

Bomen & Beesten



Part 1: The Late Quaternary Extinctions

A Time of Giants

Megafauna (= large animals) co-occurred with modern species!

European species have spent more time with elephants than with *Homo sapiens*



Megafauna Across the World



South America



North America



Australia

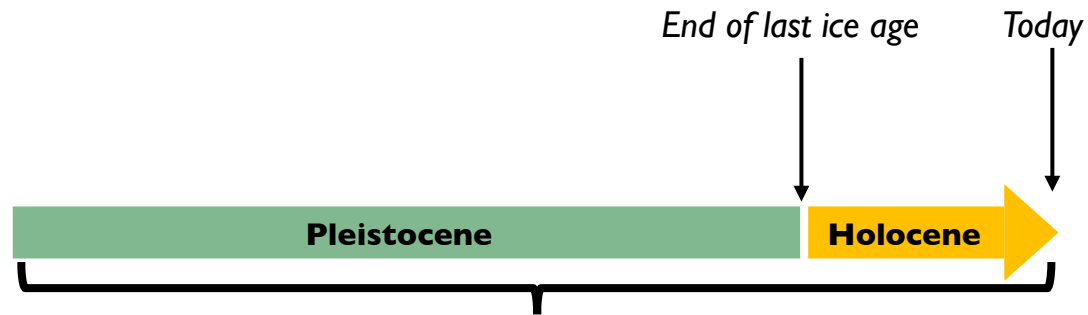


Beringia

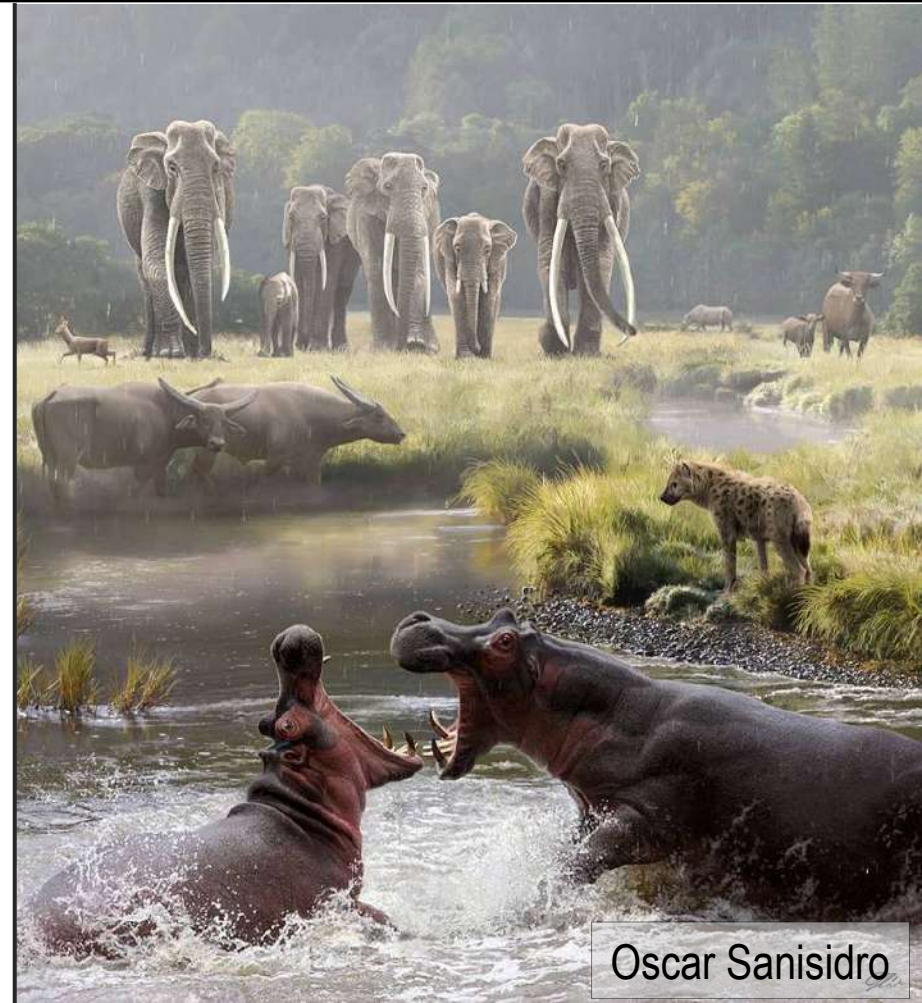
Mauricio Anton

The Late Quaternary Extinctions

During the late Pleistocene and Holocene an extinction wave took place



Quaternary

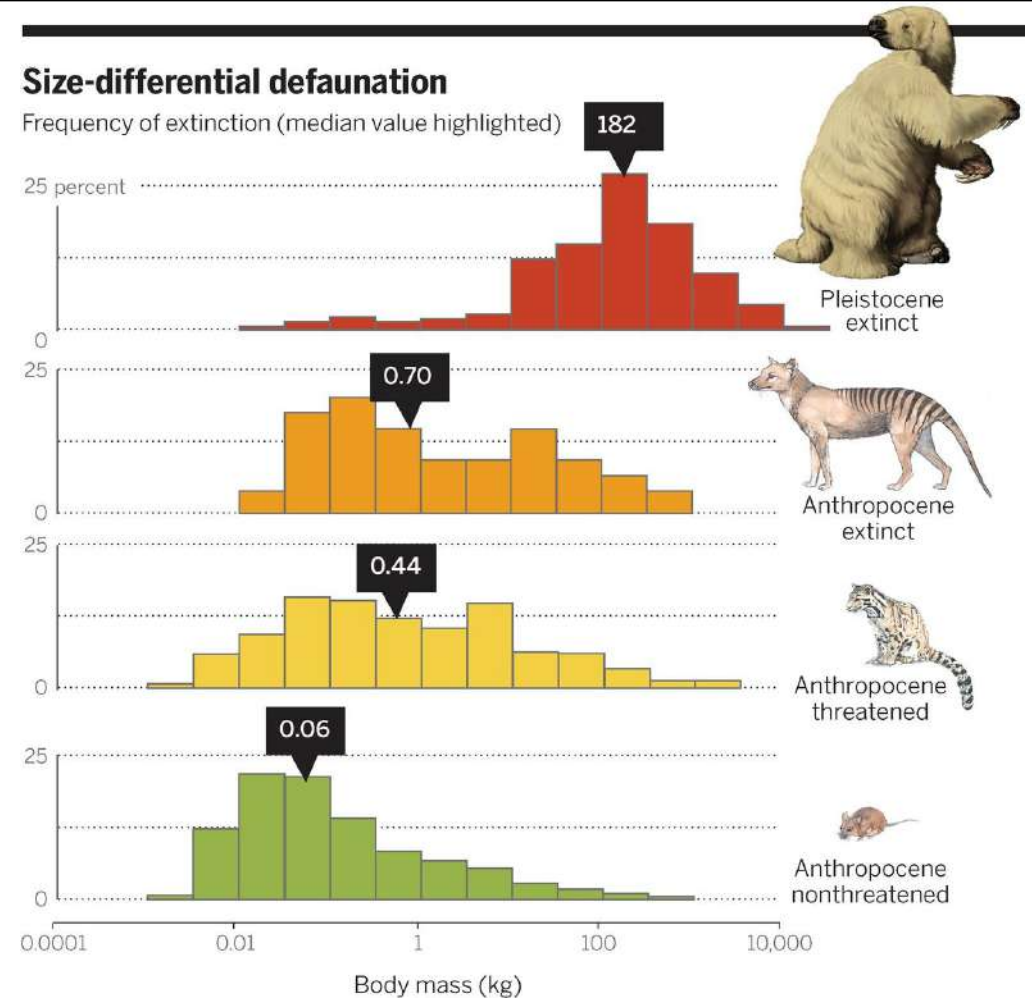


Oscar Sanisidro

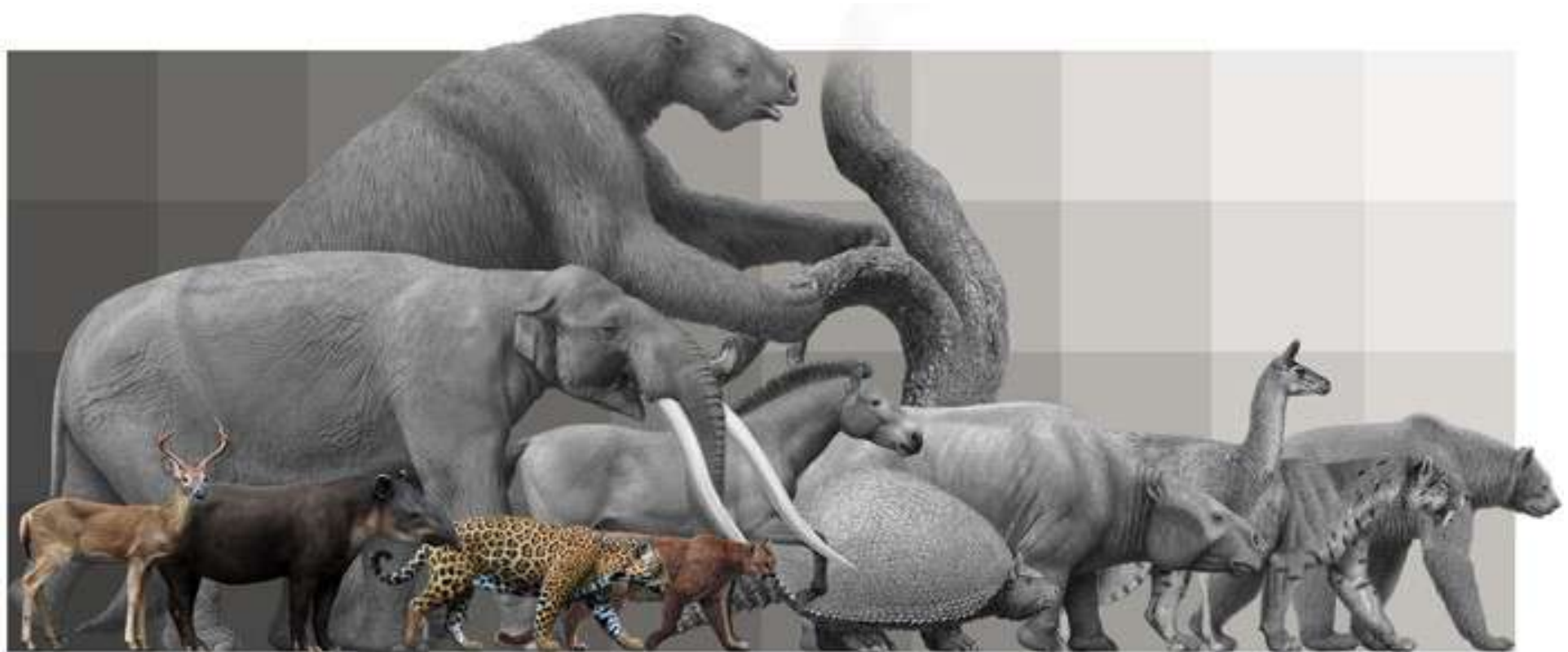
Late Quaternary Extinctions

Biased towards
large vertebrates

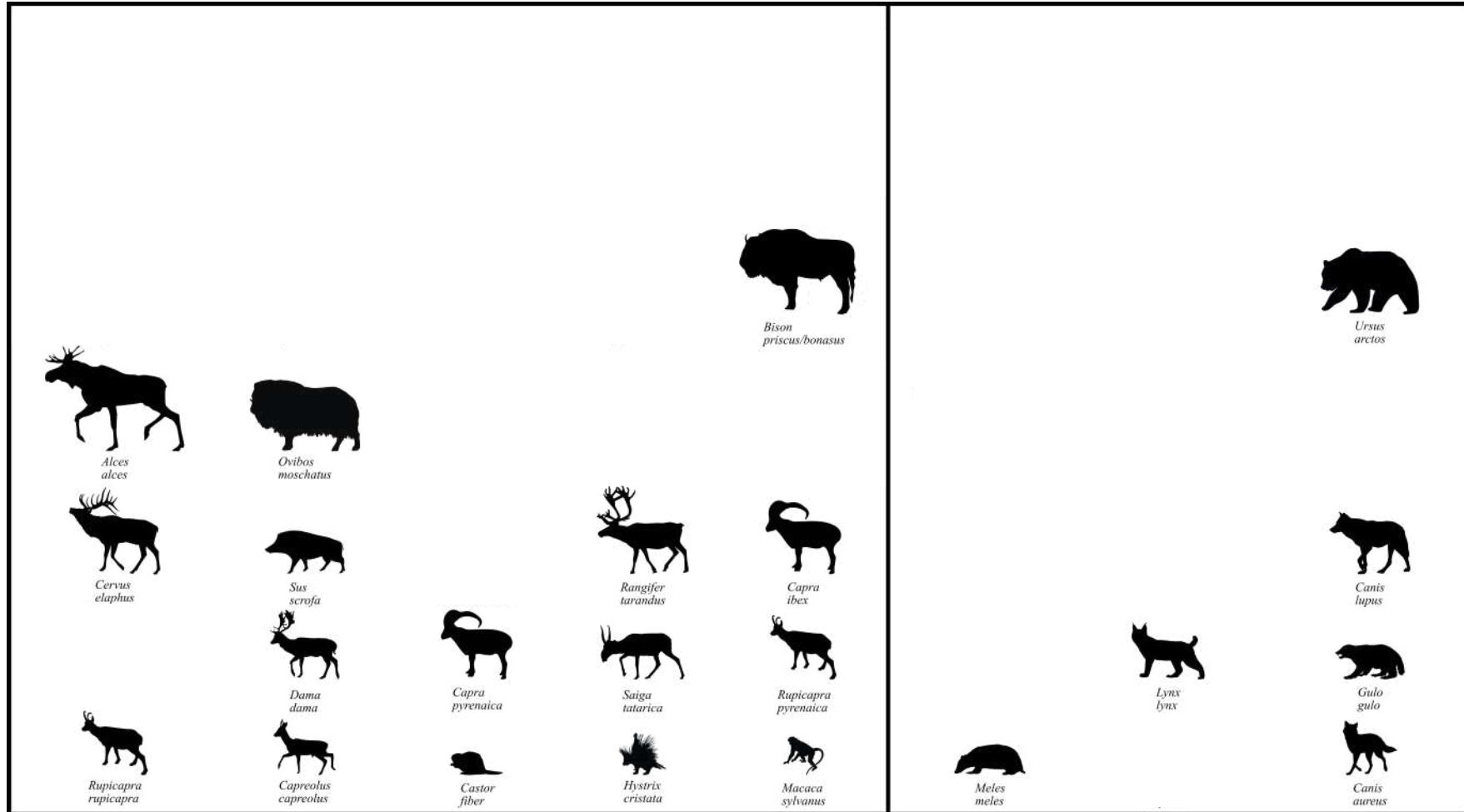
Dirzo et al. (2014)



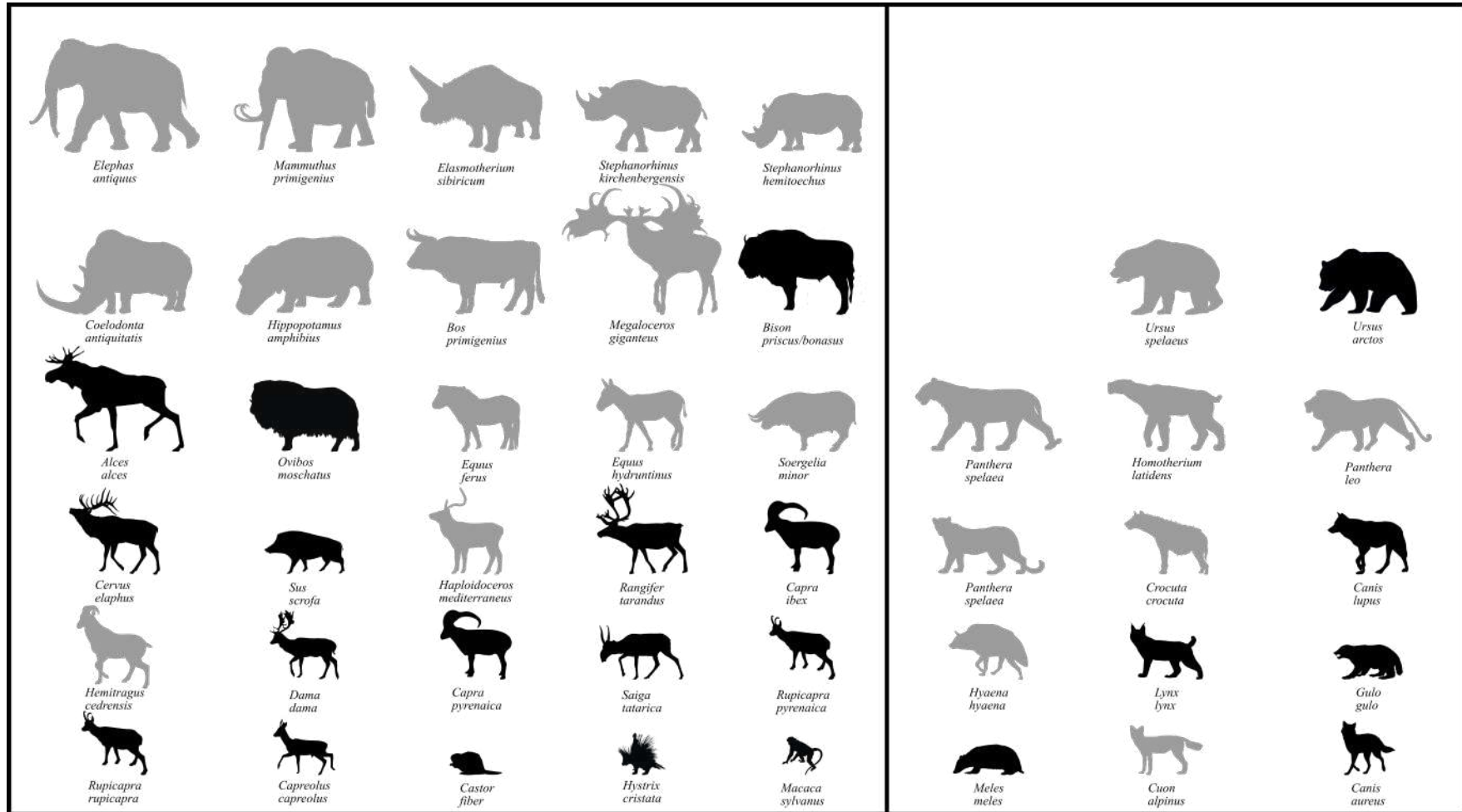
Extinctions were Size-Biased



European Megafauna



European Megafauna

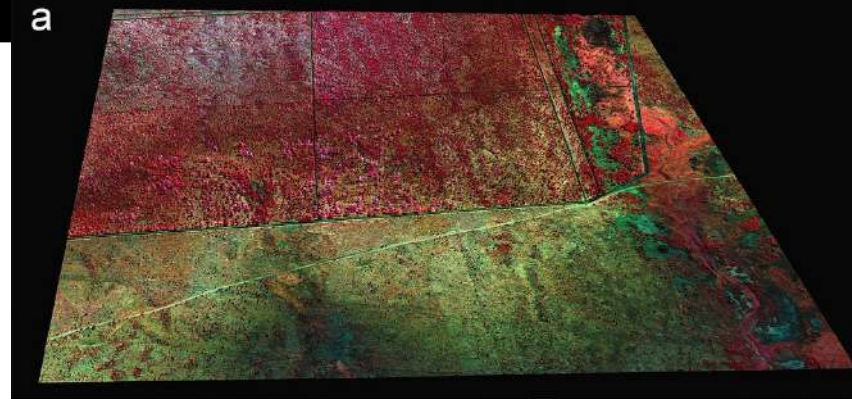


Part 2: Megafauna and European Vegetation

Effects of Large Herbivores

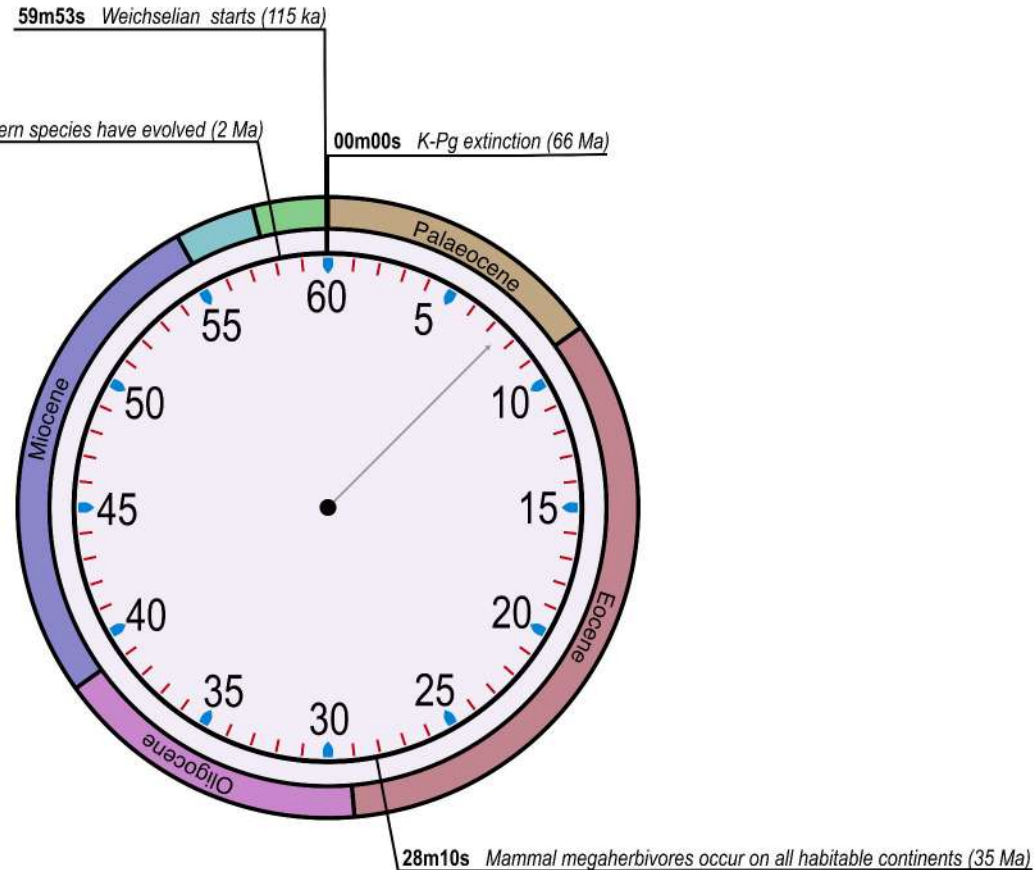
Bakker et al. 2016, PNAS

Herbivores can strongly affect vegetation



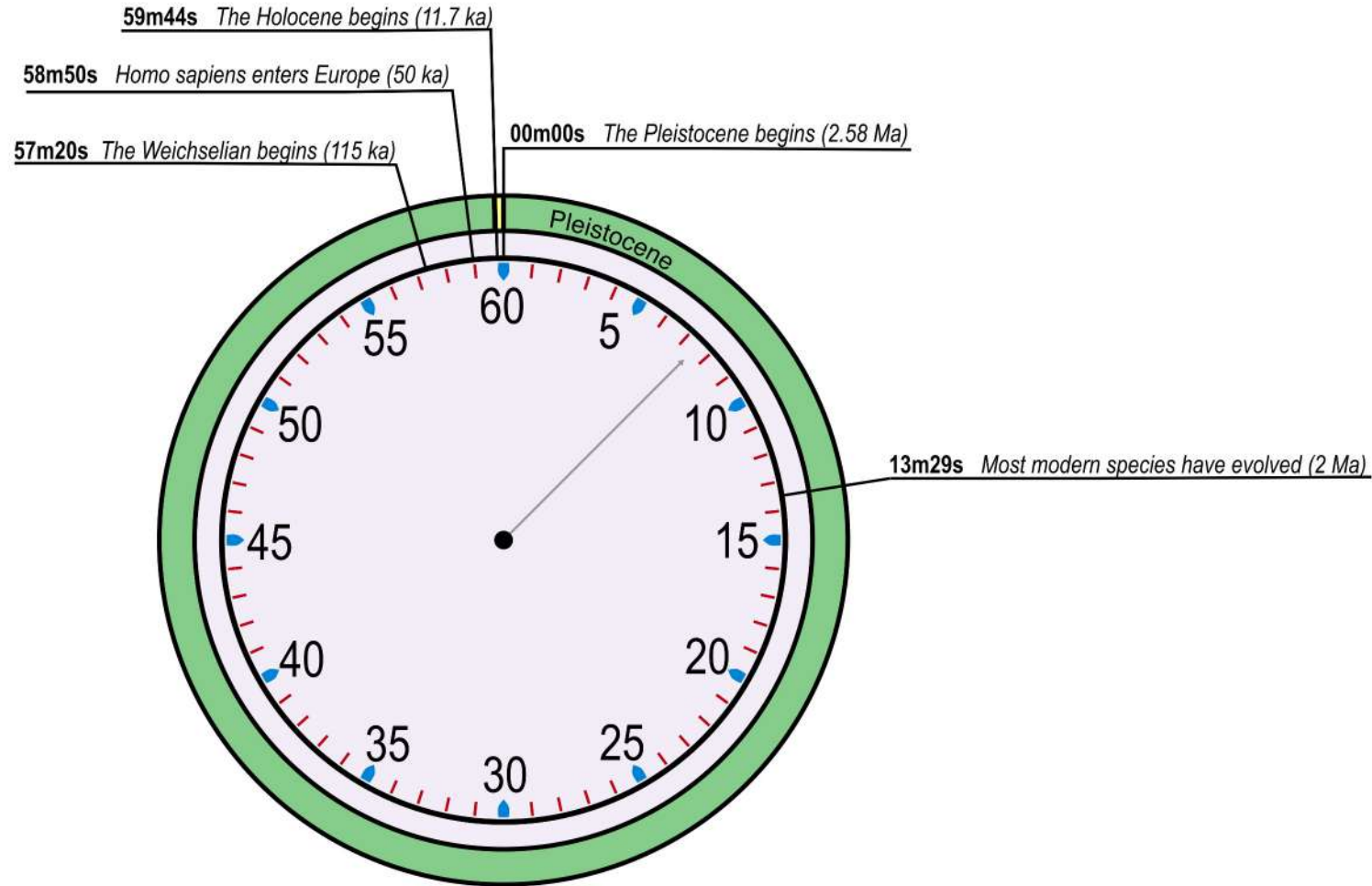
Species are Old

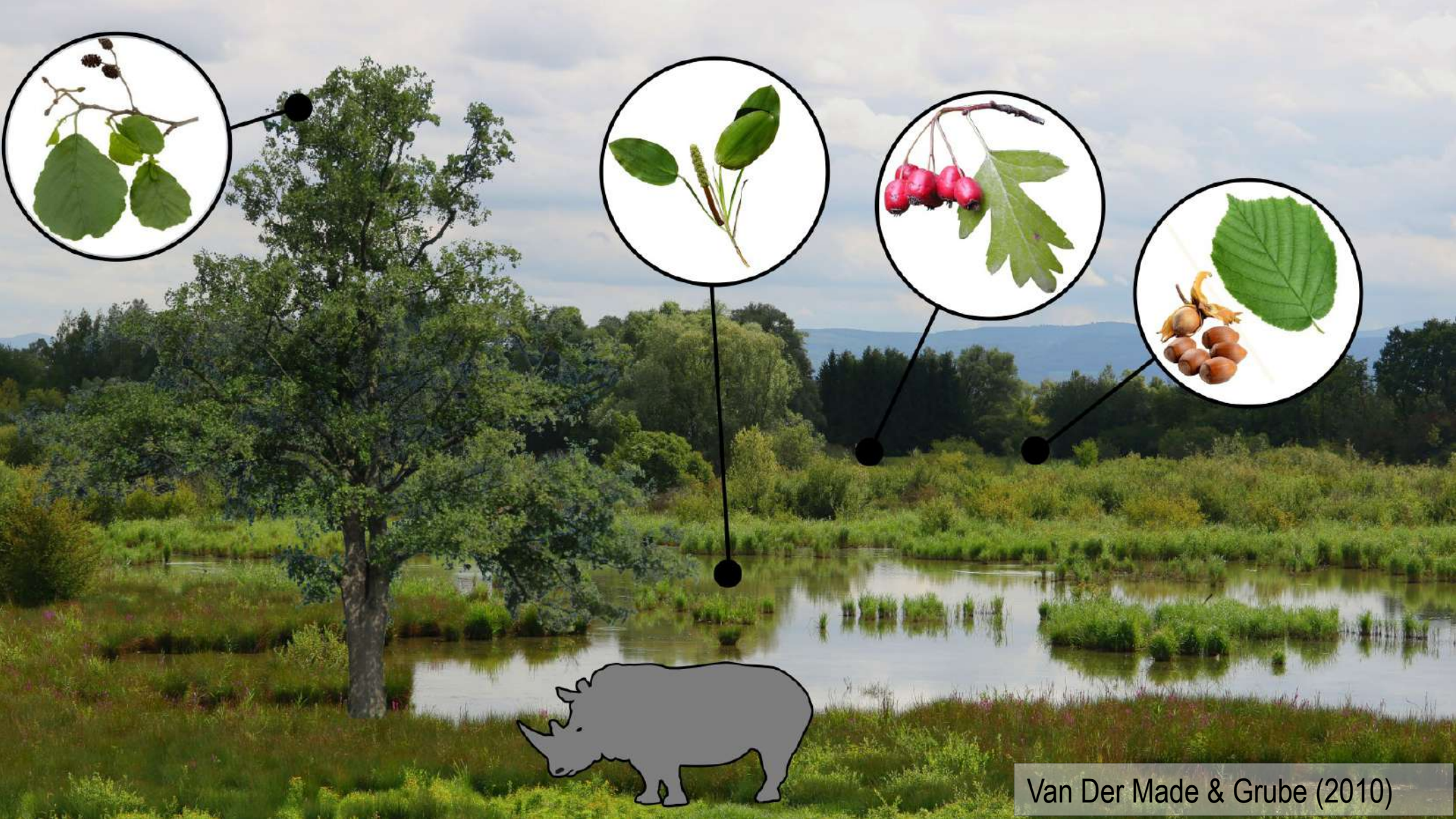
- Species are old
 - Mammals > 500 000 years old
 - Insects > 2 million years
 - Plants > > > 2 million years old



Species are Old

- Last mammoth disappears (3.8 ka BP) → 0.2 seconds before end





Are European Trees still adapted?



Megafauna Fruits

**How do plants with large
fruits disperse their
seeds?**

Janzen & Martin (1982); Guimarães et al. (2008)



Maclura pomifera