

Crash course 'kantelen'

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NIOO/WUR



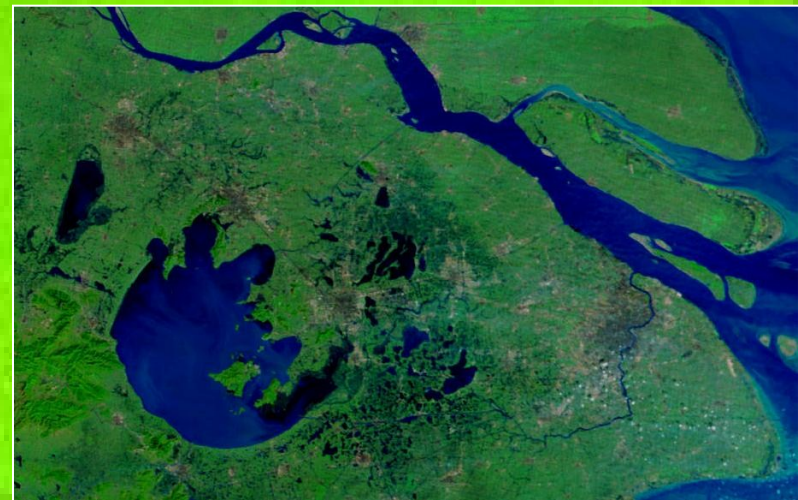


Aralmeer, Centraal Azië, 2008

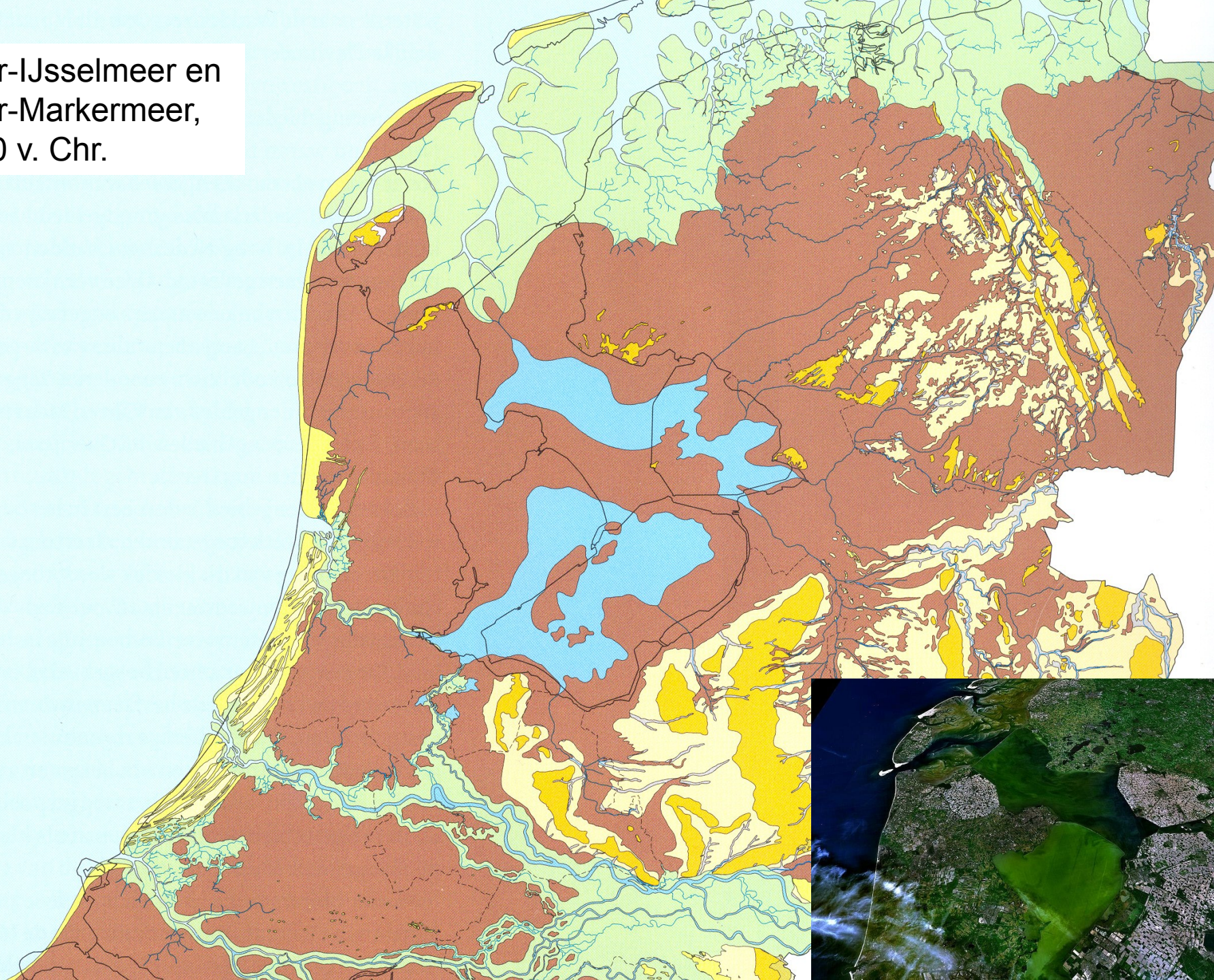


Victoriameer, Oost Afrika, 2008

Tai meer, China, 2007



Oer-IJsselmeer en
Oer-Markermeer,
500 v. Chr.



Berlijn, 1989

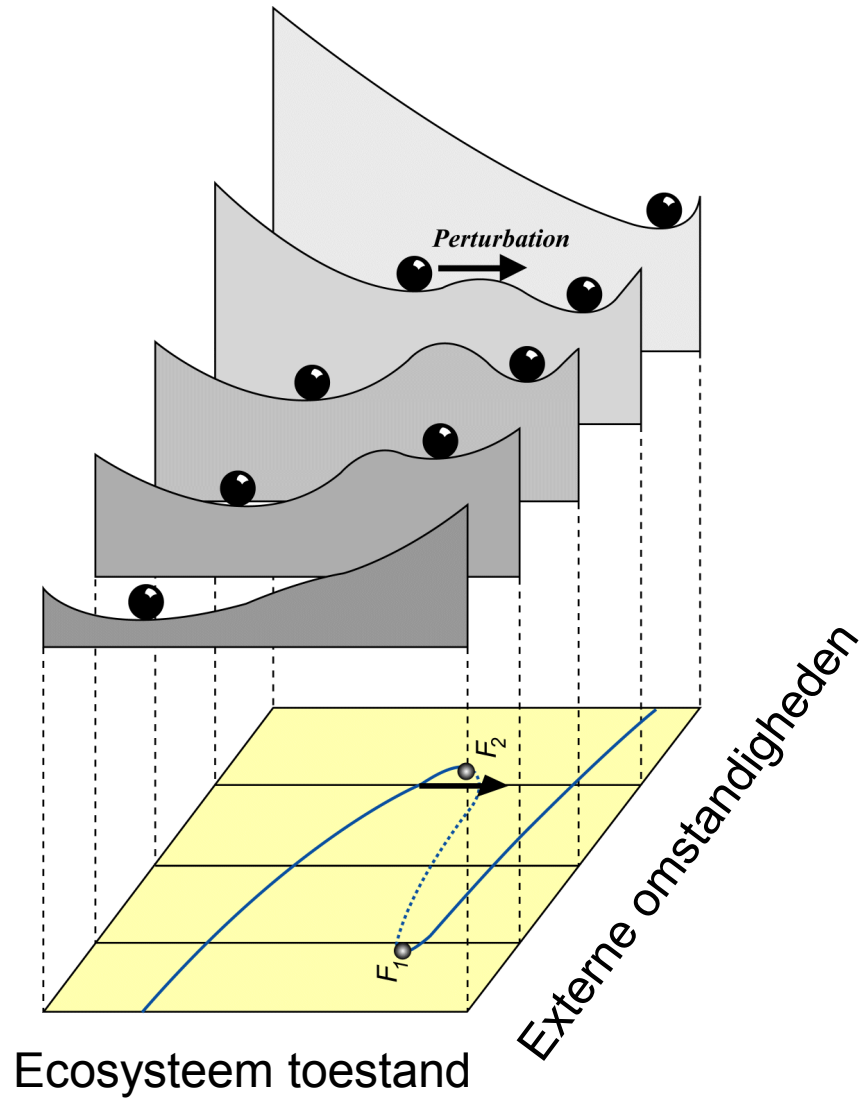


Berlijn, 1989

Chaos in de zin van wanorde!

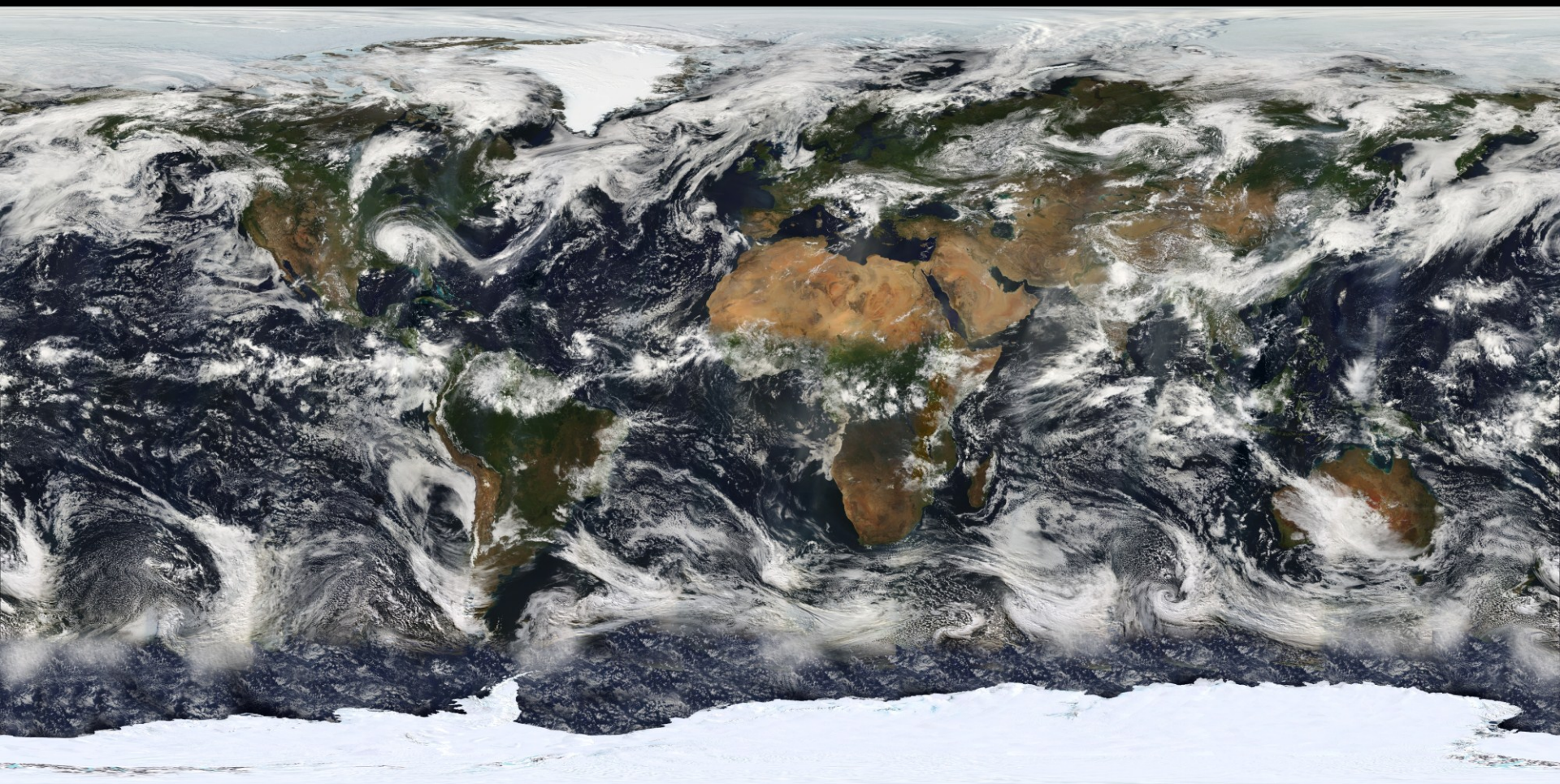


Alternatieve stabiele toestanden

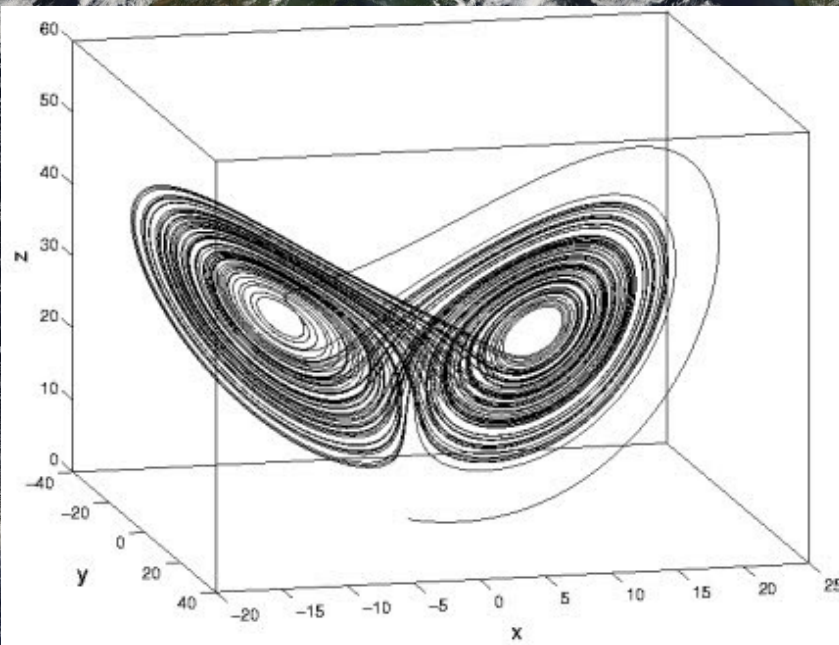






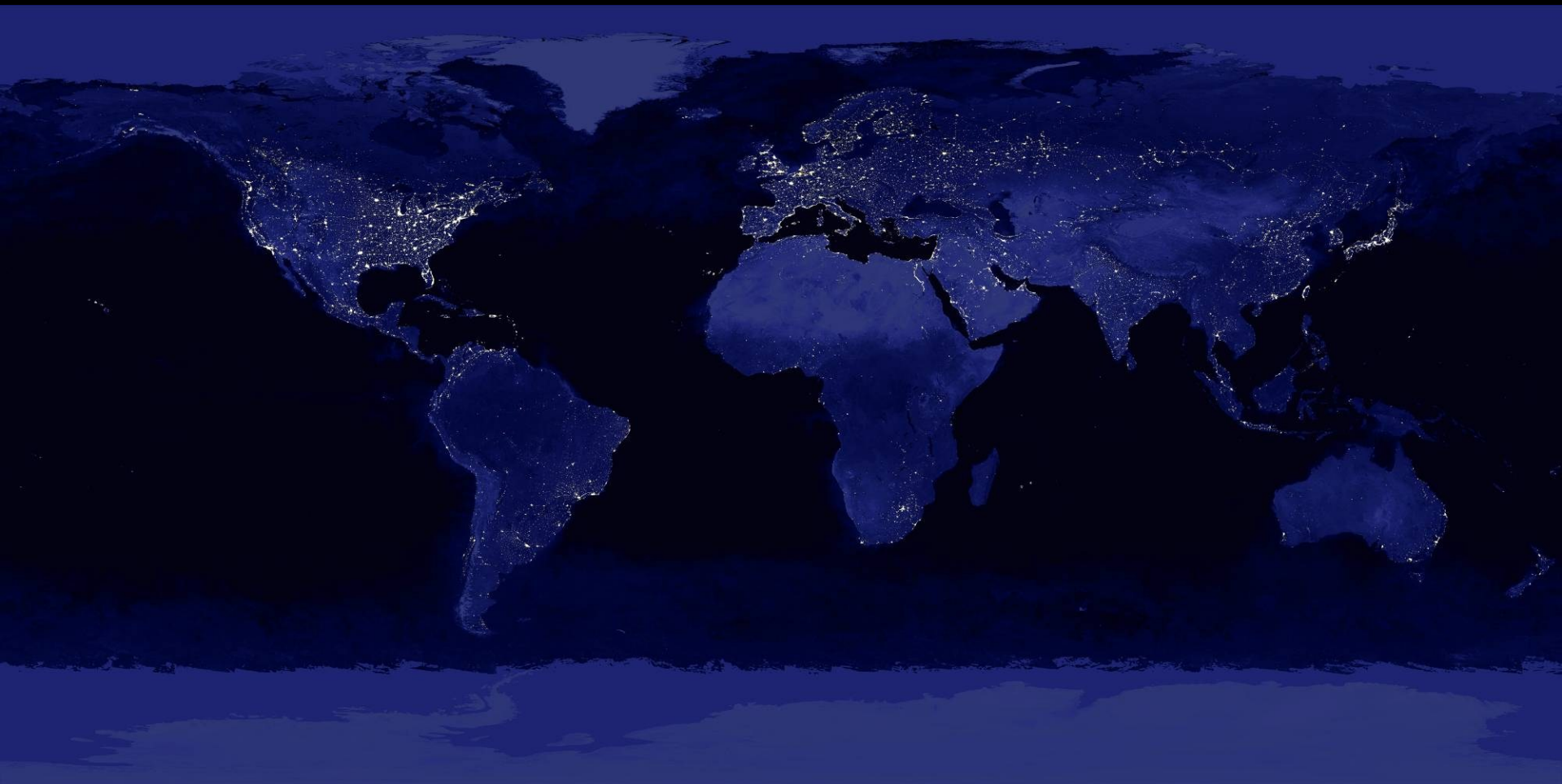


Chaos in de zin van chaos-theorie!



$$\begin{aligned} dx/dt &= s(y-x) \\ dy/dt &= rx-y-xz \\ dz/dt &= xy - bz \end{aligned}$$

$$\begin{aligned} s &= 10 \\ r &= 28 \\ b &= 8/3 \end{aligned}$$



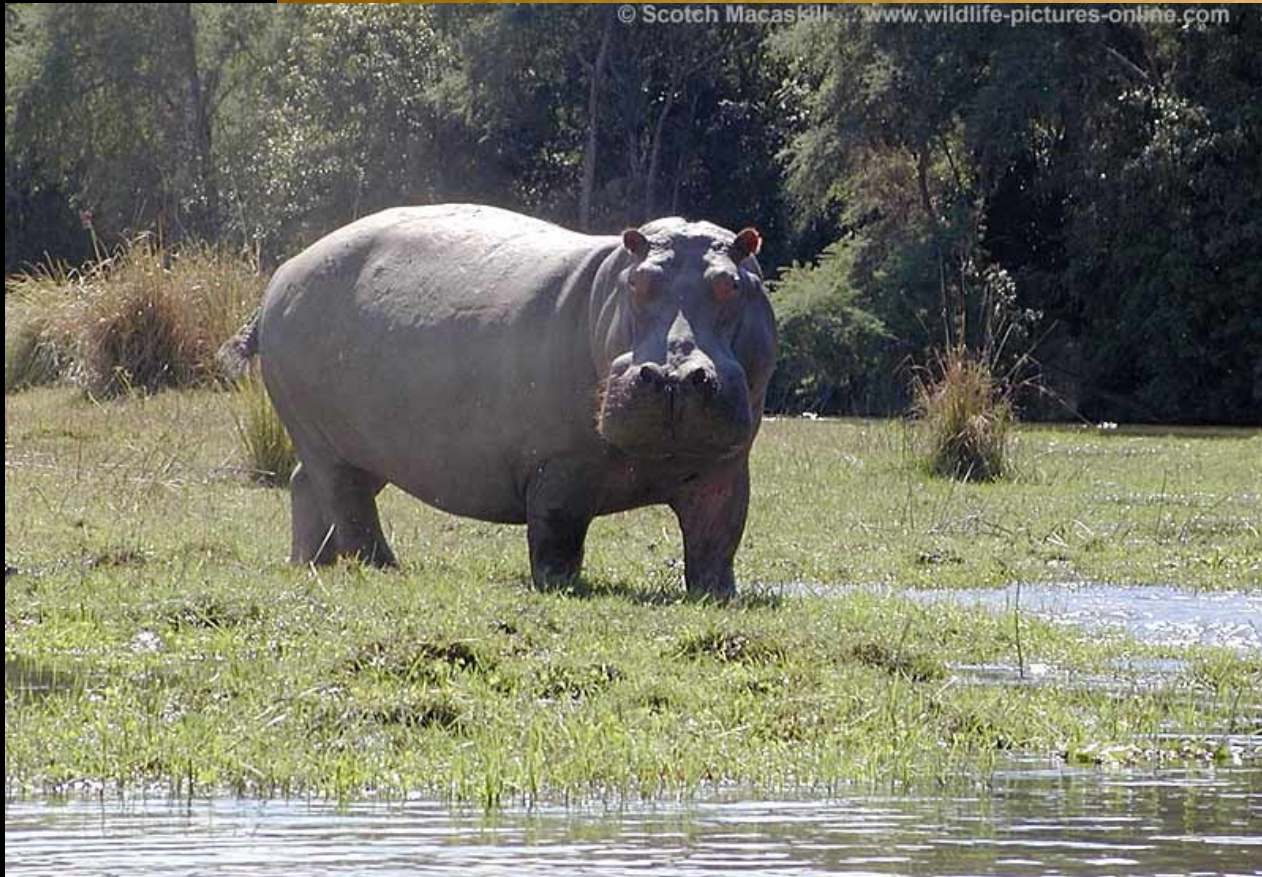
Ecosysteemdiensten volgens Millenium Ecosystem Assessment

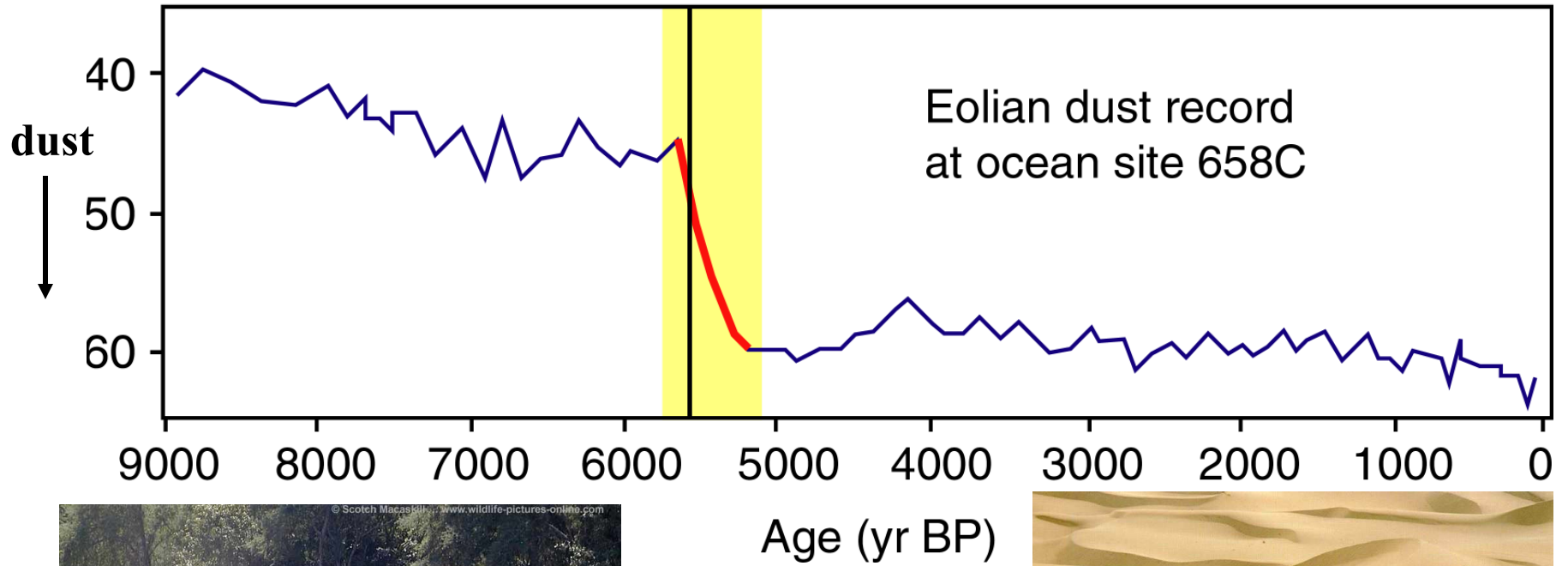
I	PROVISIONING SERVICES	III	HABITAT SERVICES
1	Food	16	Maintenance of life cycles of migratory species
2	Water	17	Maintenance of genetic diversity
3	Raw materials	IV	CULTURAL SERVICES
4	Genetic resources	18	Aesthetic information
5	Medicinal resources	19	Opportunities for recreation & tourism
6	Ornamental resources	20	Inspiration for culture, art and design
II	REGULATING SERVICES	21	Spiritual experience
7	Air quality regulation	22	Information for cognitive development
8	Climate regulation		
9	Moderation of extreme events		
10	Regulation of water flows		
11	Waste treatment		
12	Erosion prevention		
13	Maintenance of soil fertility		
14	Pollination		
15	Biological control		





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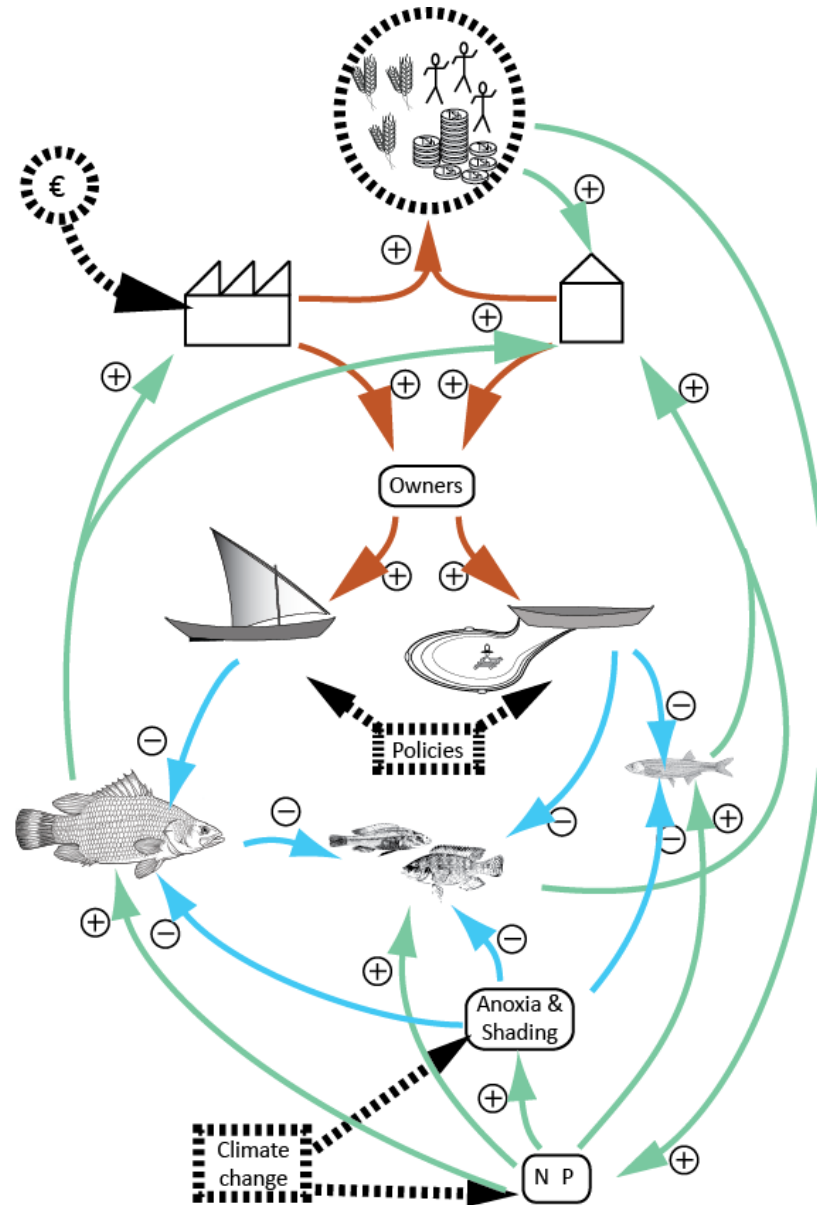


DeMenocal (2000) *Quat. Sci. Rev.*;

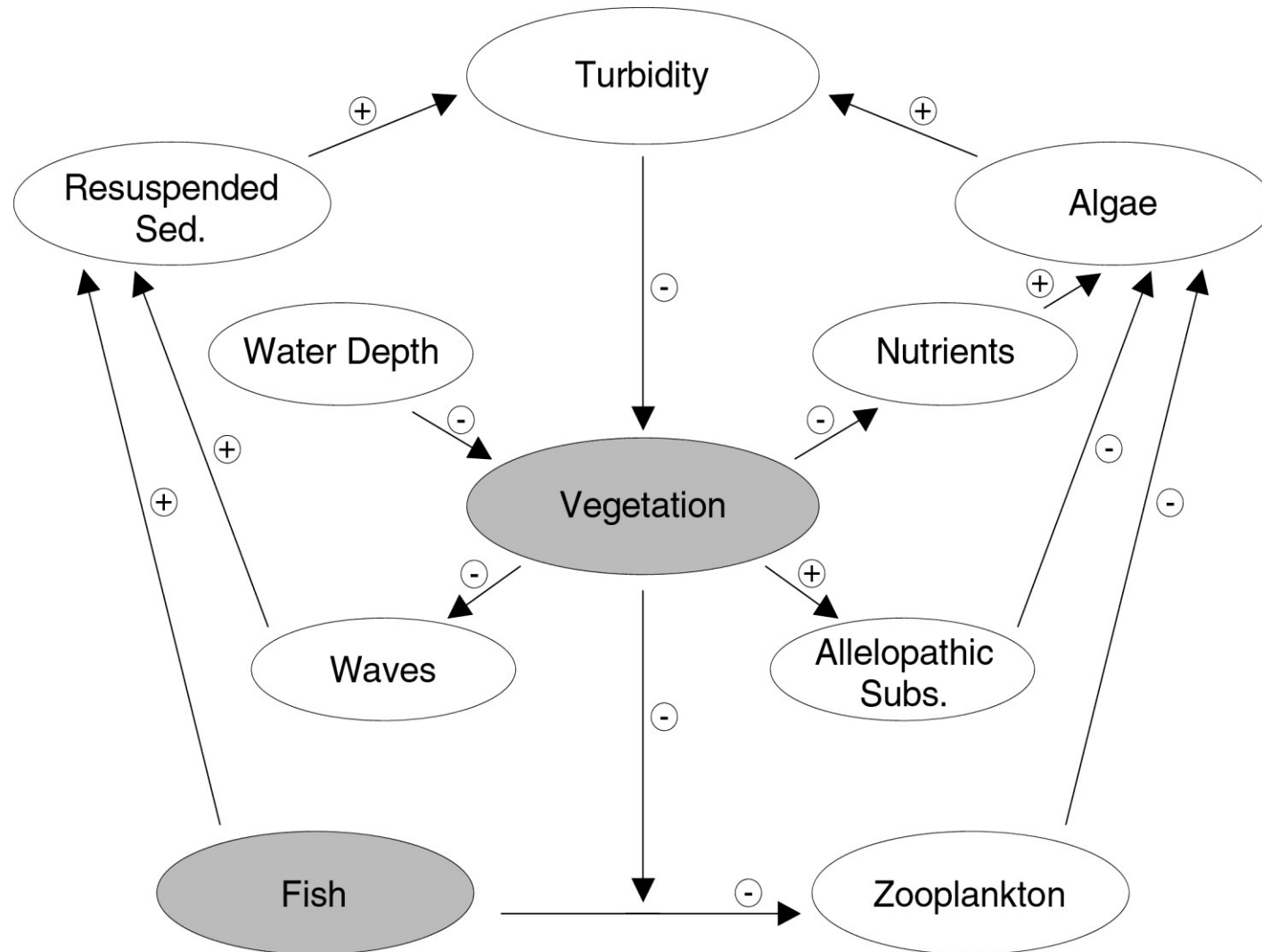


Claussen, et al (1999) *Geophysical Research Letters*

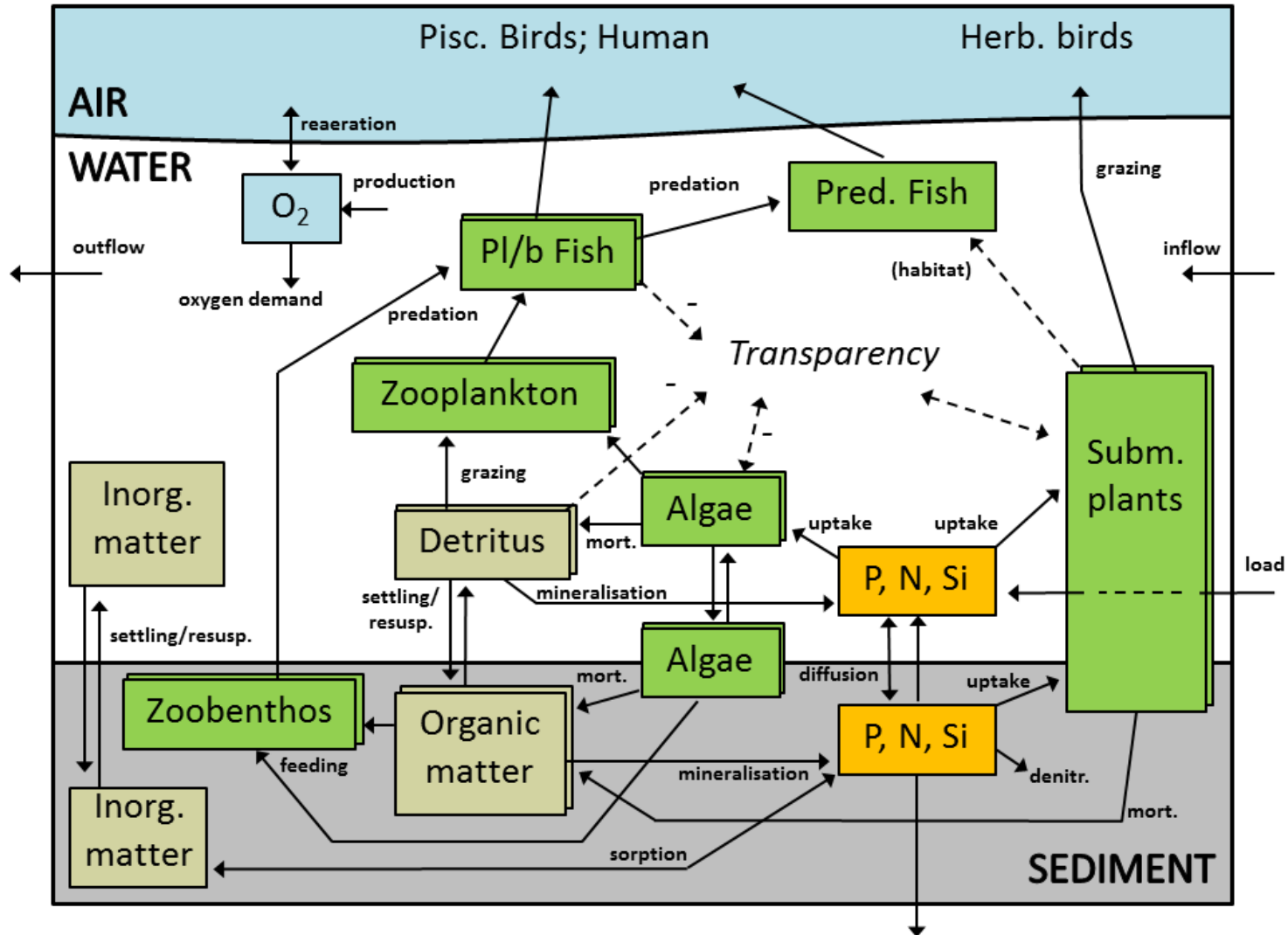
Sociaal-ecologische terugkoppelingen in Lake Victoria

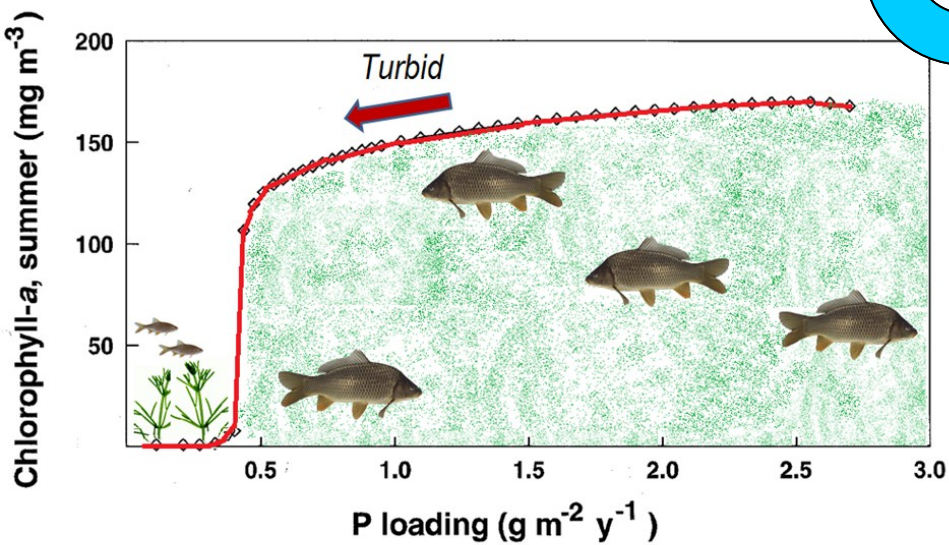
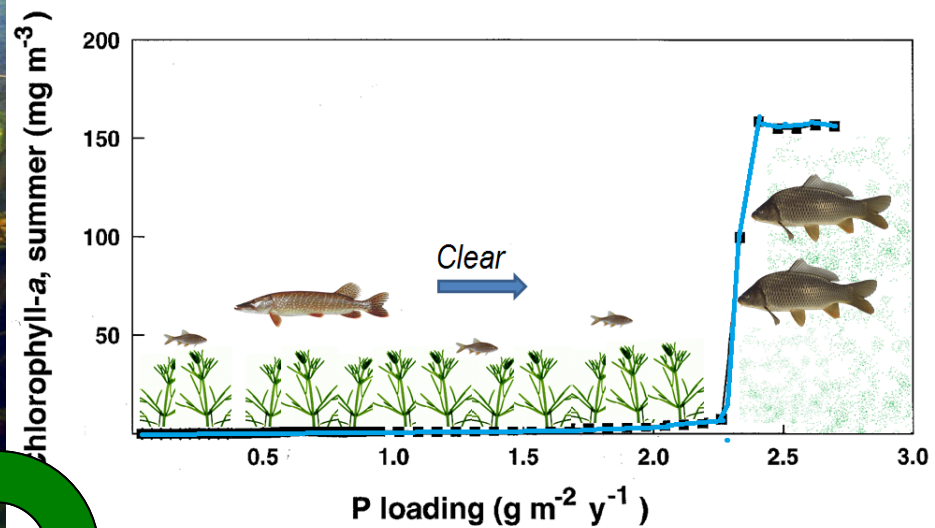


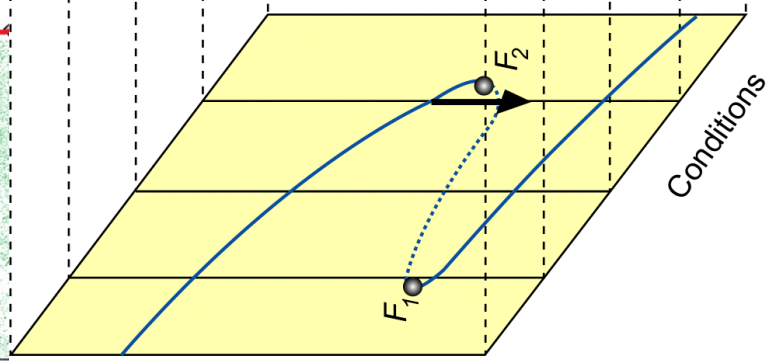
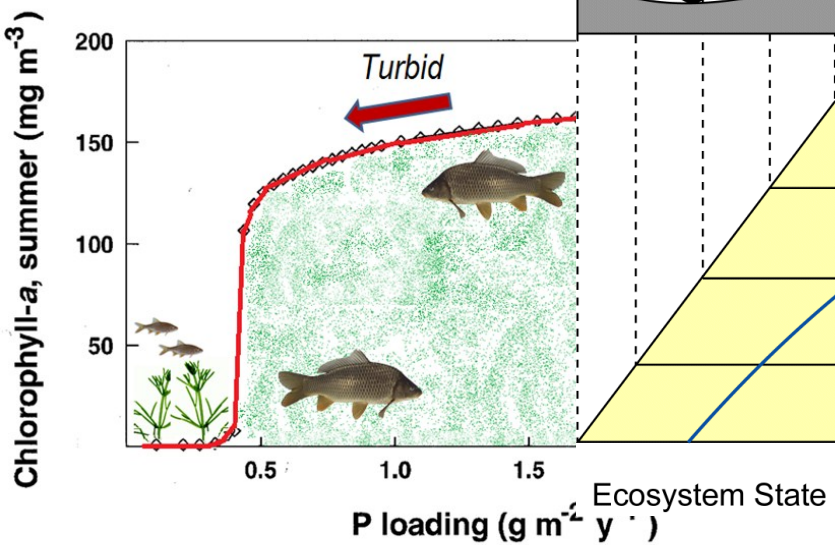
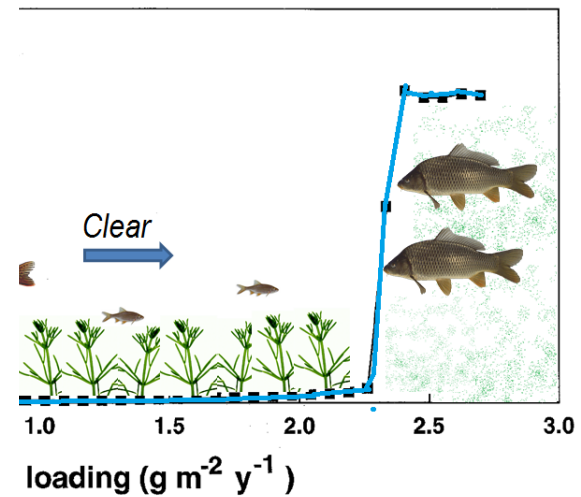
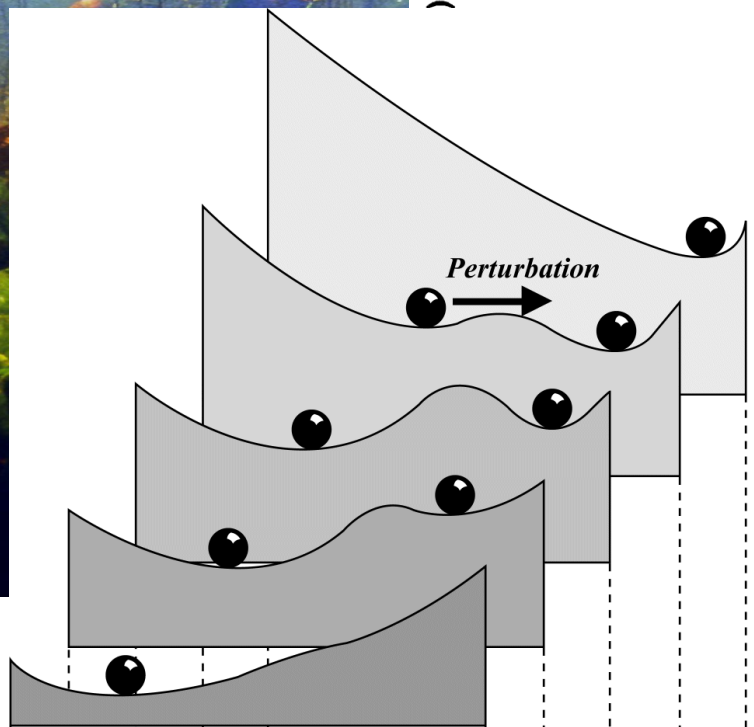
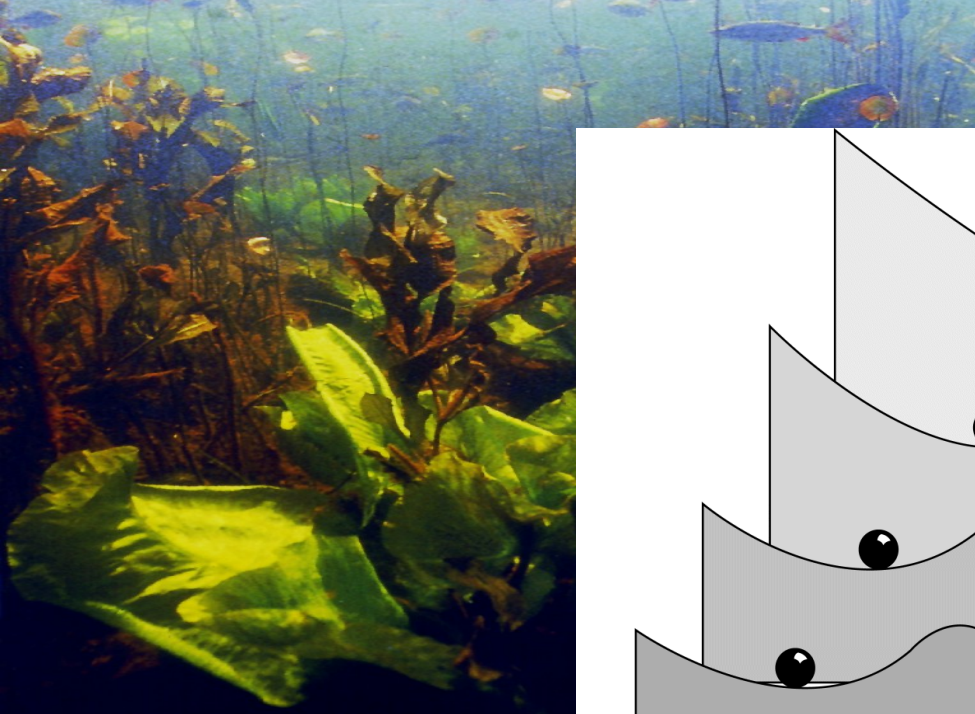
Ecologische terugkoppelingen in ondiepe meren

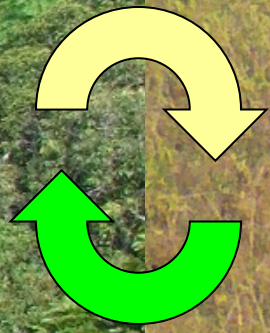


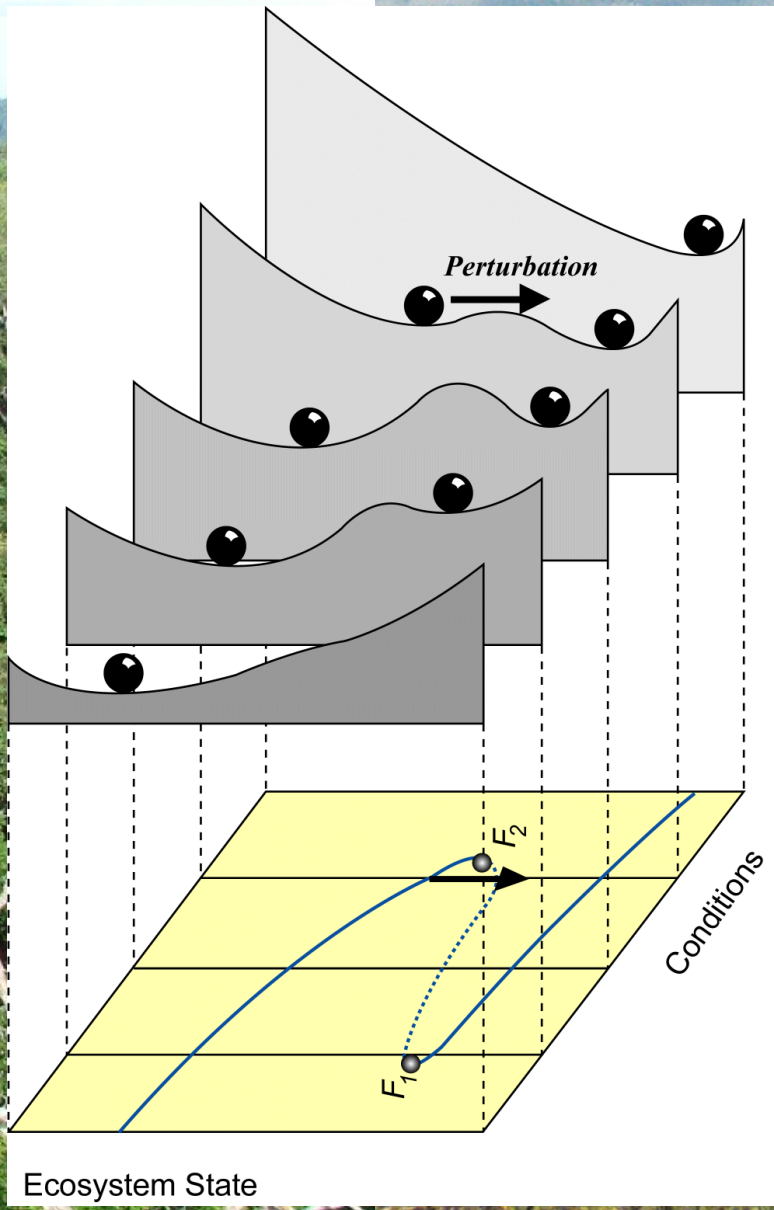
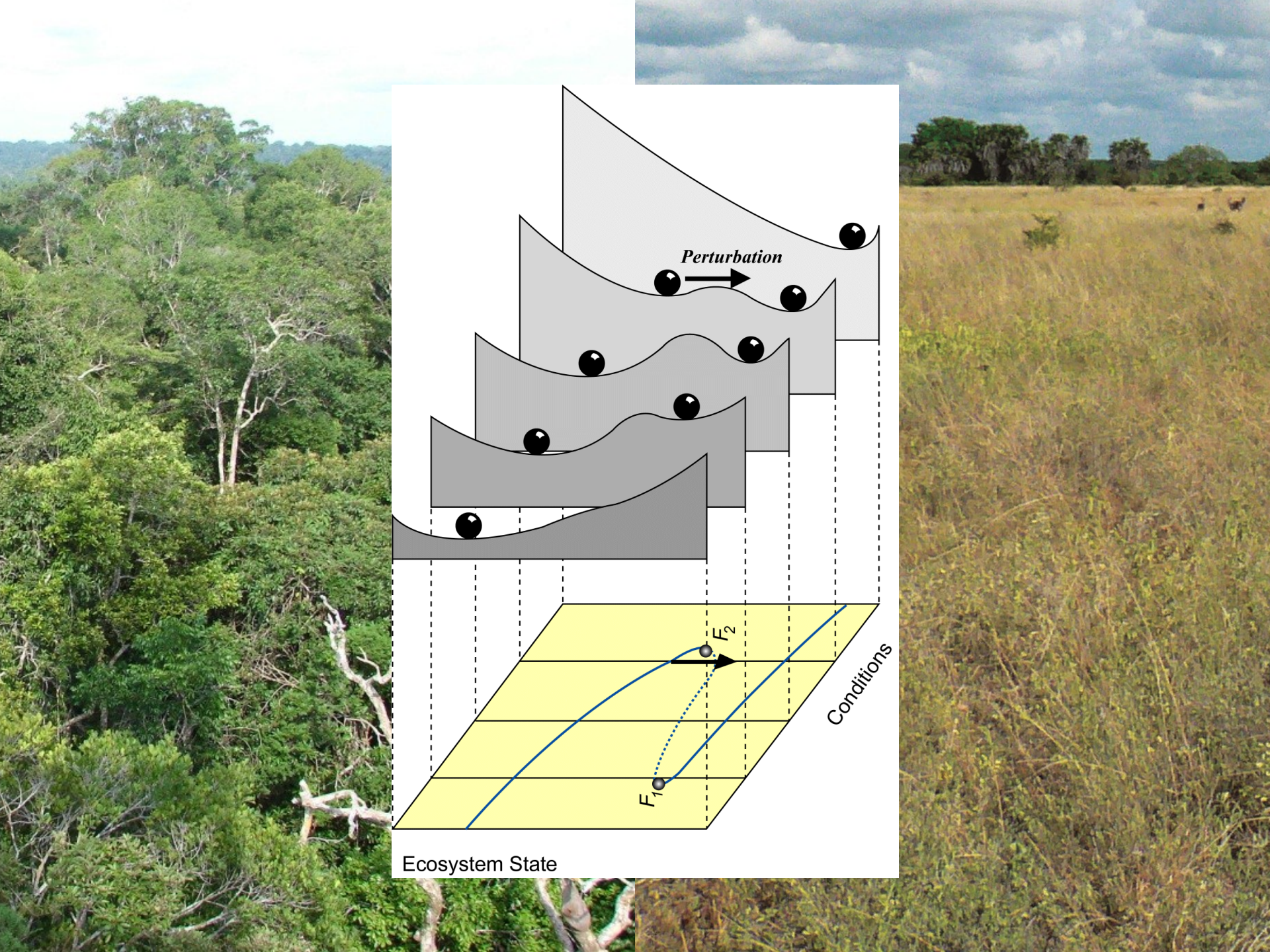
Nutrientcycli door het voedselweb



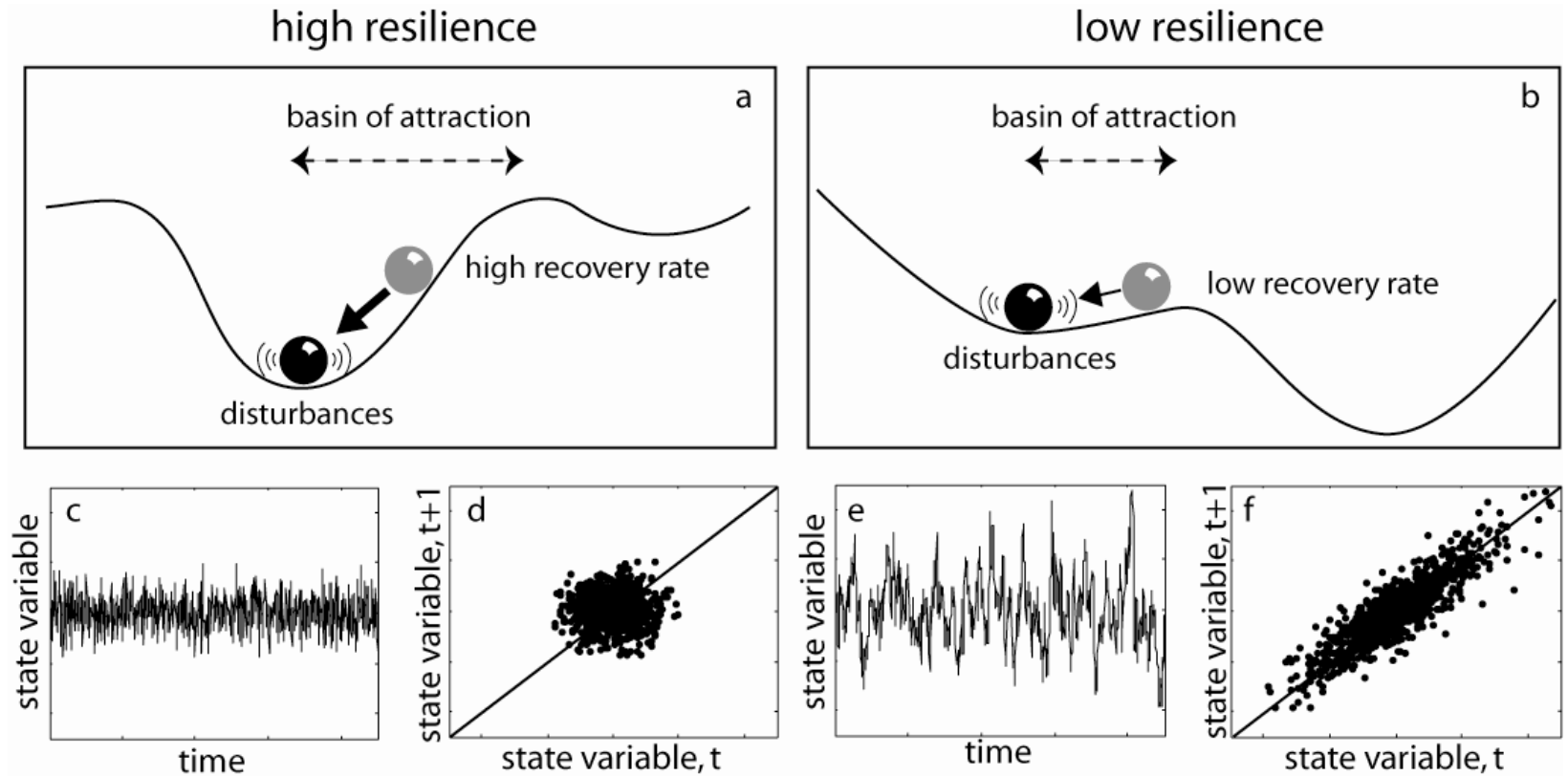


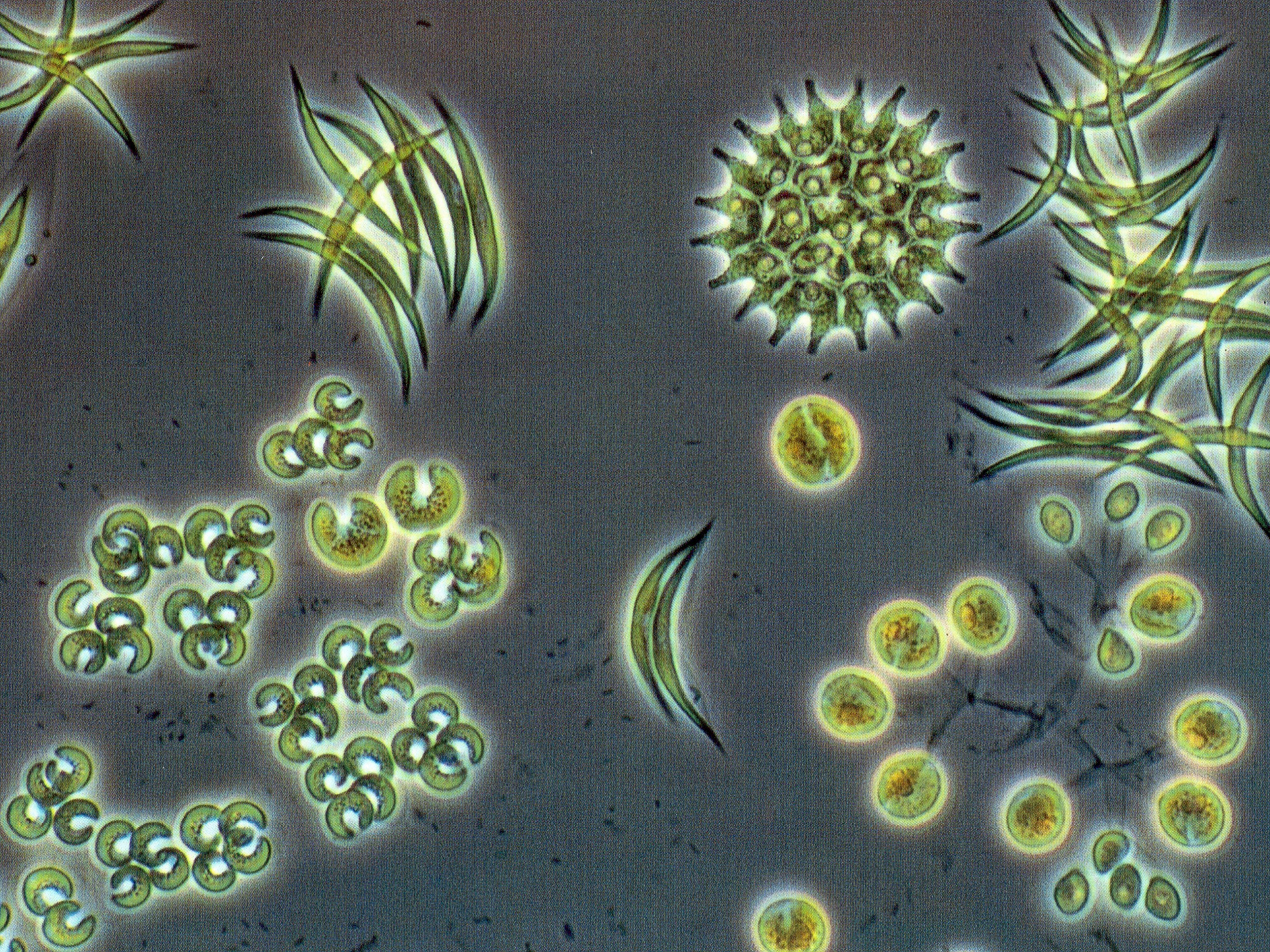


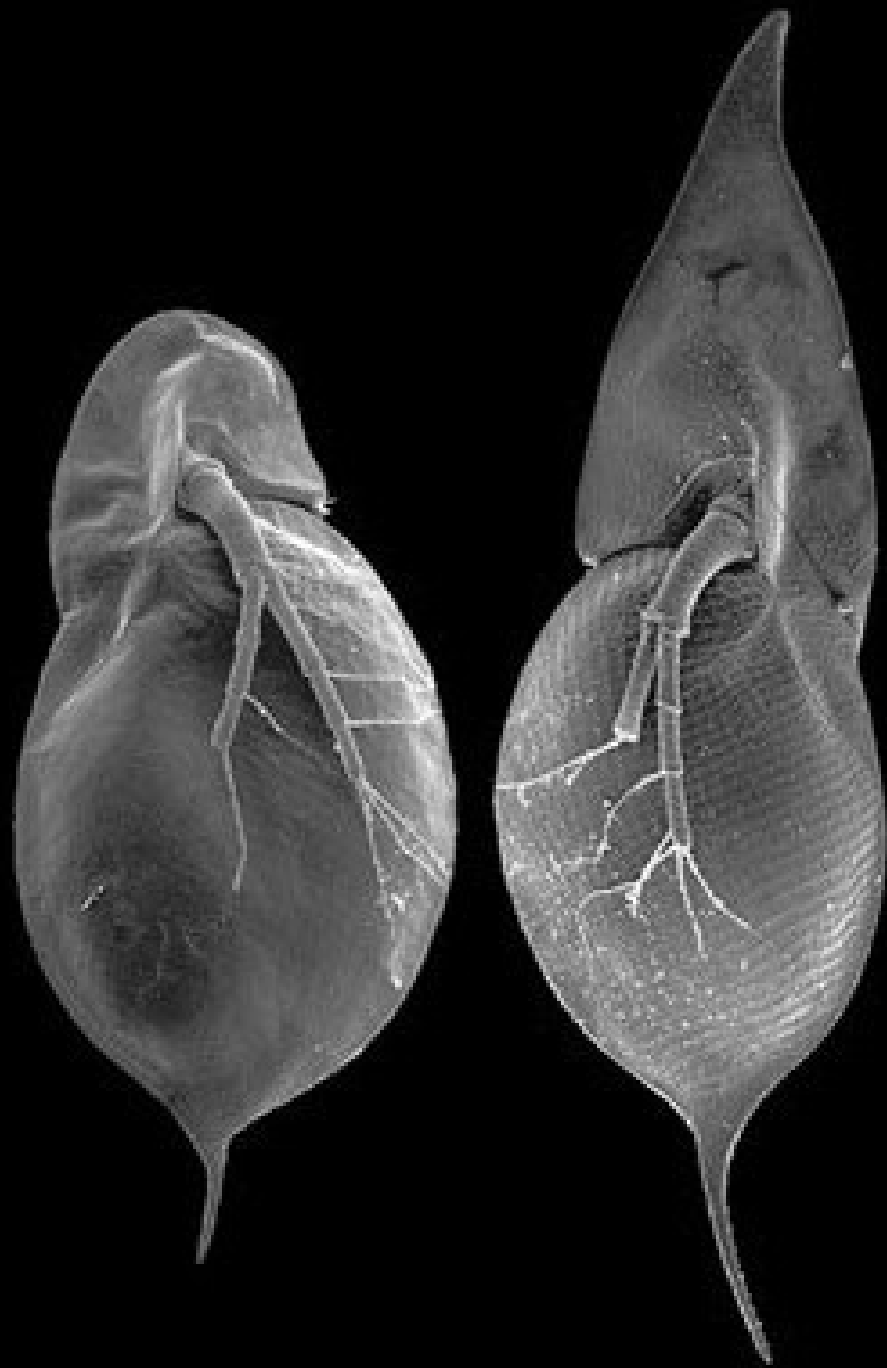


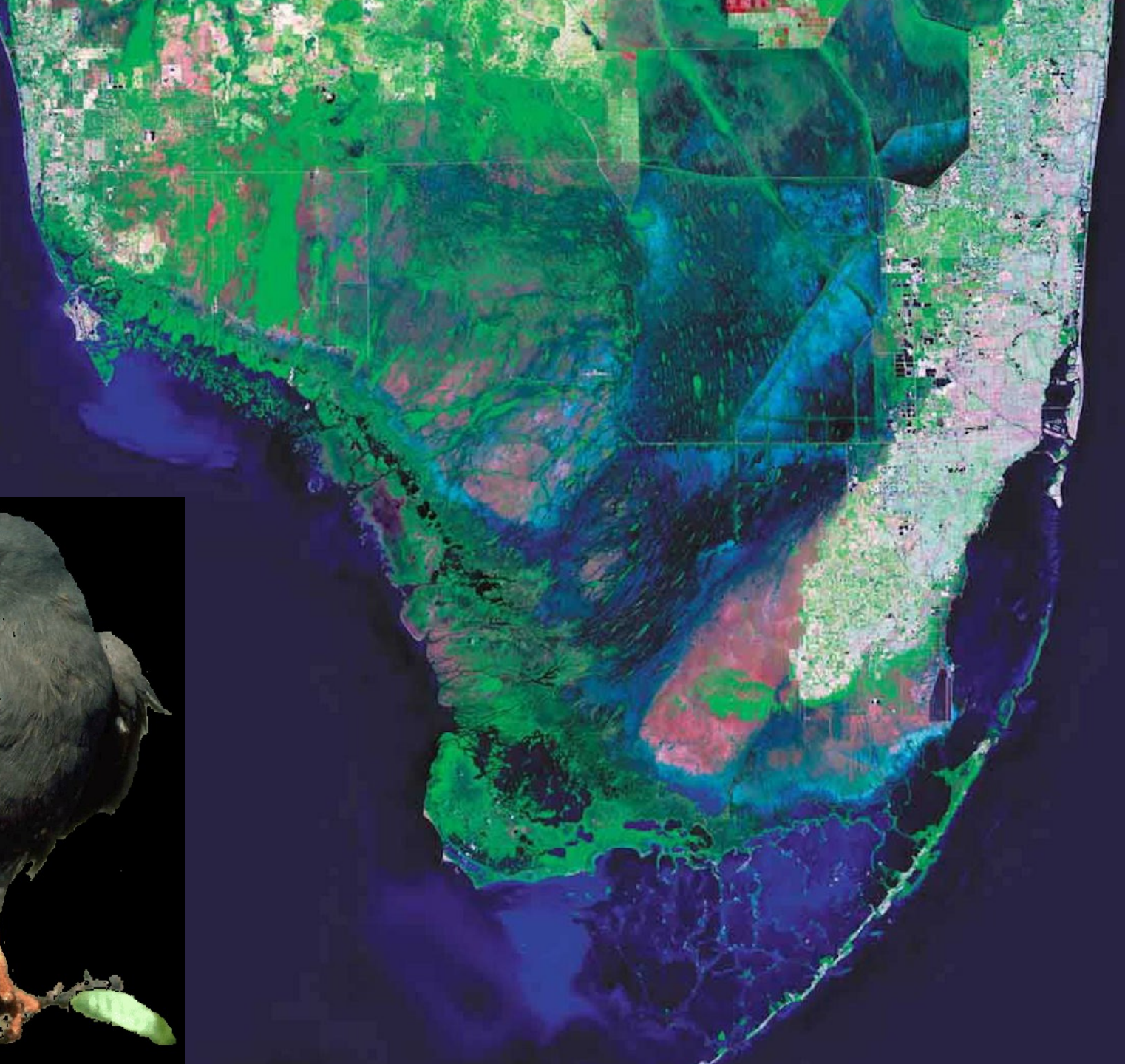


Waarschuwingssignalen voor op handen zijnde omslagen





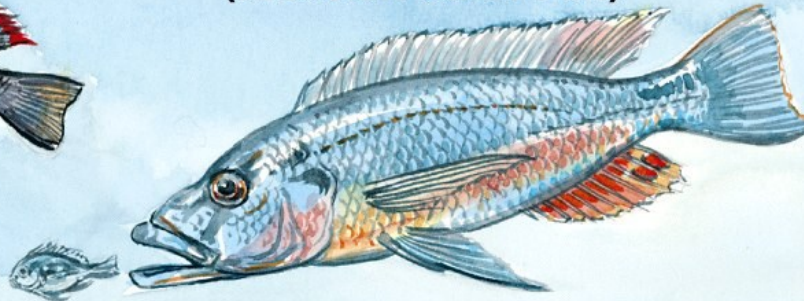




Haplochromis chilotes
(feeds on insects)



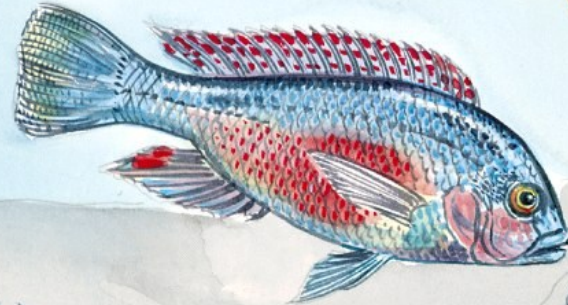
Haplochromis macrognathus
(feeds on other fish)



Astatotilapia elegans
(generalized bottom feeder)



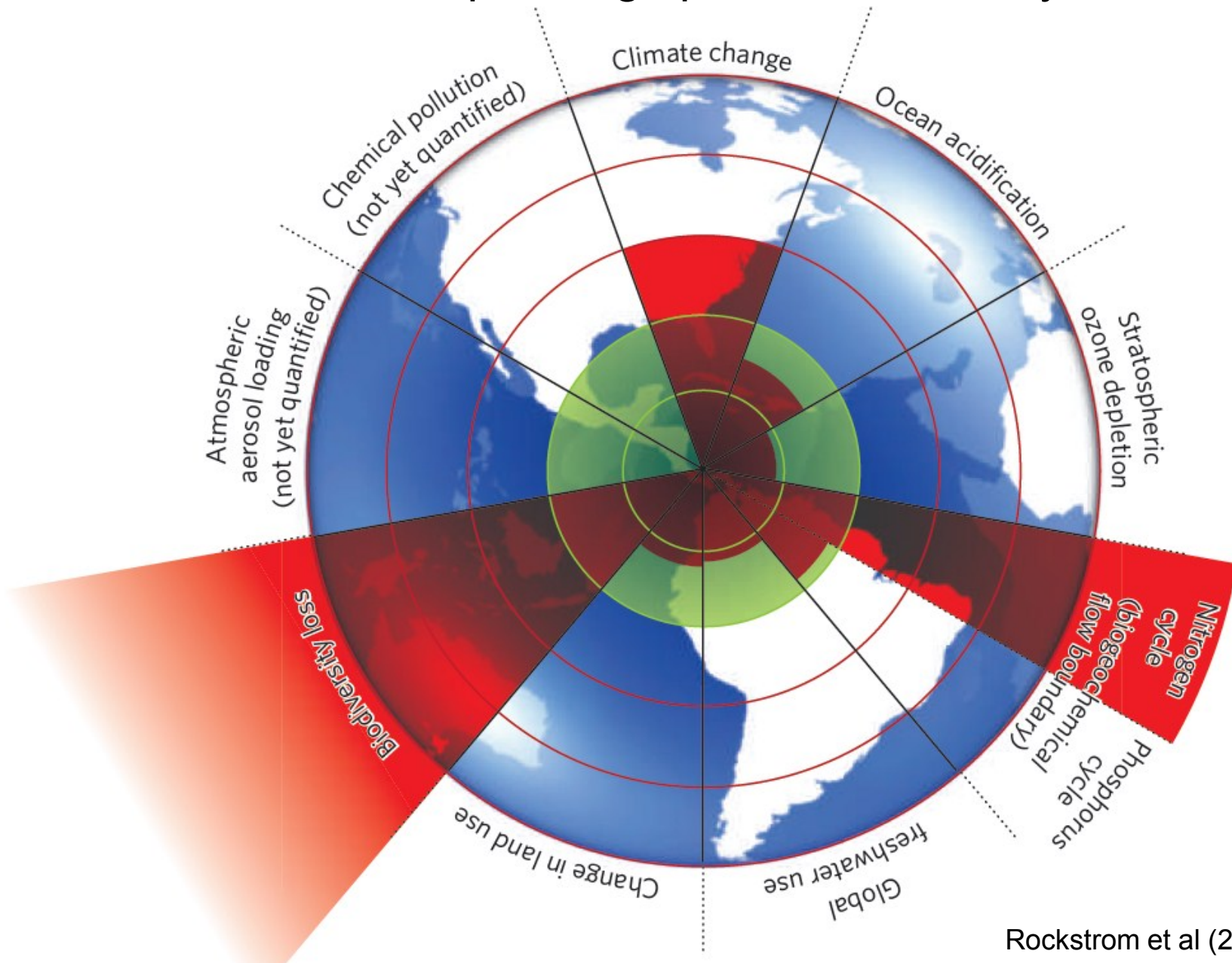
Macrolepurodus bicolor
(feeds on snails and other molluscs)





Globaal kantelen?

A safe operating space for humanity



Bedankt

voor

uw

aandacht!

