Changing Alaska habitat complicates species forecasts

Virginia Gewin

Ponds in the Arctic tundra are disappearing, according to a recent study (*J Geophys Res-Biogeo* 2015; doi:10.1002/2014JG002778). Using historical photographs and satellite images taken between 1948 and 2010, researchers analyzed 2800 ponds in the northern region of Alaska's Barrow Peninsula. Over time, the number of ponds decreased by about 17%, while pond size shrank by an average of 33%.

Warming temperatures are to blame – directly and indirectly. Ponds dry up due to heat, but the warming permafrost also releases nutrients into the water, encouraging plant growth. As a result, the gradual process of small ponds transforming into lakes is hampered. "If these changes continue over time, species – especially threatened and endangered waterfowl such as the Steller's eider (*Polysticta stelleri*) – could potentially be affected", says study author Christian Andresen, a postdoctoral fellow at the University of Texas at El Paso.

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Both the number and size of Alaskan ponds, which typically would form lakes over time, are decreasing.

In January, a separate study of northwest Alaska (*Climatic Change* 2015; doi:10.1007/s10584-014-1302-1) also found that thawing permafrost, shrinking lakes, and changing vegetation – as well as coastal erosion and increased wildfires – could diminish habitat for many species, including migratory waterfowl. However, forest and tall shrub habitat could expand – benefiting, for example, the ruffed grouse (*Bonasa umbellus*). To help cut through the complexity and identify the species that will be winners or losers, the researchers projected the effects of climate change and biophysical drivers on bird and mammal habitats. "This is a first pass at quantifying the distribution and spatial patterns of habitat change; hopefully it will serve as a starting point for future work on wildlife population dynamics", explains study author Bruce Marcot, a wildlife biologist with the US Forest Service (Portland, OR).

According to Josh Koch, a research hydrologist with the US Geological Survey (Anchorage, AK), one of the biggest shifts taking place relates to how water interacts with thawed and burned soils; "We've seen several streams flowing aboveground that suddenly disappear down a hole", he says. "We're making progress but there's more to do to nail down the complex processes and feedbacks at work over such a large area."

All agree that long-term data akin to those of Andresen's pond study will help achieve that goal. To that end, Marcot published an aerial-based survey of the US National Park Service's Arctic Network in 2014 (dx.doi.org/10.3133/ds846), complete with photos, videos, and GPS routes, to serve as a baseline for future efforts to conduct change analysis over time. ■

New life for old drywall

Ken Ferguson

Used in buildings worldwide, drywall comprises up to 27% of the solid waste associated with construction in North America, and most of it ends up in landfills – about 15 million tons of drywall waste in the US alone. M Anne Naeth, a Professor of Land Reclamation and Restoration Ecology at the University of Alberta (Edmonton, Canada), believes this material can be put to better use.

Drywall panels consist of gypsum – a calcium sulfate mineral – mixed with water and other ingredients to form a plaster, which is then compressed between two layers of heavy paper and dried. Naeth speculated that drywall waste could be used as a compost additive, to improve the relatively poor soils that are characteristic of land reclamation projects. "There is steadily increasing urban, industrial, and natural resource development in North America", she explains. "One of the main outcomes of this disturbance is the loss of soil organic matter, which provides water-holding capacity, improves soil structure, and contains many of the nutrients required by plants."

Mixing coarse and ground drywall with three biosolids-based composts and one manure-based compost, Naeth and her team examined how the various compost combinations affected the establishment and growth of three grass species sown in three different soils typical of reclamation sites. Seedling establishment and growth were relatively unaffected by drywall addition, while plant biomass was generally higher in soils treated with biosolids compost supplemented with drywall than in soils treated with traditional biosolids compost. Adding drywall to manure compost did not augment plant growth. "Enhanced plant growth with use of drywall compost was feedstock- (ie biosolids versus manure) and species-specific", according to Naeth. "Before starting a large-scale operation, each producer would need to test with their particular compost feedstocks and compost process."

"Compost often requires a bulking agent; wood chips or sawdust are commonly used, but drywall could be an alternative source", she adds. "The key focus is on finding disposal methods for drywall other than landfilling. We must identify innovative methods for disposing of industrial waste products to reduce our impact on – and even, as in this case, to enhance – the environment." ■