922	1,826	1,149	1,504	1,723
2	Red-necked Phalarope	1,630	1,500	5,152	1,501	703	3,006	1,503	39	102	1,025	2,513	102	1,014	16	1,415
3	Surfbird	292	110	574	2,919	748	2,644	2,111	1,335	1,186	715	850	350	2,740	491	1,219
4	Dunlin	1,097	561	1,283	1,205	2,548	1,530	826	508	590	928	579	1,156	641	743	1,014
5	Least Sandpiper	136	245	219	103	128	195	168	245	102	164	66	634	407	350	226
6	Semipalmated Plover	194	203	197	142	92	251	273	270	246	322	204	205	174	189	212
7	Rock Sandpiper	141	405	482	6	4	6	6	4	47	12	3	597	688	4	172
8	Black-bellied Plover	179	315	282	354	221	114	210	107	80	135	106	82	132	61	170
9	Black Turnstone	81	373	121	71	21	56	352	55	122	92	22	6	52	16	103
	Dowitcher sp.	99	82	57	76	344	49	65	17	14	139	176	55	128	130	102
10	Greater Yellowlegs	24	36	59	68	90	24	39	44	58	59	88	64	108	74	60
11	Semipalmated Sandpiper	1	5	3	34	-	13	33	3	10	10	-	613	10	5	53
12	Whimbrel	10	22	27	28	65	26	28	43	51	25	27	204	153	17	52
13	Wandering Tattler	13	56	30	18	62	39	39	58	58	55	28	5	43	12	37
14	Short-billed Dowitcher	125	-	33	76	18	15	-	20	57	24	2	17	37	78	36
15	Pacific Golden Plover	5	42	5	95	96	17	4	23	13	16	13	42	3	91	33
16	Pectoral Sandpiper	-	7	-	1	146	98	11	-	15	11	40	26	14	15	27
17	Long-billed Dowitcher	-	-	15	1	22	36	-	1	37	7	3	126	49	7	22
18	Black Oystercatcher	11	11	13	8	2	8	18	15	-	7	22	7	17	18	11
19	Marbled Godwit	3	12	1	7	-	8	5	5	11	29	4	6	4	14	8
20	Lesser Yellowlegs	-	26	3	15	9	4	11	1	5	13	-	2	1	-	6
21	Red Knot	-	-	2	-	-	1	1	-	-	-	-	67	4	-	5
22	Ruddy Turnstone	1	10	1	2	9	2	6	9	7	3	5	2	5	5	5
	Yellowlegs sp.	2	18	-	2	2	-	5	-	15	1	2	4	-	8	4
23	Hudsonian Godwit	18	-	2	-	3	3	-	-	1	3	1	6	8	8	4
24	Wilson's Snipe	1	5	1	1	-	-	-	-	-	-	3	10	6	12	3
25	Sanderling	-	1	8	8	-	2	-	-	-	1	1	3	-	-	2
26	American Golden-Plover	3	1	1	1	10	-	-	-	-	-	2	-	1	-	1
27	Bar-tailed Godwit	3	-	-	4	6	-	-	1	1	1	-	-	-	2	1
28	Baird's Sandpiper	1	-	-	6	-	-	-	1	-	-	-	-	-	-	1
29	Spotted Sandpiper	3	-	-	1	-	-	-	1	-	-	-	1	-	-	0.4
30	Bristle-thighed Curlew	-	-	-	-	5	-	-	-	-	-	-	-	-	-	0.4
31	Red Phalarope	-	-	-	-	-	5	-	-	-	-	-	-	-	-	0.4
32	Solitary Sandpiper														2	0.1
	Total Individuals	7,406	9,845	16,007	23,972	18,623	13,139	8,287	10,477	10,413	18,709	8,623	20,229	12,226	13,761	13,694
	Total Species	24	23	25	27	23	25	21	23	22	24	23	26	25	24	24

Table 5. 2013-2022 Anchor River observations

#	SPECIES	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Average
1	Red-necked Phalarope	-	5,000	400	-	-	2	1	-	-		540
2	Western Sandpiper	606	135	204	13	219	799	80	1,322	484	436	430
	LESA/WESA/SESA (peeps)	29	32	14	41	1,364	-	3	36	69	319	191
3	Greater Yellowlegs	44	39	42	50	54	64	51	62	124	108	64
4	Dunlin	67	27	24	9	47	69	41	22	54	12	37
5	Black-bellied Plover	40	48	40	16	19	16	10	19	18	20	25
6	Whimbrel	75	29	2	8	9	20	27	8	25	29	23
7	Semipalmated Plover	14	13	17	10	28	50	7	9	13	16	18
	Dowitcher sp.	19	8	15	4	3	4	8	22	28	45	16
8	Pacific Golden Plover	10	1	8	7	16	32	21	30	6	10	14
9	Rock Sandpiper	16	22	1	-	-	2	-	89	-	4	13
10	Black Turnstone	3	20	-	18	5	24	-	3	42	17	13
11	Least Sandpiper	10	28	24	17	12	19	3	6	7	4	13
12	Short-billed Dowitcher	15	27	5	4	14	4	11	2	20	19	12
13	Lesser Yellowlegs	20	20	2	1	7	5	-	1	-	5	6
14	Semipalmated Sandpiper	8	6	3	5	8	8	1	-	15	5	6
15	Pectoral Sandpiper	3	9	-	1	6	20	3	3	8		5
	Yellowlegs sp.	45	-	-	1	-	-	-	-	2		5
16	Spotted Sandpiper	-	-	6	5	1	2	2	9	5	8	4
17	Long-billed Dowitcher	18	7	3	-	2	3	2	-	3		4
18	Wandering Tattler	1	1	5	-	-	5	1	-	-	3	2
	Plover sp.	15	-	-	-	-	-	-	-	-		2
19	Ruddy Turnstone	1	-	-	-	4	3	-	-	1	3	1
20	Hudsonian Godwit	1	-	-	2	-	3	-	1	1	3	1
21	Marbled Godwit	1	-	-	-	1	1	1	-	2	3	1
22	Sanderling						3	-	3	-	2	1
23	Wilson's Snipe	3	1	-	-	-	1	-	1	1	1	1
24	Red Knot	-	3	-	-	-	2	-	-	-		1
25	American Golden-Plover	-	-	2	-	-	1	-	-	-		0.3
26	Surfbird	-	-	1	-	-	-	-	-	2		0.3
27	Black Oystercatcher	1	-	-	-	-	-	-	-	-		0.1
	godwit sp.										1	0.1
	Total Individuals	1,065	5,476	818	212	1,819	1,162	273	1,648	930	1,073	1,448
	Total Species	21	19	18	16	17	25	16	17	19	20	19

Table 6. 2013-2022 Kasilof River observations

	Summary from 2013-2022											
	SITE : Kasilof River											
	Sorted by average abundance											
#	SPECIES	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Average
1	Western Sandpiper	16,950	588	4,634	2,652	2,557	14,755	6,721	16,588	6,827	5,760	7,803
2	Dunlin	3,338	60	459	523	133	1,462	1,872	1,329	375	968	1,052
3	Short-billed Dowitcher	620	174	195	378	158	429	122	310	277	200	286
4	Black-bellied Plover	59	19	40	70	64	80	38	26	11	11	42
5	Least Sandpiper	209	5	-	2	4	41	4	3	45	23	34
6	Greater Yellowlegs	34	16	17	18	47	9	12	29	99	43	32
7	Whimbrel	43	58	8	6	5	18	18	7	32	7	20
8	Semipalmated Sandpiper	8	-	1	14	2	4	21	71	50	-	17
9	Hudsonian Godwit	25	8	12	21	14	10	6	30	10	15	15
10	Lesser Yellowlegs	8	16	6	13	16	2	6	34	6	12	12
11	Semipalmated Plover	6	3	10	5	5	32	7	22	7	4	10
12	Pectoral Sandpiper	7	2	2	1	-	20	26	1	20	6	9
13	Long-billed Dowitcher	42	-	-	-	-	4	-	2	12	-	6
14	Wilson's Snipe	3	3	4	5	4	4	7	6	11	7	5
15	Pacific Golden Plover	1	2	7	8	1	1	8	3	4	11	5
	Dowitcher sp.	3	-	-	-	-	-	-	-	21	-	2
16	Marbled Godwit	-	2	-	1	-	6	4	2	2	1	2
17	Rock Sandpiper	-	-	-	-	2	9	-	4	-	-	2
18	Red Knot	-	-	2	5	-	-	1	4	-	-	1
19	Surfbird	-	-	-	-	-	-	-	7	3	-	1
20	American Golden-Plover	5	-	-	-	-	-	-	-	-	2	1
21	Bar-tailed Godwit	1	-	-	-	-	1	-	1	-	3	1
22	Sanderling	-	-	1	2	-	-	1	2	-	-	1
23	Ruddy Turnstone				2	1	-	-	2	-	-	1
	Godwit sp.									4	-	0.4
	LESA/WESA/SESA (peeps)							1	-	3	-	0.4
24	Red-necked Phalarope	-	2	-	-	-	1	-	-	-	-	0.3
25	Killdeer	-	-	-	-	1	-	-	-	1	-	0.2
26	Baird's Sandpiper	1	-	-	1	-	-	-	-	-	-	0.2
27	Black Turnstone	-	-	-	-	-	1	-	-	-	-	0.1
	Total Individuals	21,363	958	5,398	3,727	3,014	16,889	8,875	18,483	7,820	7,073	9,360
	Total Species	19	15	15	19	16	20	17	22	18	16	18

More specific data, such as counts by monitoring site and dates, is available at https://kachemakbaybirders.org/blog/category/citizen-science/shorebird-monitoring/

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Determine migratory timing, routes, and site use of shorebirds.
- Assess the effects of climate change on shorebird demography.

POPULATION INVENTORY AND MONITORING:

- Conduct long-term population monitoring efforts (e.g., PRISM).
- Evaluate the efficacy of existing programs (e.g., the Alaska Landbird Monitoring Survey [ALMS], Breeding Bird Survey [BBS] program) to monitor shorebird populations.

HABITAT MANAGEMENT AND PROTECTION:

- Apply abundance and distribution information to identify key shorebird habitats and sites.
- Support land acquisitions, easements, restoration efforts, and conservation designations (e.g., the Western Hemisphere Shorebird Reserve Network, East Asian–Australasian Shorebird Reserve Network, Ramsar Convention on Wetlands, and Important Bird Areas Programs) for key shorebird sites.
- Minimize loss and degradation of critical shorebird habitats by participating in natural resource planning and management.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.
- Develop shorebird-related outreach and media materials.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.
- Identify and support ways to involve citizen scientists in shorebird monitoring programs.
- Incorporate principles of good governance in research and outreach efforts.

INTERNATIONAL COLLABORATIONS:

- Participate in partnerships to conserve migratory shorebirds and their habitats in the circumpolar Arctic.
- Coordinate and participate in international, national, and other regional shorebird conservation planning efforts (e.g., Pacific Americas Shorebird Conservation Strategy, Atlantic Flyway Shorebird Initiative).

Mud Bay observers in 2021. Photo Paul Allan.

#19 (BCR 4): Migratory movements of Alaska breeding Upland Sandpipers

Study Species: Upland Sandpiper

Study Location: Delta Junction, Alaska (63.91 N, 145.18 W)

Principal Investigators: Callie Gesmundo, Zak Pohlen, Hannah Vincelette, Richard Lanctot, and Jim Johnson (U.S. Fish and Wildlife Service, Migratory Bird Program)

Primary Contact: Jim Johnson, USFWS, Migratory Bird Management, 1011 East Tudor Road, Anchorage, AK 99503. Phone: 907-786-3423; E-mail: jim_a_johnson@fws.gov

Study Objectives

- Document migration routes, stopover sites, and wintering locations of Upland Sandpipers breeding in Alaska.

Preliminary Results

- 15 adults captured and processed.
- 10 solar Argos Doppler transmitters (2 g; Lotek Wireless Inc.) and 5 PinPoint Argos GPS 75 transmitters (4 g; Lotek Wireless Inc.) deployed on adults.
- 3 adults resighted from 2021 efforts • During southbound migration, all birds used a narrow migratory corridor through the Midcontinent Flyway.
- Non-breeding areas occur in Northeast Argentina/Uruguay

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Determine migratory timing, routes, and site use of shorebirds.

HABITAT MANAGEMENT AND PROTECTION:

- Support land acquisitions, easements, restoration efforts, and conservation designations (e.g., the Western Hemisphere Shorebird Reserve Network, East Asian–Australasian Shorebird Reserve Network, Ramsar Convention on Wetlands, and Important Bird Areas Programs) for key shorebird sites.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.

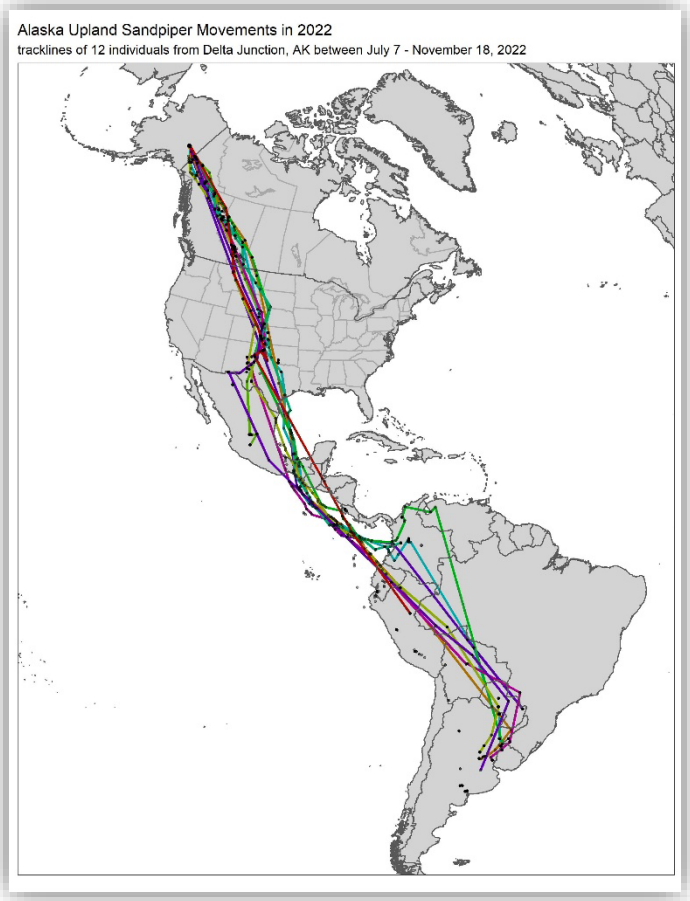


Figure Left: Migratory track lines of Upland Sandpipers breeding near Delta Junction from July 7-Nov 18.

Photo below: The Upland Sandpiper field crew decompressing after a successful capture. Photo Zak Pohlen.

#20 (BCR 4): Migratory patterns and vital rates of boreal breeding shorebirds at Eielson Air Force Base

Study Species: Lesser Yellowlegs, Solitary Sandpiper, Spotted Sandpiper

Study Location: Eielson Air Force Base, Alaska (64.65 N, 147.06 W)

Principal Investigators: Callie Gesmundo, Zak Pohlen, Hannah Vincelette, and Jim Johnson (U.S. Fish and Wildlife Service, Migratory Bird Program), Katie Christie (Alaska Department of Fish and Game, Threatened, Endangered and Diversity Program)

Primary Contact: Jim Johnson, USFWS, Migratory Bird Management, 1011 East Tudor Road, Anchorage, AK 99503. Phone: 907-786-3423; E-mail: jim_a_johnson@fws.gov

Study Objectives

- Estimate annual adult survival and recruitment of Lesser Yellowlegs, Solitary Sandpipers, and Spotted Sandpipers breeding at Eielson Air Force Base.
- Document migration routes, stopover sites, and wintering locations of Lesser Yellowlegs and Solitary Sandpipers.

Results

- Captured and marked 23 Lesser Yellowlegs, 33 Solitary Sandpiper, and 11 Spotted Sandpiper adults.
- Retrieved 1 GPS tag from a Solitary Sandpiper deployed in 2021.
- Captured and marked 13 Lesser Yellowlegs and 6 Solitary Sandpiper chicks.
- Resighted 7 Lesser Yellowlegs, 1 Solitary Sandpiper, and 6 Spotted Sandpiper previously marked in 2021.
- Found 1 Lesser Yellowlegs, 1 Solitary Sandpiper, and 8 Spotted Sandpiper nests.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Determine migratory timing, routes, and site use of shorebirds.
- Conduct breeding ecology studies on species occupying alpine, boreal, or other rare or difficult-to-access habitats.

HABITAT MANAGEMENT AND PROTECTION:

- Minimize loss and degradation of critical shorebird habitats by participating in natural resource planning and management.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Develop shorebird-related outreach and media materials.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).

Banding and collecting measurements of a Lesser Yellowlegs at Eielson Air Force Base. Photo Callie Gesmundo.

#21 (BCR 4): Lesser Yellowlegs: A path to recovery

Study Species: Lesser Yellowlegs

Study Location: Anchorage (61.17 N, 150.04 W), Churchill (58.70 N, 94.13 W), North Dakota (various), Argentina (various)

Principal Investigators: Katie Christie (ADF&G), Brad Andres (retired USFWS), Court Brown (Trent University), Jim Johnson (USFWS Migratory Bird Program), Shelby McCahon (University of Idaho), Laura McDuffie and Lee Tibbitts (USGS Alaska Science Center), Kelly Srigley Werner (University of Idaho)

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

Study Objectives

- Objective 1. Initiate a working group to forge partnerships with social scientists and stakeholders.
- Objective 2. Estimate range-wide vital rates to develop an Integrated Population Model.
- Objective 3. Evaluate the effects of agricultural practices on non-breeding Lesser Yellowlegs.
- Objective 4. Achieve a sustainable harvest in Suriname, Guyana, Barbados, Martinique, and Guadeloupe.
- Objective 5. Continue an ongoing citizen science program (Birds 'n' Bogs) in Anchorage to monitor Lesser Yellowlegs and other focal species.

Preliminary Results

- Objective 1: The Lesser Yellowlegs Restoration Team, comprised of ornithologists, social scientists, and conservation practitioners, was recently formed to evaluate and address threats that are likely to limit yellowlegs population growth.
- Objective 2: We have estimated survival and daily nest survival rates for Lesser Yellowlegs banded in Anchorage and continue to collect data on nest success, abundance, and adult survival for a sister study in Churchill, Manitoba.
- Objective 3: We have successfully completed two field seasons in North Dakota and samples are currently being analyzed for neonicotinoid concentrations. In addition, we have conducted preliminary surveys of Lesser Yellowlegs in the Argentine Pampas to determine important wintering habitats.

- Objective 4: The Atlantic Flyway Shorebird Initiative Harvest Group has taken steps to finance hunter education programs and law enforcement patrols in Suriname, transition shooting swamps into no-shooting refugia in Barbados and set daily bag limits in Martinique and Guadeloupe.
- Objective 5: Each spring, 40-50 wetlands across Anchorage and the Mat-Su Valley are surveyed by citizen scientists, field technicians, and elementary school teachers.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.
- Assess the effects of climate change on shorebird demography.
- Conduct breeding ecology studies on species occupying alpine, boreal, or other rare or difficult-to-access habitats.
- Obtain better estimates of illegal and legal harvest levels for Alaska-breeding shorebirds within Alaska and when outside Alaska.

HABITAT MANAGEMENT AND PROTECTION:

- Conduct long-term population monitoring efforts (e.g., PRISM).

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.
- Develop shorebird-related outreach and media materials.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.
- Identify and support ways to involve citizen scientists in shorebird monitoring programs.
- Incorporate principles of good governance in research and outreach efforts.

INTERNATIONAL COLLABORATIONS:

- Participate in partnerships to conserve migratory shorebirds and their habitats in the circumpolar Arctic (e.g., the Arctic Council's Conservation of Arctic Flora and Fauna working group and initiatives therein), North America (e.g., landscape conservation cooperatives, joint ventures, flyway councils), Western Hemisphere (e.g., Western Hemisphere Shorebird Reserve Network, Western Hemisphere

Shorebird Group), Asia (e.g., East Asian-Australasian Flyway Partnership), and other partnerships as they arise.

- Coordinate and participate in international, national, and other regional shorebird conservation planning efforts (e.g., Pacific Americas Shorebird Conservation Strategy, Atlantic Flyway Shorebird Initiative).

Shelby McCahon holding a Lesser Yellowlegs. Photo Mitch Paisker.

#22 (BCR 4): Hudsonian Godwits and the effects of multiple, simultaneous anthropogenic stressors

Study Species: Hudsonian Godwit

Study Location: Upper Cook Inlet (61.21 N, 151.02 W and 61.12 N, 151.10 W)

Principal Investigators: Nathan R. Senner, Lauren Puleo, and Feipeng Huang (University of Massachusetts Amherst)

Primary Contact: Nathan Senner, University of Massachusetts Amherst, nsenner@umass.edu

Project Summary

Since 2009, our research group has monitored Hudsonian Godwit breeding and migration ecology, including their arrival timing, habitat use, nest and fledging success, survival, and recruitment on two study plots near Beluga on the west side of Upper Cook Inlet. We couple this focus on godwit ecology with measures of the phenology and abundance of the local invertebrates godwit chicks rely on for food. During this time, we have followed >200 godwit nests, individually marked >150 adults and >600 chicks, and counted ~600,000 invertebrates. Previously, these efforts had demonstrated that godwits breeding in Beluga were adequately responding to recent climatic change by arriving in the region increasingly earlier each spring (Senner 2012). These shifts enabled godwits to properly time their reproductive efforts in synchrony with local invertebrate phenology, thereby allowing their young sufficient resources to successfully fledge (Senner et al. 2017). Our continued efforts have led to preliminary analysis of newly retrieved geolocators that suggest godwits may no longer be shifting their arrival timing to occur earlier in the spring and instead that they are arriving substantially later than in previous years (Puleo et al., *unpublished*). Shifts in arrival to the breeding grounds appear to be the result of similar shifts in departure timing from non-breeding sites. In combination with more recent data on godwit breeding biology and phenology — showing that phenological mismatches are now appearing in anomalously warm years (Wilde et al. 2022) — we are trying to uncover any carry-over effects associated with these shifts in migration timing.

Importantly, to attain increasingly fine-scale movements of godwit chicks on the landscape and in relation to their predators and prey, we utilized a Motus tower and radio transmitters during a pilot season in the summer of 2022. We now plan to monitor the distributions of mammalian predators and invertebrates with trail cameras and pitfall traps to inform the overlap between risks and rewards for chicks under different environmental conditions. We will investigate how this overlap influences chick movement and survival and how it is expected to evolve with climate change.

Since 2012, godwit breeding densities have declined by ~50% at Beluga. This decline is apparently the result of declining adult survival driven by conditions on the nonbreeding grounds and along the godwit migration route, coupled with the effects of predators on chick survival in Beluga, where predators account for nearly 90% of all chick mortalities. Our current goals are thus three-fold: **(1)** Understand large-scale shifts in migratory timing and changes in migratory strategy of godwits breeding in Beluga; **(2)** Quantify the degree to which trade-offs incurred during migration influence reproductive timing and success; and **(3)** Assess how movement of godwit chick predator and prey on a changing Alaskan landscape affects overall chick success.

ANNUAL SUMMARIES

BIRD CONSERVATION REGION 5

Northwest Pacific Rainforest- Formerly Southcentral and Southeastern Alaska: The coastal rainforest stretches from extreme southern Alaska to the western Gulf of Alaska and is characterized by heavy precipitation and mild temperatures typical of a maritime climate. Sub-regions include A) Coastal Hemlock-Spruce Forests, and B) Pacific Coastal Mountains. The regions stark, rugged features are a result of intense glaciation during the Pleistocene and nearly all adjacent land area remains glaciated. Much of the terrain is steep sloped from sea level up to 3,300 feet (1,000 m), but large floodplains, alluvial fans, outwash plains, and river deltas also occur here. The region is dominated by needleleaf forests of Western Hemlock and Sitka Spruce; other needleleaf species also occur in coastal forests. Broadleaf forests are found along large mainland river drainages. Several other communities are present in this region and include tall, low, and dwarf scrub; tall and low scrub bogs and swamps; and wet graminoid and forb herbaceous communities. The Copper and Stikine River deltas and the Yakutat forelands are major stopover sites for migrating shorebirds, especially Western Sandpipers and Dunlins. Black Oystercatchers, Rock Sandpipers, Black Turnstones, and Surfbirds are common wintering species. Nearshore marine areas support many breeding and wintering sea ducks (e.g., Surf Scoter, Harlequin Duck) and seabirds (e.g., Black-legged Kittiwakes, murres, murrelets). Coastal forests support a host of resident and breeding passerines (e.g., Chestnut-backed Chickadee, Winter Wren, Brown Creeper, Ruby and Golden-crowned Kinglets, Red-breasted Sapsucker), raptors (Bald Eagle, Northern Goshawk, Northern Saw-whet Owl), and seabirds (Marbled Murrelet). *Information derived from Boreal Partners in Flight* Bird Conservation Areas | U.S. Geological Survey (usgs.gov)

#23 (BCR 5): Monitoring Semipalmated Plovers breeding at Egg Island, Copper River Delta

Study Species: Semipalmated Plover

Study Location: Egg Island, Alaska (60.38 N, 145.91 W)

Principal Investigators: Mary Anne Bishop and Anne Schaefer (PWS Science Center)

Primary Contact: Mary Anne Bishop, Prince William Sound Science Center, PO Box 705, Cordova, Alaska 99574 mbishop@pwssc.org

Study Objectives

- Monitor breeding phenology.
- Determine survivorship based on return rates of banded breeders.

Results

- Documented 20 nests in the study area.
- Color-banded 5 Semipalmated Plovers.
- Resighted 20 Semipalmated Plovers.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.

POPULATION INVENTORY AND MONITORING:

- Conduct long-term population monitoring efforts (e.g., PRISM).

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.

Surfbirds resting on the rock in Prince William Sound. Photo Mary Anne Bishop.

Outdoor dining on the beach. Photo Mary Anne Bishop.

#24 (BCR 5): Red Knot abundance, diet and habitat use in Controller Bay

Study Species: Red Knot

Study Location: Controller Bay, Alaska (60.14 N, 144.27 W)

Principal Investigators: Jenell Larsen Tempel (ADF&G), Erin Cooper (USFS), Dan Ruthrauff (USGS Alaska Science Center)

Primary Contact: Jenell Larsen Tempel, Endangered Species Biologist, ADF&G. jenell.larsentempel@alaska.gov. 1255 W. 8th St., Juneau, AK 99801

Study Objectives

- Determine the abundance of Red Knots using Controller Bay as a spring stopover site
- Assess prey availability in Controller Bay.
- Determine Red Knot diet in Controller Bay.

Preliminary Results

- In May 2022, we were unable to develop a robust abundance estimate from this year because we did not have enough resights from individually marked birds (birds with leg flags) and we did not time the migration very well.
- Prey availability is being assessed currently. At present, it appears that there are 3 main prey items available to Red Knots in Controller Bay during late-April through mid-May: *Limecola balthica*, *Mya arenaria* and *Eteone longa*. While the diversity of benthic invertebrates is low, this is not unexpected and is very similar to the diversity of benthic invertebrates reported from the nearby Copper River Delta.
- Diet of Red Knots was assessed using DNA metabarcoding on fecal samples. We were unable to determine main dietary items using this methodology as the primers used did not do a good job of amplifying marine invertebrate DNA. More work is needed to assess shorebird diet using these techniques.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Determine migratory timing, routes, and site use of shorebirds.

HABITAT MANAGEMENT AND PROTECTION:

- Apply abundance and distribution information to identify key shorebird habitats and sites.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).
- Participate in partnerships to conserve migratory shorebirds and their habitats in the circumpolar Arctic (e.g., the Arctic Council's Conservation of Arctic Flora and Fauna working group and initiatives therein), North America (e.g., landscape conservation cooperatives, joint ventures, flyway councils), Western Hemisphere (e.g., Western Hemisphere Shorebird Reserve Network, Western Hemisphere Shorebird Group), Asia (e.g., East Asian-Australasian Flyway Partnership), and other partnerships as they arise.

The challenges of riding fat bikes on the mudflats of Controller Bay. Photo Jenell Larsen Tempel.

#25 (BCR 5): Copper River Delta Shorebird Festival

Study Species: Western Sandpiper, Dunlin, Least Sandpiper, Short-billed Dowitcher, Long-billed Dowitcher, Pectoral Sandpiper, Whimbrel

Study Location: Copper River Delta (60.25 N, 145.11 W)

Principal Investigators: Erin Cooper (U.S. Forest Service), Cordova Chamber of Commerce

Primary Contact: Erin Cooper, USFS, PO 280 Cordova AK 99574, erin.cooper@usda.gov

Study Objectives

- Promote ecotourism and stewardship in Cordova, Alaska.

Event Summary

- Keynote Speaker: Mike Webber: Totem Pole installation and PWS Science Center, Connecting Native Culture, Art and Science.
- International Speakers: Fernando Angulo, Peru: CONABIO International Speaker: Anna Agreda, Ecuador: Aves y Conservacion
- Local Speaker: Erin Cooper
- Birding 101, Various art workshops, Family and kid activities, Field Trips, Virtual daily bird diary
- Registration: 136 (more attended but did not register)
- Economic Impact: $173,030.06 (statistics from the Chamber of Commerce)

Alaska Shorebird Conservation Plan II Objectives Reached:

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.
- Develop shorebird-related outreach and media materials.
- Host workshops and outreach events to engage the diverse communities of Alaska in shorebird conservation.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.
- Identify and support ways to involve citizen scientists in shorebird monitoring programs.

INTERNATIONAL COLLABORATIONS:

- Participate in partnerships to conserve migratory shorebirds and their habitats in the circumpolar Arctic (e.g., the Arctic Council's Conservation of Arctic Flora and Fauna working group and initiatives therein), North America (e.g., landscape conservation cooperatives, joint ventures, flyway councils), Western Hemisphere (e.g., Western Hemisphere Shorebird Reserve Network, Western Hemisphere Shorebird Group), Asia (e.g., East Asian-Australasian Flyway Partnership), and other partnerships as they arise.

Young participant of the Copper River Shorebird Festival. Photo Erin Cooper.

ANNUAL SUMMARIES

Bird Conservation Regions outside of Alaska

Pacific Golden-Plover in non-breeding plumage. Photo Dan Ruthrauff.

#26 (Hawaii): GPS tags on Pacific Golden-Plovers wintering in Hawaii

Study Species: Pacific Golden-Plover

Study Location: Honolulu, Hawaii (21.31 N 157.84 W)

Principal Investigators: Oscar W. Johnson (Montana State University), Michael F. Weber and David R. Bybee (BYU Hawaii) T. Lee Tibbitts (USGS Alaska Science Center)

Primary Contact: Oscar W. Johnson, Dept. of Ecology, Montana State University, Bozeman, MT 59717 owjohnson2105@aol.com

Study Objectives

- In a previous GPS-Argos tracking study of Pacific Golden-Plovers wintering on Moorea Island in French Polynesia, we were perplexed by premature loss of signals and absence of tagged returnees. To explore possibilities such as tag-induced mortality or tag-related navigation difficulties, we did a controlled study using birds that winter in the National Memorial Cemetery of the Pacific (locally known as the Punchbowl) in Honolulu, Hawaii.

Preliminary Results

- This population consists of about 70 territorial individuals with very strong inter-seasonal fidelity.
- In spring 2022, we equipped 10 plovers with active 4 g Lotek pinpoint GPS tags (the same kind deployed at Moorea), 10 with identical but inactive tags, and 10 with color-bands only. Active tags indicated nesting from the Alaska Peninsula northward to approximately 64°N.
- Returns in the fall were essentially the same (about 80%) in all three groups. Thus, we detected no apparent negative effects among birds carrying tags.
- Other analyses concerning the flights to/from Alaska, movements in Alaska, and movements within the urban landscape of Honolulu are in progress.

Alaska Shorebird Conservation Plan II Objectives Reached:

RESEARCH:

- Determine migratory timing, routes, and site use of shorebirds.
- Identify and delineate potentially distinct populations of shorebirds breeding in Alaska.

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.
- Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.
- Identify and support ways to involve citizen scientists in shorebird monitoring programs.

#27 (Midway Atoll): Effects of large-scale rodent eradication on migratory shorebird populations at Midway Atoll

Study Species: Bristle-thighed Curlew, Pacific Golden-Plover, Ruddy Turnstone

Study Location: Midway Atoll National Wildlife Refuge (28.20 N, 177.37 W)

Principal Investigators: Lee Tibbitts and Dan Ruthrauff (USGS Alaska Science Center), Beth Flint (USFWS Marine National Monuments of the Pacific), Jared Underwood (USFWS, Papahānaumokuākea Marine National Monument), Jon Plissner and Amanda Adams (USFWS Midway Atoll NWR), and Jim Lyons (USGS Patuxent Wildlife Research Center)

Primary Contact: Lee Tibbitts, 4210 University Ave., Anchorage, AK 99508
Phone: 907 786 7038 email: ltibbitts@usgs.gov

Project Summary

We are in the second year of a study to quantify the effects of a rodent eradications on shorebird populations on Midway Atoll in the Northwestern Hawaiian Islands. After some covid-related delays, the eradication is now scheduled to occur in July 2023. In the meantime, we have established marked populations of the three most common migratory shorebirds on the atoll, Bristle-thighed Curlew, Pacific Golden-Plover, and Ruddy Turnstone. We plan to use direct counts and a mark-recapture approach to: (1) compare relative population sizes of the three species on Midway pre- (2017-2022) and post- (2023-2025) the eradication, (2) estimate apparent annual survival across this period, and (3) measure any changes in local movement patterns related to different types of hazing associated with the eradication process.

This year, Refuge biologists continued weekly, island-wide shorebird surveys along established routes and continued to document peak numbers of all species during August and September. To date, we have individually color-marked 20 BTCU, 55 PAGP, and 74 RUTU. We have also tagged several birds with GPS PinPoint Argos transmitters and preliminary location data indicate that while turnstones spend the night on the outer reef, plovers and curlews usually stay close to their daytime feeding territories. Resight rates appear to vary by season (birds are more active and visible in spring) and by local conditions such as grass height and presence of vagrant Peregrine Falcons. Migratory connectivity, as suggested by the tagging, shows the Midway curlews breeding in the Andreafsky Wilderness of Alaska, plovers in the western Yukon-Kuskokwim Delta region, and turnstones on Wrangel Island, Russia.

Alaska Shorebird Conservation Plan II Objectives Reached:

POPULATION INVENTORY AND MONITORING:

- Inventory alpine, boreal, and other poorly studied shorebird species.
- Evaluate the efficacy of existing programs (e.g., the Alaska Landbird Monitoring Survey [ALMS], Breeding Bird Survey [BBS] program) to monitor shorebird populations.
- Assess the utility of new technologies (e.g., Automated Recording Units, aerial drones, eBird) to determine shorebird presence and abundance.

INTERNATIONAL COLLABORATIONS:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).

Assessing wing molt of a captured Pacific Golden-Plover to ascertain age class (this is an adult) at Midway Atoll in September 2021. Photo credit: Beth Flint.

#28 (Global): Factors affecting success of back-mounted tracking tags in shorebirds

Study Species: More than 20 species of shorebirds from around the world

Study Location: Global

Principal Investigators: >80 people. Study initiated by Richard Lanctot and Sarah Saalfeld (USFWS Migratory Bird Management), Dan Ruthrauff, Lee Tibbitts, and Emily Weiser (USGS Alaska Science Center)

Primary Contact: Emily Weiser, U.S. Geological Survey, 4210 University Drive, Anchorage, AK 99508, eweiser@usgs.gov

Study Objectives

- Identify characteristics of tags that affect success (defined as whether the tag survives its expected lifespan). Characteristics include tag mass, attachment type, power source, data retrieval method, glue attachment method, capture location, and sex of the bird.

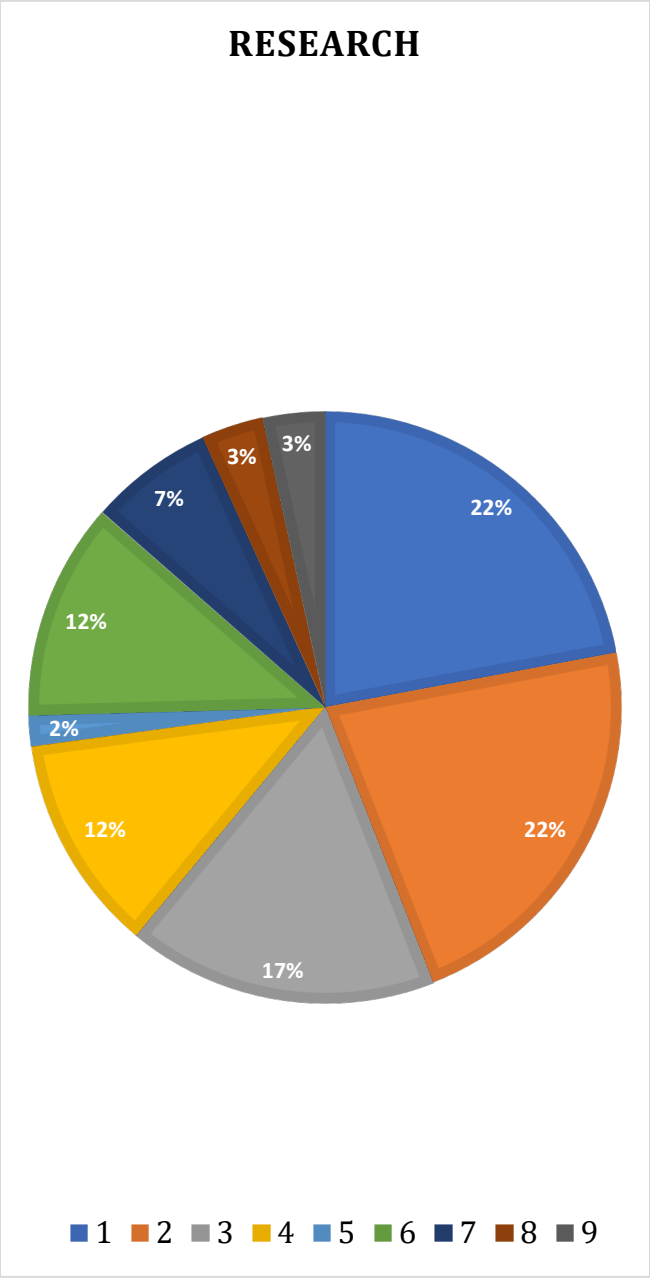
Alaska Shorebird Conservation Plan II Objectives Reached:

ENVIRONMENTAL EDUCATION AND PUBLIC OUTREACH:

- Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).

ANNUAL SUMMARIES

Alaska Shorebird Conservation Plan II Objectives Summary



1= Identify and determine the magnitude of factors limiting shorebird populations during breeding and nonbreeding periods of the annual cycle.

2=Determine migratory timing, routes, and site use of shorebirds.

3=Assess the effects of climate change on shorebird demography.

4=Conduct breeding ecology studies on species occupying alpine, boreal, or other rare or difficult-to-access habitats.

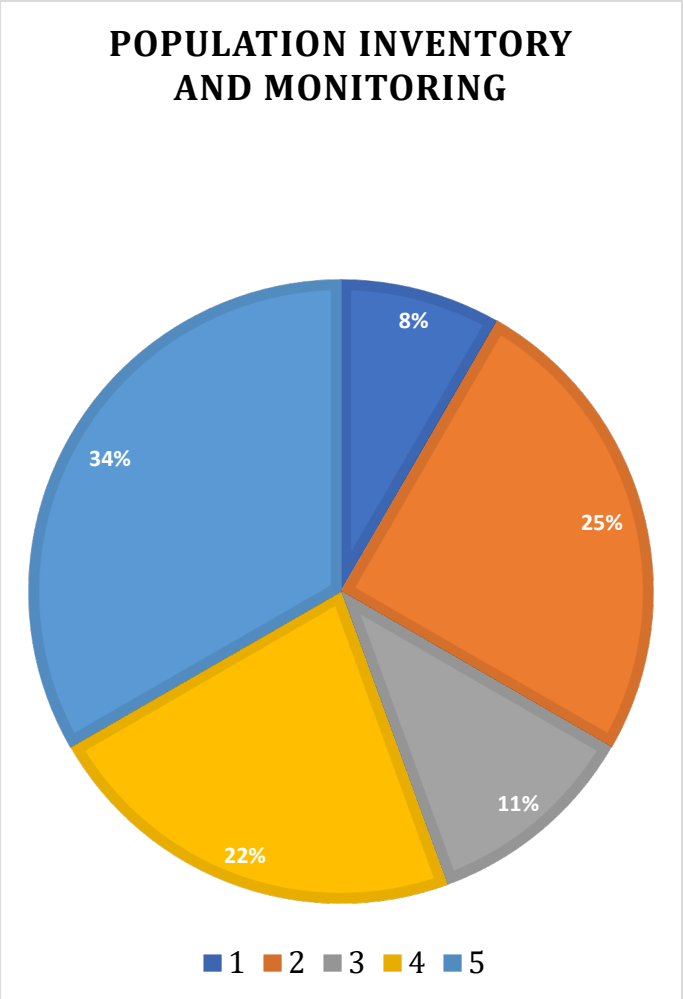
5=Obtain better estimates of illegal and legal harvest levels for Alaska-breeding shorebirds within Alaska and when outside Alaska.

6= Identify effects associated with energy production, mining, disturbance, and other anthropogenic activities on shorebirds.

7=Identify and delineate potentially distinct populations of shorebirds breeding in Alaska.

8=Develop habitat-based models to predict the abundance and distribution of shorebirds and assess the adaptability of shorebirds to habitat changes.

9=Not applicable



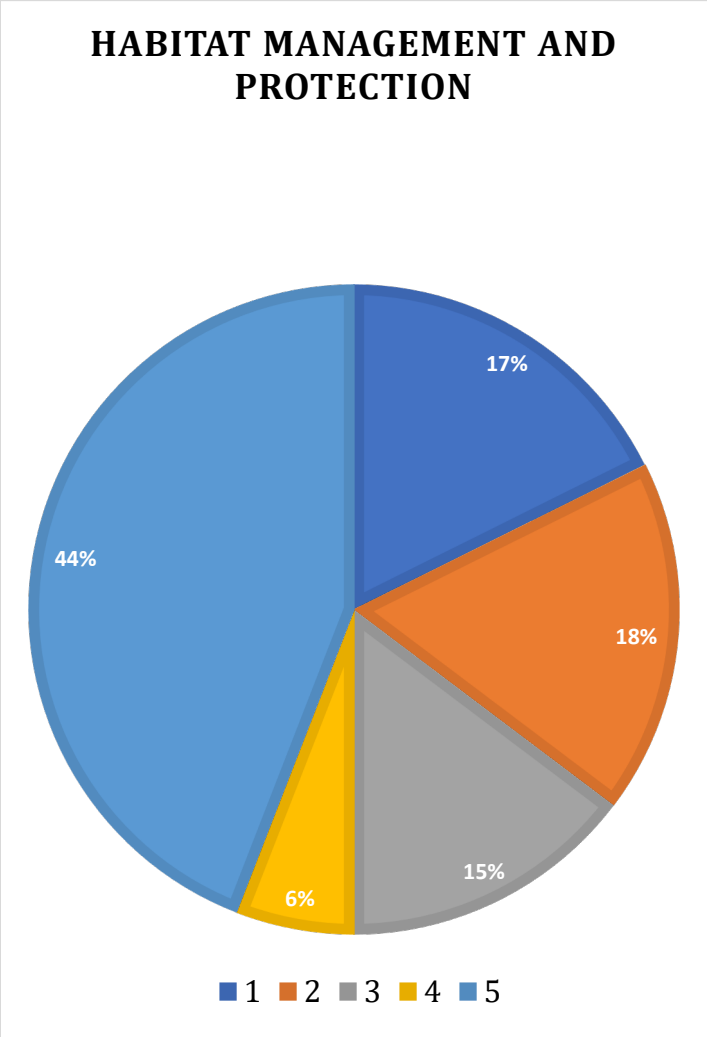
1=Inventory alpine, boreal, and other poorly studied shorebird species.

2=Conduct long-term population monitoring efforts (e.g., PRISM).

3=Evaluate the efficacy of existing programs (e.g., the Alaska Landbird Monitoring Survey [ALMS], Breeding Bird Survey [BBS] program) to monitor shorebird populations.

4=Assess the utility of new technologies (e.g., Automated Recording Units, aerial drones, eBird) to determine shorebird presence and abundance.

5=Not applicable



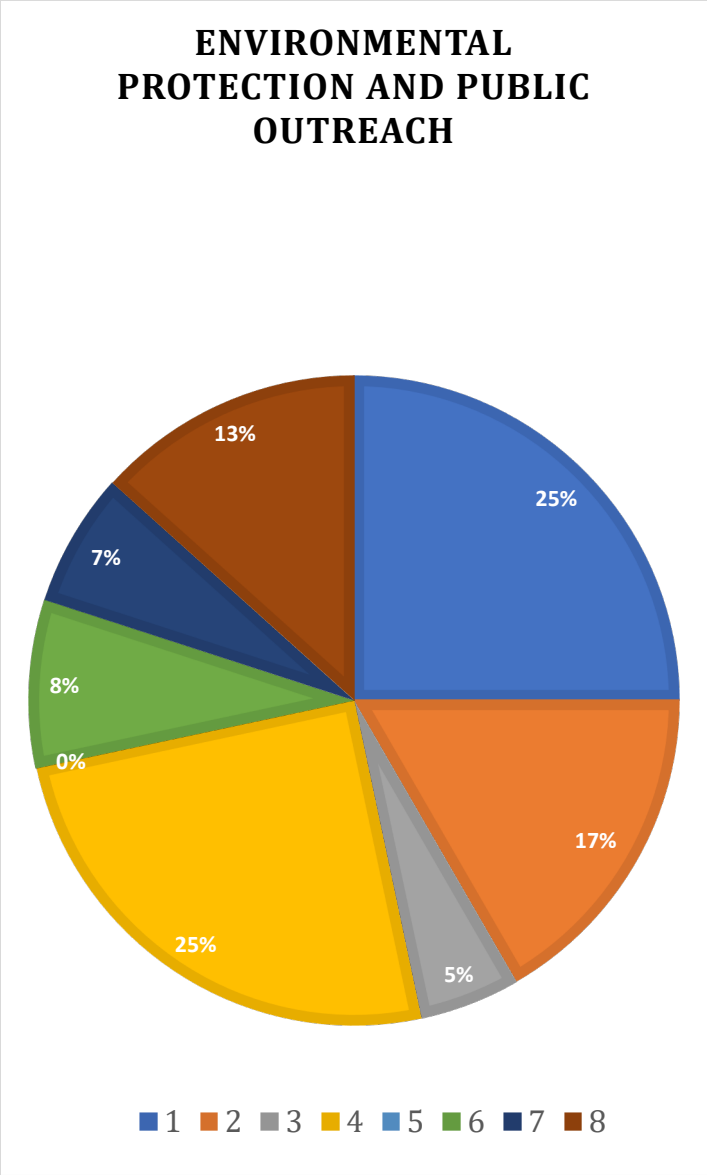
1=Apply abundance and distribution information to identify key shorebird habitats and sites.

2=Support land acquisitions, easements, restoration efforts, and conservation designations (e.g., the Western Hemisphere Shorebird Reserve Network, East Asian–Australasian Shorebird Reserve Network, Ramsar Convention on Wetlands, and Important Bird Areas Programs) for key shorebird sites.

3=Minimize loss and degradation of critical shorebird habitats by participating in natural resource planning and management.

4=Model the potential effects of climate change on shorebird habitats and identify future potential regions of habitat refugia.

5=Not applicable



1= Raise the profile of shorebirds through public presentations, media outreach, support of shorebird festivals, and collaboration with education programs.

2= Develop shorebird-related outreach and media materials.

3= Host workshops and outreach events to engage the diverse communities of Alaska in shorebird conservation.

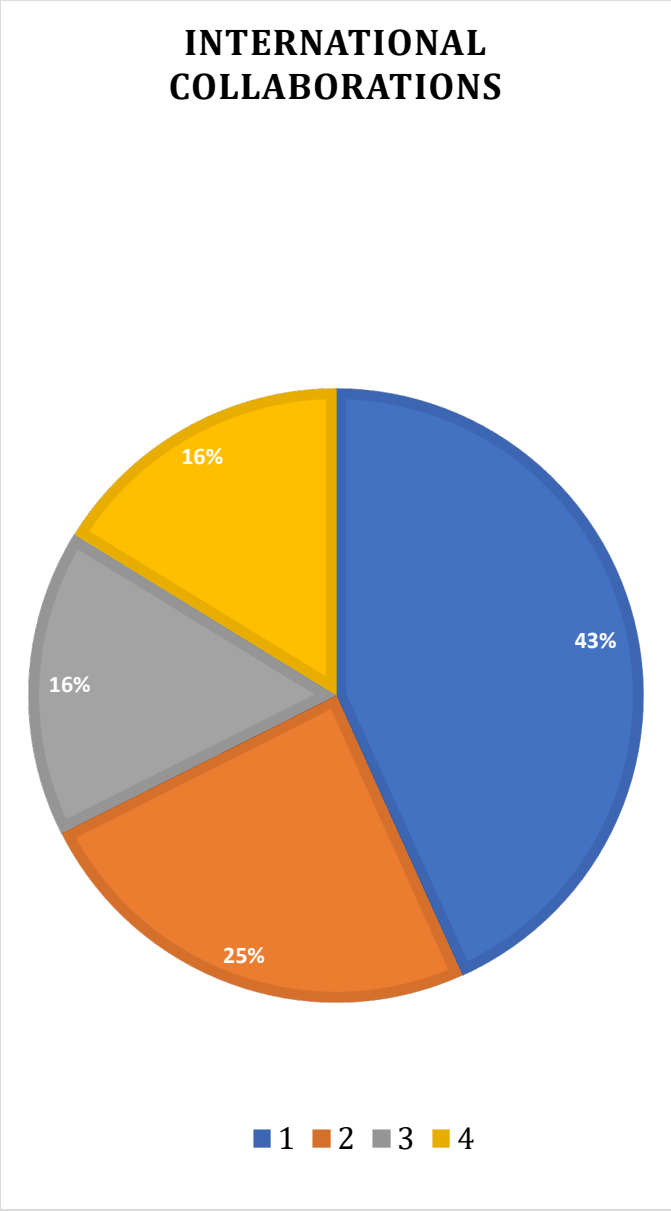
4= Encourage the synthesis and reporting of results of Alaskan shorebird studies to scientific and general audiences.

5= Promote shorebird education to youth via the Shorebird Sister Schools Program.

6= Identify and support ways to involve citizen scientists in shorebird monitoring programs.

7= Incorporate principles of good governance in research and outreach efforts.

8= Not applicable



1=Foster and participate in cooperative research and monitoring efforts throughout species' ranges (e.g., Arctic Shorebird Demographics Network, PRISM, Migratory Shorebird Project, and Arctic Birds Breeding Conditions Survey).

2=Participate in partnerships to conserve migratory shorebirds and their habitats in the circumpolar Arctic (e.g., the Arctic Council's Conservation of Arctic Flora and Fauna working group and initiatives therein), North America (e.g., landscape conservation cooperatives, joint ventures, flyway councils), Western Hemisphere (e.g., Western Hemisphere Shorebird Reserve Network, Western Hemisphere Shorebird Group), Asia (e.g., East Asian-Australasian Flyway Partnership), and other partnerships as they arise.

3=Coordinate and participate in international, national, and other regional shorebird conservation planning efforts (e.g., Pacific Americas Shorebird Conservation Strategy, Atlantic Flyway Shorebird Initiative).

4=Not applicable

PUBLICATIONS & ABSTRACTS

Attanas, L. B., K. S. Orion, A. R. Bankert, A. K. Prichard, and R. W. McNown. 2022. Shorebird monitoring in the Willow Project area, National Petroleum Reserve-Alaska, 2021. Unpublished report for ConocoPhillips Alaska, Inc., Anchorage, AK by ABR, Inc.-Environmental Research & Services, Fairbanks, AK. 39 pp. Available at: https://catalog.northslopescience.org/dataset/741de395-883b-45e9-8d32-6a4c693aad0c/resource/ac7dfaec-f46d-4f64-8846-f7323c507137/download/2021-willow-shorebirds.pdf

In 2021, ABR, Inc.—Environmental Research & Services (ABR) began a long-term study documenting the distribution, abundance, and nest survival of shorebirds in the proposed Willow Master Development Project (Willow Project) area to satisfy North Slope Borough land rezone stipulations. We established 20 new 10-ha study plots in the Willow Project area and re-established 4 plots north of Greater Mooses Tooth 2 (GMT2/MT7) that were last monitored by ABR in 2004.

Bishop, M.A. & A. Schaefer. 2022. Semipalmated Plovers: Bolder Eyebrows Reveal the Sex! Delta Sound Connections 2022-2023.
https://pwssc.org/wp-content/uploads/2022/06/DSC-2022-WEB.pdf

Semipalmated Plovers, named for the partial-webbing between their toes, are small plovers that breed across the Arctic and subarctic, and winter along both coasts of North and South America. The Prince William Sound Science Center has been capturing and color-banding a population of these plovers that breed on an uninhabited island on the Copper River Delta to determine their annual survival rates. Survival rates can often vary by sex. While sex in some shorebird species can be determined based on the size of the bill or weight (with females often larger than males), at first glance it appears that male and female Semipalmated Plovers look alike. Interestingly, one measurement that can be used to help identify the sex of a Semipalmated Plover is its eyebrow! Female Semipalmated Plover eyebrows are typically bolder, longer, and much more distinct than the shorter, often faded eyebrows of the males. When we tested the difference between eyebrow length of males and females using DNA-confirmed sexing results, average eyebrow length for a female was 10.7 mm versus only 6.9 mm for the males, or 1.5 x longer.

Brlík, V., P. Pipek, K. Brandis, N. Chernetsov, F.J.V. Costa, L.G. Herrera M., Y. Kiat, R.B. Lanctot, P.P. Marra, D.R. Norris, C.J. Nwaogu, P. Quillfeldt, S.T. Saalfeld, C.A. Stricker, R.L. Thomson, T. Zhao, and P. Procházka. 2022. The reuse of avian samples: opportunities, pitfalls, and a solution. *Ibis* 164:343-349. https://doi.org/10.1111/ibi.12997.

Tissue samples are frequently collected to study various aspects of avian biology, but in many cases these samples are not used in their entirety and are stored by the collector. The already collected samples provide a largely overlooked opportunity because they can be used by different researchers in different biological fields. Broad reuse of samples could result in multispecies or large-scale studies, interdisciplinary collaborations, and the generation of new ideas, thereby increasing the quality and impact of research. Sample reuse could also reduce the number of new samples needed for a study, which is especially pertinent to endangered species where sample collection is necessarily limited. Importantly, reusing samples may be mutually beneficial for both the researchers providing samples and those reusing them. Here, we identify the benefits of sample reuse, describe currently available sources of already collected samples and their limitations, and highlight the wide range of potential applications in a single research field – avian isotopic ecology. To facilitate the reuse of avian samples worldwide and across research fields, we introduce the AviSample Network metadata repository. The main aims of this metadata repository are to collate and provide access to descriptions of available avian tissue samples. We contend that the creation of the AviSample Network metadata repository will provide the opportunity for new collaborations and studies. Moreover, we believe that this will help create research connections between ornithologists across the globe and encourage sample reuse in other fields.

Johnson, O.W., T.L. Tibbitts, M.F. Weber, D.R. Bybee, R.H. Goodwill, A.E. Bruner, E.J. Smith, E.L. Buss, T.Q.A. Waddell, D.C. Brooks, C.D. Smith & J.-Y. Meyer. 2020. Tracking the migration of Pacific Golden-Plovers from nonbreeding grounds at Moorea, French Polynesia, using Pinpoint GPS-Argos tags. *Wader Study* 127(1): 53–57. https://doi.org/10.18194/ws.00172

We used Pinpoint GPS-Argos tags to track migration of Pacific Golden-Plovers Pluvialis fulva in 2017 and 2018 from Moorea Island, at the extreme southeastern edge of the species' winter range. Of 20 tagged birds, 13 uploaded locations during all or part of their northward migration. The birds departed in mid-April traveling a long (8,250–10,200 km) northwestward track. Ten individuals signaled from Japan, where they stopped over (or 'staged') for periods up to about one month. Almost all stopovers were on the island of Honshu, with coordinates indicating inland habitats, most likely rice fields. In May, at least nine of the plovers left Japan on a mid-length (3,200–5,400 km) northeastward track to the Bering Sea region, where one bird reported from a possible nesting site in Kamchatka Krai and eight from traditional breeding grounds (three from Chukotka, five from Alaska). Thereafter, contact with tags was intermittent and gradually lost. We received signals from only two individuals during fall migration; one bird flew 1,600 km southeast from Alaska before its tag ceased transmitting, and the other flew >8,600 km directly southward from

its post-breeding site in southwest Alaska and made landfall in Samoa where transmissions ended. Throughout the study, lengthy transoceanic flights appeared to be nonstop, and the annual migratory pathway (though defined by only a single bird in fall) was circular. As we have shown in other studies, Japan emerges as a key stopover site for Pacific Golden-Plovers during northward migration.

Krietsch, J., M. Valcu, M. Cragnolini, S. Kuhn, R.B. Lanctot, S.T. Saalfeld, and B. Kempenaers. 2022. Extra-pair paternity in a sequentially polyandrous shorebird: limited evidence for the sperm-storage hypothesis. *Animal Behaviour* 183:77-92.

In socially monogamous species, extrapair paternity typically results from extrapair copulations, but it can also be due to rapid mate switching. Oring, Fleischer, Reed, and Marsden (1992, *Nature, 359* (6396), 631–633) proposed a mechanism to explain the occurrence of extrapair paternity in sequentially polyandrous species: sperm stored by females from within-pair copulations with a previous mate could fertilize eggs in the clutch of a subsequent male. Despite being proposed decades ago, evidence for this hypothesis remains limited. We studied social polyandry, extrapair paternity and copulation behaviour in a population of the red phalarope, *Phalaropus fulicarius*, a nonterritorial, sex role-reversed shorebird, with male-only care, in Utqiaġvik, Alaska. We tested multiple predictions from the 'sperm storage' hypothesis. Extrapair paternity occurred in 11% (37/334) of the nests and 4% (42/1182) of the eggs were sired by a male other than the incubating parent. Although a female's initial mate occasionally sired offspring in her next clutch, our results suggest that sperm stored from a previous mate does not play a major role in explaining the occurrence of extrapair paternity in this sequentially polyandrous species. Instead, extrapair paternity was generally due to extrapair copulations by both sexes during the period between pair establishment and early incubation and to rapid mate switching by females in the context of attempts to acquire multiple care-giving males.

Lagassé, B.J., R.B. Lanctot, S. Brown, A.G. Dondua, S. Kendall, C.J. Latty, J.R. Liebezeit, E.Y. Loktionov, K.S. Maslovsky, A.I. Matsyna, E.L. Matsyna, R.L. McGuire, D.C. Payer, S.T. Saalfeld, J.C. Slaght, D.V. Solovyeva, P.S. Tomkovich, O.P. Valchuk, and M.B. Wunder. 2022. Migratory network reveals unique spatial-temporal migration dynamics of Dunlin subspecies along the East Asian-Australasian Flyway. *PLoS ONE* 17: e0270957.

Determining the dynamics of where and when individuals occur is necessary to understand population declines and identify critical areas for populations of conservation concern. However, there are few examples where a spatially and temporally explicit model has been used to evaluate the migratory dynamics of a bird population across its entire annual cycle. We used geolocator-derived migration tracks of 84 Dunlin (Calidris alpina) on the East Asian-Australasian Flyway (EAAF) to construct a migratory network describing annual subspecies-specific migration patterns in space and time. We found that Dunlin subspecies exhibited unique patterns of spatial and temporal flyway use. Spatially, C. a. arcticola

predominated in regions along the eastern edge of the flyway (e.g., western Alaska and central Japan), whereas C. a. sakhalina predominated in regions along the western edge of the flyway (e.g., N China and inland China). No individual Dunlin that wintered in Japan also wintered in the Yellow Sea, China seas, or inland China, and vice-versa. However, similar proportions of the 4 subspecies used many of the same regions at the center of the flyway (e.g., N Sakhalin Island and the Yellow Sea). Temporally, Dunlin subspecies staggered their south migrations and exhibited little temporal overlap among subspecies within shared migration regions. In contrast, Dunlin subspecies migrated simultaneously during north migration. South migration was also characterized by individuals stopping more often and for more days than during north migration. Taken together, these spatial-temporal migration dynamics indicate Dunlin subspecies may be differentially affected by regional habitat change and population declines according to where and when they occur. We suggest that the migration dynamics presented here are useful for guiding on-the-ground survey efforts to quantify subspecies' use of specific sites, and to estimate subspecies' population sizes and long-term trends. Such studies would significantly advance our understanding of Dunlin space-time dynamics and the coordination of Dunlin conservation actions across the EAAF.

Lamarre, J.-F., G. Gauthier, R. Lanctot, S.T. Saalfeld, O. P. Love, E. Reed, O.W. Johnson, J. Liebezeit, R. L. McGuire, M. Russell, E. Nol, L. Kolosky, F. Sanders, L. McKinnon, S. Flemming, N. Lecomte, M.-A. Giroux, S. Bauer, T. Emmenegger, and J. Bêty. 2021. Timing of breeding site availability across the North-American Arctic partly determines spring migration schedule in a long-distance Neotropical migrant. *Frontiers in Ecology and Evolution* 9: 710007.

Long-distance migrants are under strong selection to arrive on their breeding grounds at a time that maximizes fitness. Many arctic birds start nesting shortly after snow recedes from their breeding sites and timing of snowmelt can vary substantially over the breeding range of widespread species. We tested the hypothesis that migration schedules of individuals co-occurring at the same non-breeding areas are adapted to average local environmental conditions encountered at their specific and distant Arctic breeding locations. We predicted that timing of breeding site availability (measured here as the average snow-free date) should explain individual variation in departure time from shared non-breeding areas. We tested our prediction by tracking American Golden-Plovers (Pluvialis dominica) nesting across the North-American Arctic. These plovers use a non-breeding (wintering) area in South America and share a spring stopover area in the nearctic temperate grasslands, located >1,800 km away from their nesting locations. As plovers co-occur at the same non-breeding areas but use breeding sites segregated by latitude and longitude, we could disentangle the potential confounding effects of migration distance and timing of breeding site availability on individual migration schedule. As predicted, departure date of individuals stopping-over in sympatry was positively related to the average snow-free date at their respective breeding location, which was also related to individual onset of incubation. Departure date from the shared stopover area was not explained by the distance between the stopover and the breeding location, nor by the stopover duration of

individuals. This strongly suggests that plover migration schedule is adapted to and driven by the timing of breeding site availability per se. The proximate mechanism underlying the variable migration schedule of individuals is unknown and may result from genetic differences or individual learning. Temperatures are currently changing at different speeds across the Arctic and this likely generates substantial heterogeneity in the strength of selection pressure on migratory schedule of arctic birds migrating sympatrically.

McDuffie, L. A., Christie, K. S., Taylor, A. R., Nol, E., Friis, C., Harwood, C. M., Rausch, J., Laliberte, B., Gesmundo, C., Wright, J. R., & Johnson, J. A. (2022). Flyway-scale GPS tracking reveals migratory routes and key stopover and non-breeding locations of lesser yellowlegs. *Ecology and Evolution*, 12, e9495. https://doi.org/10.1002/ece3.9495

Many populations of long-distance migrant shorebirds are declining rapidly. Since the 1970s, the lesser yellowlegs (*Tringa flavipes*) has experienced a pronounced reduction in abundance of ~63%. The potential causes of the species' decline are complex and interrelated. Understanding the timing of migration, seasonal routes, and important stopover and non-breeding locations used by this species will aid in directing conservation planning to address potential threats. During 2018–2022, we tracked 118 adult lesser yellowlegs using GPS satellite tags deployed on birds from five breeding and two migratory stopover locations spanning the boreal forest of North America from Alaska to Eastern Canada. Our objectives were to identify migratory routes, quantify migratory connectivity, and describe key stopover and non-breeding locations. We also evaluated predictors of southbound migratory departure date and migration distance. Individuals tagged in Alaska and Central Canada followed similar southbound migratory routes, stopping to refuel in the Prairie Pothole Region of North America, whereas birds tagged in Eastern Canada completed multi-day transoceanic flights covering distances of >4000 km across the Atlantic between North and South America. Upon reaching their non-breeding locations, lesser yellowlegs populations overlapped, resulting in weak migratory connectivity. Sex and population origin were significantly associated with the timing of migratory departure from breeding locations, and body mass at the time of GPS-tag deployment was the best predictor of southbound migratory distance. Our findings suggest that lesser yellowlegs travel long distances and traverse numerous political boundaries each year, and breeding location likely has the greatest influence on migratory routes and therefore the threats birds experience during migration. Further, the species' dependence on wetlands in agricultural landscapes during migration and the non-breeding period may make them vulnerable to threats related to agricultural practices, such as pesticide exposure.

Piersma, T., Gill, Jr., R. E., Ruthrauff, D. R., Guglielmo, C. G., Conklin, J. R. and Handel, C. M. 2022. The Pacific as the world's greatest theater of bird migration: Extreme flights spark questions about physiological capabilities, behavior, and the evolution of migratory pathways. *Ornithology* 139: ukab086. https://doi.org/10.1093/ornithology/ukab086

The Pacific Basin, by virtue of its vastness and its complex aeroscape, provides unique opportunities to address questions about the behavioral and physiological capabilities and mechanisms through which birds can complete spectacular flights. No longer is the Pacific seen just as a formidable barrier between terrestrial habitats in the north and the south, but rather as a gateway for specialized species, such as shorebirds, to make a living on hemispherically distributed seasonal resources. This recent change in perspective is dramatic, and the research that underpins it has presented new opportunities to learn about phenomena that often challenge a sense of normal. Ancient Polynesians were aware of the seasonal passage of shorebirds and other landbirds over the Pacific Ocean, incorporating these observations into their navigational "tool kit" as they explored and colonized the Pacific. Some ten centuries later, systematic visual observations and tracking technology have revealed much about movement of these shorebirds, especially the enormity of their individual nonstop flights. This invites a broad suite of questions, often requiring comparative studies with bird migration across other ocean basins, or across continents. For example, how do birds manage many days of nonstop exercise apparently without sleep? What mechanisms explain birds acting as if they possess a Global Positioning System? How do such extreme migrations evolve? Through advances in both theory and tracking technology, biologists are poised to greatly expand the horizons of movement ecology as we know it. In this integrative review, we present a series of intriguing questions about trans-Pacific migrant shorebirds and summarize recent advances in knowledge about migratory behavior operating at temporal scales ranging from immediate decisions during a single flight, to adaptive learning throughout a lifetime, to evolutionary development of migratory pathways. Recent advances in this realm should stimulate future research across the globe and across a broad array of disciplines.

Ruthrauff, D. R., Patil, V. P., Hupp, J. W. and Ward, D. H. 2021a. Life-history attributes of Arctic-breeding birds drive uneven responses to environmental variability across different phases of the reproductive cycle. *Ecology and Evolution* 11: 18514-18530. https://doi.org/10.1002/ece3.8448

Animals exhibit varied life-history traits that reflect adaptive responses to their environments. For Arctic-breeding birds, traits related to diet, egg nutrient allocation, clutch size, and chick growth are predicted to be under increasing selection pressure due to rapid climate change and increasing environmental variability across high-latitude regions. We compared four migratory birds (black brant [*Branta bernicla nigricans*], lesser snow geese [*Chen caerulescens caerulescens*], semipalmated sandpipers [*Calidris pusilla*], and Lapland longspurs [*Calcarius lapponicus*]) with varied life histories at an Arctic site in Alaska, USA, to understand how life-history traits help moderate environmental variability across different phases of the reproductive cycle. We monitored aspects of reproductive performance related to the timing of breeding, reproductive investment, and chick growth from 2011 to 2018. In response to early snowmelt and warm temperatures, semipalmated sandpipers advanced their site arrival and bred in higher numbers, while brant and snow

geese increased clutch sizes; all four species advanced their nest initiation dates. During chick rearing, longspur nestlings were relatively resilient to environmental variation, whereas warmer temperatures increased the growth rates of sandpiper chicks but reduced growth rates of snow goose goslings. These responses generally aligned with traits along the capital-income spectrum of nutrient acquisition and altricial–precocial modes of chick growth. Under a warming climate, the ability to mobilize endogenous reserves likely provides geese with relative flexibility to adjust the timing of breeding and the size of clutches. Higher temperatures, however, may negatively affect the quality of herbaceous foods and slow gosling growth. Species may possess traits that are beneficial during one phase of the reproductive cycle and others that may be detrimental at another phase, uneven responses that may be amplified with future climate warming. These results underscore the need to consider multiple phases of the reproductive cycle when assessing the effects of environmental variability on Arctic-breeding birds.

Ruthrauff, D. R., Pohlen, Z. M., Wilson, H. M. and Johnson, J. A. 2021b. Bar-tailed Godwits Limosa lapponica in Alaska: revisiting population estimates from the staging grounds. *Wader Study* 128: 255-264. https://doi.org/10.18194/ws.00251

Bar-tailed Godwits Limosa lapponica baueri breed in Alaska and spend the non-breeding season primarily in eastern Australia and New Zealand. Long-term declines spurred recent surveys at nonbreeding sites that yielded a revised population estimate of ~126,000 godwits. We conducted aerial surveys for Bartailed Godwits in 2018 and 2019 at pre-migratory staging sites in western Alaska. Counts from similar surveys in 1997 accorded with counts of baueri from the nonbreeding range. Instead of relying on observer estimates of flock sizes, we enumerated 97% of our survey totals using digital photography. Our survey results differed markedly between 2018 (39,751) and 2019 (100,926), differences that reflected a relatively late autumn survey period in 2018, when some godwits were likely to have left the area, compared to 2019. In contrast to the 1997 surveys, we found few Bar-tailed Godwits at estuaries on the Alaska Peninsula. However, we counted nearly 93,000 godwits (~92% of survey total) along ~60 km of coast at the Kuskokwim River Delta in 2019, a value constituting nearly three-quarters of the subspecies' current population estimate. Our survey totals for 2019 were in agreement with contemporaneous counts at austral nonbreeding sites, demonstrating how aerial surveys from Alaska can provide useful insights into counts conducted elsewhere in the subspecies' range. When combined with measures of reproductive output, estimates of seasonal survival, and dedicated studies of the movement and survival of juvenile godwits, future surveys from Alaska can further contribute to efforts to determine mechanisms of population changes in baueri Bar-tailed Godwits.

DATA RELEASES

U.S. Geological Survey - Alaska Science Center, National Park Service - Southwest Alaska Inventory and Monitoring Network, University of Alaska Fairbanks - College of Fisheries and Ocean Sciences, 2017, Black Oystercatcher nest and diet data from Kachemak Bay, Katmai National Park and Preserve, Kenai Fjords National Park, and Prince William Sound, 2006-2022 (ver 2.0, November 2022): U.S. Geological Survey data release, https://doi.org/10.5066/F7WH2N5Q