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Some Alaska animals may benefit from climate change while others suffer, studies say

Yereth Rosen | Alaska Dispatch News | March 28, 2015

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Climate change in Northwest Alaska is good for the birds -- at least for some of them -- but bad news for several small mammals.

As shrubs and trees spread north with rising temperatures, so will some bird species. Tree-dwellers like [northern goshawks](#) are among the projected climate change winners listed in a new [study](#) predicting long-term changes in boreal and Arctic habitats used by 162 bird species and 39 land mammal species in Northwest Alaska.

Rising temperatures and other trends will change habitats through the end of the 21st century in ways that will favor tree- and shrub-using species, the study concludes, but harm animal species that need lots of open space, that feed on low-growing plants like lichen or that use coastal or river habitats.

Spruce, birch and aspen forests and areas of tall willows will expand, the study says.

"That favors some species of raptors, woodpeckers, songbirds, porcupine, black bears," said lead author [Bruce Marcot](#), a research wildlife biologist at the U.S. Forest Service Pacific Northwest Research Station. "It'll also create habitat for some of the large ungulates, especially moose," he said.

But permafrost thaw, lake shrinkage, coastal erosion, vegetation transformations, more wildfires and other changes will diminish habitat for other species. Expected climate change losers in Northwest Alaska include migratory waterfowl like tundra swans and greater white-fronted geese. Also in the loser category are several mammals that are important to subsistence hunters, like caribou, which roam over big open spaces and feed on lichen and moss.

One complicated case is that of the beaver. In the short term, beavers appear to be moving north -- and building dams that are causing some problems for fish runs and water quality in streams and rivers, Marcot said. But in the long term, the study finds, beaver habitat will decline.

The study was published last month in the journal [Climatic Change](#). The study area includes territory in six protected areas -- Bering Land Bridge National Preserve, Cape Krusenstern National Monument, Gates of the Arctic National Park and Preserve, Kobuk Valley National Park, Noatak National Preserve and Selawik National Wildlife Refuge.



While expansion of trees and tall shrubs would draw more moose north, those moose could attract more wolves which would then prey on Dall sheep and other species, scientists say.

Loren Holmes / Alaska Dispatch News

The study builds on [earlier research](#) by Marcot and his co-authors, published in November in the same journal, that divided the region into 60 types of habitat and projected long-term changes for them.

The new study uses three scenarios to predict the bird and mammal habitat outcomes through the end of the century.

The most conservative scenario simply projects forward the changes that have already been seen in the past 30 years. The second projects into the future the rate of change in air temperature seen in the past. The third and most complex model factors in vegetation and temperature changes, plus other habitat-changing forces like permafrost melt, wildfire, erosion of streams, rivers and coastlines and human development.

Under the conservative scenario, about half the bird species will experience habitat increases and about half will experience habitat decline, while 62 percent of the mammal species will see habitat decline. The worst outcomes are predicted under the temperature-dependent model; the more complex model results in outcomes that fall in between those of the other two models.

The most vulnerable species are those with the narrowest or rarest habitat. That category includes the Arctic fox. "There's some coastal habitat that foxes tend to focus on that are fairly rare," Marcot said. It also includes birds that use specific Beringian habitat, the study said.

The habitat changes are expected to have ripple effects.

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Loss of habitat for small burrowing animals like shrews and voles, whose homes will get overtopped by tall shrubs, will result in less prey for some of the raptors and carnivores, Marcot said. Those burrowing animals perform important functions when they dig around -- they mix up the soil, create air pockets in it and distribute seeds -- so reductions in their numbers could bode ill for the underground ecosystem, he said.

A separate [study](#) also finds ominous signs for some small Alaska mammals that live in alpine or alpine-tundra habitats.

Vegetation shifts and other changes are going to be bad for singing voles and Arctic ground squirrels -- two of the expected climate losers in the Northwest Alaska study -- and three other species, according to that study, by researchers affiliated with the University of Alaska and published in the March 3 issue of the journal [PLOS ONE](#).

The other three species are [collared pikas](#), which live in mountainous terrain in Interior and Southcentral Alaska; [hoary marmots](#), which live in alpine areas south of the Yukon River; and [brown lemmings](#), which dwell in wet habitats and eat mosses, grasses and sedges.

The study, led by University of Wyoming assistant zoology professor and former UAF doctoral student [Hayleigh Lanier](#), concludes that singing voles, Arctic ground squirrels and collared pikas have actually been in gradual decline over the millennia following the end of the last Ice Age.

All five of the mammals studied prefer open territory with low-growing plants, not tall shrubs or trees. The voles like alpine areas above the tree line, pikas like rocky areas near open meadows and squirrels are found in tundra and in soft soils around lakes and rivers. They have evolved to eat the tundra and alpine plants that grow in such open ecosystems -- and they use the unobstructed views to stay safe, said co-author Link Olson, a UAF associate professor of biology and curator of mammals at the [University of Alaska Museum](#).

The open alpine and tundra territory -- which was much more widespread during the Pleistocene era -- provides several benefits to the animals that live there, Olson said.

"Organisms adapted to tundra and alpine tundra can be dependent on vegetation only or predominantly found in those ecosystems, other organisms found only in those ecosystems, or conditions found only in those ecosystems. Marmots, ground squirrels and pikas are thought to require open habitat in order to detect predators from far enough away to escape," he said in an email.

But trees and large shrubs are expanding northward, and more quickly than at the end of the Pleistocene, he said.

That means those tiny mammals will have to climb higher to find the open spaces, meaning their territory will be more limited and the population more isolated in fragmented habitat, the study found.

Farther north, new research has documented another long-term habitat transformation that might be squeezing out some migratory birds.

On the 115-square-mile Barrow Peninsula in northernmost Alaska, for example, tundra ponds -- key habitats for migratory waterfowl like threatened [Steller's eiders](#) and [spectacled eiders](#) -- are shrinking and vanishing, a [new study](#) shows.

Of the more than 2,800 tundra ponds that existed in that area in the late 1940s, at least 17 percent disappeared in the past six decades, and the remaining pond coverage is a third smaller than it was then, according to the study, published online in the [Journal of Geophysical Research: Biogeosciences](#).

The ponds, about the size of small swimming pools, are plentiful and distinctive on the tundra, said lead author Christian Andresen, a landscape ecologist at the University of Texas-El Paso. "They're just a hole in the grass," he said. But they have dwindled as air temperatures have warmed, permafrost has thawed and released nutrients and vegetation has expanded, he said.

"Warmer conditions and warmer ponds and more nutrients means happier plants," he said.

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