Ice Age climate change played a bigger role in skunk genetics than geological barriers

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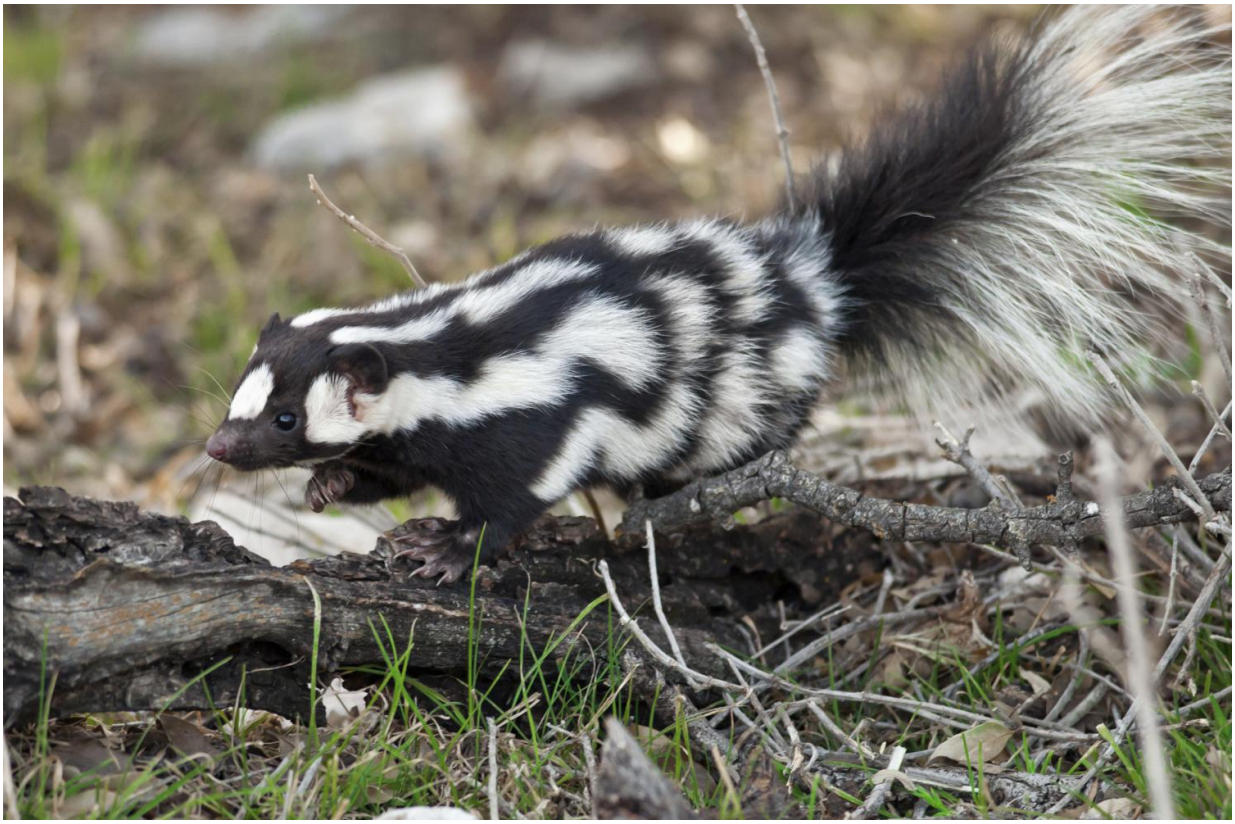


Western spotted skunk. Credit: © Robby Heischman.

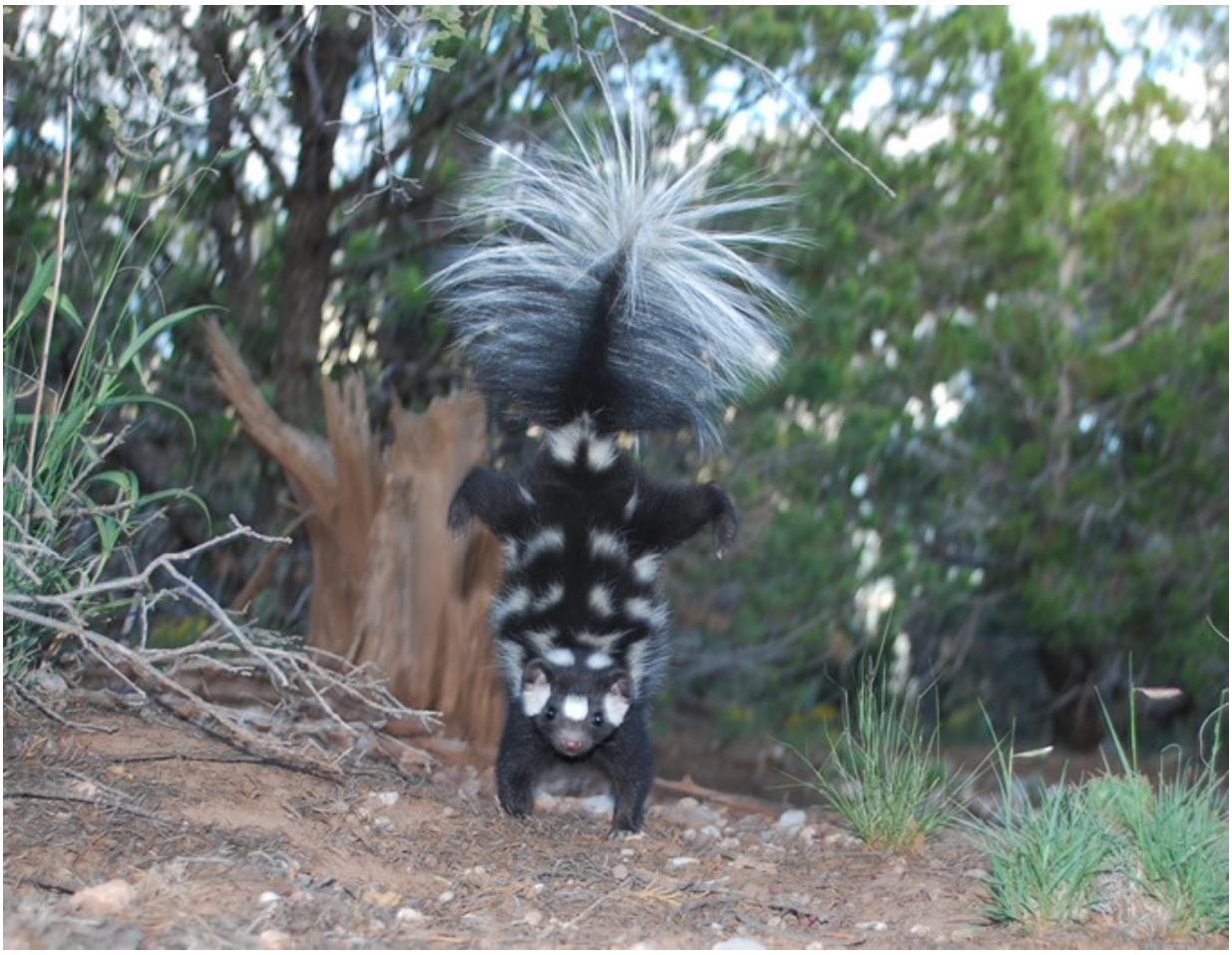
Climate plays a key role in determining what animals can live where. And while human-induced climate change has been causing major problems for wildlife as of late, changes in the Earth's climate have

impacted evolution for millions of years—offering tantalizing clues into how to protect animals facing climate change today. In a new paper in *Ecology and Evolution*, scientists have delved into the effects of Ice Age climate change upon the evolution of tiny, hand-standing skunks.

"By analyzing western spotted skunk DNA, we learned that Ice Age climate change played a crucial role in their evolution," says lead author Adam Ferguson, Collections Manager of Mammals at The Field Museum in Chicago and affiliate of Texas Tech University. "Over the past million years, changing climates isolated groups of spotted skunks in regions with suitable abiotic conditions, giving rise to genetic sub-divisions that we still see today."

Western spotted skunks are really stinkin' cute— at two pounds, they're smaller than the striped Pepe Le Pew variety, their coats are an almost maze-like pattern of black and white swirls, and when they spray, they often do a hand-stand, hind legs and fluffy tail in the air as they unleash smelly chemicals to ward off predators. They're found throughout the Western US and Mexico, in a wide variety of climates— they thrive everywhere from Oregon's temperate rainforests to the Sonoran, the hottest desert in Mexico.

There are three genetic sub-groups, called clades, of western spotted skunks. Often, clades develop when a species is split up by geography. If a species is separated by, say, a mountain range, the groups on either side of the mountain may wind up splitting off from each other genetically. However, the division of the skunks into three clades doesn't seem to have been driven solely by geographical barriers— populations separated by mountains are more or less genetically identical. Instead, the skunks vary genetically from one historic climate region to another, due to Ice Age climate change.



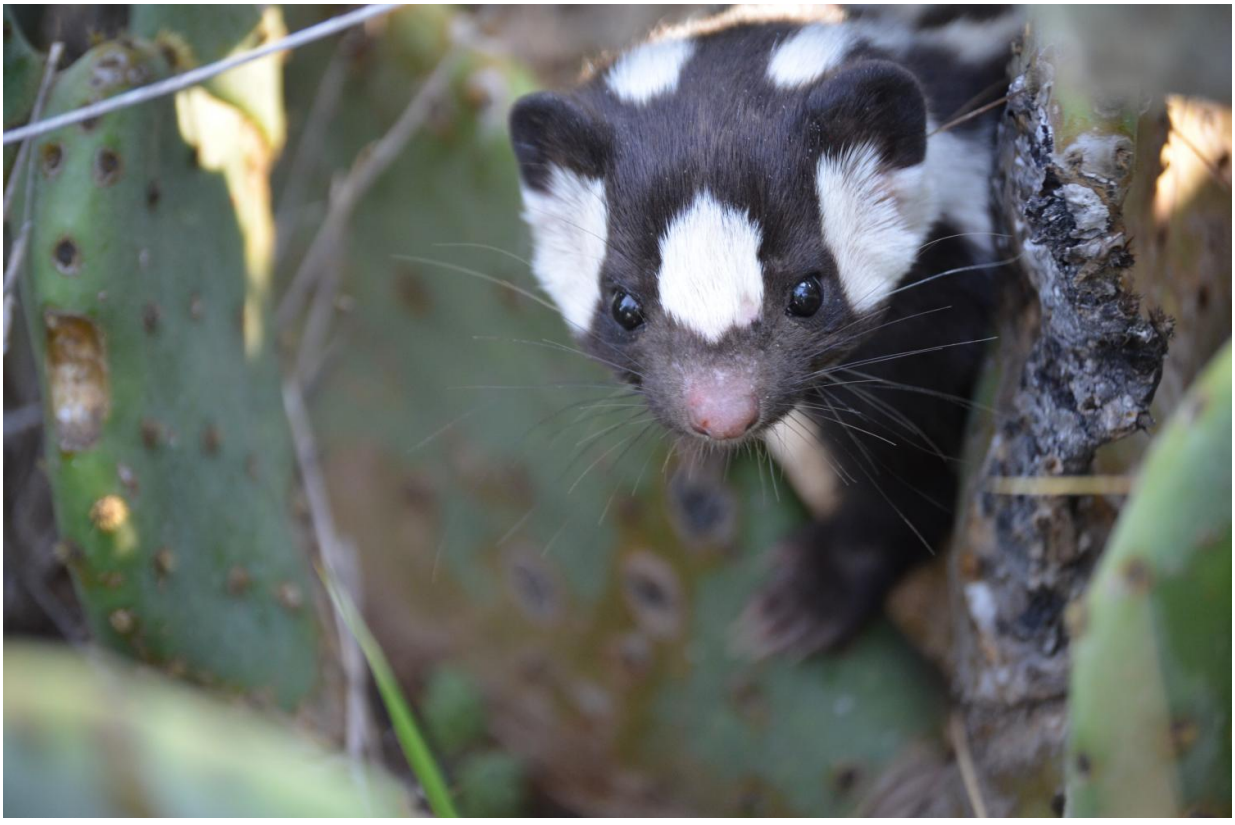
Western spotted skunk is shown doing its characteristic hand-stand when spraying. Credit: © Jerry W. Dragoo.

"Western spotted skunks have been around for a million years, since the Pleistocene Ice Age," explains Ferguson. "During the Ice Age, western North America was mostly covered by glaciers, and there were patches of suitable climates for the skunks separated by patches of unsuitable climates. These regions are called climate refugia. When we analyzed the DNA of spotted skunks living today, we found three groups that correspond to three different climate refugia."

"That means that for spotted skunk evolution, climate change appears to have been a more important factor than geographical barriers," says Ferguson.

In the study, scientists used DNA samples from 97 skunks from a variety of regions and climates in the American Southwest. Upon sequencing the DNA, the scientists were surprised to see that the skunks split into three clades based on pockets of suitable climate present during the Pleistocene.

"Small carnivores like skunks haven't been well-studied when it comes to historical climate change," says Ferguson. "We know how small mammals like rodents respond to changing climates, and we know how bigger carnivores like wolves respond, but this study helps bridge the gap between them."



Western spotted skunk face is shown. Credit: © R. C. Dowler

Ferguson also notes that skunks don't deserve the bad rap they get. "Skunks are a really interesting family of North American carnivores—they're well-known, but not well-studied. And studying them comes with a cost— they stink, even their tissues stink, and you run the risk of getting sprayed. But they're important to their ecosystems— for example, they eat insects and rodents that damage our crops," he says.

Moreover, Ferguson says, the study can illuminate the bigger picture of biodiversity in the face of climate change— an issue that grows increasingly relevant as human-driven climate change affects more and more of the world's animals.

"What we know about the past can inform what we expect to see in the future," says Ferguson. "Understanding these genetic subdivisions that happened as a result of changing climatic conditions can help us conserve skunks and other animals in the future."

Before working at The Field Museum, Adam Ferguson was affiliated with Texas Tech University and completed this research there. Ferguson's co-authors are affiliated with Angelo State University, the National Museum of Natural History, the National Zoological Park, the US Fish and Wildlife Service, and the University of New Mexico.

Provided by Field Museum

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