

Faced with global warming, can wilderness remain natural?

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Africa escaped the megafauna extinctions that hit the rest of the world at the end of the last ice age. Now, global warming promises to take out many of Africa's large herbivores, including the tsessebe and the kudu. (Anthony Barnosky/UC Berkeley)

(PhysOrg.com) -- For those who think of nature as a wild, unspoiled Eden that preserves the natural flora and fauna free from human interference, global warming has a nasty surprise in store, according to University of California, Berkeley, biologist Anthony Barnosky.

In his new book, "Heatstroke: Nature in an Age of [Global Warming](#)" (Island Press, 2009), Barnosky says that because of climate change,

wilderness left to its own will no longer look like the natural areas we see today. Our [conservation](#) strategies must be rethought, he adds, because business-as-usual will not preserve all the aspects of nature we have come to know, love and respect.

Setting aside preserves, for example, puts animals and plants in a bind: As global warming makes their current habitats unsuitable, surrounding human development prevents them from moving to more hospitable places. The alternative, assisted [migration](#), smacks of creating wild zoos - quasi-natural areas like the dinosaur wonderland portrayed in the book and movie "Jurassic Park."

"The new twist in preserving nature is that we might have to come up with a separate but equal system, where we actively set aside some tracts of land as wildlands where people can experience this feeling of 'wilderness,' but recognize that the species that live in those places and the landscape are not going to be the species and landscape we are used to," he says. "Our kids are going to see very different things in those kinds of places than we do."

Barnosky describes in his book how global warming is already causing shifts in the ranges of animals and plants, disrupting migrations and spawning, and stressing animals confined to parks and reserves.

"We now have this conflict between saving species and saving natural ecological processes; between saving species and saving the interactions that take place between species in the absence of active management," he says. "Assisted migration, where you help species along, is great and what we need to do, but as soon as you do that, all of a sudden, nothing is wild anymore."

Barnosky is a paleoecologist who has studied and written about the rise and fall of species over the past few million years and the climatic

upheavals that caused them. His book contrasts current ecosystem disruptions with past extinctions, showing, for example, how climate change coupled with human activity was the one-two punch that led to the extinctions of large animals around the globe in the past 12,000-50,000 years. Mammoths, mastodons and giant bison in North America, Irish elk and woolly rhinos in Europe, giant kangaroos and hog-size wombats in Australia all disappeared - and extinctions were most intense where global warming and human hunting coincided.

While ecosystem change and extinction are normal, Barnosky reminds us that past climate change, such as cooling at the beginning of glacial periods and warming with the onset of interglacial periods, took place over thousands of years. The current warming is happening faster, by a factor of about 10.

In the best-case scenario, he says, the temperature in 2100 will be warmer than it has been since humans first appeared. In the worst case, it will be hotter than it has been in at least 3 million years, "which is longer than basically any species you can name has been on Earth," he says, adding that animals and plants are wired to evolve to adapt to change, but not at such a rapid pace.

"If you look at how ecosystems have responded over the past hundreds of thousands and perhaps millions of years to natural climate changes, and then compare that with how they are responding today and what they have to respond to in the next 100 years, we are way outside the normal baseline of what those ecosystems are adapted to," says Barnosky.

Global warming comes on top of many other environmental impacts that have been stressing the environment, Barnosky notes in his book. He wrote "Heatstroke," in part, because he "wanted to raise awareness that global warming is not just an add-on consequence as far as impacts on ecosystems and nature are concerned. We are all aware of habitat

fragmentation, invasive species, growing human populations, and the tradeoff between resources needed to sustain us versus resources to sustain other species. People tend to think those are the big problems, and that global warming is going to heat things up a bit.

"In reality, global warming, as far as how it is going to change nature, is as big or bigger a problem than all of those other four, and especially when you put it together with all of the other four. There are feedbacks that make everything much more severe. It is like multiplying rather than adding everything up."

In the book, he documents how global warming is already reducing roan antelope and tsessebe populations in Africa, amphibians in Yellowstone National Park, polar bears in the Arctic and pikas in the Western United States. One common thread is that warming is targeting "keystone" species that, "although represented by relatively small numbers of individuals, have an inordinately important effect on keeping their ecosystems in functioning order," he writes. "When elephants disappear in Africa or the whitebark pine dies out in Yellowstone, the whole ecology can collapse."

Barnosky says the scientific data led him to the conclusion that "how to save the particular ecosystems we value and, in the larger scheme of things, nature itself, is the challenge we now face in the Age of Global Warming."

Wilderness must be protected, he says, if for no other reason than that it acts as a canary in a coal mine, "a barometer of how healthy the Earth actually is." But imperiled species must also be protected as biodiversity resources, he adds, even if this requires assisted migration of not only the endangered species, but also the plants and animals these species interact with in their ecosystem.

One alternative that some scientists have put forward is Pleistocene rewilding, a wild idea to re-establish the large "megafauna" that dominated Earth during the planet's last major bout with global climate change, the period of on-and-off glaciation that took place between 2 million and 10,000 years ago. This involves importing elephants from Africa to stand in for the extinct mammoths and mastodons, lions and cheetahs for the saber toothed cats, wild horses and camels as replacements for the grazers. This would preserve endangered animals and plants that face pressure from humans and global warming in their current habitat, but, as Barnosky points out, it could also have a long list of downsides.

Unfortunately, both assisted migration and Pleistocene rewilding would lead to managed ecosystems - the antithesis of wilderness. Just as we manage fisheries to preserve an important food source, we will have to give up some wildness in order to preserve species.

"We can't protect all three faces of nature - ecosystem services, like clean water and fisheries; species diversity; and the feeling of wilderness - without somehow separating those three different concepts of nature and working with each one of them differently," he says. "All can be complementary, but you have to do different things for each one."

"I think there are people who are quite happy to settle for one or two of those, but my personal philosophy and feeling is that we can have all three faces of nature," he says.

He foresees two types of preserves, for example: species preserves to protect a species or assemblages of species, but requiring heavy management; and wildland preserves that retain ecological interactions without the influence of humans - the feel of wilderness - but which will see changing [species](#) and even extinctions.

Barnosky says he is optimistic that scientists, politicians and "the rest of us" can hash out the details to preserve much of what we see today - but only if we act now.

"Earth is not going to die. But global warming by itself, especially with feedbacks from the other big threats on nature, is going to lead to a loss of biodiversity big-time if we don't get our act together," he says. "We are not over the brink yet. And we don't have to go over the brink unless we want to. It is decision time."

Source: University of California - Berkeley ([news](#) : [web](#))

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