Feedbacks

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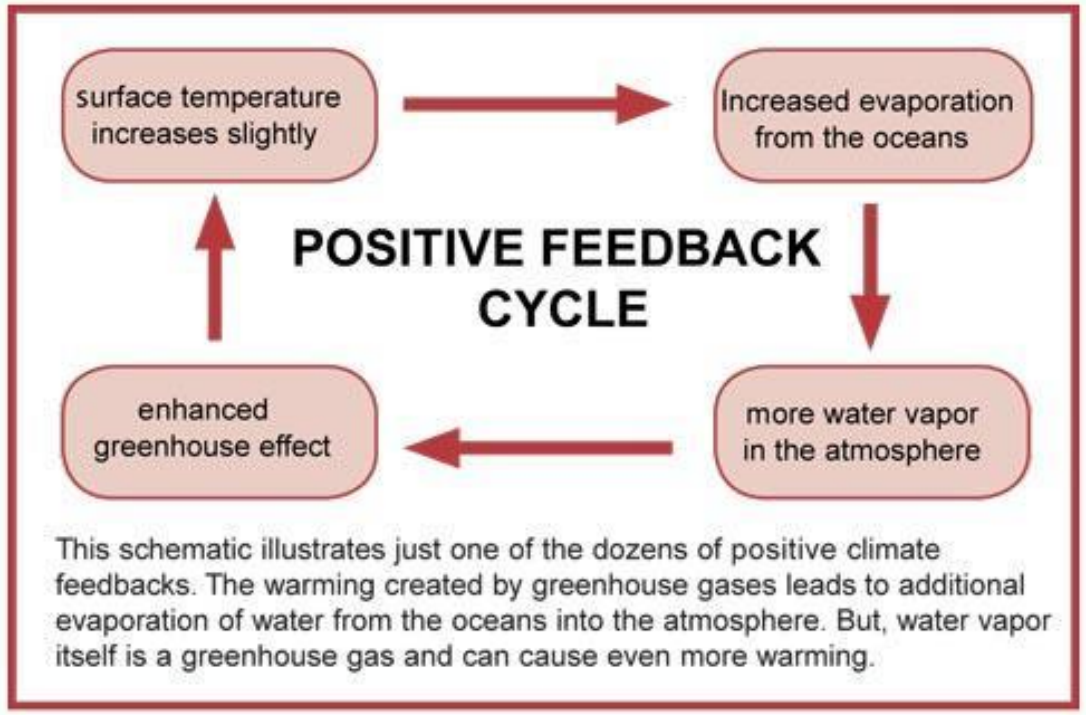
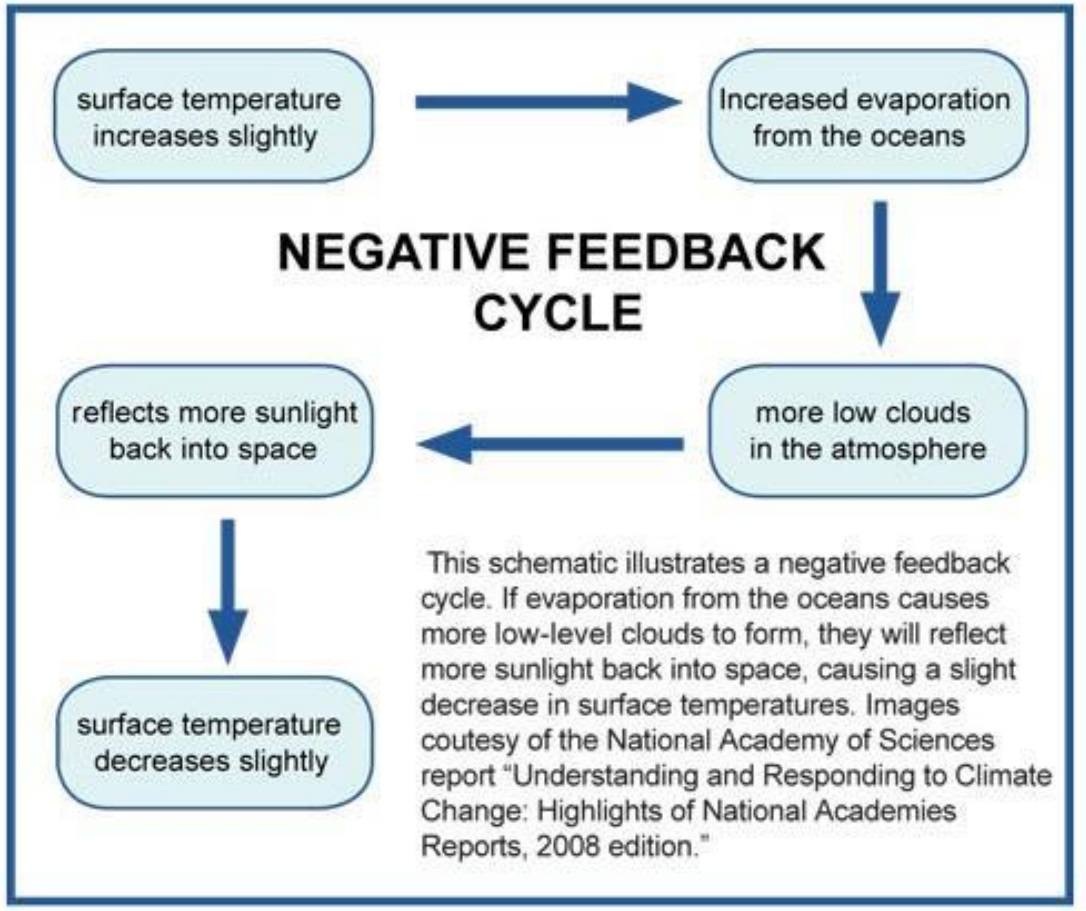
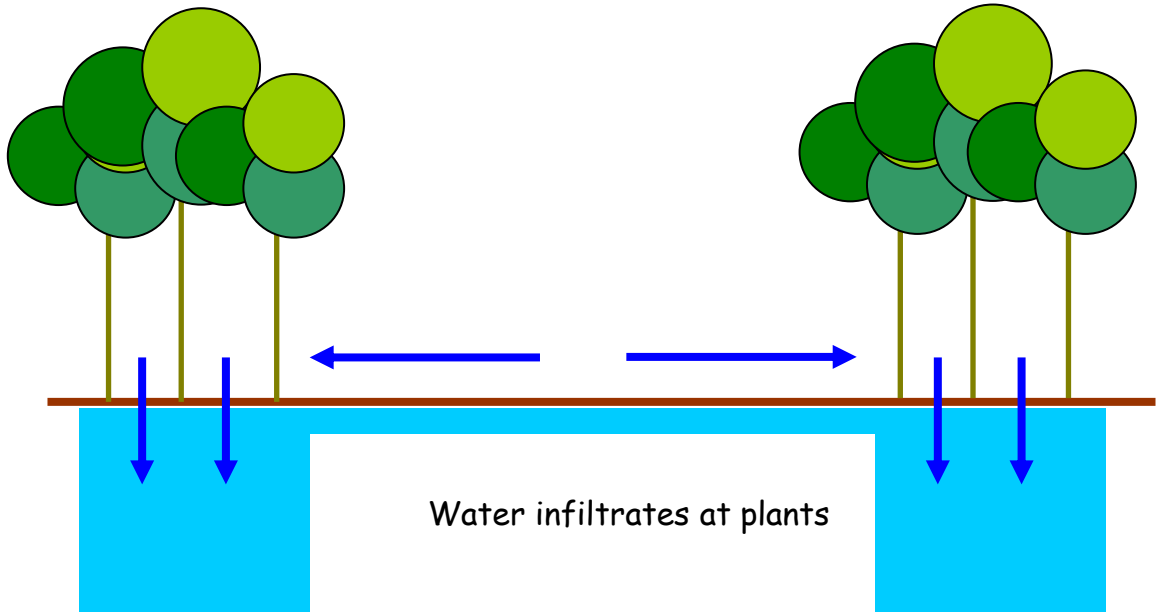
Positive and negative feedbacks



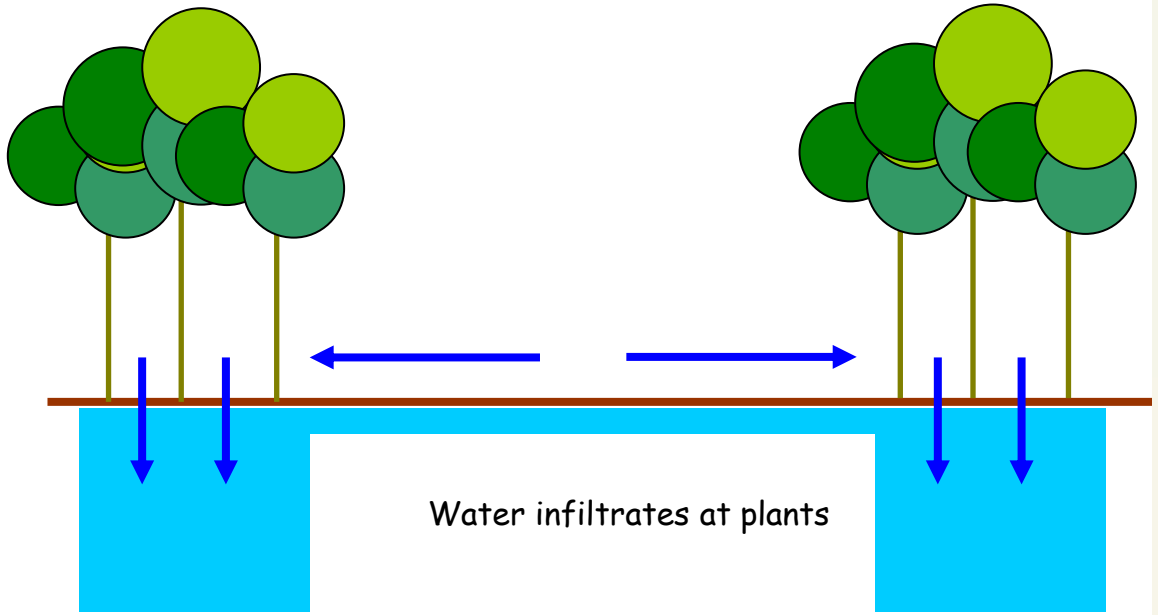


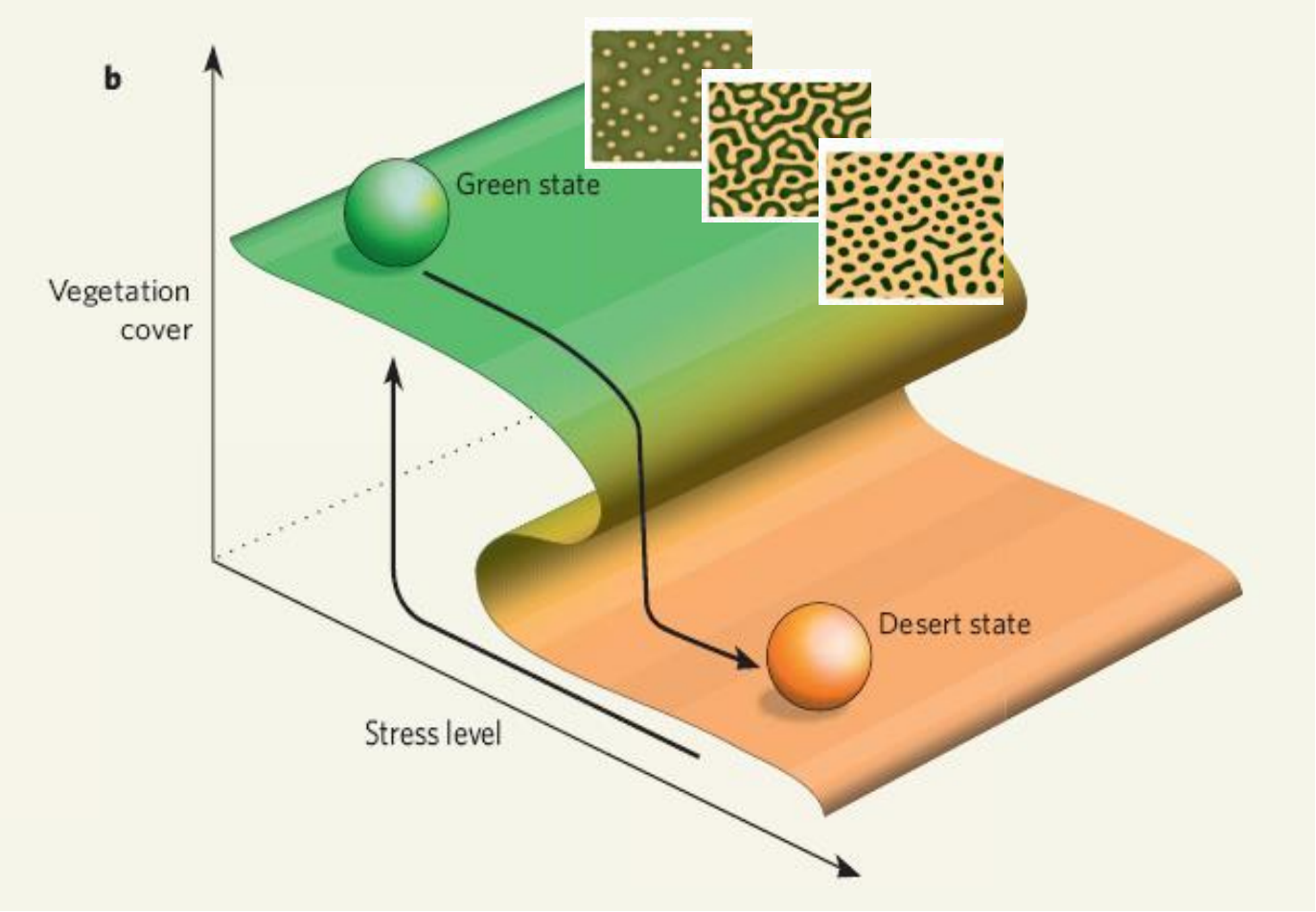
Positive feedbacks in dryland ecosystems



Rietkerk et al., 2004. *Science* & Kefi et al. 2007. *Nature*
Verwijmeren et al. 2014. *Journal of Arid Environments*

Positive feedbacks in dryland ecosystems





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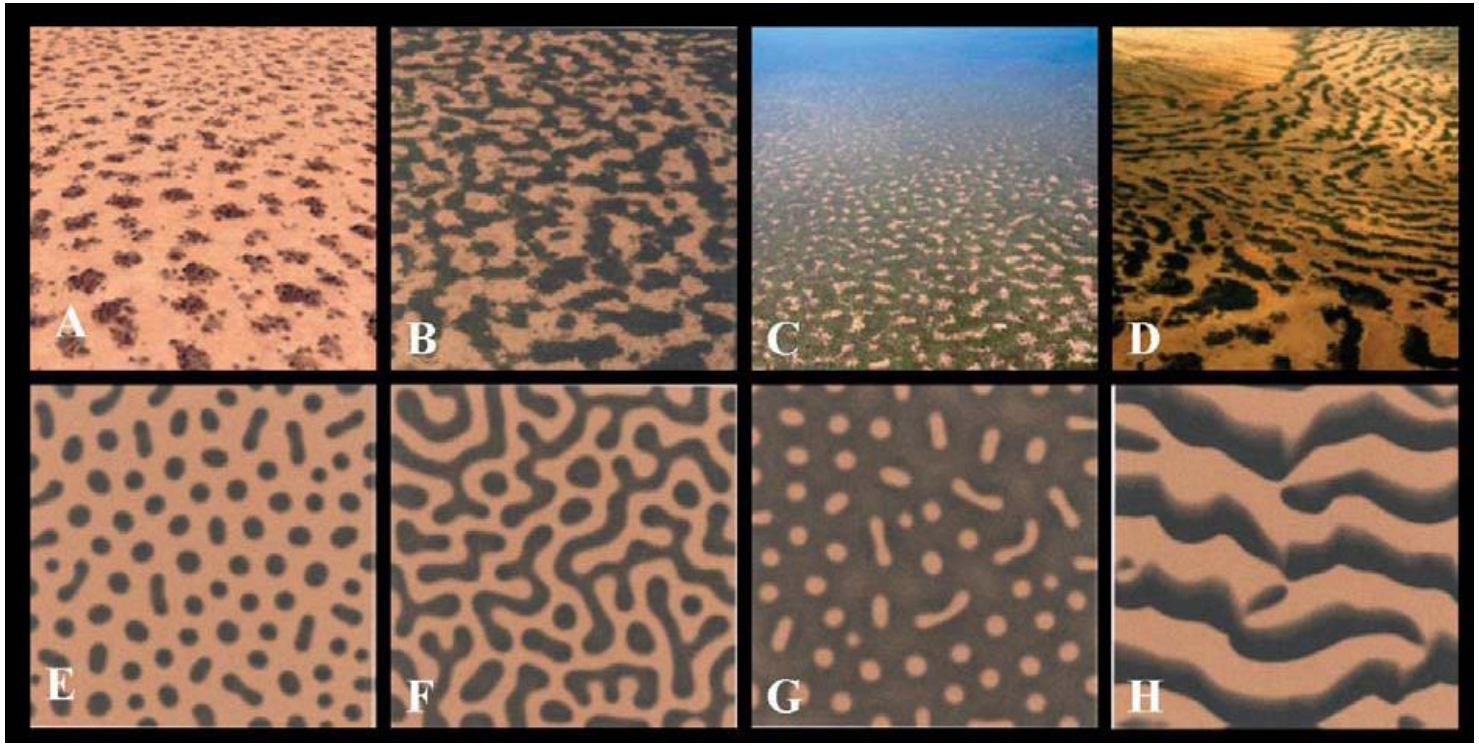
How can we understand the role of feedbacks?

Use dynamical models



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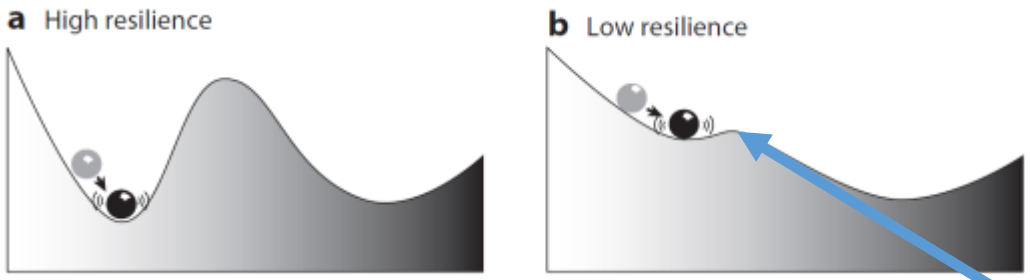
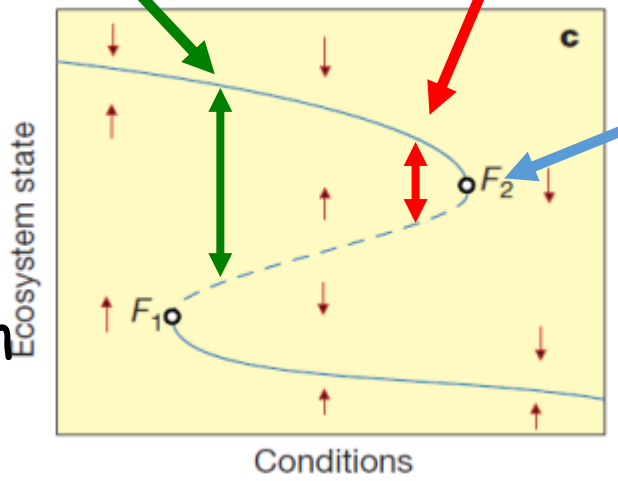


High resilience

Low resilience

Tipping point / catastrophic shift

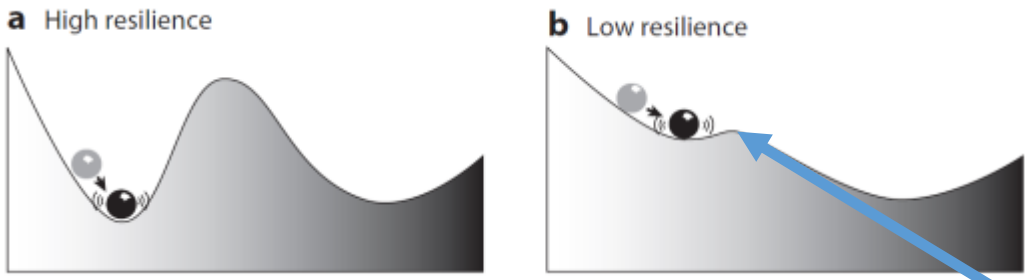
Large and deep basin of attraction



Small and shallow basin of attraction

Scheffer et al Nature 2009

How can we understand the role of feedbacks?



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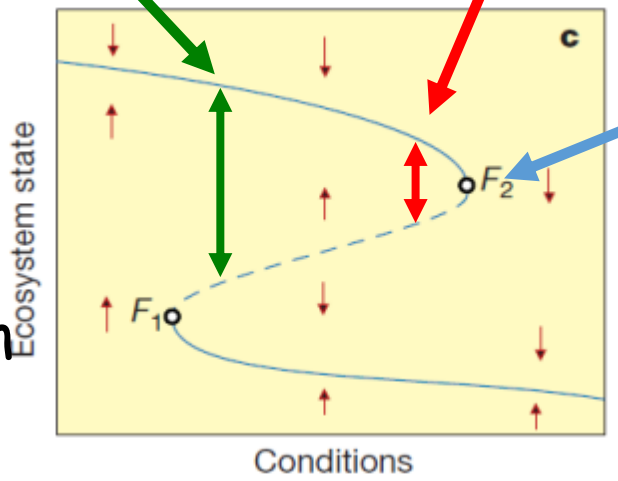
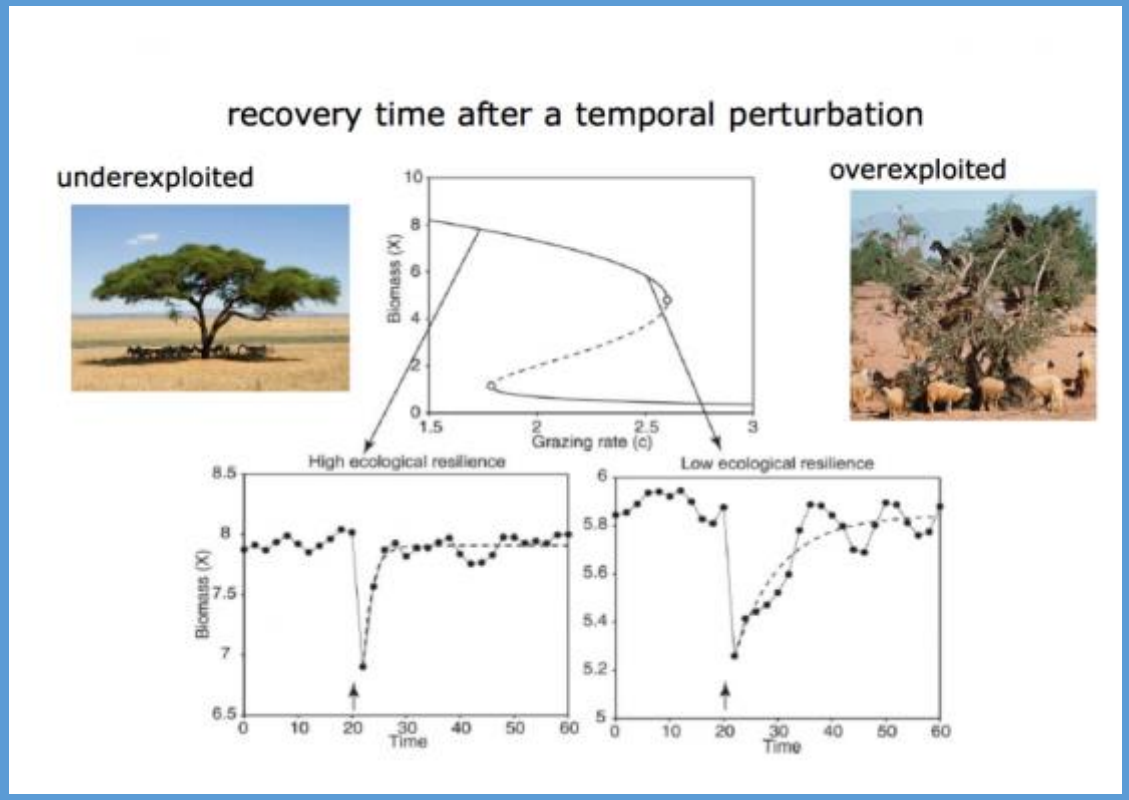


Small shallo basin attrac

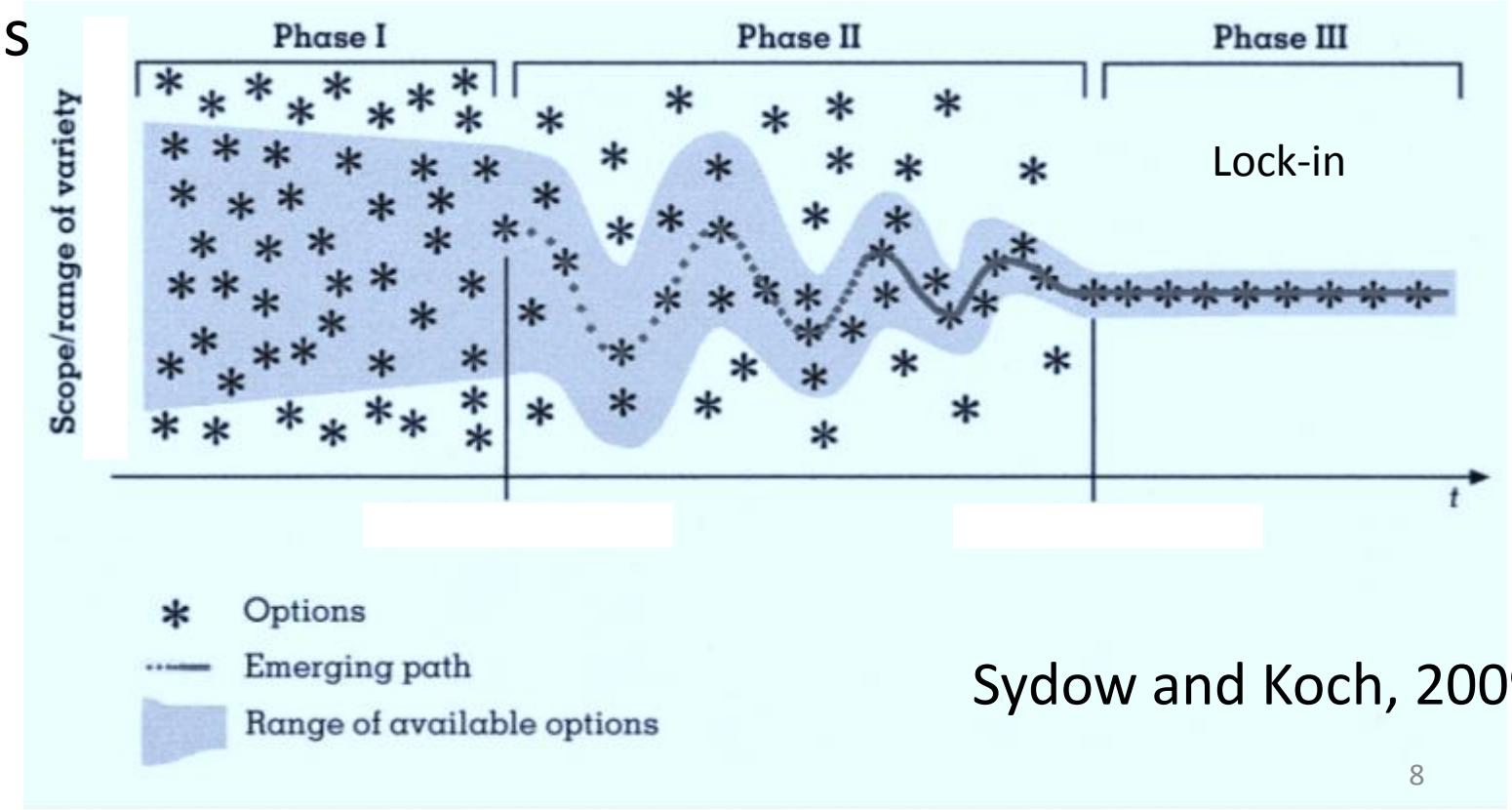
Temporal autocorrelation



Timothy M. Lenton et al. PNAS 2008

Feedbacks and path dependence

- Positive feedbacks reinforce pathway, narrowing options



Sydow and Koch, 2009

Thanks!