

The use of geodiversity information in biodiversity assessments

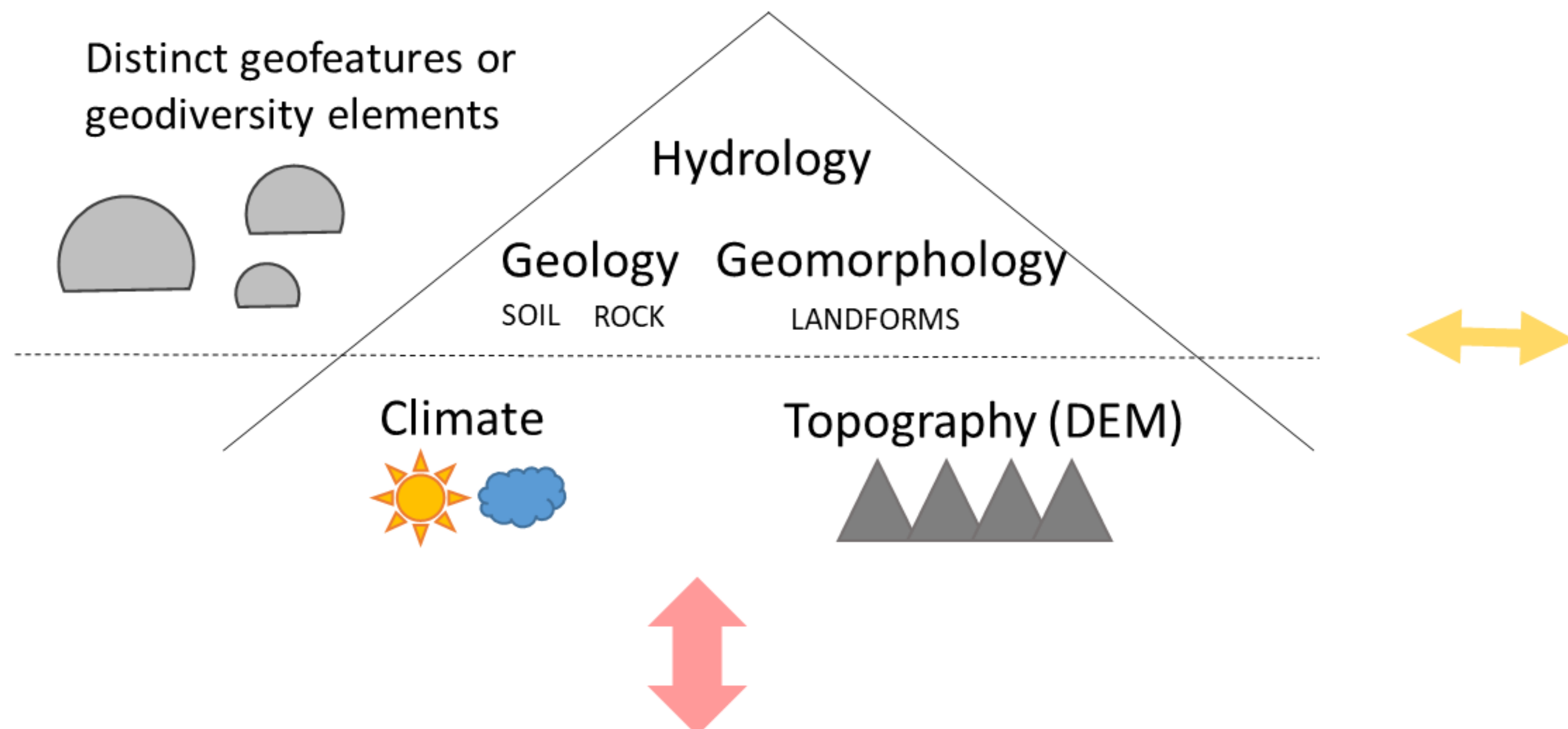
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GEODIVERSITY

Abiotic richness of Earth surface

The variety of earth surface materials, landforms and processes



"The stage" "The actors"
Where to focus? → Conserving Nature's Stage

BIODIVERSITY

Biological diversity

Different taxonomic groups, levels (α β γ), measures

Ecosystem services & human welfare

Global change: climate change, biodiversity loss, land-use change

Geodiversity constitutes a fundamental part of the Earth system and is broadly defined as the variability of the abiotic nature, or the abiotic richness of the earth's surface. Together with **biodiversity**, geodiversity constitutes the natural diversity of the Earth. Geoconservation aims at the identification, protection and management of valuable elements of geodiversity

This theme relates especially to Arctic Biodiversity Assessment Policy Recommendation number 7 and implementation action for safeguarding biodiversity under changing environmental conditions.

The connection between geo- and biodiversity

- Geodiversity has been put forward as a novel, potentially useful approach to explore and understand biodiversity patterns
- Recent studies show that geodiversity contributes to biodiversity in boreal and arctic environments. For example:
 - Geodiversity is correlated with present biodiversity especially in natural-state environments (Tukiainen et al. 2017)
 - Geodiversity variables add explanatory power for threatened species richness models (Tukiainen et al. 2016)
- Geodiversity could be used as a coarse filter strategy for conserving biodiversity:

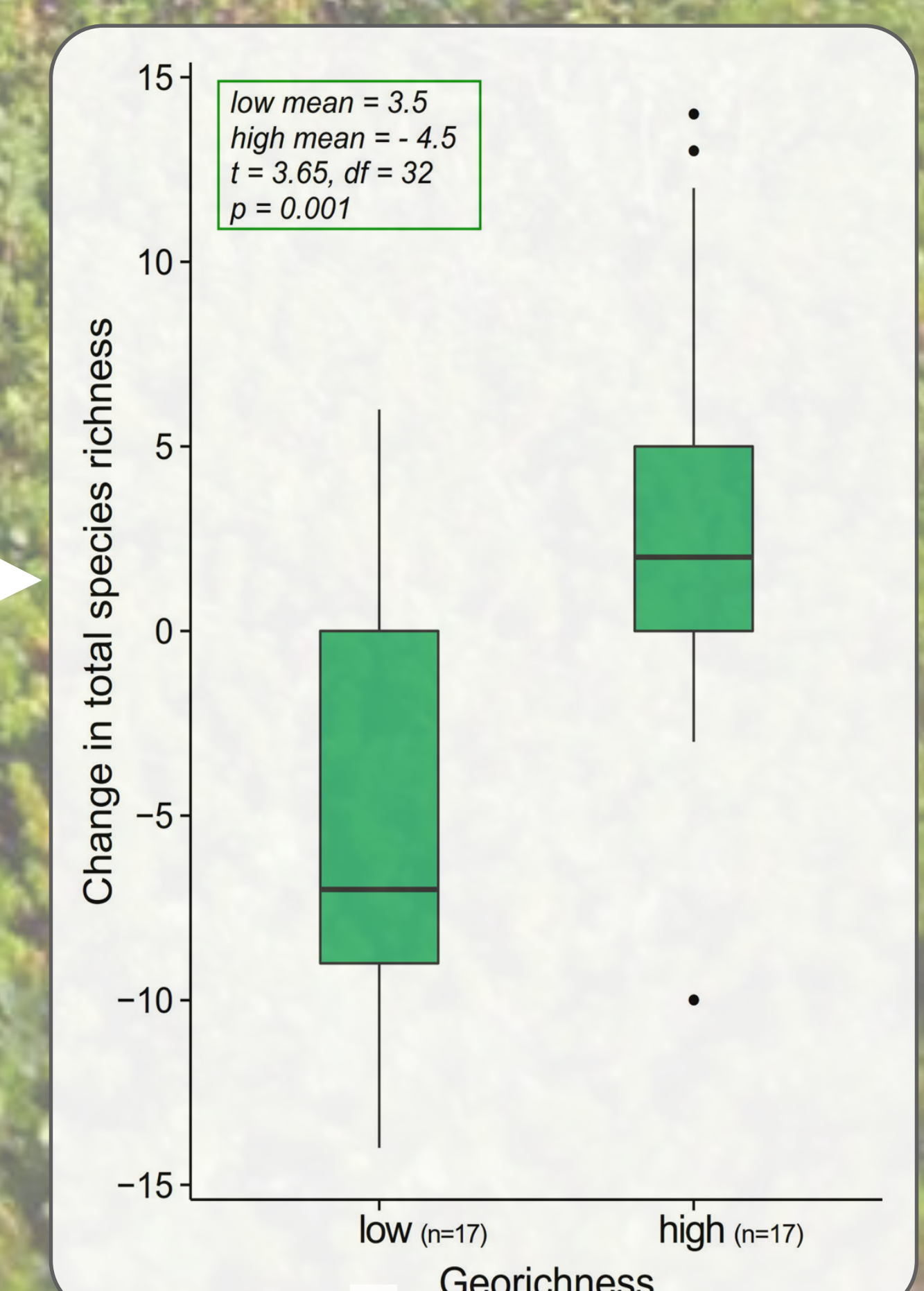
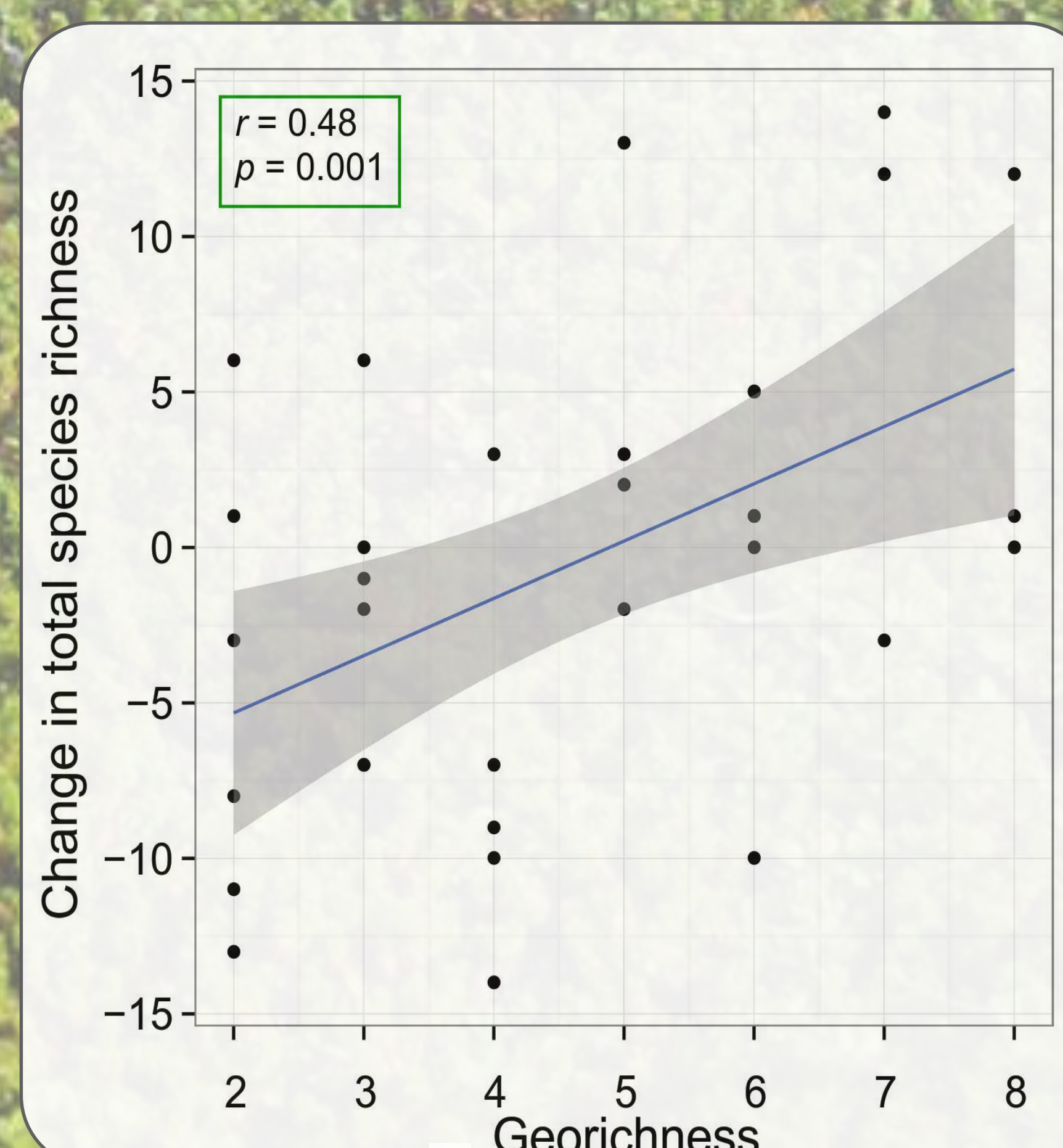
Conservation principle called **Conserving Nature's Stage** targets on areas with high geodiversity and that are potentially capable of supporting high biodiversity under environmental changes. Instead of single species or current biological communities of an area, the focus is on the physical structures that underlie biodiversity.



Preliminary **results** from an ongoing research which explores the connection between geodiversity and temporal changes in biodiversity of treeless heaths and tundra vegetation suggest that species richness tended to increase in sites with higher geodiversity (here, at > 4) under recent climatic warming. In turn, species richness in sites with lower geodiversity (at ≤ 4) rather decreased.

These results suggest that geophysically diverse landscapes not only support high biological diversity under changing climate but also enhance species richness.

Total species richness (vascular plants, bryophytes and lichens) was resurveyed from 2 x 2 m vegetation grids ($n = 34$) from 13 different fields around northern Finland. The original survey was conducted nearly 60 years ago (Haapasaari, 1988). Geodiversity of these sites was estimated from aerial pictures.



These patterns will be further explored at different spatial scales and habitats and for different aspects of biodiversity (e.g. beta diversity).

References:

- Haapasaari, M. (1988). *Acta botanica Fennica* 135, 1–219.
 Tukiainen, H. et al. (2016). *Conservation Biology* 31, 364–375.
 Tukiainen, H. et al. (2017). *Landscape Ecology* 32: 1049–1063