USGS
science for a changing world

Shorebird Research at the U.S. Geological Survey Alaska Science Center

Shorebirds in Decline

Shorebirds—which include sandpipers, plovers, and oystercatchers—are perhaps best known by their presence on sandy beaches, running along the water's edge while they probe for food. But they are probably less recognized for their impressive long-distance migrations. Millions of individuals travel from across the globe to breed throughout Alaska each spring, making these birds a familiar and important part of local wildlife communities and Alaska Native cultures. Unfortunately, many shorebird populations have steeply declined worldwide. Because shorebirds use the same coastal habitats as humans, anthropogenic development can lead to habitat loss that degrades the extent and quality of coastal sites important to these species. However, Alaska has an abundance of intact coastal ecosystems that provide important breeding and migratory stopover sites for shorebirds, making the State one of the world's most critical sites for shorebirds. The focus of shorebird research at the U.S. Geological Survey (USGS) Alaska Science Center is to help identify important breeding and migratory sites, and to investigate the causes of the declines in many shorebird populations.

Shorebirds on the Wing—Global Citizens

The globe-spanning migrations of shorebirds inspire wonder and curiosity in observers. At the USGS Alaska Science Center, these movements also motivate research to understand the potential obstacles that these birds encounter during their lives. Nearly all shorebirds that breed in Alaska arrive from nonbreeding locations throughout North, Central, and South America, Asia, Oceania, Australia, and New Zealand. Shorebirds rely on interconnected networks of functional ecosystems at sites that often are located thousands of miles apart. These sites must provide food and safety to enable the survival and successful completion of their migratory movements. The USGS Alaska Science Center participates in range-wide studies with international collaborators to help determine the sensitivity of shorebirds to events throughout their annual cycle.

Flock of Calidris alpina (dunlins) wheeling through the air prior to fall migration, Egegik, Alaska.

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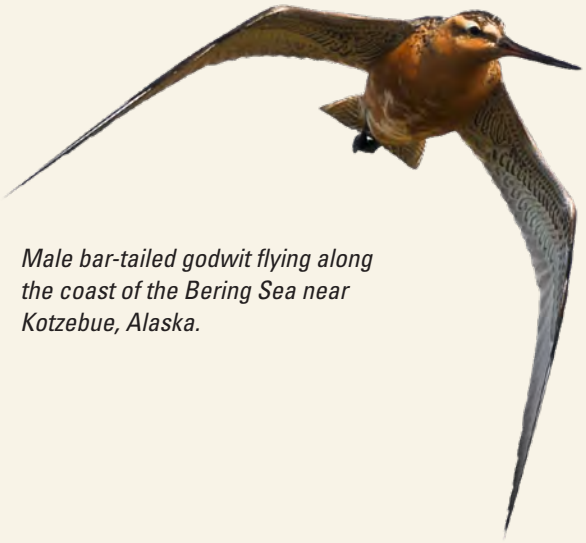

Male bar-tailed godwit flying along the coast of the Bering Sea near Kotzebue, Alaska.

For example, the USGS Alaska Science Center documented that *Limosa lapponica* (bar-tailed godwits) complete their fall migration in a single nonstop flight across the central Pacific Ocean, a 7,000-mile, 9-day movement that represents the world's longest non-stop bird migration. Numbering about 125,000 individuals, this population of bar-tailed godwits breeds in coastal wetlands in western and northern Alaska and fuels its spring and fall migrations at food-rich estuaries in western Alaska. Bar-tailed godwits spend the nonbreeding season at sites in New Zealand and eastern Australia, where recent declines have been observed in adult survival and overall population size. As with many other waterbird species in the Pacific region, bar-tailed godwits heavily rely on coastal wetlands in Asia. Bar-tailed godwits that migrate to Alaska spend about 1 month each spring refueling at sites in the Yellow Sea, and this region has experienced an unprecedented loss and degradation of coastal wetlands. Identifying population threats for bar-tailed godwits, however, is complicated; because of their migratory nature, effects during one phase of the annual cycle may not be expressed until a subsequent phase. For this reason, the USGS Alaska Science Center conducts research on multiple shorebird species across multiple sites. Taken together, these studies offer a more complete perspective on conservation threats that shorebirds face around the world.

Shorebirds in a Changing World

Our warming climate disproportionately affects high-latitude sites. Habitat changes, wetland drying, and sea-level rise are potential threats to shorebirds breeding in Alaska. However, because of their migratory lifestyle, shorebirds also must contend with climate-related changes outside Alaska. Changing weather patterns could potentially disrupt the routes and timing of bird migrations in ways that will favor flexible readjustments to changing conditions. Recent work by the USGS Alaska Science Center uncovered how the population of *Limosa fedoa* (marbled godwits) that breeds in Alaska adaptively structures its migration around prevailing environmental conditions. Researchers determined that individual birds predictably visited the same coastal sites in the Pacific Northwest year after year, but that the duration of stay and timing of their use of these sites varied annually, detailing a previously unappreciated flexibility in the annual routines of these birds.

Marbled godwit on its breeding grounds near Ugashik, Alaska.

As their name implies, shorebirds are intimately linked to shorelines and wetlands throughout their annual cycle, a fact that potentially heightens their vulnerability to climate-related effects attributable to rising seas and diminished wetland functions. Work initiated in 2012 by the USGS Alaska Science Center on *Numenius tahitiensis* (bristle-thighed curlews)—a long-distance migratory shorebird that breeds only in Alaska—shows some ways in which shorebirds may be able to accommodate such changes. The species winters on low-lying atolls and islands throughout Oceania, sites that are especially vulnerable to sea-level rise. The recent colonization of curlews to an upland site on Oahu, Hawaii, shows how the species positively responded to the active management of habitats that controlled predators and enhanced foraging opportunities. Such management practices may help species such as bristle-thighed curlews mitigate some negative effects of climate change.

Bristle-thighed curlew outside Nome, Alaska.

Rock sandpiper eating a small clam (Macoma balthica) on frozen mudflats near Kasilof, Alaska.

Understanding how shorebirds fit into their environments and their importance to Alaska indigenous culture is important for discussing possible future changes in shorebird abundance and distribution. USGS Alaska Science Center research on a hardy shorebird, *Calidris ptilocnemis* (rock sandpipers), examines how future warming may potentially benefit some shorebirds. Rock sandpipers spend the winter farther north than any other shorebird in the Pacific, occupying the icy shores of Cook Inlet, Alaska. These birds manage this feat of cold endurance by increasing their metabolic rates by as much as a factor of seven.

Each rock sandpiper accomplishes this by eating hundreds of energy-rich clams every day during the winter, a foraging requirement that is predicted to relax as Alaska winters become milder. Climate-driven changes present many challenges to shorebirds, and research and outreach by the USGS Alaska Science Center brings together human, seasonal, and geographic perspectives to better understand the current and future status of Alaska's shorebirds in a changing world.

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Just-hatched Calidris pusilla (semipalmated sandpiper) chick on Alaska's North Slope.

Authors: Dan Ruthrauff, Lee Tibbitts, and John Pearce

For more information:
Director, Alaska Science Center
U.S. Geological Survey
4210 University Drive
Anchorage, Alaska 99508
https://www.usgs.gov/centers/asc

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