

Rewilding: Bring in the big beasts to fix ecosystems

By Sara Reardon



Top predators like wolves can shape entire ecosystems (Image: Joel Sartore/National Geographic Creative)

Top animals shape ecosystems, so some conservationists want to unleash big beasts like elephants and lions to restore the countryside

THE sky is purple and the wind is fierce on top of the cliff. David Burney has to shout as he explains what we're looking at. Below us is the Makauwahi Cave, which contains the remains of plants and animals going back thousands of years. It is revealing what the Hawaiian island of Kauai was like before people arrived. Here you can find the bones of moa-nalo, the giant flightless ducks that once ruled Hawaii.

"The moa-nalo were giant flightless ducks that once ruled the Hawaiian islands"

For millions of years, these plant-eating fowl roamed the islands, taking their pick of the lush vegetation. There were no large predators to threaten them. Then came the Polynesians. They probably started feasting on the plump, defenceless birds as soon as they had jumped out of their canoes. "It was an instant luau" – a feast – says Burney.

The ducks were soon wiped out, and the onslaught was only just beginning. European settlers introduced rabbits and goats to Hawaii, and the defences that native plants had evolved against the ducks' thick beaks were little use against sharp teeth. Today, many of the original plant species of Kauai are extinct, replaced by invasive weeds. "For years, I documented extinction," says Burney, who has spent much of the past two decades unearthing fossils here with his wife Lida Pigott Burney. "I felt like the county coroner."

Then, a few years ago, the Burneys decided to go beyond studying the past, to recreating it. They searched for surviving native plants and began to plant them on disused farmland near the cave. The Makauwahi Cave Reserve was born. Here, endangered yellow hibiscus flowers called ma'o hau hele, brought from nearby islands and from Kew Gardens in London, stand out starkly against the dark sky. Burney points out a lone loulu palm tree, one of the last of its kind, which he planted after finding it in the cave's fossil record.

But even on this small site of just a few acres, keeping weeds in check is a major battle. What if, Burney wondered, the giant ducks were still around. They might feast on the weeds in preference to the beak-resistant native plants. So he decided to try a little experiment. As we arrive at an enclosure, one of his surrogate ducks comes to meet us. It is a giant tortoise named Cal. Burney says Cal and his fellow duck impersonators are doing what he hoped. They prefer to eat non-native plants, and they are thriving and laying eggs.

The Makauwahi Cave Reserve is a tiny example of what's come to be known as "rewilding". The term means different things to different people, and in the widest sense of putting aside land for wildlife, it has been going on for more than a century. But the rewilding movement now springing up around the world is a bit different. Its supporters almost all agree on two things. First, that many supposedly wild areas are actually a mere shadow of what they were before our ancestors arrived on the scene. Second, that we cannot restore these ruined ecosystems to their former glory without restoring the animals that shaped them – especially the big animals at the top of the food chain.

This is where it gets controversial. In Britain, for instance, there has been opposition to reintroducing the beaver, never mind the wolves and bears that once roamed the island. What's more, most of the world's large animals have gone the way of the moa-nalo over the past 10,000 years or so. Undeterred, rewilding enthusiasts want to replace them with substitutes just as Burney is doing – which in North America might mean letting African cheetahs, lions and elephants loose on the great plains. Is this madness or genius?

Surprisingly, one of the most densely populated continents has taken the lead on rewilding. An initiative called Rewilding Europe has set aside ten areas of 1000 hectares that it aims to rewild by 2020. Some of these projects are well under way – red deer and ibex roam sites near the border of Portugal and Spain, for example. Director Wouter Helmer envisions these reserves becoming Europe's version of the national parks in North America and Africa. "We are not looking backward, we are looking forward," he says. "It's the future harmony between man and nature in which we are interested."

"Surprisingly, Europe has taken the lead in rewilding, setting aside ten areas"

Yet it is easy to forget that nature is red in tooth and claw. Since the 1980s, researchers in the Netherlands have been slowly introducing large grazing animals to a reclaimed marshland, about 40 kilometres from Amsterdam, called the Oostvaardersplassen. But in a particularly harsh winter in 2005, many animals died of starvation, prompting protests from the public and debate in the Dutch parliament over whether this constituted animal cruelty. But feeding the animals, the rewilders argued, would change their behaviour.

As a compromise, the site's managers now shoot any starving animals they see and leave the bodies for scavengers, although many are not spotted. Drawn to the carrion, white-tailed eagles have returned to the Netherlands for the first time in the modern era. The site now contains thousands of red deer, miniature horses and Heck cattle, a species bred to resemble the 1500-kilogram aurochs that once roamed the area. Sooner or later, wolves are bound to move in.

Wolves were the key to one of the best known examples of rewilding. In 1995, nearly 70 years after hunters had wiped them out, wolves were reintroduced to Yellowstone National Park in the US. In the absence of large predators, deer populations had burgeoned out of control and begun to venture into nearby areas. Overabundant wapiti (also known as elk) ate trees down to their nubs, leaving beavers with no lumber for their dams, which, in turn, changed the flow of rivers. Once the wolves were restored to the park, however, deer and wapiti numbers decreased and they became less bold.

Examples like this show that restoring the animals at the top of the food chain can reshape entire ecosystems. Conservationists say this demonstrates that rewilding can have practical benefits.

To sceptics, though, such complex effects are exactly what is worrisome. "Inserting species into ecosystems with the hope they will play a specified role is incredible science hubris," says Justin Brashares of the University of California in Berkeley. In some cases, he says, when species have been driven out of an area by people, returning them is not a problem. But history is full of examples of well-meaning introductions of species that got out of control, from cane toads in Australia to the kudzu vine in the US. So there is a lot of caution about the idea of substitute species.

But enthusiasts can point to a few small success stories. On Ile aux Aigrettes, a little island off the coast of Mauritius, 20 Aldabra giant tortoises were introduced by the Mauritian Wildlife Foundation in 2000 as a substitute for the extinct native tortoises. The restoration wasn't motivated by nostalgia, says Christine Griffiths of the University of Bristol, UK, who leads the project. It was done to help save native plants, such as a kind of ebony tree found only on this island.

Although logging stopped in the 1980s, the trees were not recovering. Since the tortoises arrived, however, seedlings have sprung up everywhere (*Current Biology*, vol 2, p 762). The tortoises eat the trees' fruits and disperse the seeds about the island in their faeces. The seeds are also more likely to germinate after passing through a tortoise, the team has discovered. "Tortoises would be a wonderful tool for most islands," Griffiths enthuses.

In 2007, her group introduced Aldabra and Madagascan radiated tortoises to Round Island, also near Mauritius. Its native tortoises are extinct, too, and the island is overrun with weeds, as Kauai is. As hoped, the tortoises are feasting on the weeds and mostly leaving native plants alone, the team reported last year (*Conservation Biology*, vol 27, p 690).

Substituting one tortoise for another on a small island is a fairly safe bet. "It's hard to imagine a runaway tortoise population," says rewilding advocate Josh Donlan of Advanced Conservation Strategies, an environmental consultancy based near Salt Lake City, Utah. "We killed them once, we can do it again." But Donlan wants to go much further to rewild North America.

In a 2005 article in *Nature*, Donlan, Burney and 10 other biologists pointed out that, while most conservationists think of the time before European settlers arrived as the continent's wild state, they really should look further back. They should focus on the late Pleistocene around 13,000 years ago, before humans wiped out most of the large animals. "History is the best guide we have for creating a roadmap for biodiversity and conservation in the future," Donlan says.

The group proposed rewilding a large swathe of North America to recreate an ecosystem as rich as the ancient one. The Bolson giant tortoise, now found only in Mexico, could be returned to its former range. Bactrian camels could stand in for North America's extinct native camelids. African and Asian elephants, the researchers proposed, could replace the lost mammoths, mastodons and gomphotheres that helped maintain grasslands by feeding on trees. African lions could replace the extinct American lion.

The backlash was immediate. Persuading the public that dangerous creatures should be allowed to run wild near inhabited areas, many researchers pointed out, would be nearly as mammoth a task as restoring the mammoths themselves. Scant conservation funds would be better spent preserving the top predators that still survive, such as wolves.

Even with public support and funding, there would still be practical problems. For instance, an analysis by Brashares suggests that the climate in most of North America is not suitable for lions and cheetahs (*PLoS ONE*, e12899). "It's a fun and interesting philosophical idea, but when the rubber hits the road, we can't move things around and expect them to do well," says Brashares.

Climate complicates things in more than one way. In Europe, for instance, one would need to go back at least 50,000 years to determine the continent's virgin state, but this was the middle of the last ice age, so it is no surprise that the fauna and flora were very different. Go further back to the last interglacial period, 100,000 years ago, when Europe's climate was similar to the present, and the wildlife was, well, wild. Hippopotamuses and hyenas roamed Britain, for instance. Is this what we should regard as the natural state?

Any serious rewilding effort would also need to consider why a species went extinct. In the New World, the loss of large animals was relatively recent and coincided with the spread of people. But in the Old World, there has been much debate about whether it was warming after the last ice age or ancient hunters that wiped out big animals.

Spain, for instance, had both reindeer and lions 20,000 years ago. It is thought the lions were hunted to extinction, whereas the reindeer couldn't deal with the warming climate. If so, lions might thrive if reintroduced but reindeer might not.

Pleistocene Park

In western Siberia, Sergey Zimov of the Russian Academy of Sciences is turning this argument on its head. Instead of studying the causes of past extinctions to determine whether rewilding is feasible, he is rewilding to see what caused the extinctions.

Zimov has built a 125-hectare "Pleistocene Park" complete with horses, reindeer, musk ox, wapiti and moose. These large herbivores thrived on the Siberian steppe for a million years before disappearing along with the mammoths around 10,000 years ago. The vegetation of the steppe changed too, with grasses giving way to mosses and forests. Zimov suspects hunters triggered this change by killing large numbers of the herbivores. And he hopes to prove it by showing that high densities of herbivores can thrive on the steppe even in a warm climate, and that their presence will restore the original vegetation.

As part of this, Zimov and his colleagues are developing a second park in a warmer area 250 kilometres south of Moscow, containing even more large herbivores as well as, eventually, cheetahs and lions. Tourists will be able to visit this fenced "Wild Field" as if on an African safari, Zimov says.

Rewilding could have other environmental benefits, too, such as helping to slow the melting of permafrost. Undisturbed snow traps ground heat accumulated over the summer, whereas land under trampled snow cools much faster. As a result, the permafrost at Pleistocene Park, is 4 °C cooler than elsewhere, Zimov says. Grasslands also reflect more of the sun's heat than dark forests. What's more, Zimov thinks converting the tundra back to grassland will capture carbon from the air.

Besides combating climate change directly, rewilding could also help ameliorate some of the consequences. For instance, the UK has been suffering from severe flooding in recent years. George Monbiot, author of the rewilding manifesto *Feral*, points out that there is strong evidence that reforesting upland areas denuded by Britain's ancient farmers will reduce water run-off.

In many places the land is deliberately kept tree-free, but in some parts the burgeoning deer population is thwarting reforestation efforts by destroying saplings. So introducing wolves could help, as in Yellowstone.

For its enthusiasts, though, rewilding is about more than practical benefits. In a world where we are bombarded by dismal news about the environment, it offers inspiration rather than gloom. "It's a new kind of ecotourism that captures the imagination," says Joe Bull of Imperial College London, who runs a rewilding consultancy.

"Rewilding is a new kind of ecotourism that captures the imagination"

Even critics such as Tim Caro of the University of California in Davis, who dismisses the idea of Pleistocene rewilding with exotic animals such as elephants as "a stupid idea", concede this point. "It's a more positive view of conservation rather than just talking about what went wrong," he says.

Leader: "When is an artificial ecosystem no longer a fake?"

Clarification: *Moose can cause an elk of a muddle. A possible confusion over whether this article referred to wapiti (also known as elk) or moose (known as elk in Europe) has been clarified since this article was first published.*

This article appeared in print under the headline "Return of the wild"

Sara Reardon writes for *Nature* in Washington DC

Magazine issue 2958, published 1 March 2014

NewScientist | Jobs



Staff Scientist- Molecular Biologist



Visiting Assistant Professor - Ecology and Conservation Biology



Postdoctoral Fellow (Center for Neuroscience and Regenerative Medicine)



Scientist I, Cell Biology

[More jobs ►](#)

