

## BIG ANIMALS ENRICH THE ENVIRONMENT



Elephants distribute nutrients that make the African landscape more fertile

### *Transcription of an interview with Dr Christopher Doughty, Lecturer in Ecosystem Ecology*

**B**ig animals act as nutrient arteries for the planet. If you remove the big animals, nutrients are less well distributed. You can think of it as the human body: if we have fewer arteries the nutrients aren't going to be distributed evenly. And some 10,000 years ago we largely removed several of these nutrient arteries.

People are good at concentrating nutrients – when you take them from one area and concentrate them in agricultural systems. Currently on the planet there are regions that have too many nutrients and others that have too few. And that has a real cost too: a less fertile planet. These large animals provide an unrecognised ecosystem service.

For this paper (in the journal *Nature Geoscience*) we largely depended on decades' worth of field studies of animal movement, animal behaviour. We know that big animals move more, eat more and live longer than small animals. All these aspects mean that big animals are disproportionately important in moving the nutrients away from the flood plain. We tried to put this in a simple model. Specifically we looked at the Amazon; 10,000 years ago there were 60 large animals that aren't there anymore. We know nutrients are generally derived from the Andes mountain range, and are flushed into the Amazon basin through the river system.

We wanted to compare Africa, which still has its existing megafauna, to the Amazon, which is an incredible bio-diverse force, except it just doesn't have the large animals. What we see nowadays is the eastern Amazon, which is quite nutrient-limited. This is important, because by taking these animals out of the ecosystem we have affected nutrient distribution, we have affected tree cover, we have even affected climate.

We came at this from an interest in conservation. We wanted to use our understanding of the past to be able to predict what effect extinctions might have in the future. It is very difficult for people to think on these longer-term timescales. It is the same with climate change – we are asking people to think on longer timescales, and that is already difficult, and this is an order of magnitude larger.

I think people were very surprised – this is an instance where we are saying that when we go out and measure this force, it's not what we call 'steady state'. We are still seeing the effect of these extinctions. In central Africa over 50 per cent of the forest elephants have been lost in the last ten years alone. The nice thing about this model is that we can extrapolate into the future just as easily as we have in the past. So we can say that if forest elephants do become extinct in central Africa, that will have a large impact on fertility well into the future – thousands of years into the future.