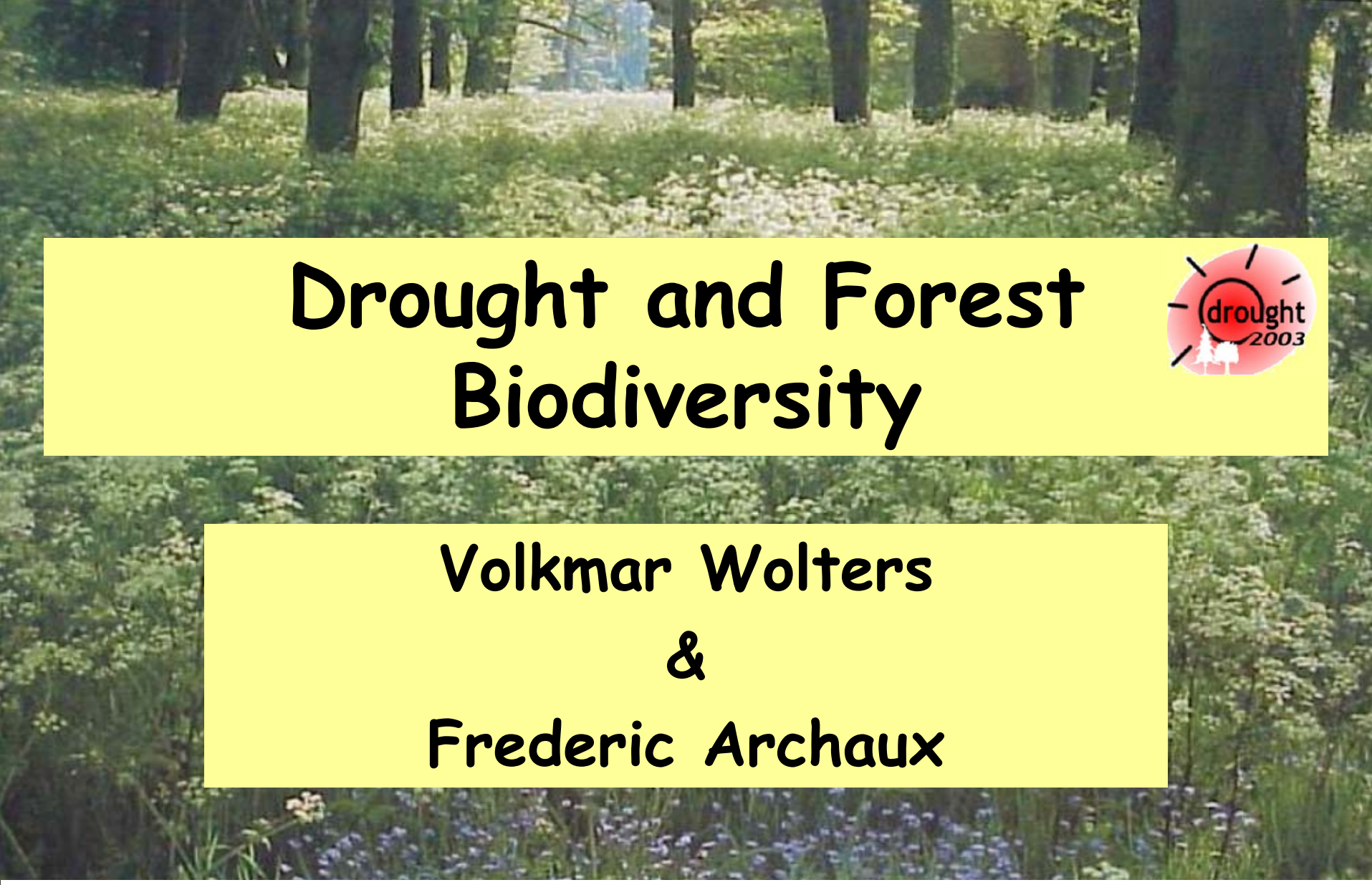

Drought and Forest Biodiversity

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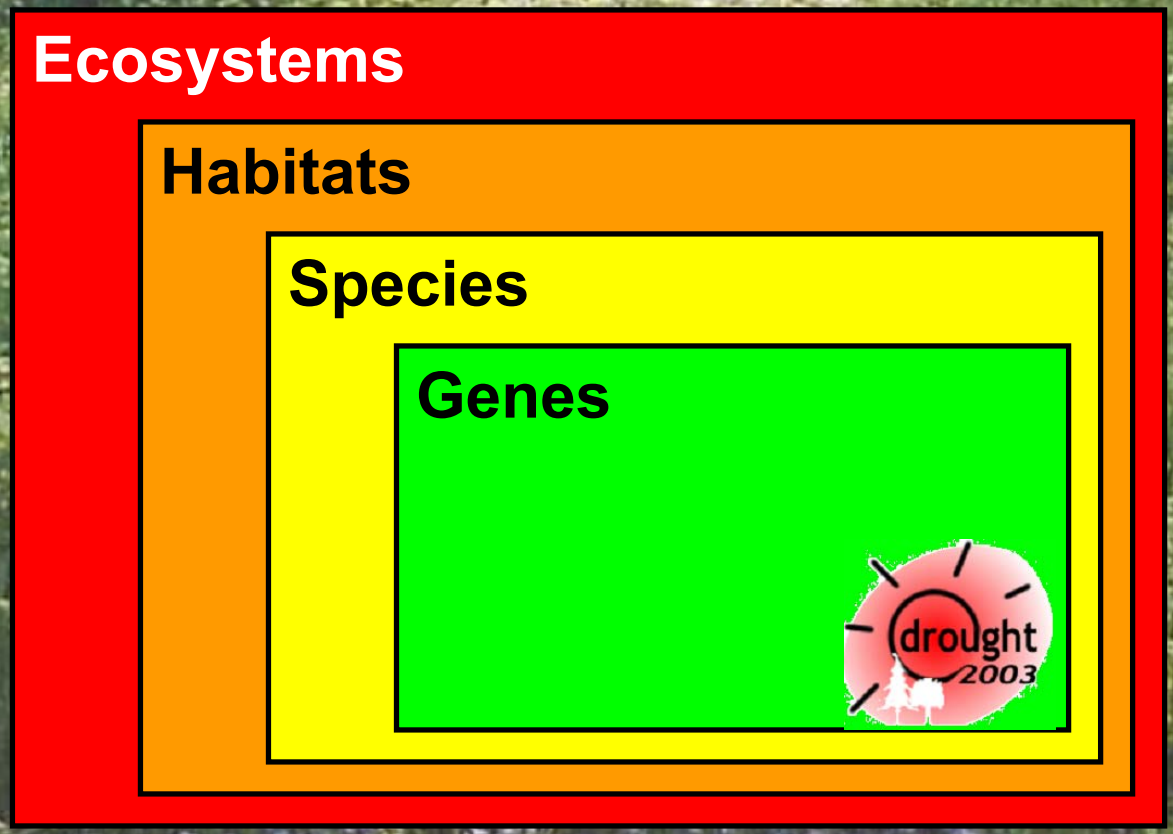
Cemagref

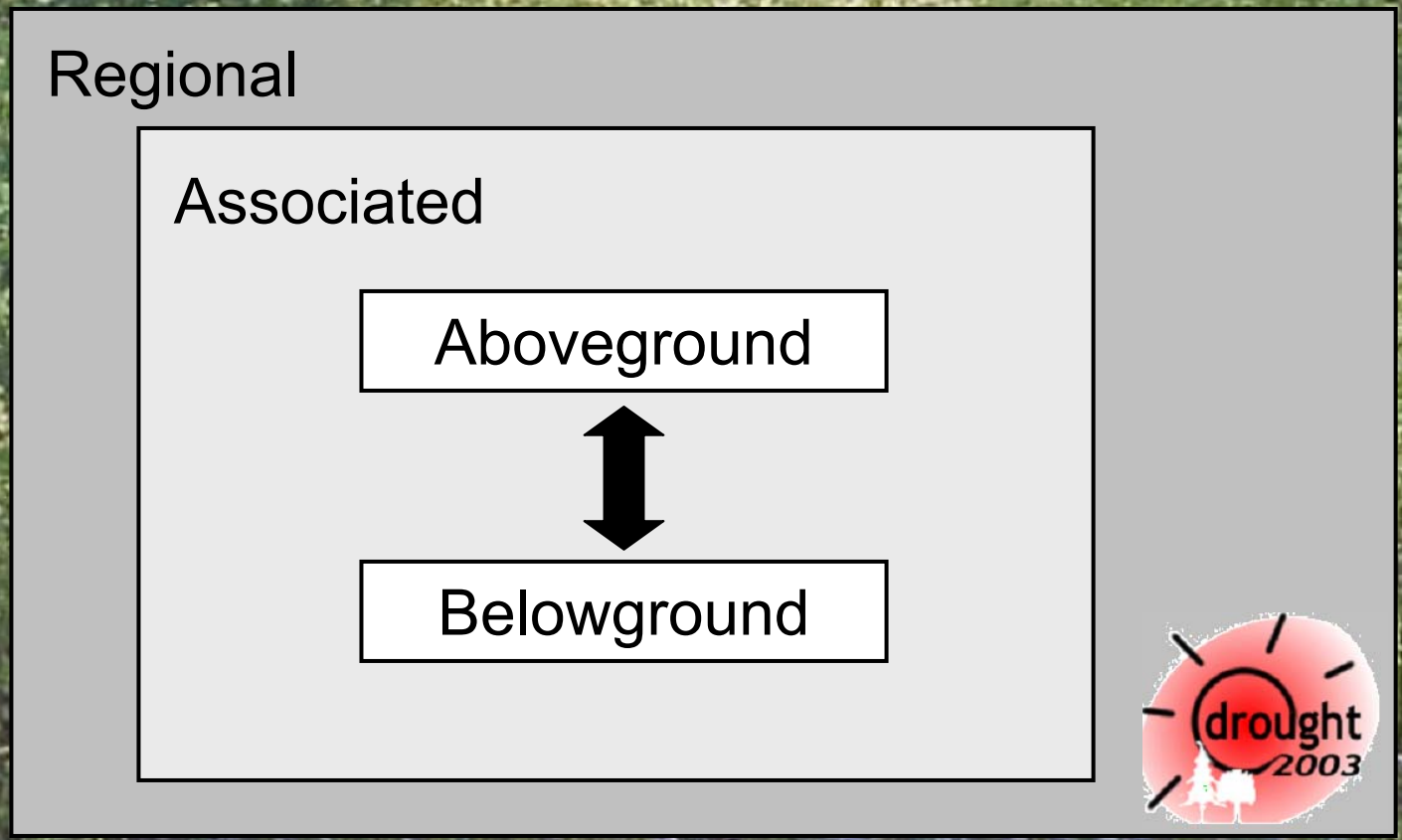
The context: Biodiversity crisis

- **Fastest species loss ever.**
- **20% within the next 30 – 50 yrs.**
- **Man-made!**
- **Most species will go extinct before they are described / known.**

Levels of Biodiversity

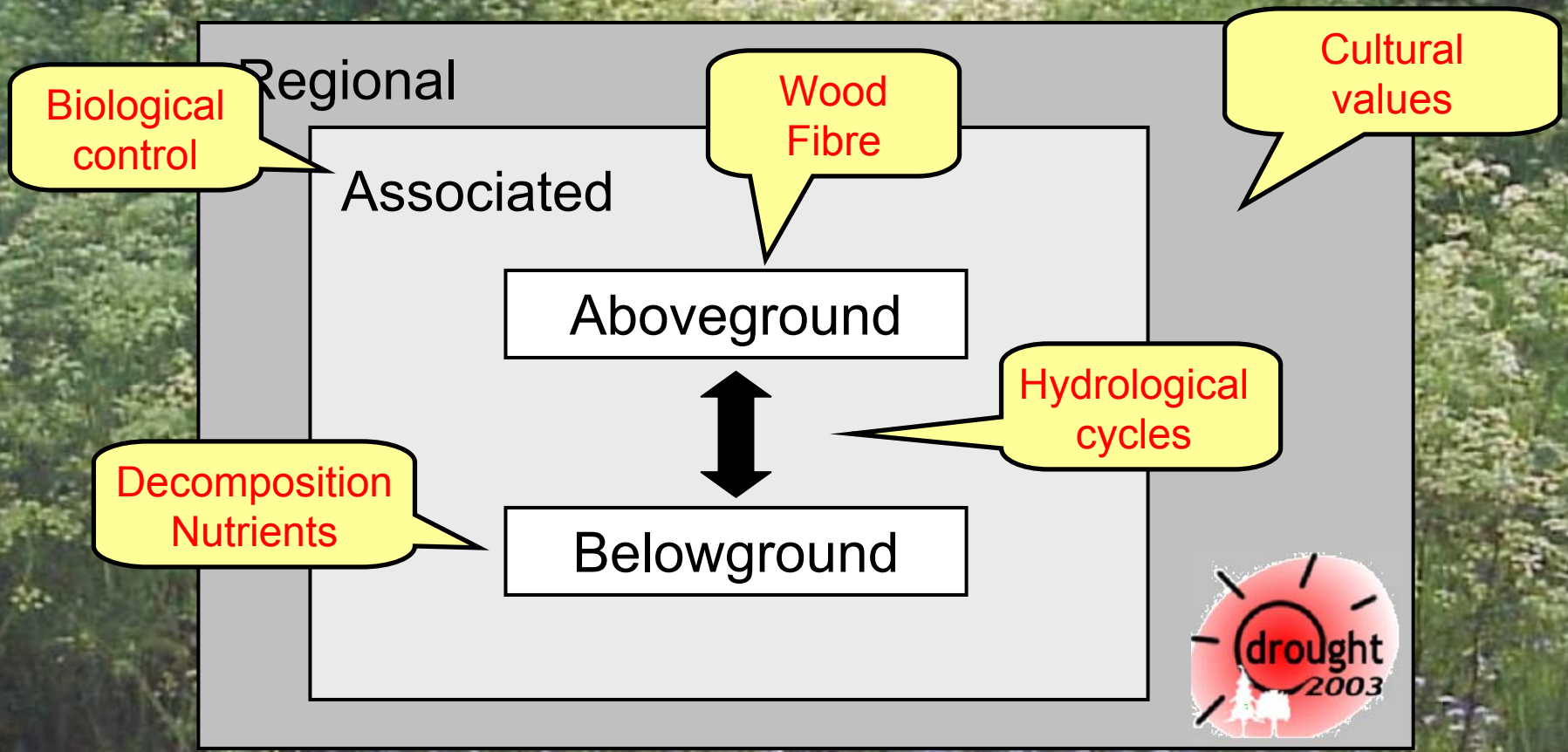


Biodiversity Compartments



Why do we care?

Ecosystem services



Major Questions

- How does drought affect the various levels and components of forest diversity?
- How does diversity affect the resistance of forests against drought (incl. secondary effects such as pest outbreaks)?

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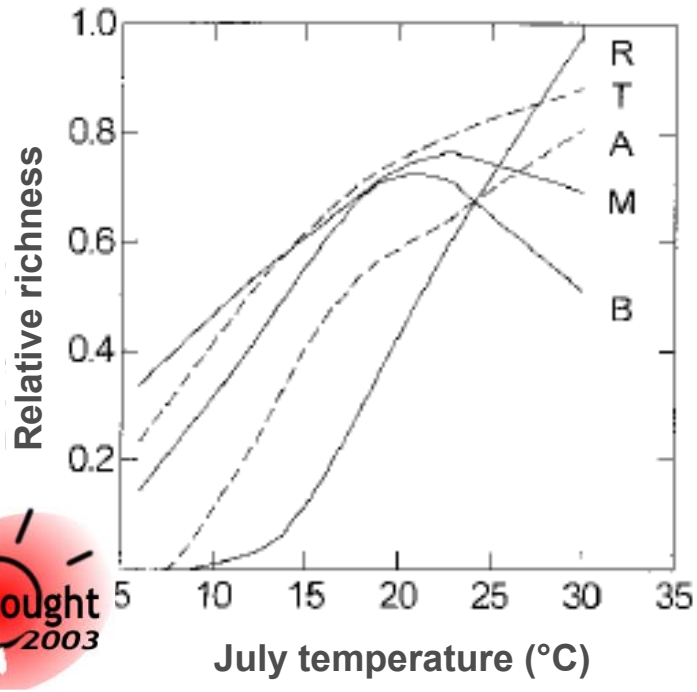
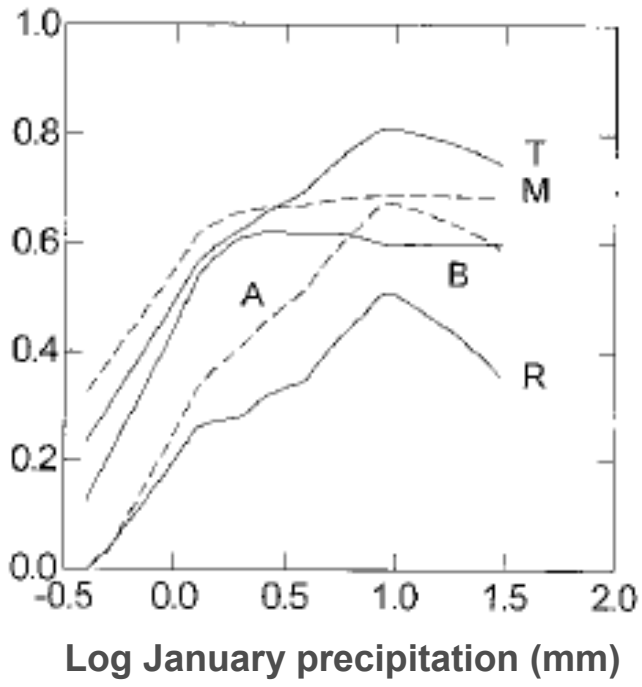
Richness, Temperature & Precipitation

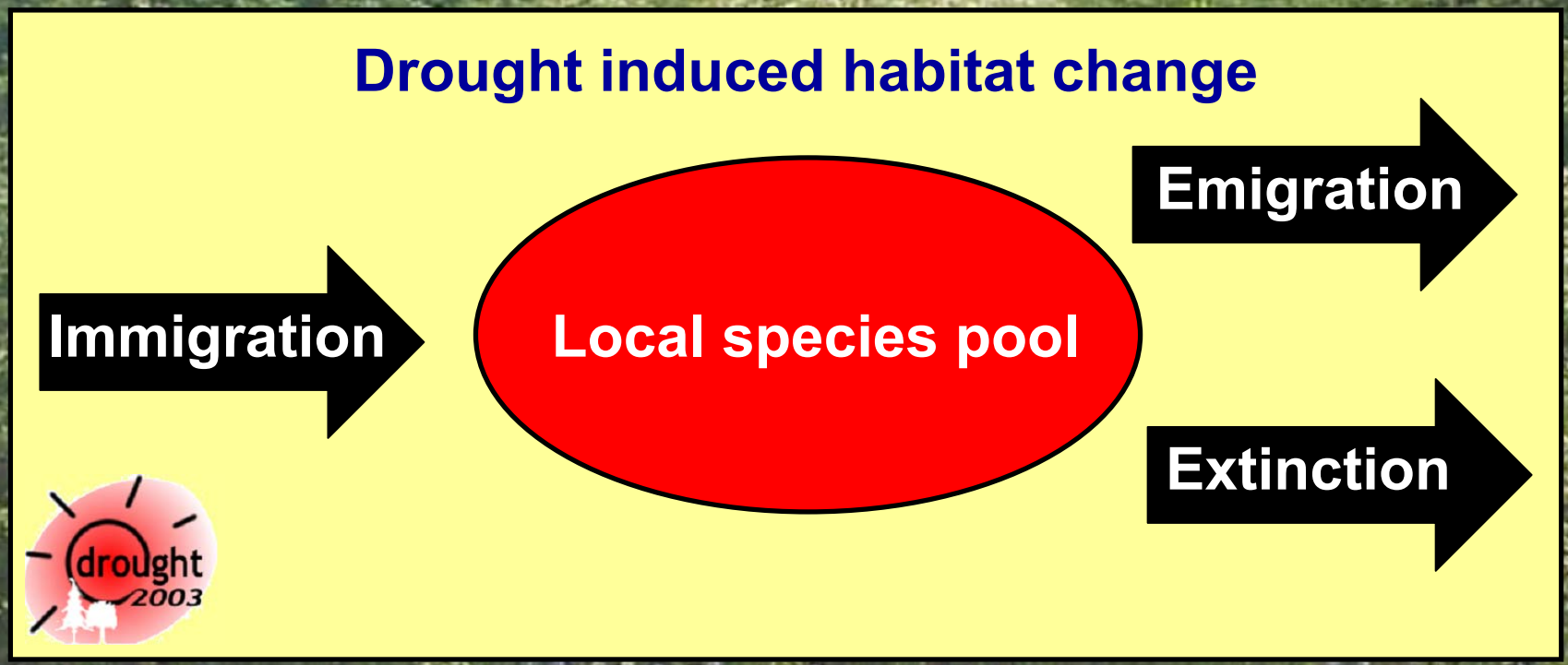
R: Reptiles T: Trees M: Mammals A: Amphibians B: Birds





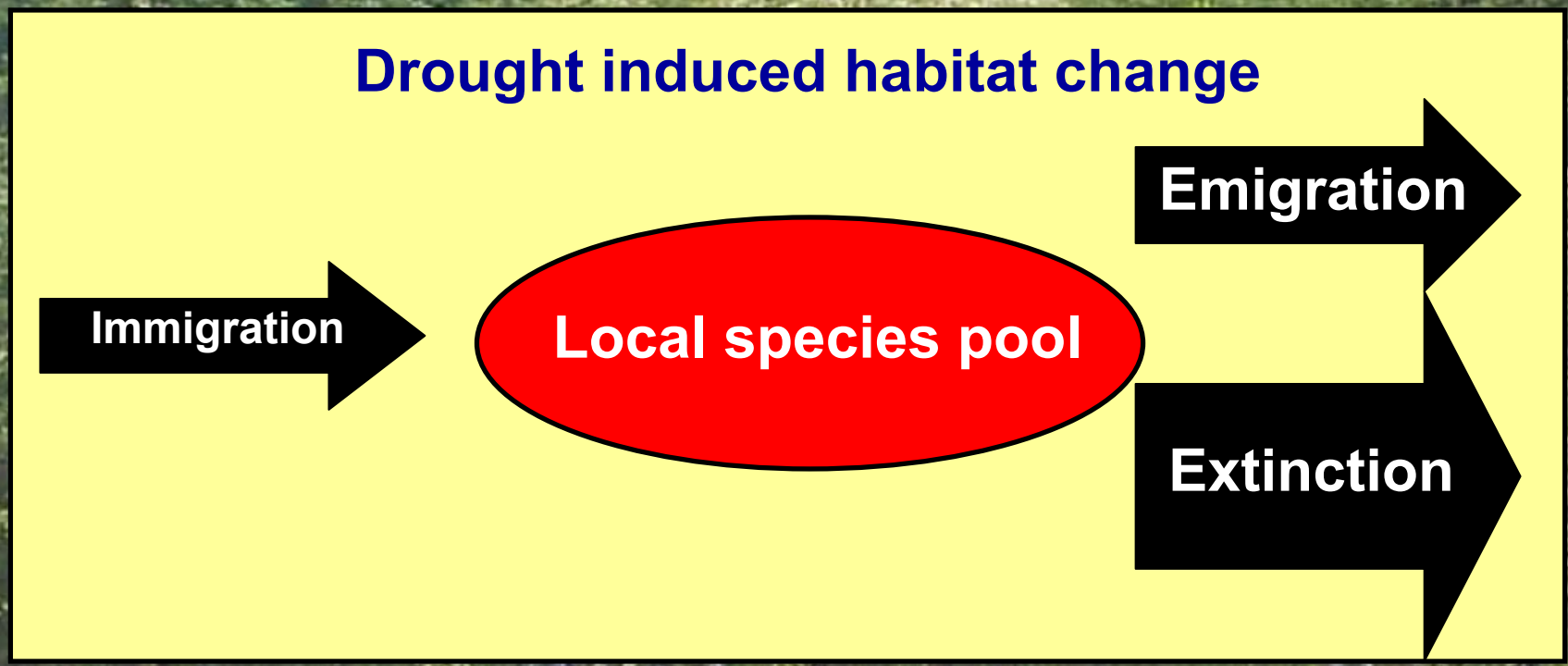
drought 2003

Drought & Species response
Mechanisms



Drought & Species response

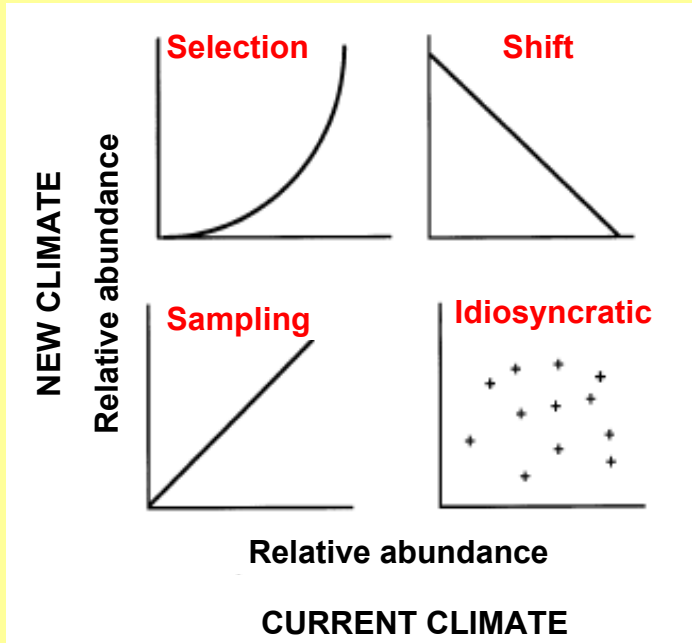
short-term: Decline



Drought & Species loss

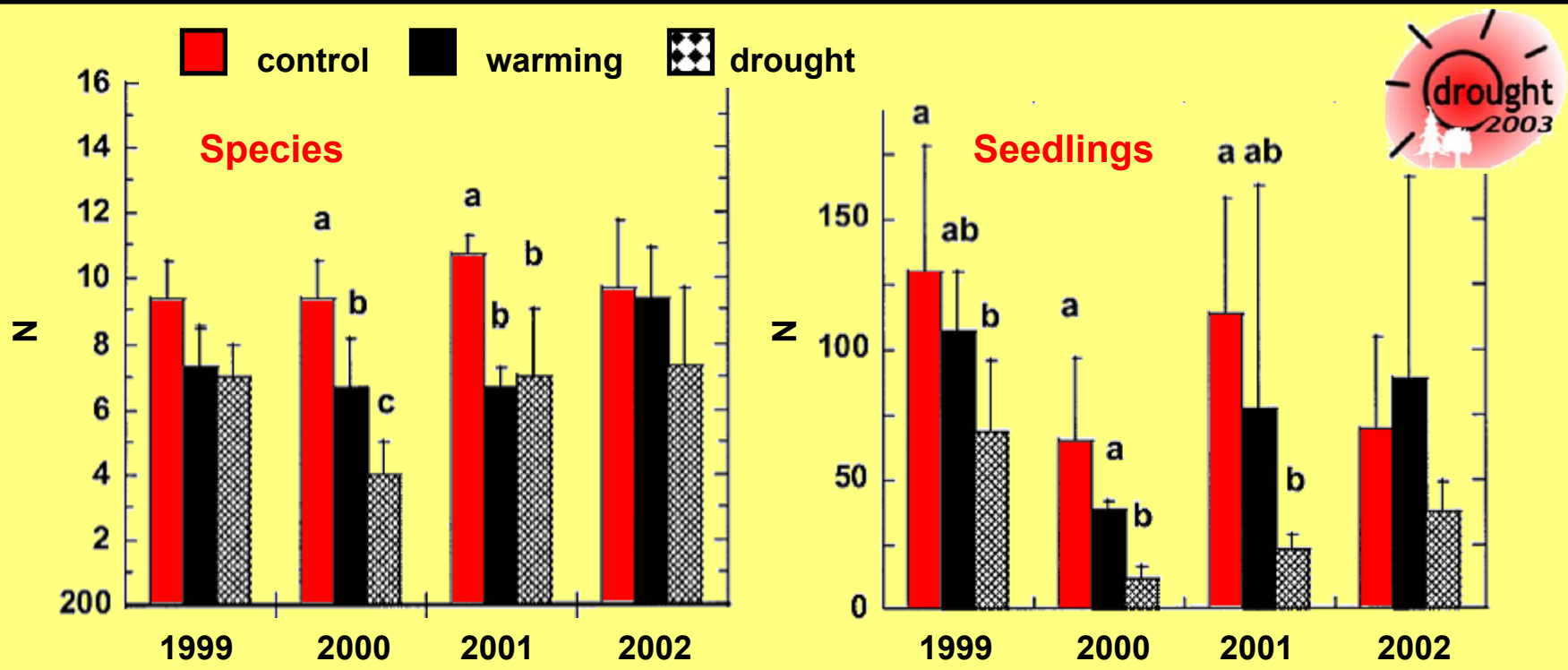
Hypotheses

- **Selection:**
  Less abundant species are lost.
- **Shift:**
  Abundant species are lost.
- **Sampling:**
  Loss proportional to abundance.
- **Idiosyncratic:**
  Not related to abundance.



Drought & Sensitivity

Experiments

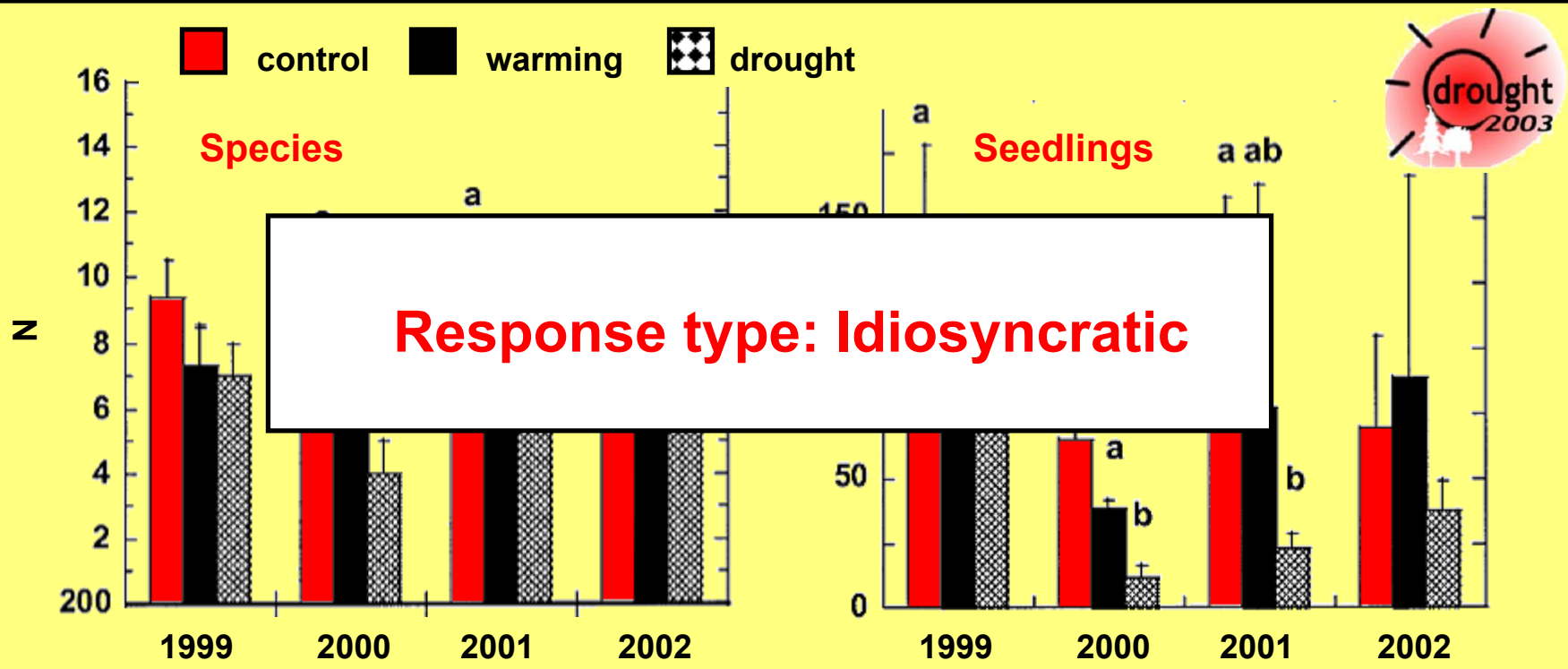


Strong effects of drought on seedling recruitment

Lloret et al. (2004)

Drought & Sensitivity

Experiments



Response type: Idiosyncratic

Strong effects of drought on seedling recruitment

Lloret et al. (2004)

Drought & Species loss

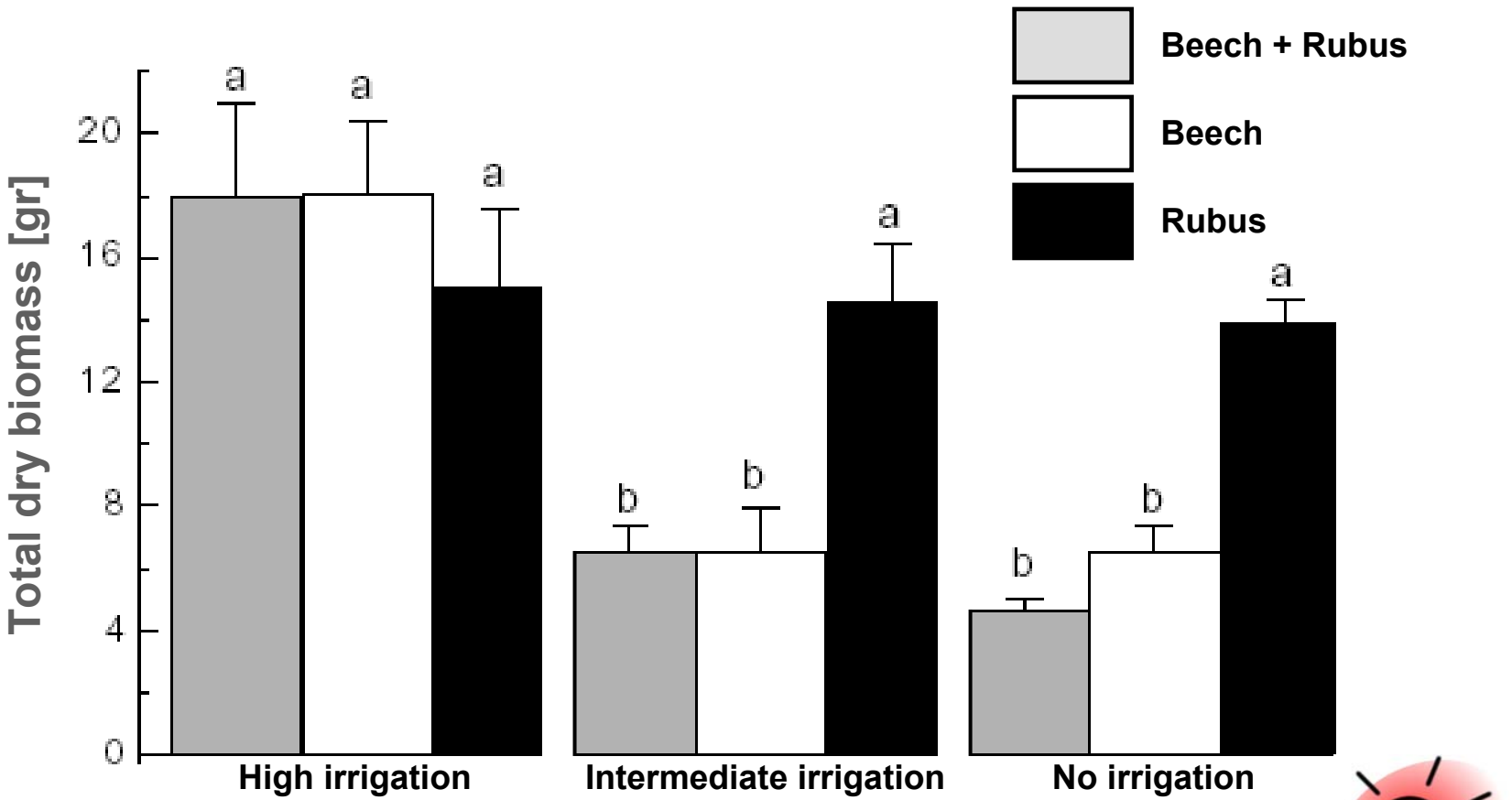
Literature search

Most sensitive species:

- **Competitive**
- **Adapted to cold and wet conditions**
- **Low reproduction rate**
- **Low mobility**

Drought & Community structure

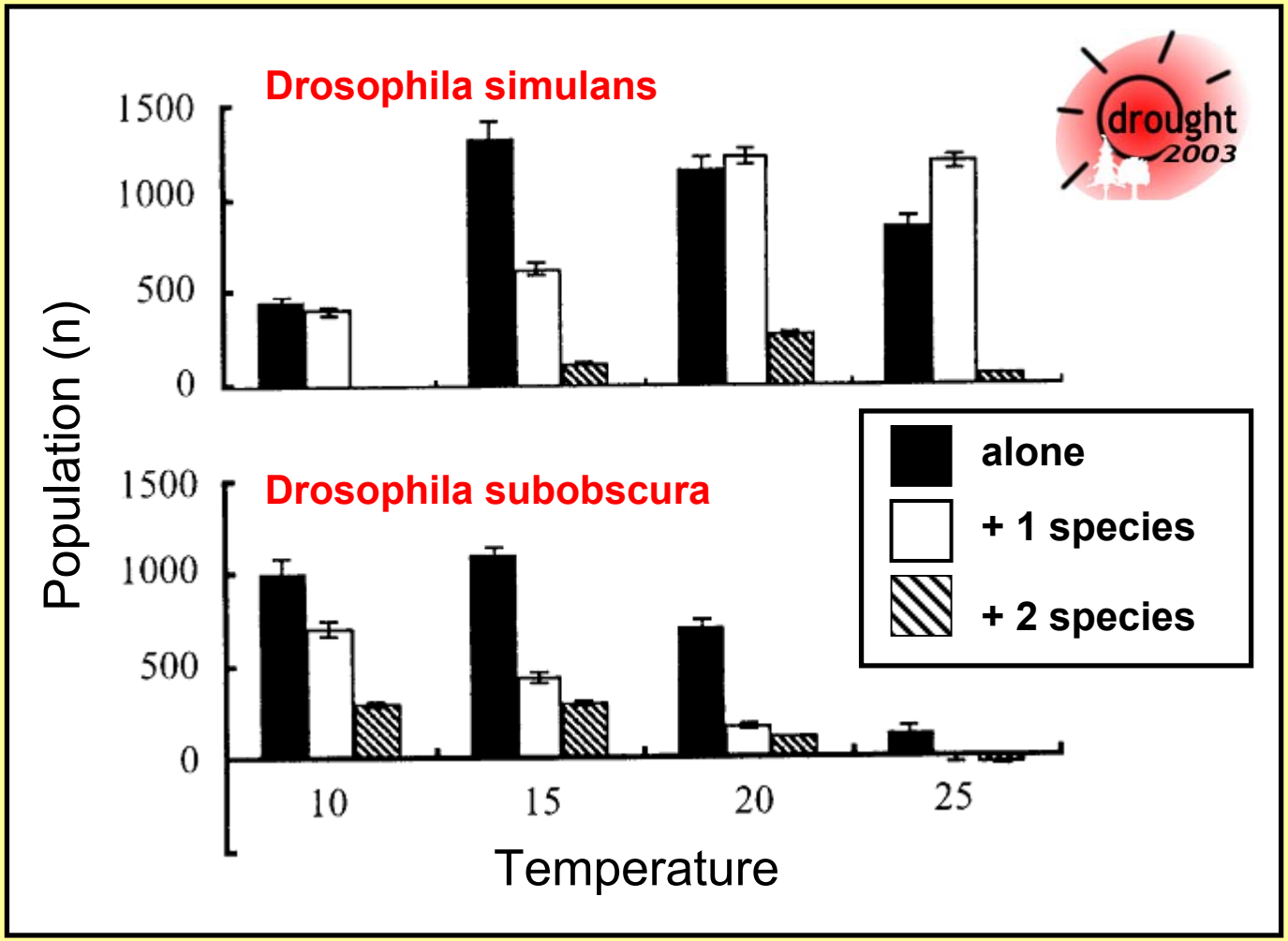
Example: Beech seedlings vs. *Rubus fruticosus*



Fotelli et al. (2001)

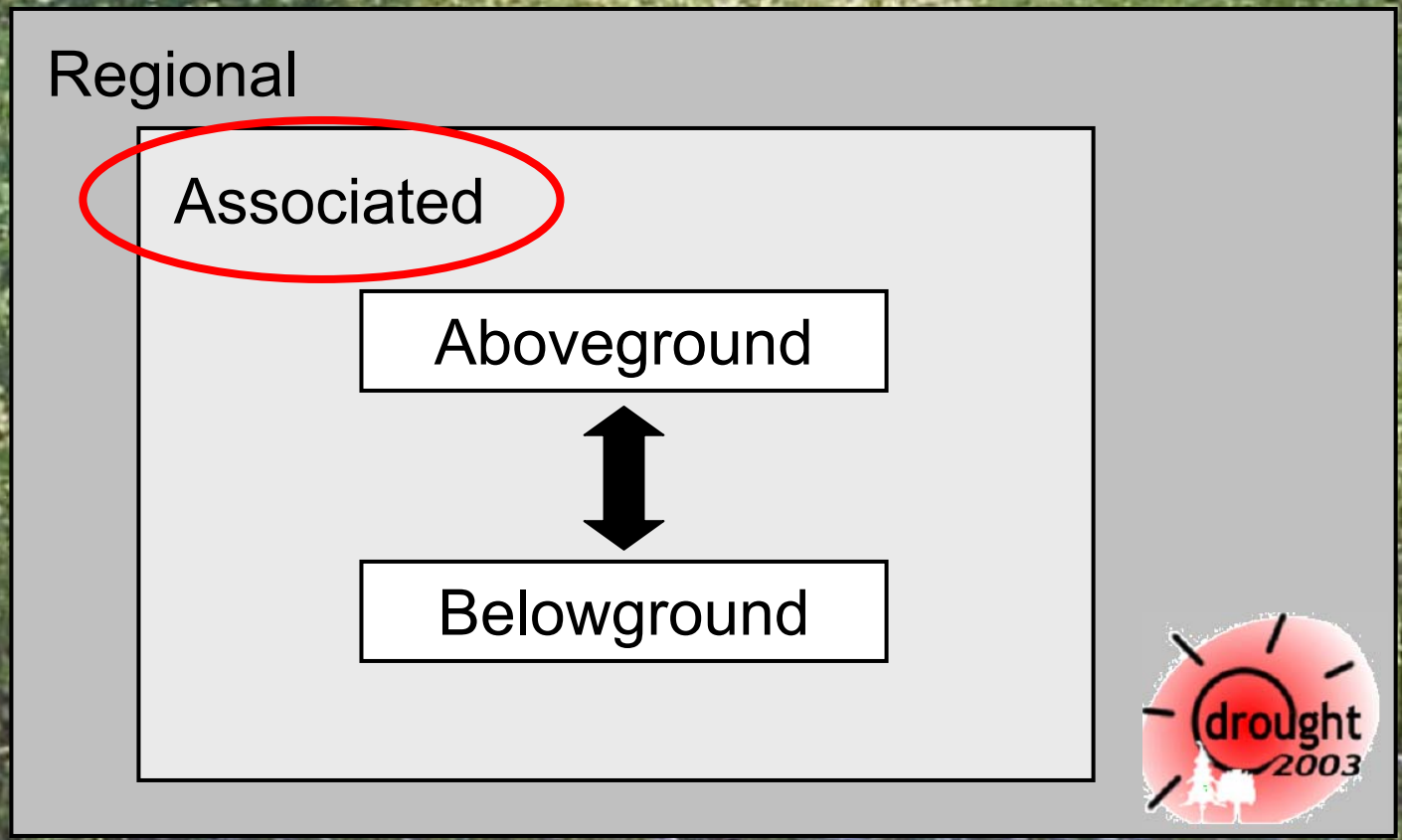
Temperature & Community structure

Example: Animals



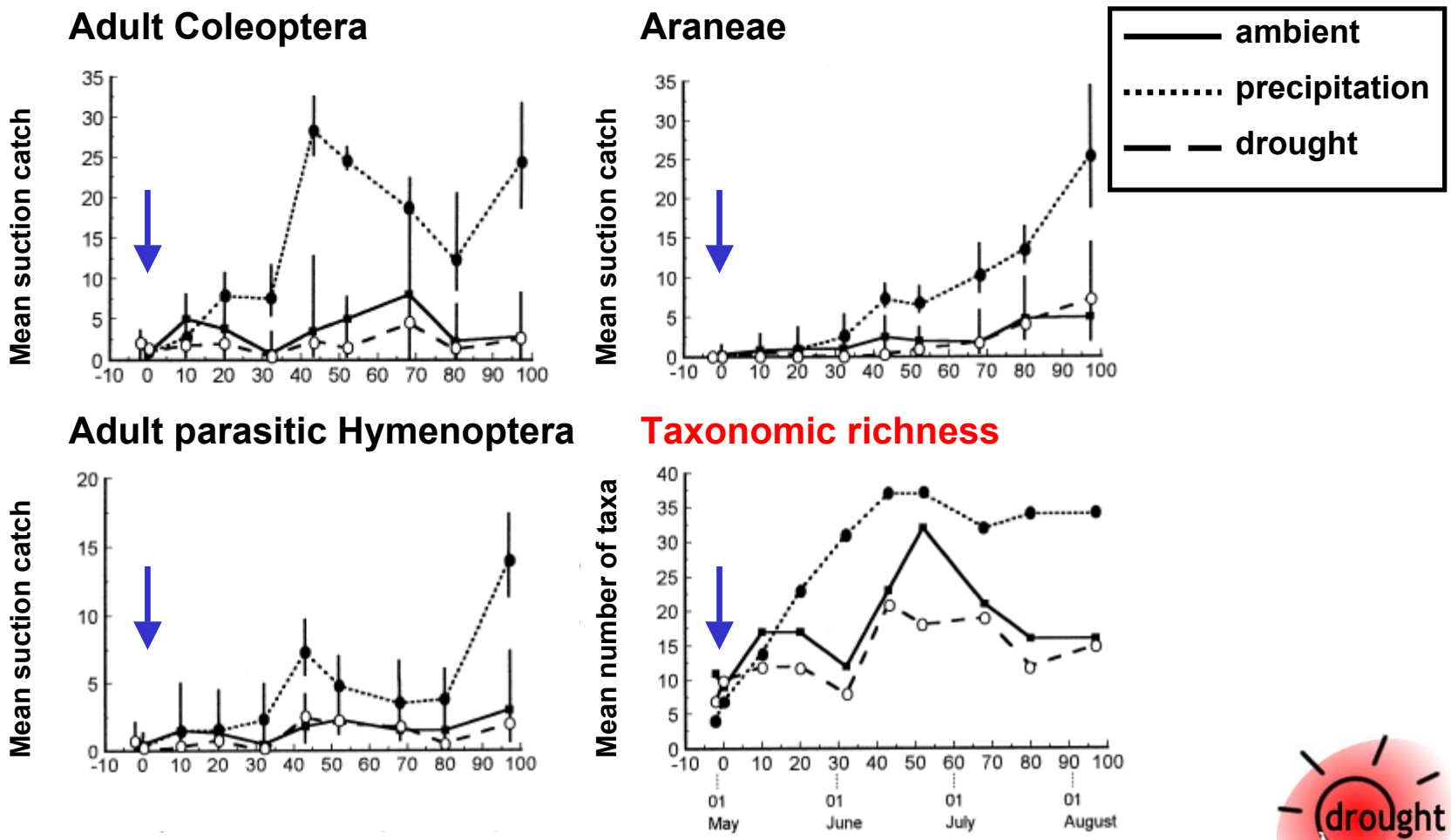
Davis et al. (1998)

Associated Diversity



Associated Diversity

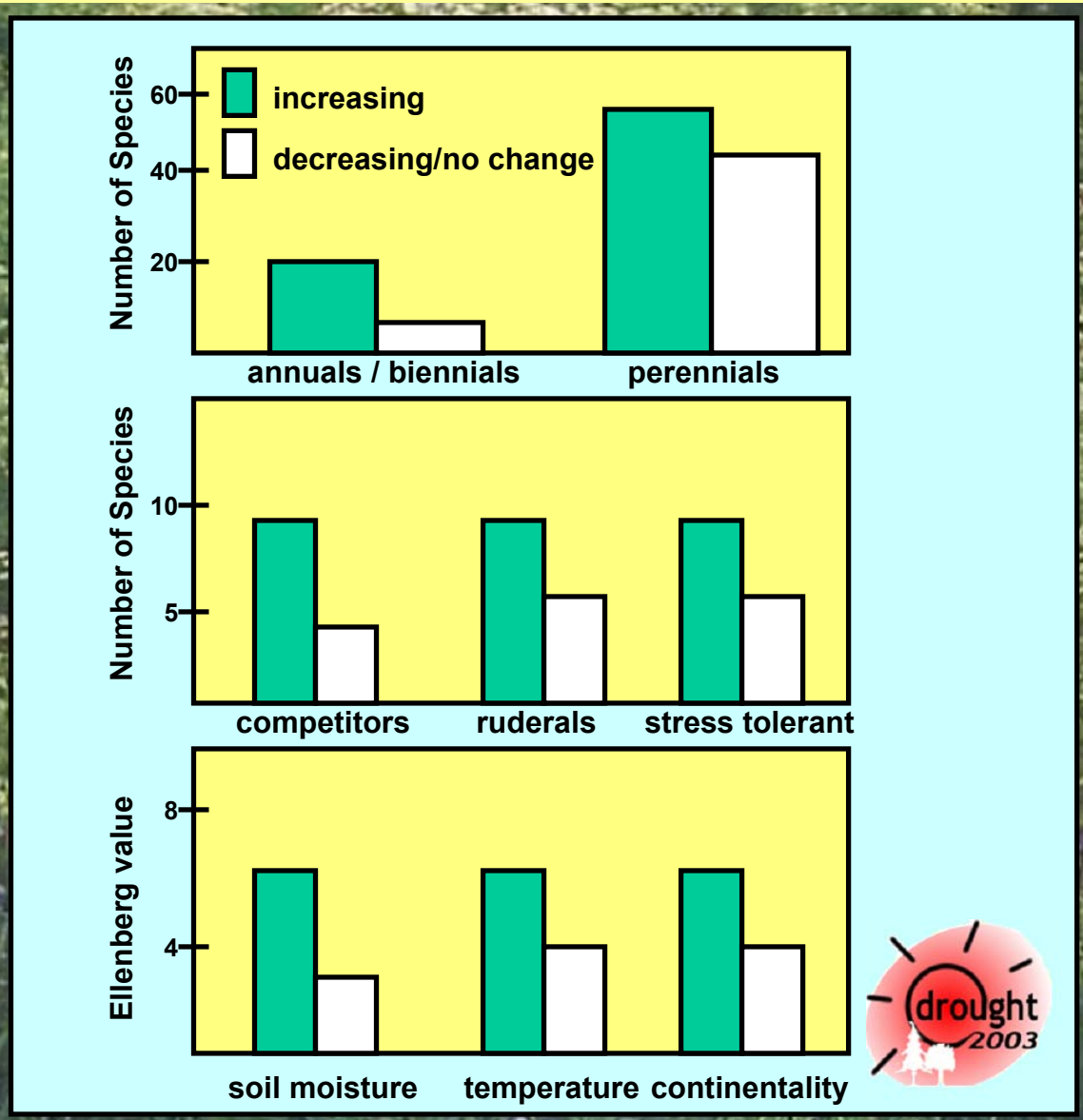
Field experiment



Frampton et al. (2000)

Response of the Herb layer

Summer drought 1995

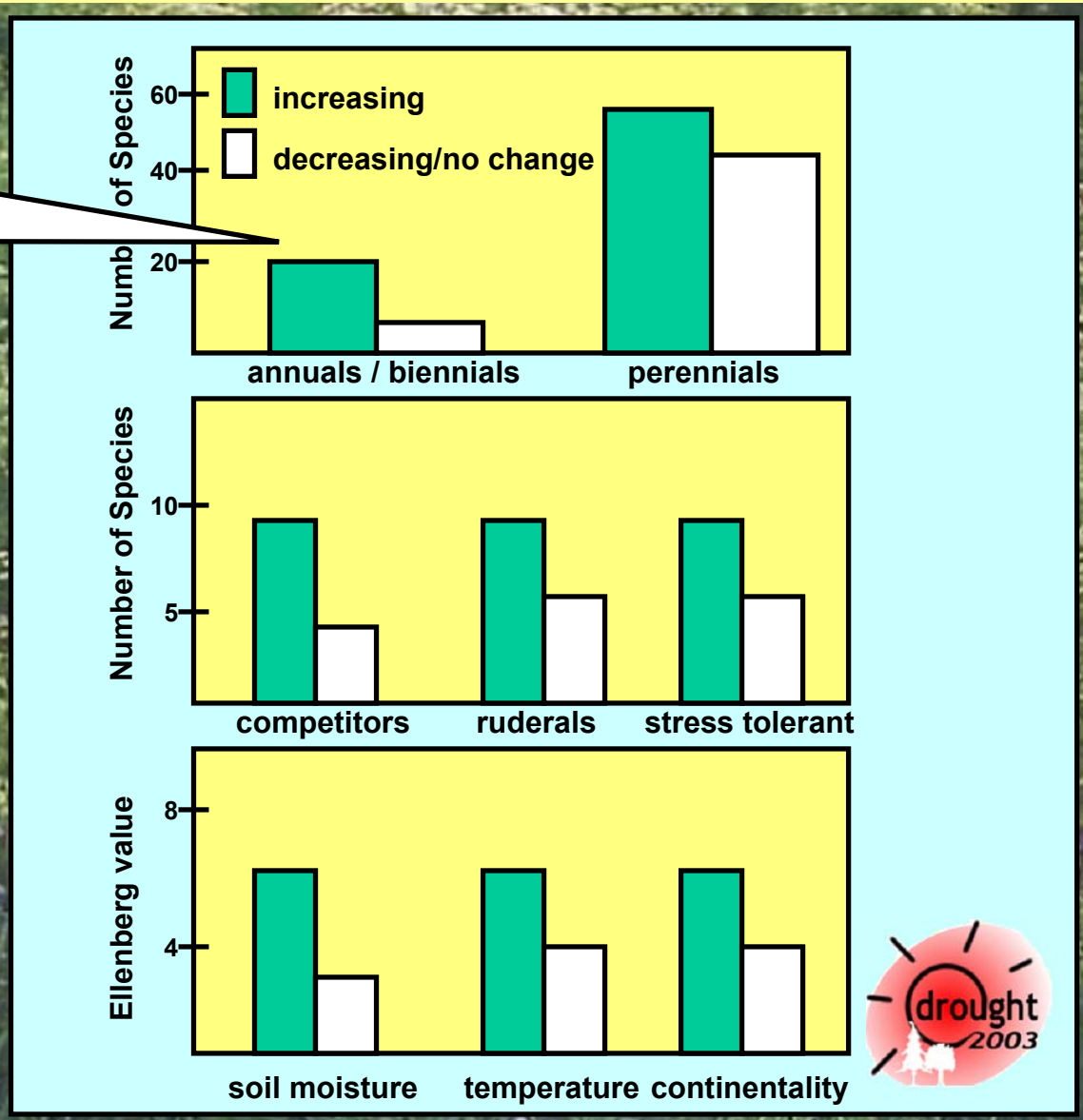


Morecroft et al. (2002)

Response of the Herb layer

Summer drought 1995

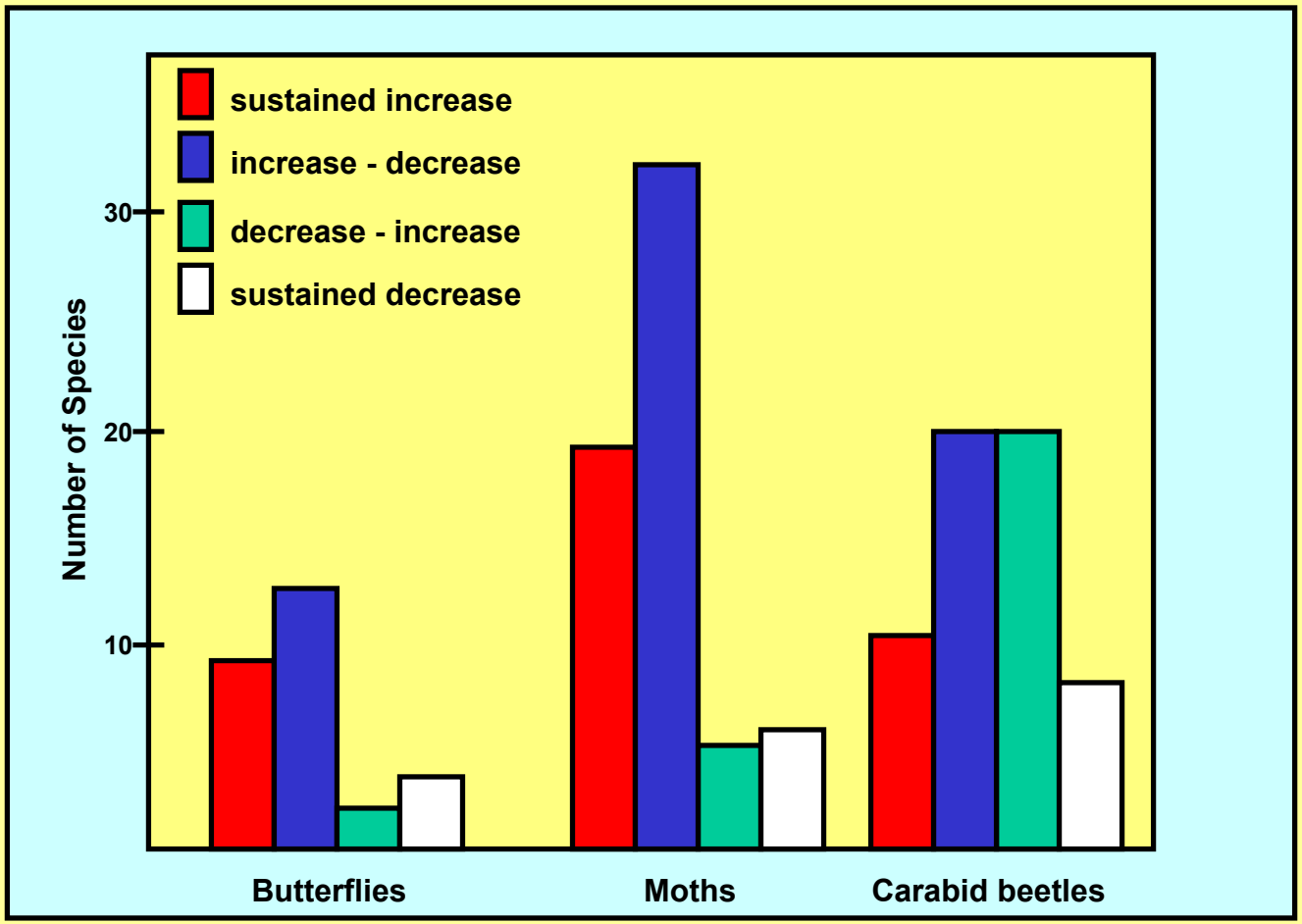
Proportionally more annuals / biennials than perennials



Morecroft et al. (2002)

Associated Diversity

Summer drought 1995

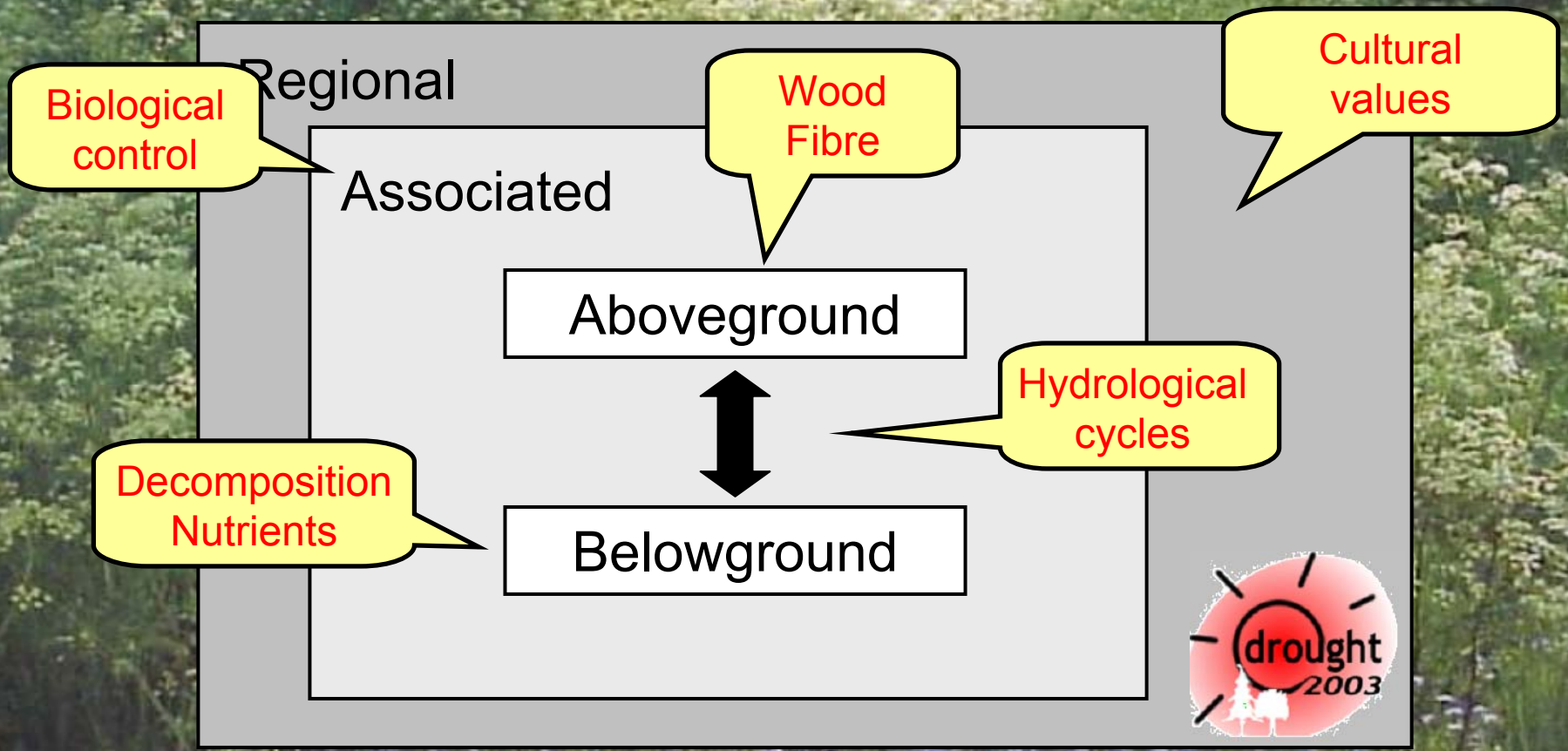


drought 2003

Morecroft et al. (2002)

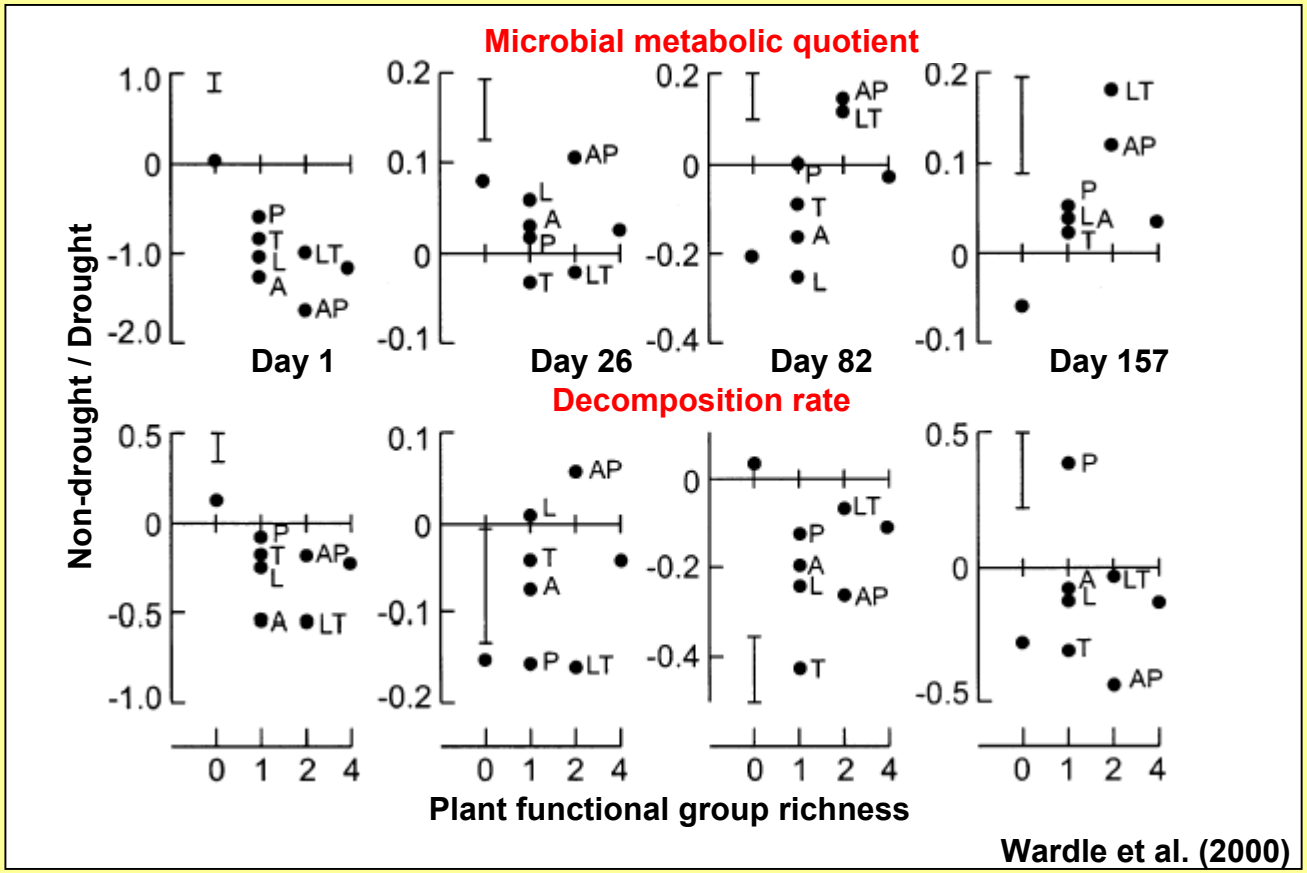
Drought, Richness & Function

Function = Ecosystem services



Drought, Richness & Function

Microcosm experiment: Soil



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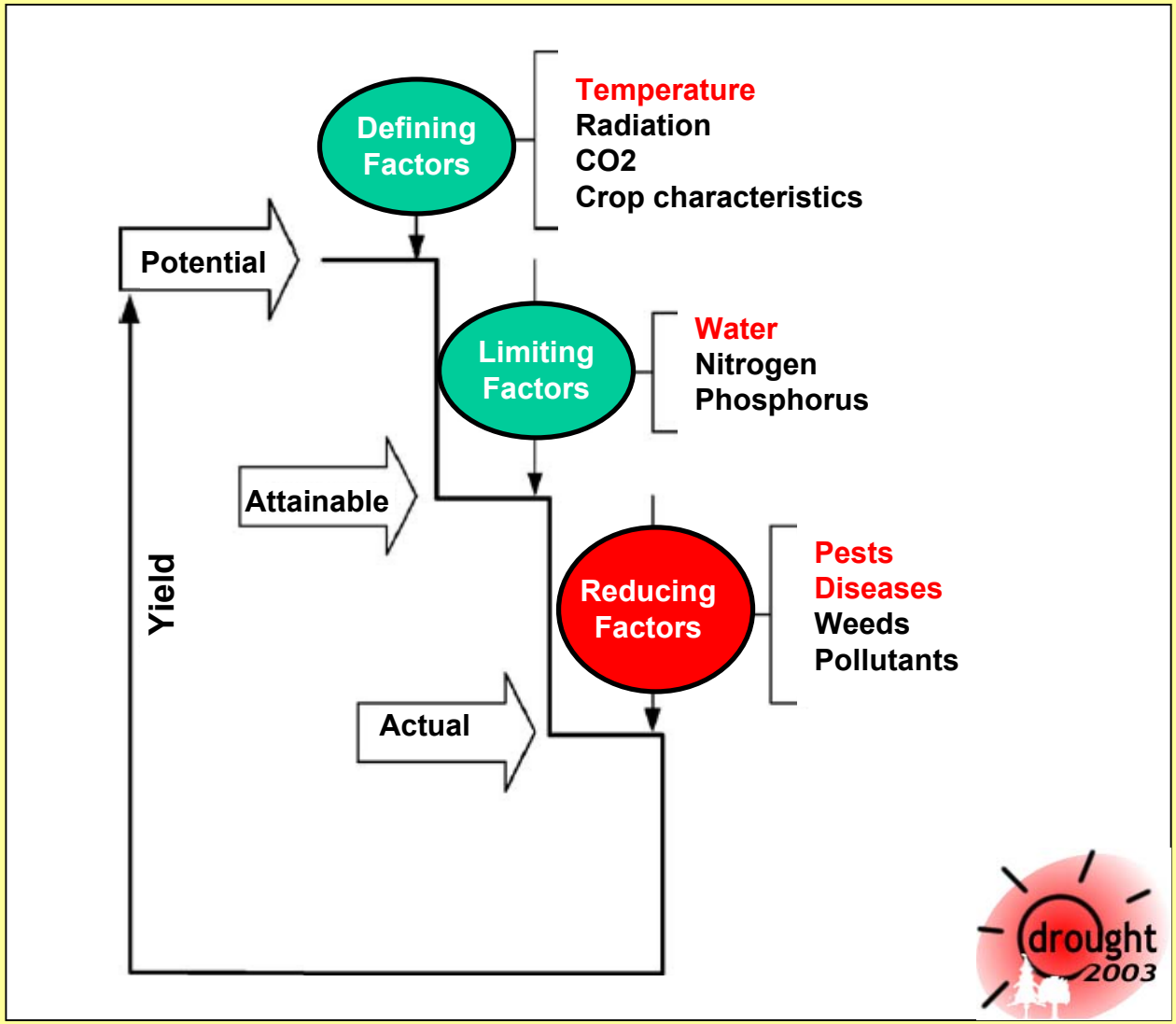
Drought and Forest Biodiversity (Wolters & Archaux)

Associated Diversity

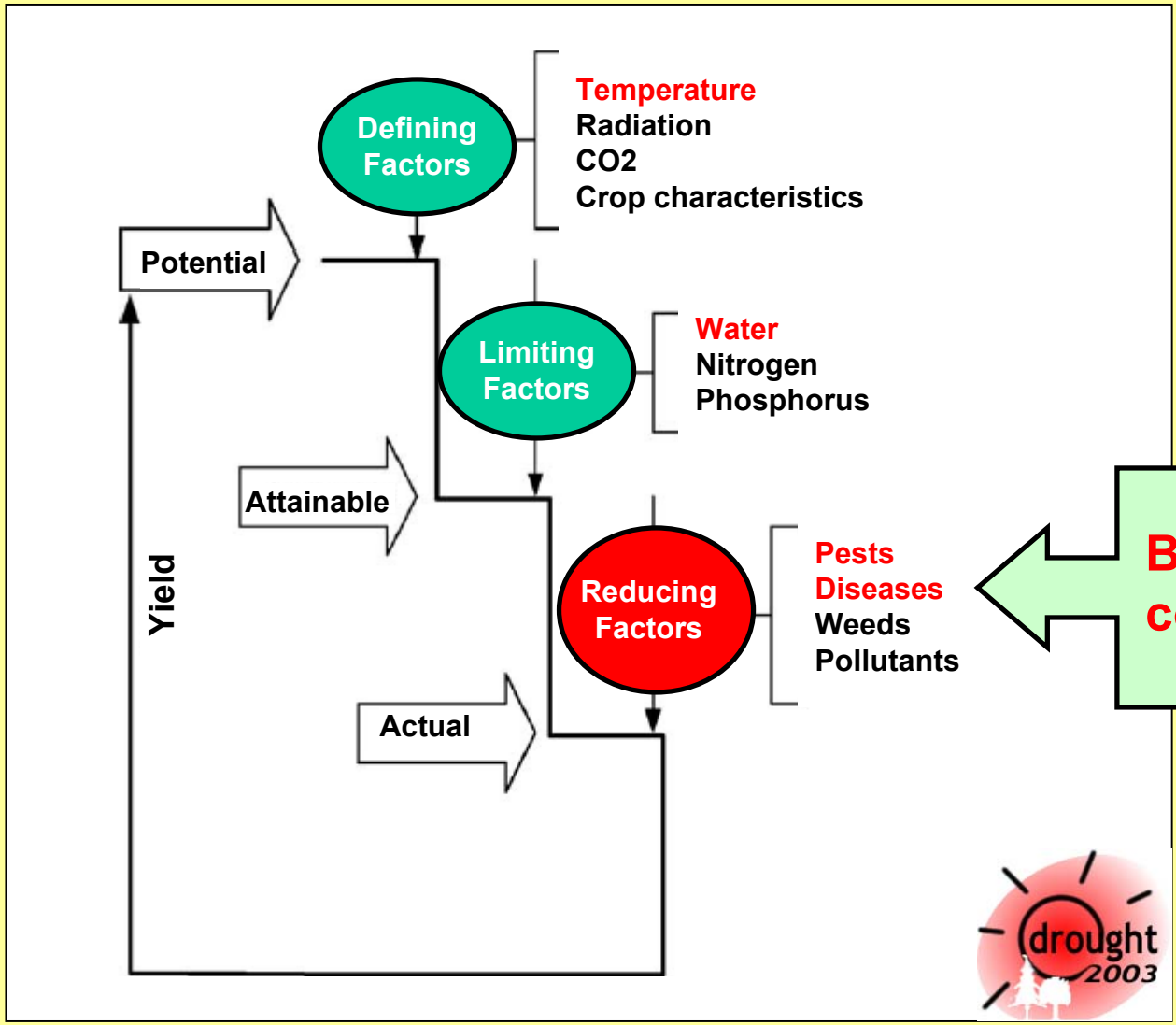
Lessons from Agriculture



Fuhrer (2003)

Associated Diversity

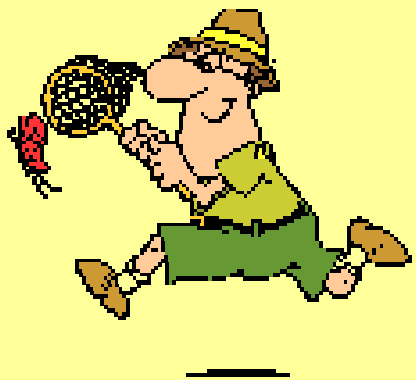
Functional implications



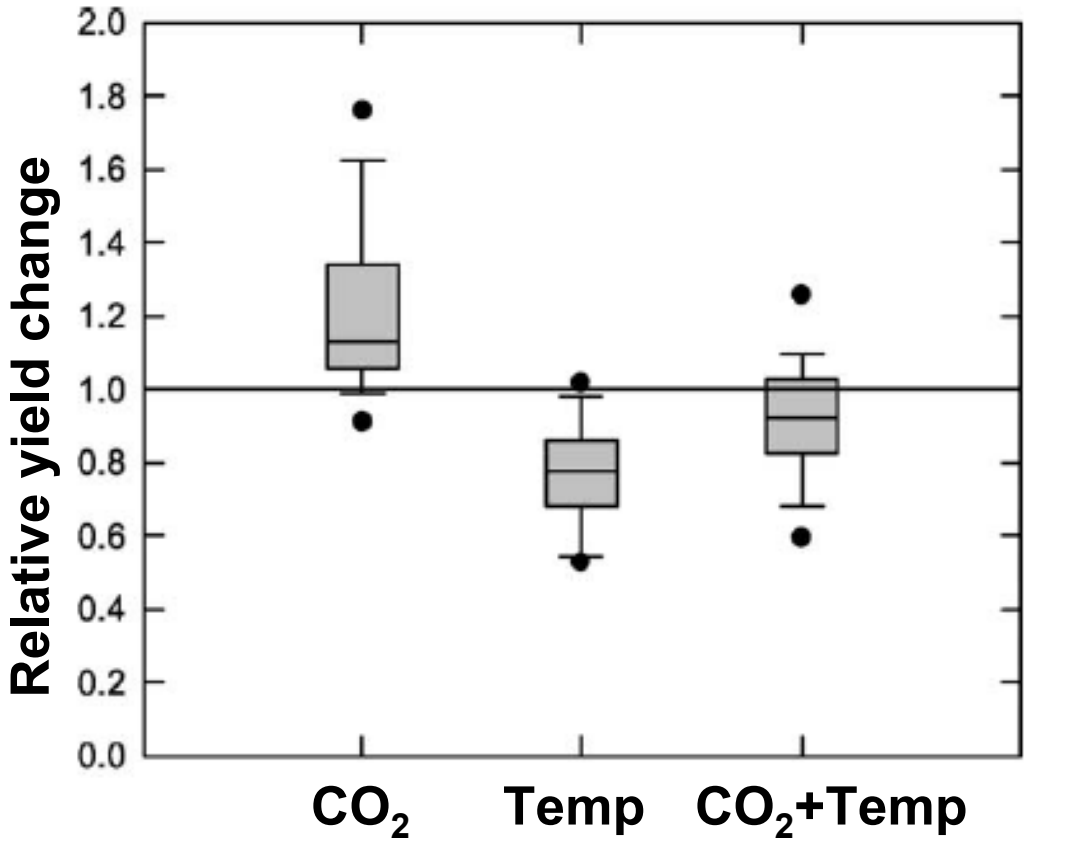
Fuhrer (2003)

Future Activities

- We need to get a better understanding of mechanisms and processes in interdisciplinary approaches!

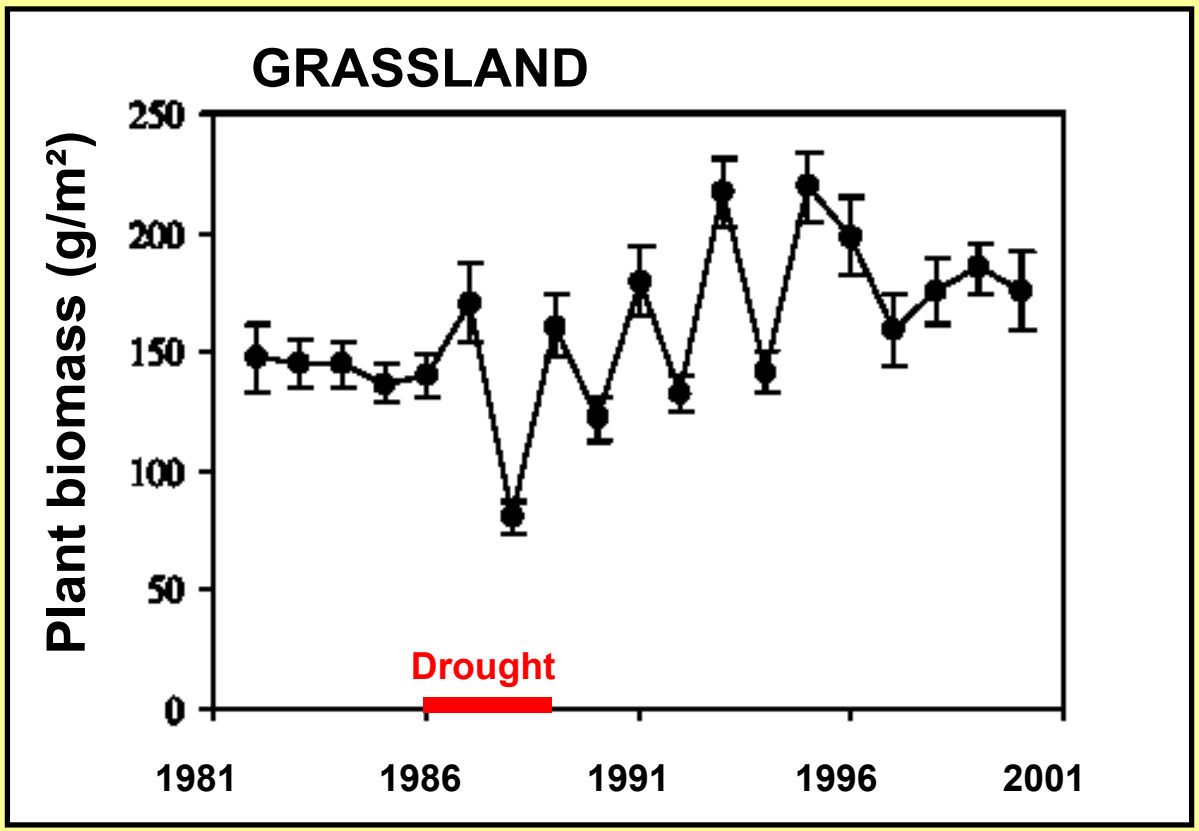


Problem: GC drivers interact



Fuhrer (2003)

Problem: Long-lasting effects



Haddad et al. (2002)

Future Activities

- Predictions and priorities for the impact of drought on each level and compartment of diversity in the light of the ecosystem services provided.
- Balance biodiversity as a social and biological value on its own right against management strategies driven by economic interests and practical priorities.
- Device biodiversity scenarios on drought effects as a tool for developing management strategies and supporting political decisions.

Thank you
for your attention!