



BIG CLIMATE CHALLENGES FACING SMALL MAMMALS

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Across the United States and around the world, climate change is threatening wildlife—big and small. Changes to our climate are destroying critical wildlife habitat, causing habitat ranges to shift, increasing incidence of pests and invasive species, decreasing available food and water, changing the chemistry of the ocean, and increasing the rate of species' extinction. While many may think of polar bears, penguins, or moose when they think of climate change, it is important for us to also recognize the plight of smaller mammals like bats, fox, squirrels, and pika, which have an important place in the health of our ecosystems and economy.

This Groundhog Day, when Punxsutawney Phil makes his annual prediction about the coming spring, we have an opportunity to learn how climate change poses a big threat to the smaller wildlife and wild places we cherish, and to the natural resources that we all depend on.

TOGETHER, WE CAN HELP WILDLIFE—BIG AND SMALL!

Help wildlife by supporting efforts to cut climate-disrupting carbon pollution and to safeguard wildlife habitat across our country. Learn more at www.nwf.org/SmallMammals

CAN PUNXSUTAWNEY PHIL FORECAST CLIMATE CHANGE?

Can Punxsutawney Phil actually predict the weather, or for that matter, even climate change?

While no one should make any vacation plans based on his weather predictions, the nation always pays attention to the famous groundhog's forecast. Every year we listen in to find out if it is going to be a long winter or an early spring. However, Punxsutawney Phil has a pretty poor track record—he is right only 39% of the time, according to one meteorologist who studied his forecasting.

Given Punxsutawney Phil can't forecast even six weeks ahead, his ability to predict climate change is no doubt equally untrustworthy. However, while his methods could hardly be considered scientific, Phil might have a knack for forecasting climate change. In the first half



of the 20th century, Phil Predicted an early spring just twice. In the last half of the century he predicted an early spring ten times—five times more often. Apparently Punxsutawney Phil thinks he has something to say about climate change.

Phil may be a lousy weather forecaster, but wildlife around the United States are feeling the heat of climate change, and are not too happy about it.

DELMARVA FOX SQUIRRELS LEARNING TO SWIM

The Delmarva fox squirrel is aptly named. It is a subspecies of the fox squirrel that inhabits portions of the Delmarva (Delaware/Maryland/Virginia) Peninsula. Among fox squirrels, this one is a true heavy-weight, tipping the scales at twice that of other fox squirrel subspecies. Due to habitat loss and probably over-hunting, this species once disappeared from 90% of its original range and was listed as an endangered species in 1967. Reintroduction efforts, protection, and better habitat management helped it recover, leading to its removal from the endangered species list in 2015.



Now, the Delmarva fox squirrel is expected to be on the run due to climate change. Sea level rise is projected to inundate and destroy several tens of thousands of acres of suitable forest habitat on the Delmarva Peninsula, which doesn't bode well given squirrels prefer not to swim. How soon this will happen depends upon the rate of sea level rise, which continues to accelerate due to the warming climate.

Predicted increases in the intensity and duration of extreme weather events, particularly drought, may also harm the fox squirrel. Such events would likely reduce forest productivity, which is important given the Delmarva fox squirrel's dependence on many forest food sources, including nuts, seeds, tree buds, flowers, fungi, insects, fruit, and pine cones.

FLYING SQUIRRELS GLIDING AWAY

Who doesn't love flying squirrels? Seldom seen, these odd-looking nocturnal creatures have large bulging eyes which help them see at night. Although they don't really fly, a large fold of skin stretching from front legs to hind legs allows them to glide from tree to tree in search of food. To top things off, their long tail is flattened and used like a rudder when gliding.



The southern flying squirrel is quite common in the eastern half of the lower-48 states. As the climate has already been warming, this species is expanding its range northward into the southern portion of Michigan.

Climate change is unlikely to be as well received by the northern flying squirrel, a separate and larger species living in isolated and remote populations in the highest areas of the Appalachians. Adapted to cold environments, its southernmost populations face shrinking habitat. Already vulnerable to logging, climate change may also affect its preferred habitat located in and near higher-altitude red spruce forests. These isolated populations would have no place to go if climate change seriously affects red spruce forests.

LYNX HABITAT MELTING AWAY

The Canada lynx, a denizen of the North, is quite at home in deep snow throughout much of Canada and Alaska. Their large snowshoe-like feet help them stay atop the snow to chase after their favorite prey, snowshoe hare. In 2000, the lynx was listed as a threatened species in the lower-48 states under the Endangered Species Act. It inhabits portions of the Rockies from Montana to Colorado, where it was successfully reintroduced. It also inhabits the Cascades and northern Maine.



Due to a number of factors, including climate change, the range of the Canada lynx has already been receding northward. Declining snowpack may give other predators who are less adept in deep snow, such as bobcats and fishers (similar to mink), a greater competitive advantage, threatening to lead to the decline of this furtive and beautiful cat in its last refuges in the lower 48 states.

ARCTIC FOXES SEARCHING FOR A GOOD MEAL AND SAFE HAVEN

Scarlett Fox, a good friend of the National Wildlife Federation's mascot, Ranger Rick, is up to no good this time. Scarlett is a red fox, and thanks to climate change, she is putting the Arctic fox on the run.

The warming climate, which is heating up much faster to the north of the lower-48 states, is allowing red foxes to move into Arctic fox territory. This encroachment is life-threatening for Arctic foxes. The diminutive Arctic fox weighs in at about seven pounds, while the red fox can be three times as heavy. The red fox can stand 20 inches at the shoulder, towering over the Arctic fox, which comes in at about 12 inches. These size differences mean that, in addition to the red fox competing with Arctic fox for food, the red fox considers the Arctic fox fair game for a good meal.



As if the red fox's movement northward wasn't hard enough on the Arctic fox, the melting ice of the Arctic Ocean is squeezing it out of important hunting grounds. When Arctic foxes can't find enough small rodents, they will venture on to the ice to feast on the seal scraps left behind by polar bears. The rapid decline of Arctic ice habitat is putting this lifestyle at risk.

Making things even worse, the lemmings which Arctic foxes love to eat, are on the decline due to warmer temperatures. Warmer weather is giving lemmings a very hard time by flooding their burrows as well as covering their food with sheets of ice.

Climate change is also affecting the Arctic fox's preferred open-tundra habitat. Typically, low temperatures and short growing seasons inhibit tree growth in the tundra, but warmer temperatures are melting the permafrost, as well as allowing forested areas to move northward.

ARMY OF ARMADILLOS MARCHING NORTHWARD

A first armadillo sighting is a memorable experience, and more people are going to have this opportunity. Built like little tanks, nine-banded armadillos are marching northward. These odd creatures with an external bony armor are the official small mammal of Texas, which arrived from Mexico in the mid-1800s. Now living throughout the Southeast, armadillos have trouble surviving bitter cold winter temperatures. Thus, as climate change brings warmer winters, the suitable area for armadillos is projected to expand northward by hundreds of miles in the eastern United States, including Ohio and Virginia.

Armadillos' northwards movement is welcomed by many outdoor enthusiasts. This is because they help keep imported red fire ant populations under control and lessen the chances of people being bit, which is a welcome relief to those who have experienced these invasive non-native insects. However, armadillos are not native and there are some negative aspects associated with their spread northward. Because they are a nest predator, there is a possibility they could put added pressure on ground dwelling bird species like the quail. This lovely bird is already struggling to defend its nests from predators such as possums, raccoons, and snakes and it may not be able to handle the spread of the armadillo.



BELEAGUERED BATS

Bats are voracious insect predators. The world's largest urban bat colony resides under the Congress Avenue Bridge in Austin, Texas. The 1.5 million Mexican free-tailed bats roosting in the bridge's crevices fly as far as 60 miles away, consuming 10,000 to 20,000 pounds of insects, nightly. Bats consume mosquitoes and many agricultural insect pests. Insects are very sensitive to temperature and overall climate, which affects both their growth rate and populations. Changing weather patterns and extreme weather affecting insect populations

in certain drought stricken areas may upset the ability of bats to find adequate food sources.

The reproductive cycles, hibernation patterns, and migration of bats are very sensitive to temperature. With such a narrow range of tolerance, the endangered Indiana bat, for example, is projected to disappear from much

of its current range as temperatures during the breeding season become too hot.



Availability of water in the Southwest, especially for female bats nursing young, may be a critical factor for the fringed myotis, a type of long-eared bat. While nursing, their young bats have a high need for readily

available water. The increasing warmth and dryness from climate change may limit the availability of adequate water for nursing bats in the already dry climate of the Southwest.

The popular beverage tequila is made by the distillation of juice from agave, a desert dwelling succulent. Pollinated by bats, revenue from the sale of tequila in the United States is more than \$2 billion annually. It is estimated that bats contribute more than \$3.7 billion to our economy annually, mostly through agricultural benefits derived from bats keeping insect populations under control. One wonders whether the Eagles and Jimmy Buffet know how much they owe to bats for the success of their iconic songs "Tequila Sunrise" and "Margaritaville," respectively.

PIKAS ON A STEEP CLIMB

Looking cute and cuddly, these cousins of rabbits love the mountains. More precisely, pikas love alpine areas of the western United States with no trees, little vegetation and lots of talus (loose rocks). To survive the long cold and snowy winters underground, pikas harvest grasses and other small plants in the summer, dry them in the sun, and then store them in their dens for a winter snack.

Some pika populations have already disappeared from their chilly habitats as air temperatures have increased. Declining snowpack is thought to increase their exposure to extreme cold, and it is also known that pikas are vulnerable to hot summer temperatures, seeking refuge in their burrows.

Forced to "climb" higher and with literally nowhere to go to find suitable climate areas, many pika populations throughout the West are expected to disappear. As climate change progresses, pikas may survive at only the very highest altitudes and be much harder to find and observe.



PINE MARTEN TRYING TO WEASEL OUT OF CLIMATE CHANGE

Related to weasels, Pine marten, also called American marten, are seldom seen. They prefer forested habitat and depend upon voles and mice for their diet, but they also eat nuts and berries in the summer. To catch their winter prey, American martens often travel under deep snow. Quite adept at this subnivean behavior, they may surface again from the deep snow some 100 feet away. Weighing less than three pounds, they are also very adept at traveling on top of the snowpack. In the late 20th century, marten populations were on the rise due to better forest management, improved management of regulated take, and even reintroductions in some areas.



Climate change may jeopardize this progress because of declining availability and depth of snowpack. Where habitat is fragmented, marten appear to be reluctant to travel across non-forested habitat, especially with little or no snow present. This means that populations will become increasingly isolated as snowpack declines. Their range throughout the western mountains is likely to decrease, as is their southern-most habitats in the northern Great Lakes and northern New England, including northern New Hampshire and Maine.

SNOWSHOE HARE BOUNDING INTO TROUBLE

The snowshoe hare is a master of camouflage, giving it an advantage in hiding from predators. The white pelt in winter and the brown pelt in summer match the changing seasons. However, climate change is causing a later onset of winter and earlier onset of spring and summer. These changes throw the seasons out of sync with the hare's annual molting times in the fall and spring.

A white snowshoe hare stands out like a sore thumb in the spring if the snow melts before the hare molts from a white to brown pelt. A good disguise is essential for avoiding being eaten by a lynx, fox, bobcat, or coyote.



Pennsylvania, at the southern limit of the snowshoe hare range in the eastern United States, is in danger of losing the species altogether as a result of disappearance of the hare's preferred habitat. The young, dense, regenerating hardwoods and conifers it prefers have been devastated by tree diseases and invasive pests, and in 2012 the Pennsylvania Game Commission reduced snowshoe hare hunting season to less than a week and then only in restricted areas. The range of suitable climate for the snowshoe hare is likely to shift northward out of Pennsylvania as the climate warms.

TAKE ACTION FOR WILDLIFE!

We know what's causing climate change and we know the solutions. What we need now is national and local leadership to make smart energy choices and wise investments in protecting our wildlife and natural resources. Join the National Wildlife Federation in calling on our policymakers and communities to:

- Support the federal Clean Power Plan and encourage states to implement state plans to reduce carbon pollution from our largest source—power plants.
- Support strong Environmental Protection Agency and Department of Interior standards for methane emissions in the oil and gas industry, which is a major source of methane pollution.
- Reduce use of fossil fuels, which not only are a major source of carbon pollution, but also destroy, degrade, pollute, and fragment habitat in the extraction process.
- Invest in clean, wildlife-friendly energy sources such as wind, solar, sustainable bioenergy, and geothermal and improve energy efficiency to reduce power demand.
- Safeguard wildlife by establishing protected habitat networks that allow connectivity across the landscape and enable species to shift their range as the climates changes.

Learn more and take action at www.nwf.org/SmallMammals.

AUTHORS

Doug Inkley, Ph.D., Senior Scientist, National Wildlife Federation

Tara Losoff, National Outreach Senior Manager, National Wildlife Federation

Lauren Anderson, Climate and Energy Intern, National Wildlife Federation

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