

DANGEROUS GIANTS? – LARGE HERBIVORES, FOREST FEEDBACKS AND CLIMATE TIPPING POINTS

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Abstract. Could large herbivores (“megaherbivores”) modify tree-cover sufficiently to disrupt the hydrological cycle? The implications of such interactions are profound: potentially switching climates from wet to arid. Was such instability important in the past? Here, inspired by the suggestions of Gorshkov and Makarieva [1], I review the influence of megaherbivores on forests and examine what we can learn from the largest modern example, the Bush elephant (*Loxodonta africana* Blumenbach). These animals can certainly reduce tree and forest cover, but some tree species appear able to repel, resist or even tolerate them. Furthermore, elephant populations are vulnerable to dehydration, starvation, disease, and predation, and are thus not immune to environmental change and feedbacks. I look at the dynamics of tropical tree cover, and the balance with tropical savannas. I find evidence that megaherbivores can influence tree cover over extensive regions and might, in suitable circumstances, help tip the climate from wet to dry if such a tipping point was close. But the overall story remains complex and human influences obscure our view of key processes. While there are good reasons to believe that megaherbivores could be influential, we neither know nor fully understand the processes that led to past expansion and maintenance of savanna and other fire-maintained biomes. The role of fire and flammable biomes, and the factors – including animals – that may influence them, require more attention. Fire has an appetite considerably larger than that of any megaherbivore.

Key words: disturbance-ecology, elephants, fire, forest-dynamics, *Loxodonta*, megafauna, savanna, tipping points.

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