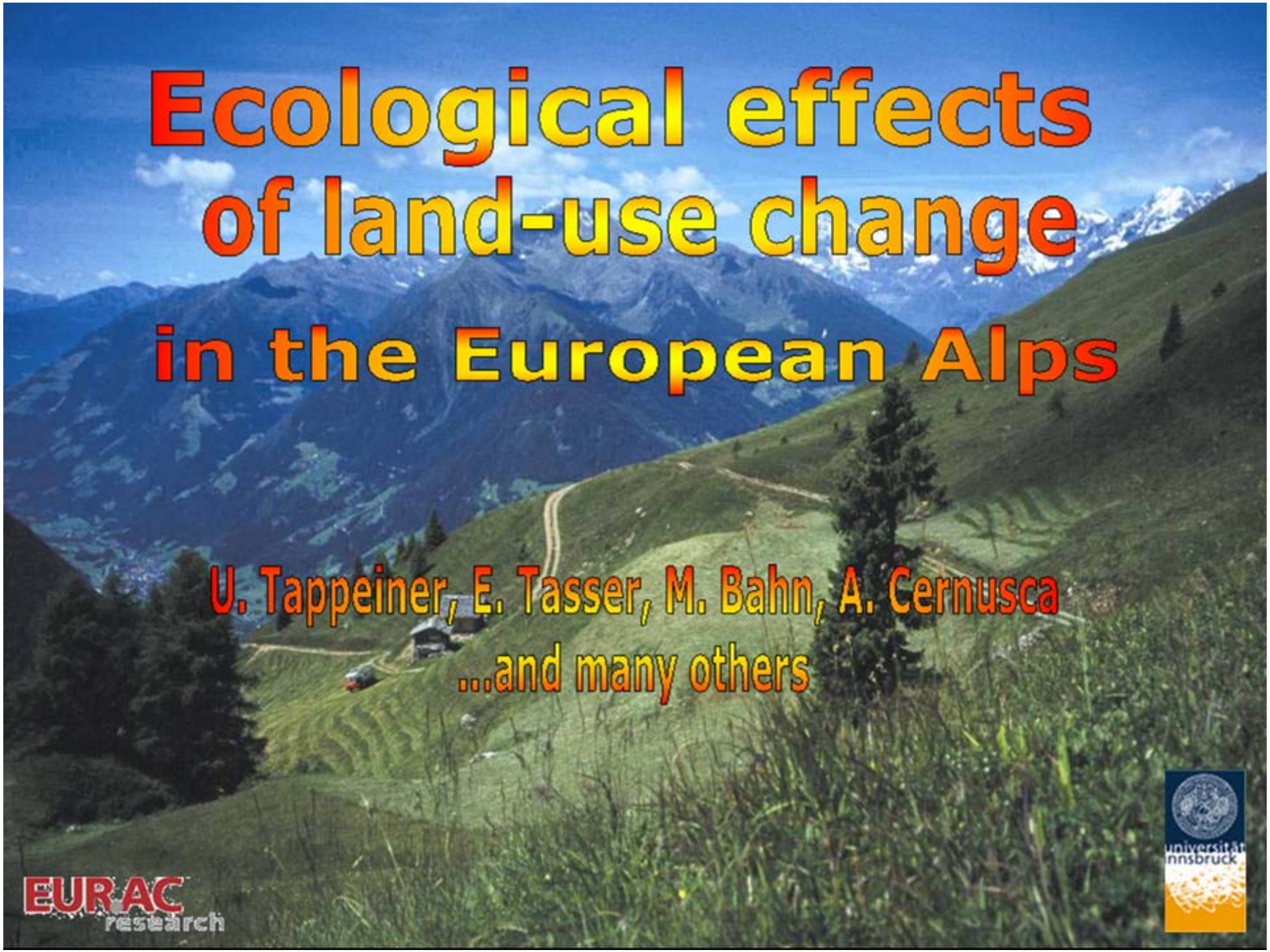
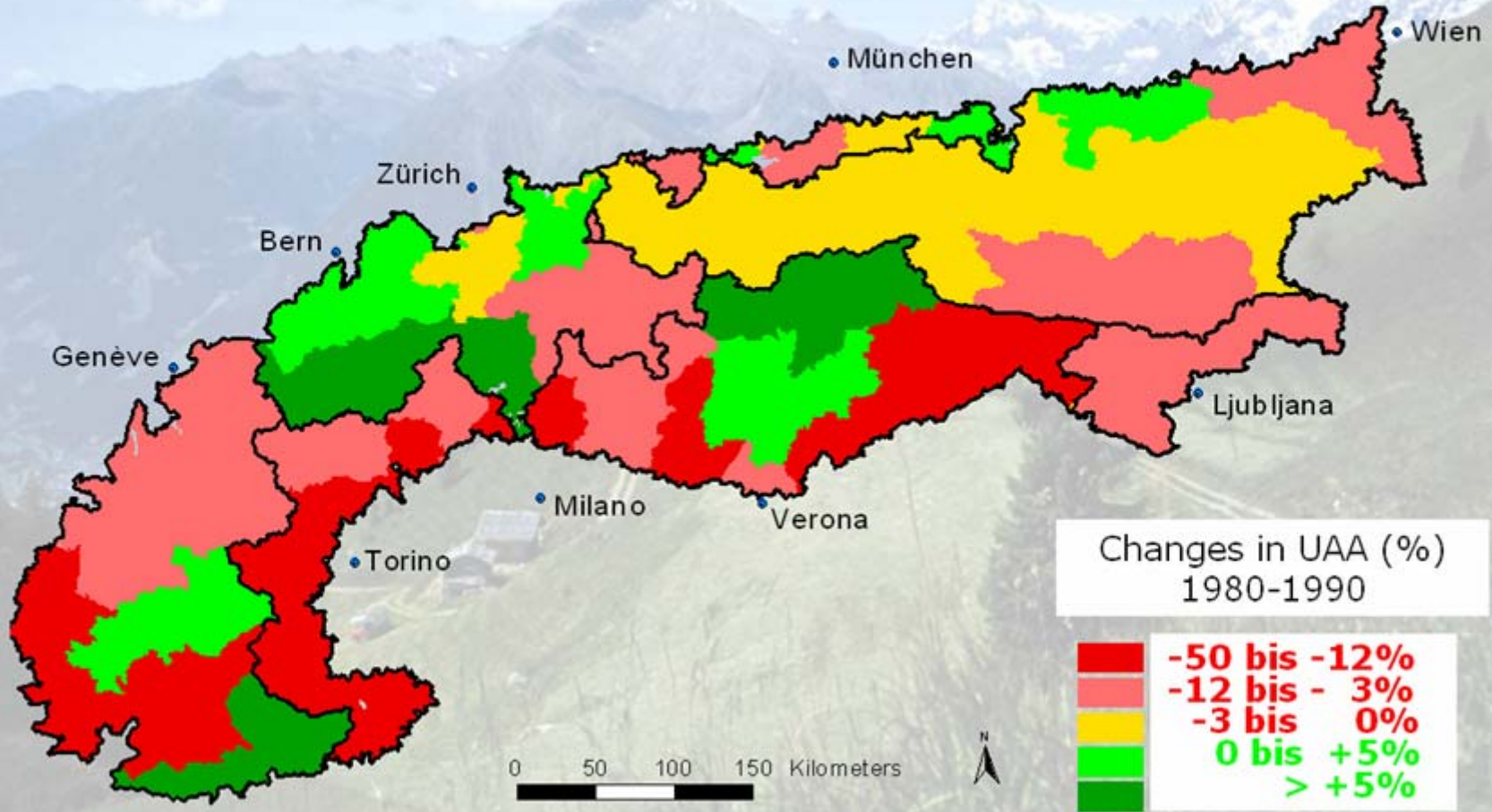

Ecological effects
of land-use change
in the European Alps
U. Tappeiner, E. Tasser, M. Bahn, A. Cernusca
...and many others
EURAC
research
universität
innsbruck

Problem
1. Rapid land-use changes in the European Alps
2. What are the main consequences of these agro-economic developments on ecosystems and the landscape?

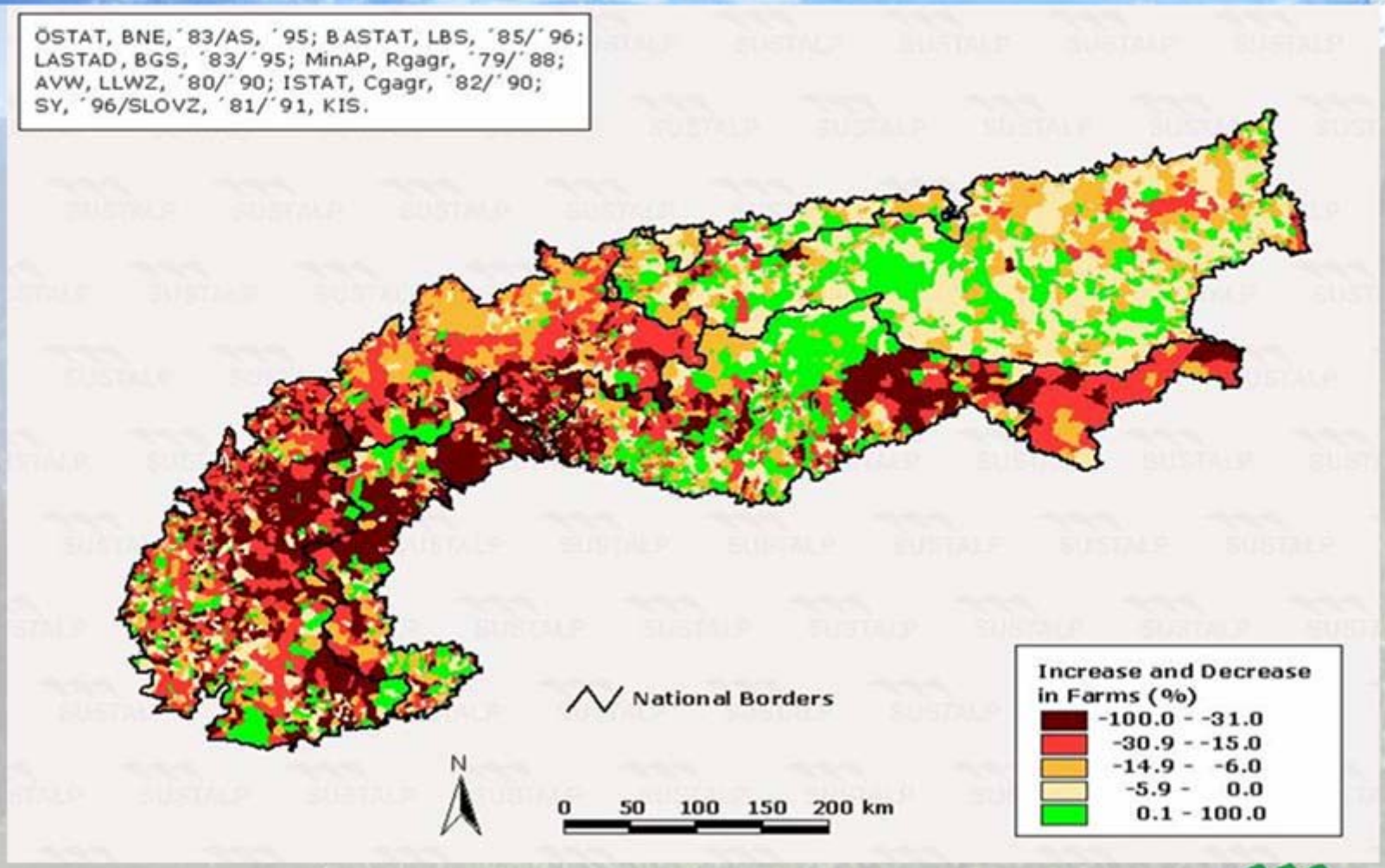
Change in utilised agricultural area in the Alps in 10 years



Tappeiner et al. (2003) Blackwell Science, Berlin

SUSTALP
ENV4-97-0442

Farm abandonment in the Alps in 10 years

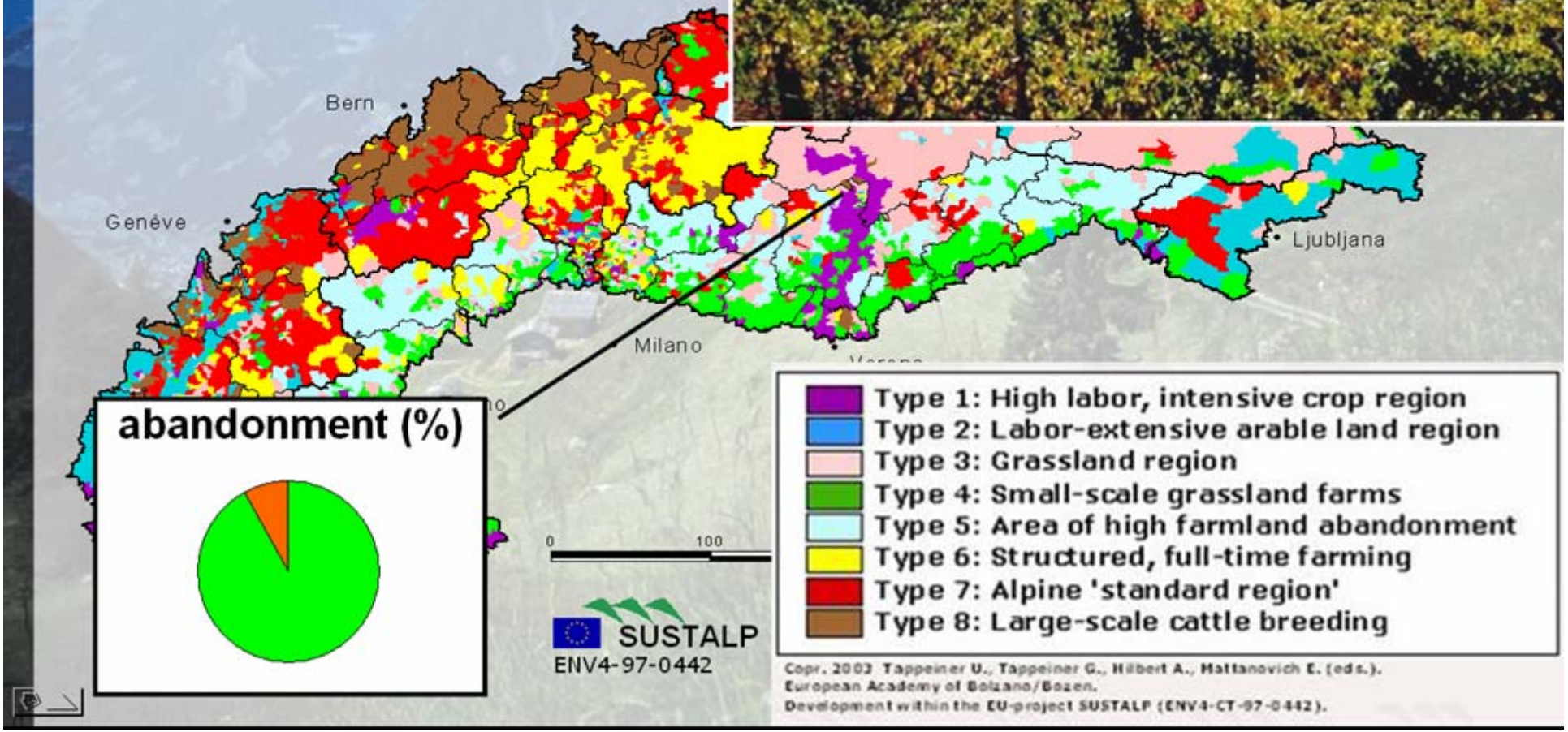


Tappeiner et al. (2003) Blackwell Science, Berlin

SUSTALP
ENV4-97-0442

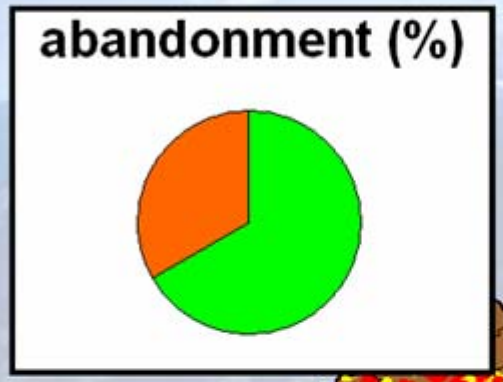
Abandoned areas in the last 150 years

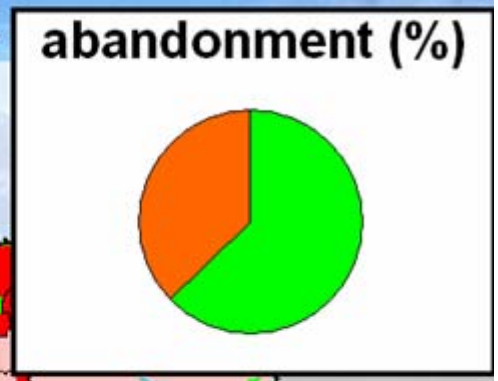
8 agrarian structure regions
In the European Alps

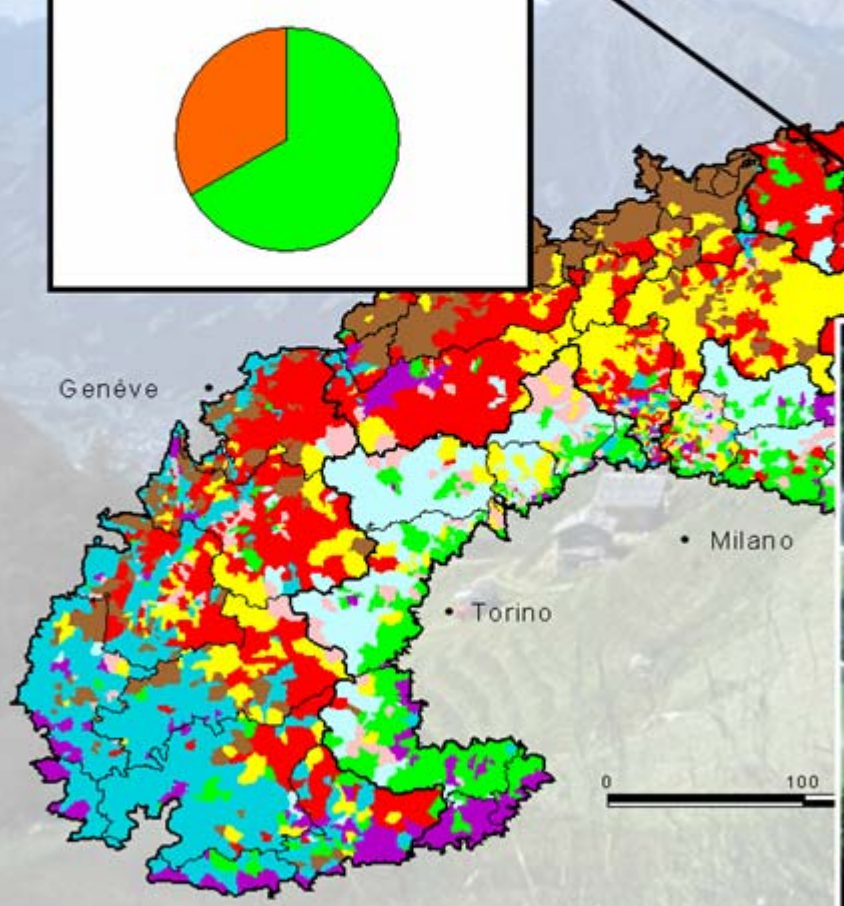


Copr. 2003 Tappeiner U., Tappeiner G., Hilbert A., Mattanovich E. (eds.).
European Academy of Bolzano/Bozen.
Development within the EU-project SUSTALP (ENV4-CT-97-0442).

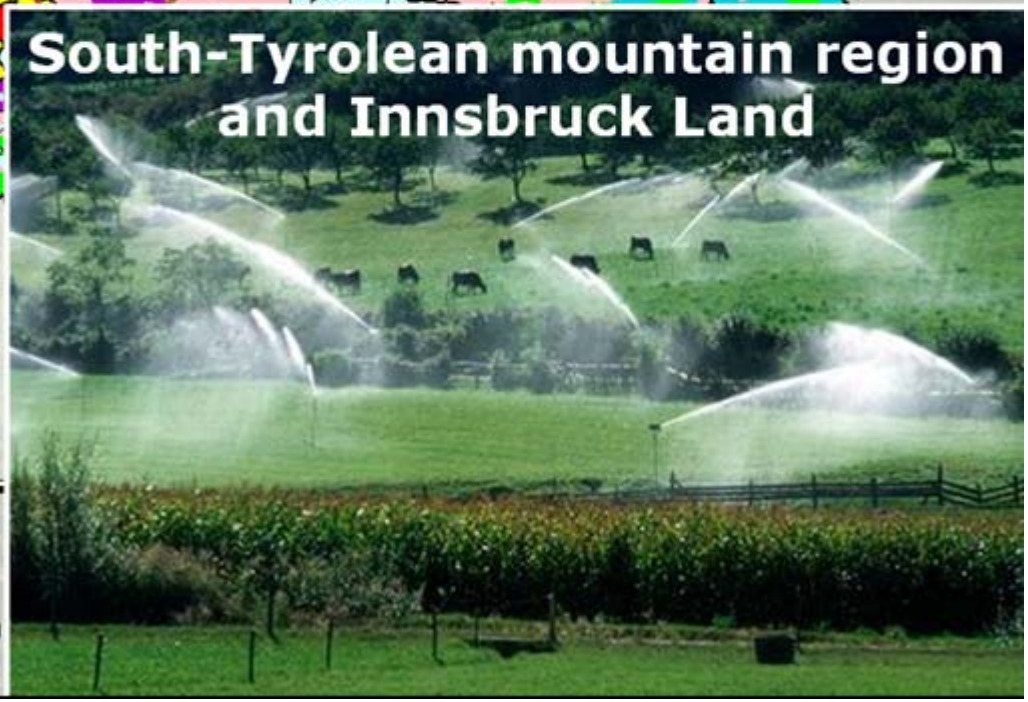
Abandoned areas
in the last 150 years



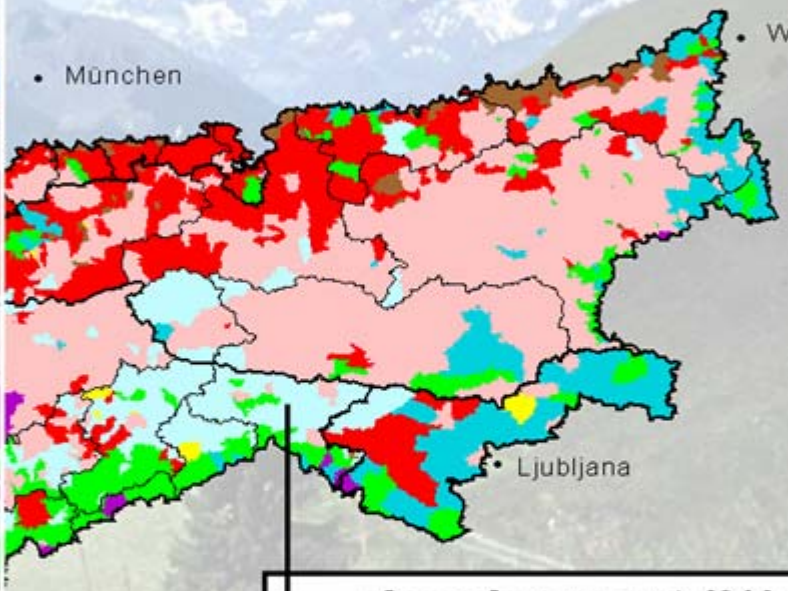


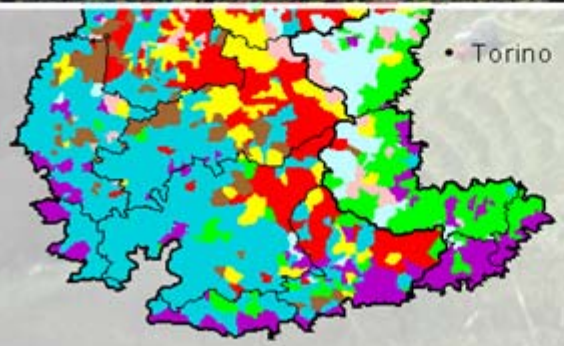


Tappeiner et al. (2003) Blackwell Science, Berlin

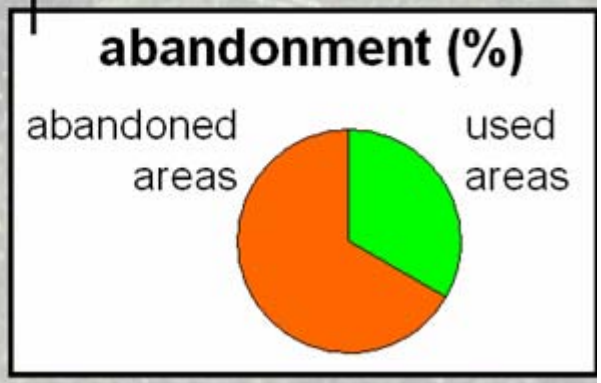


Abandoned areas
in the last 150 years





0 100 200 Kilometers



Tappeiner et al. (2003) Blackwell Science, Berlin

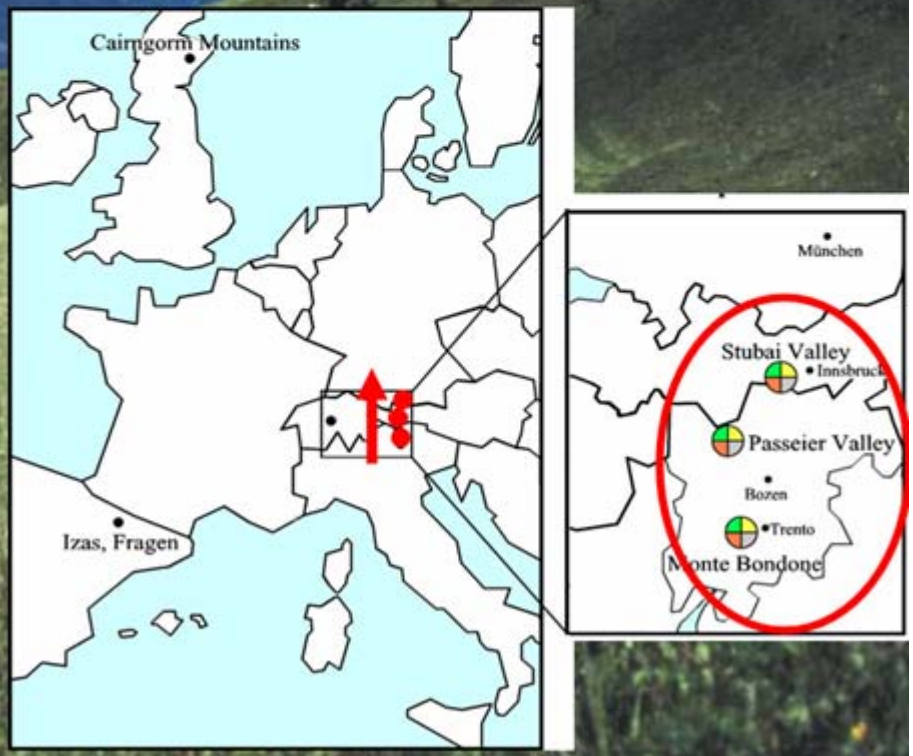
- **Results from several FP4, FP5 and INTERREG projects**

SUSTALP
ENV4-CT97-0442

INTERREG
INTEGRALP

ECOMONT
ENV4-CT95-0179

CARBOMONT
EVK2-CT2001-00125



- **Investigations in Mountain areas along European transects**
- **SFT Studies**

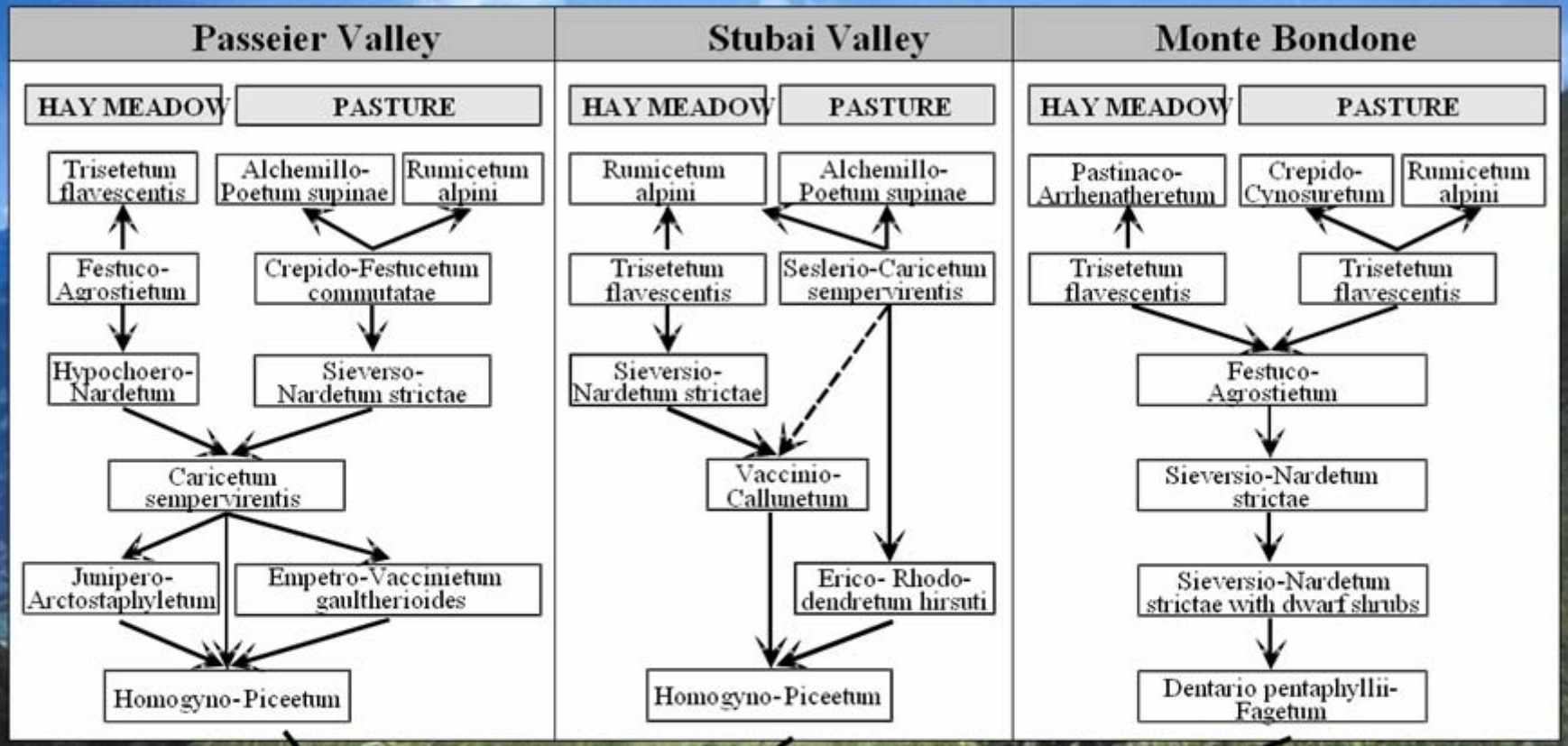
Research topics

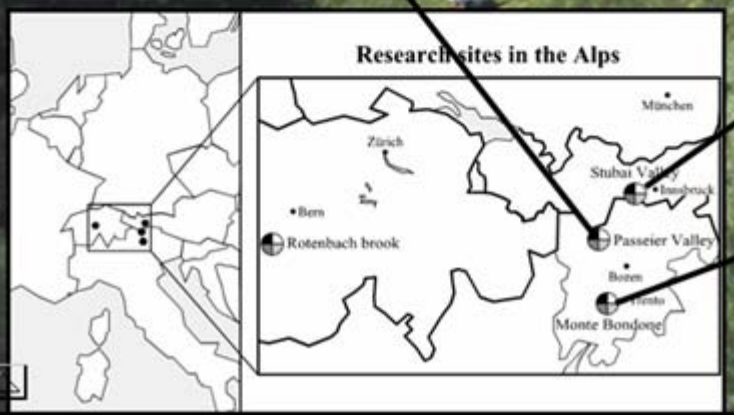
Land use

Effects on species, ecosystem and landscape processes :

- **Diversity**
- **Bio-geochemical and hydrological cycles**
- **Potential risks – natural hazards**

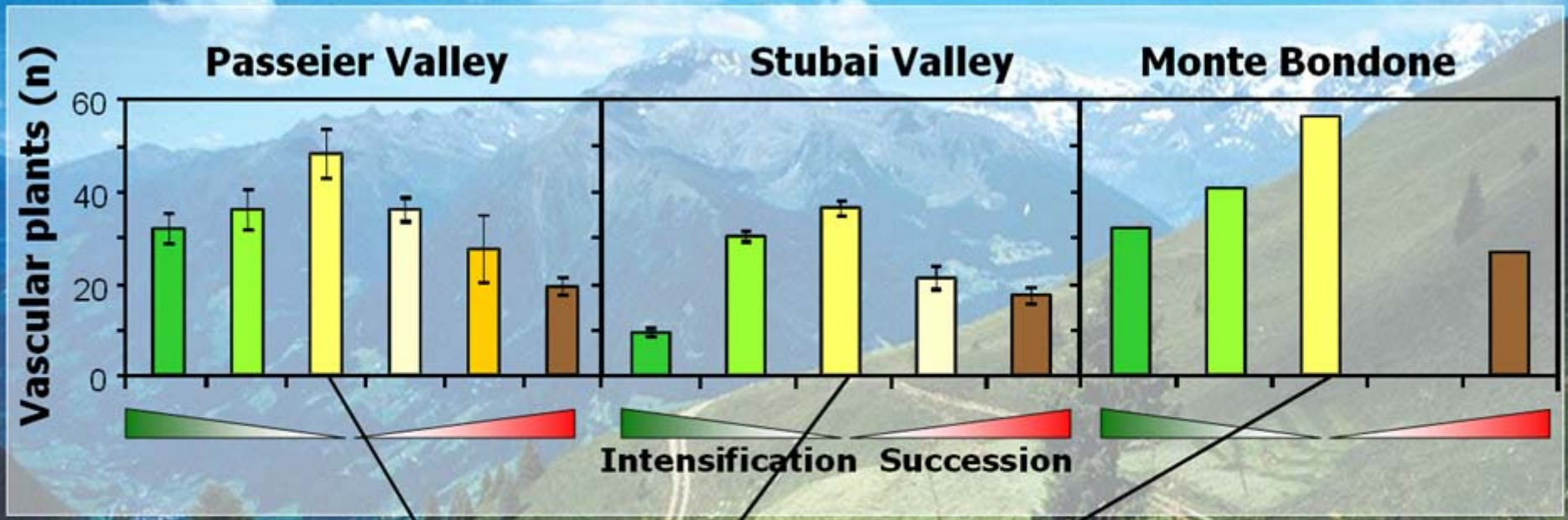
Succession

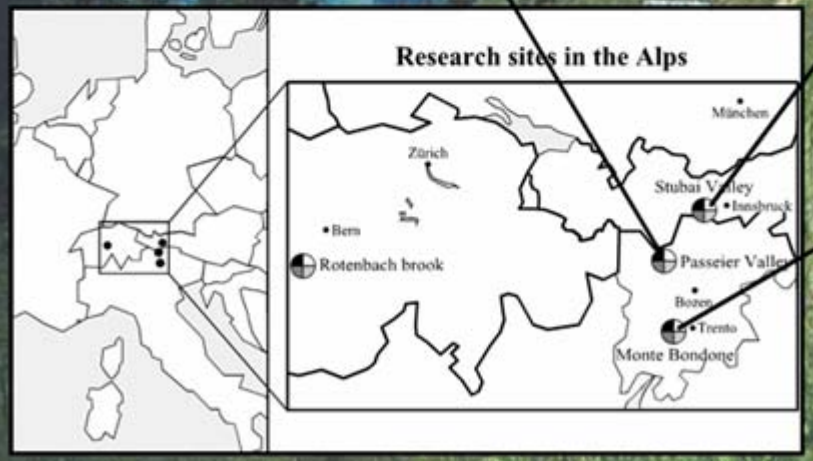




Tasser & Tappeiner (2002) Appl Vegetation Sci

Biodiversity





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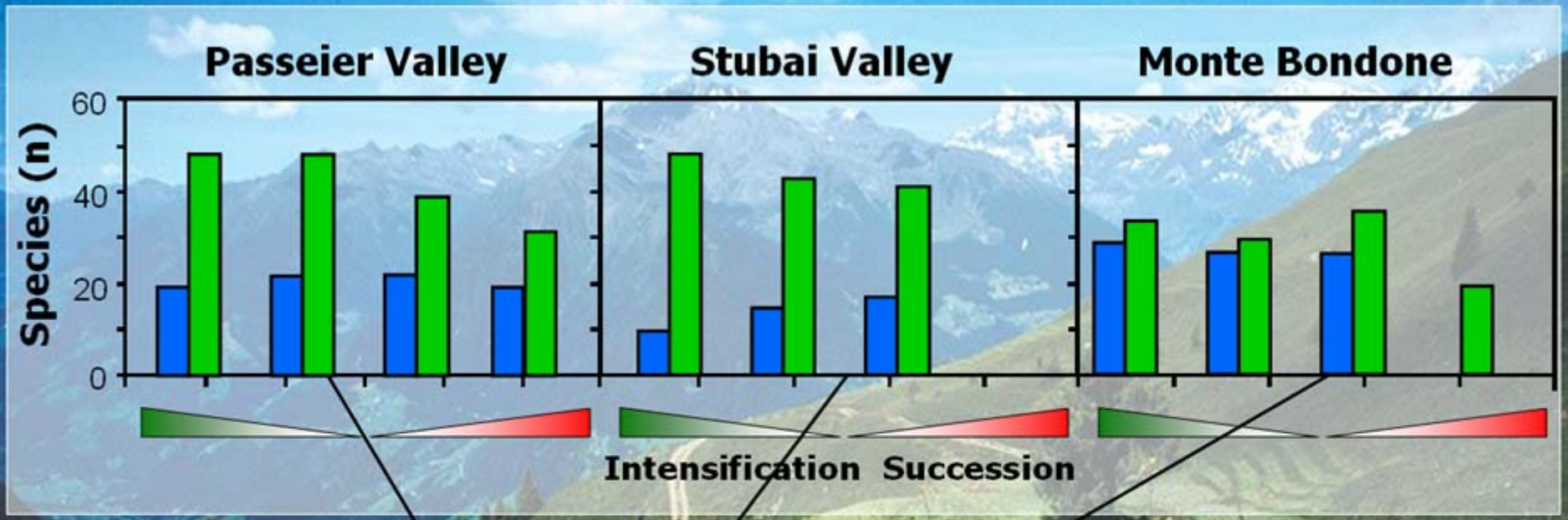
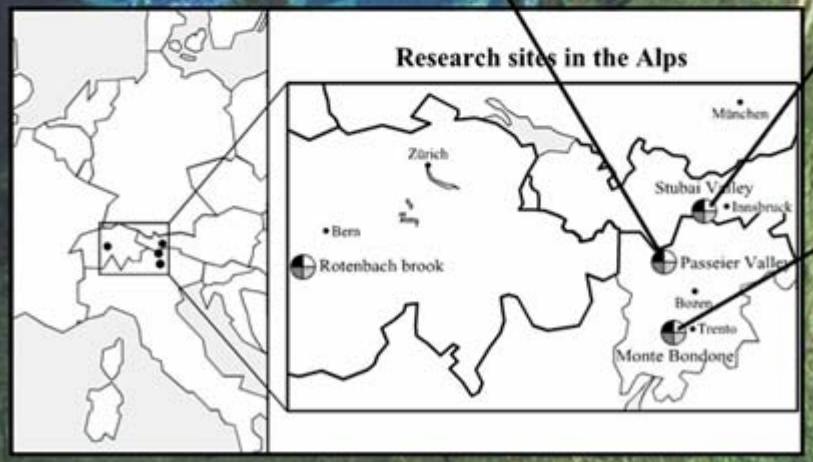
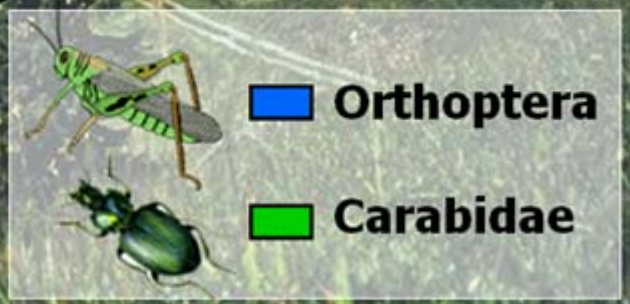
Biodiversity



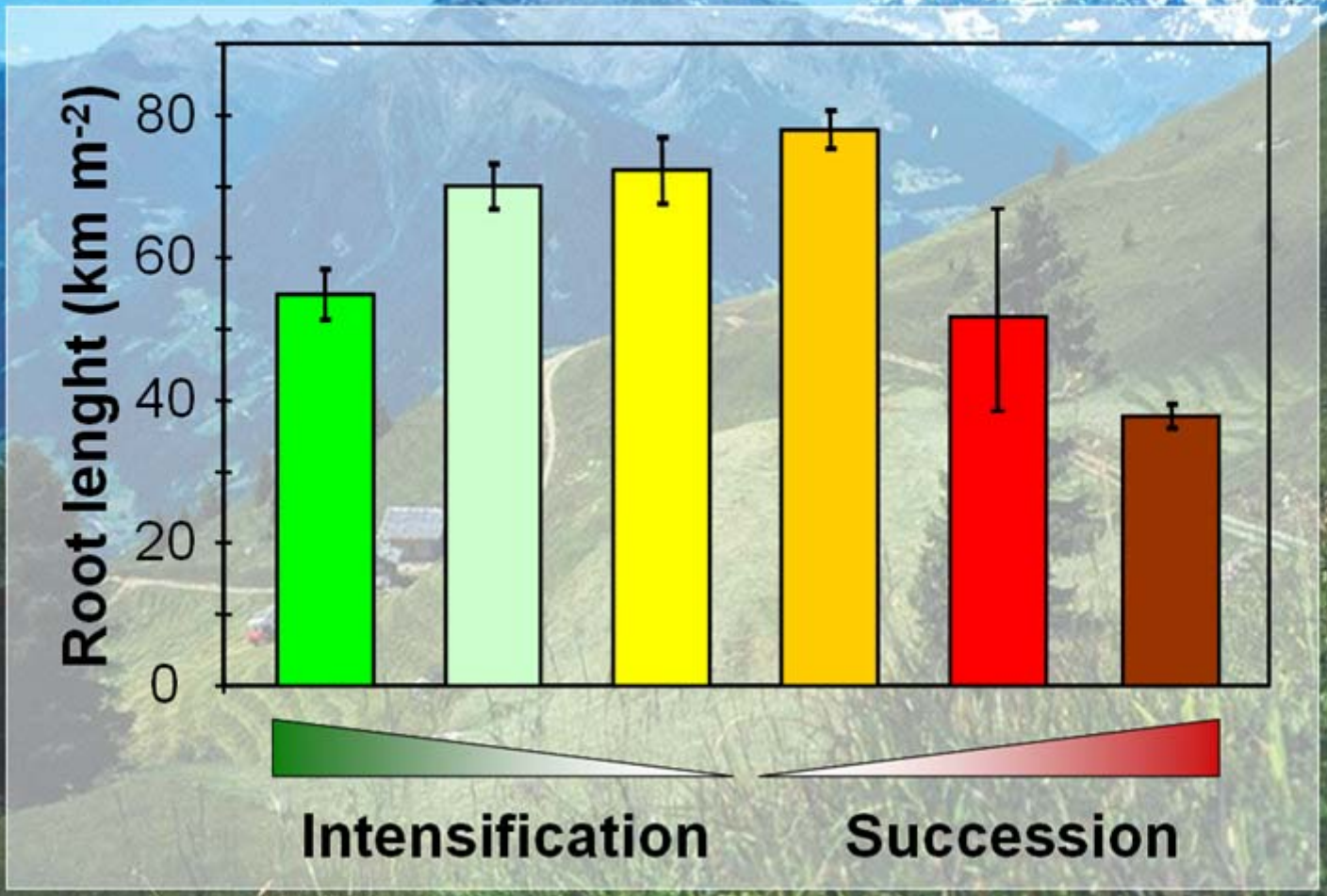




Guido & Gianelle (2001), Acta Oecologica

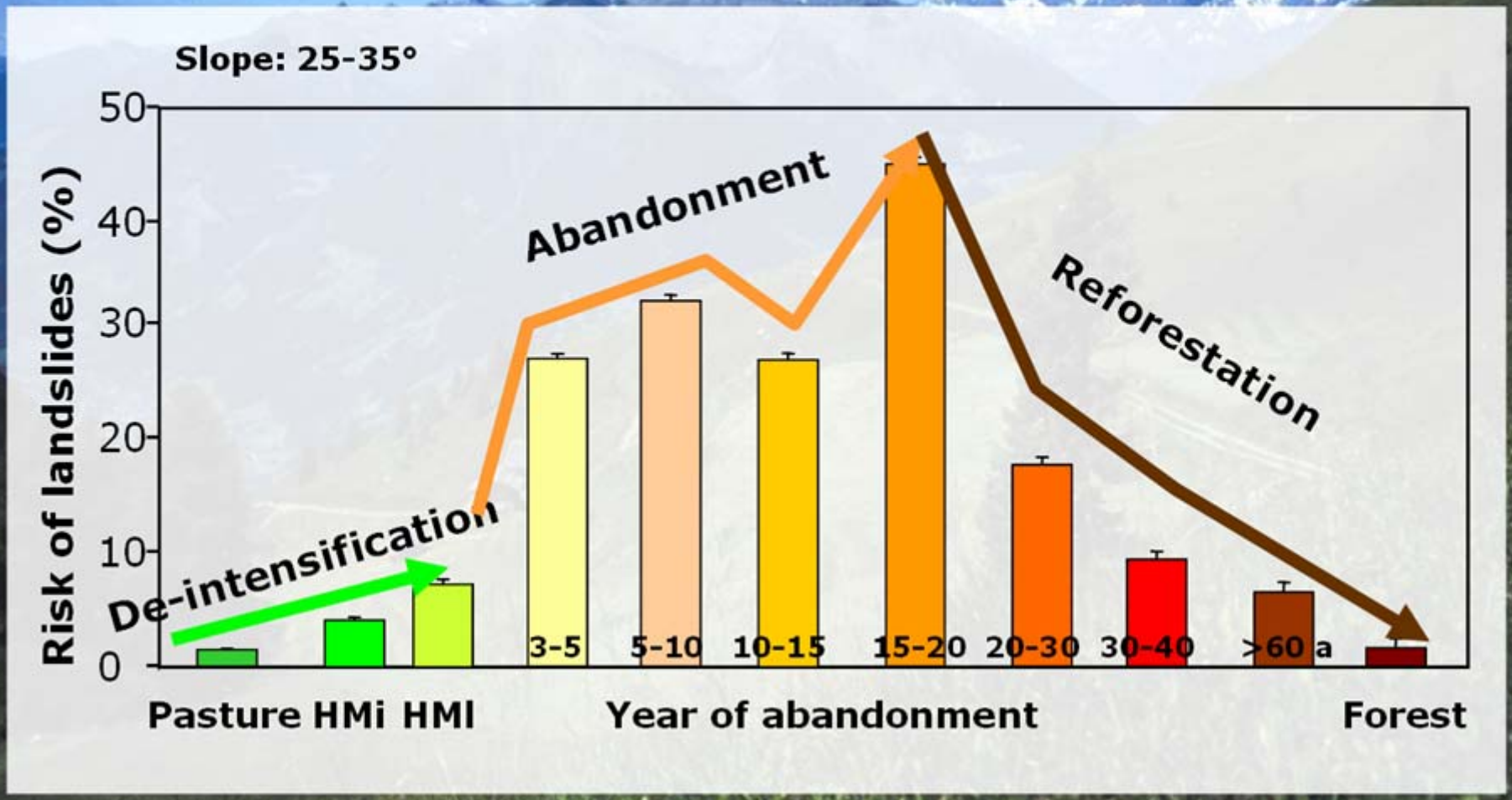
Root diversity and density

=> Stability?



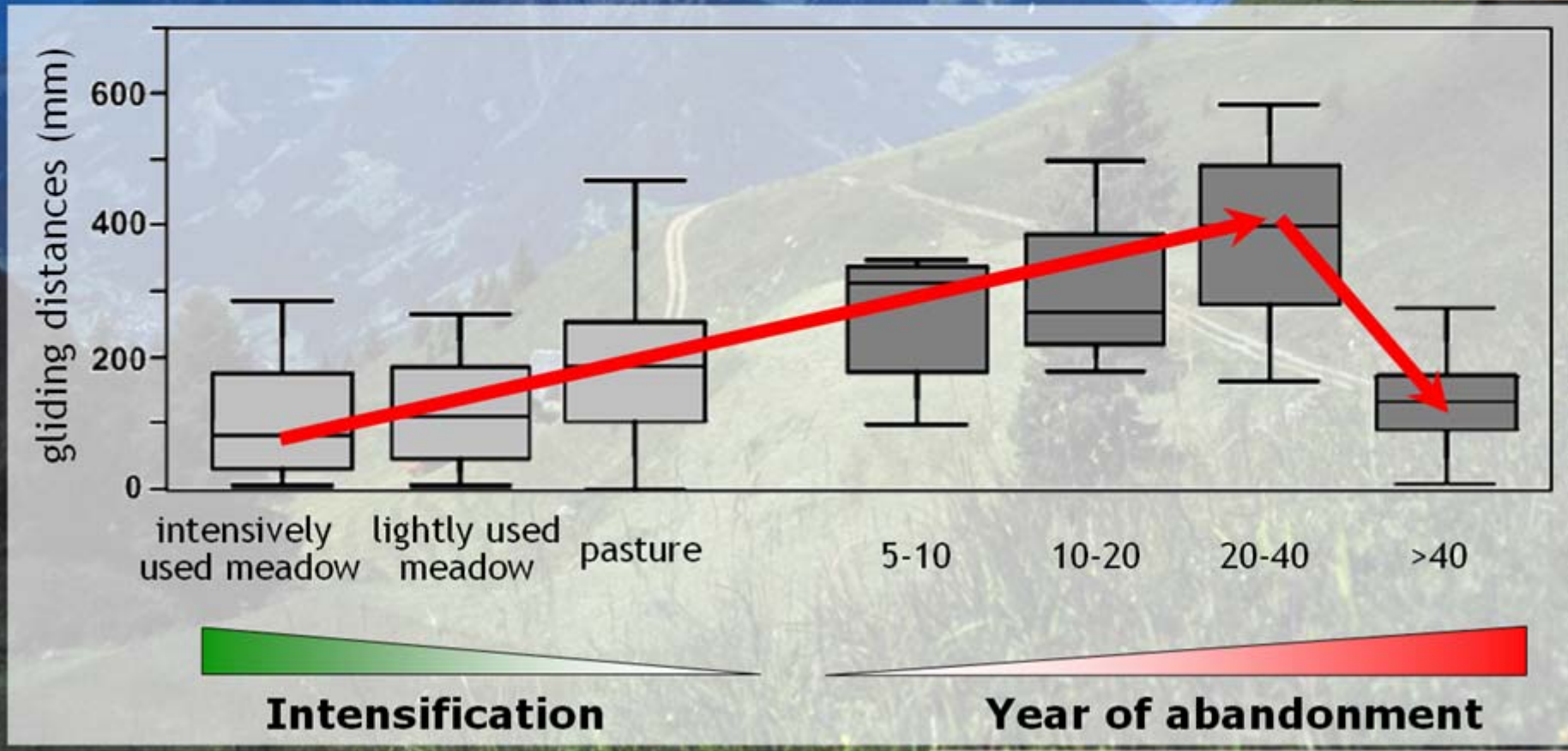
Tasser, Tappeiner, Cernusca (2001)

Hillslope erosion



Tasser, Mader, Tappeiner (2003), Basic Appl Ecol

Snow gliding



Tasser, Tappeiner, Cernusca (2004), Springer

Research topics

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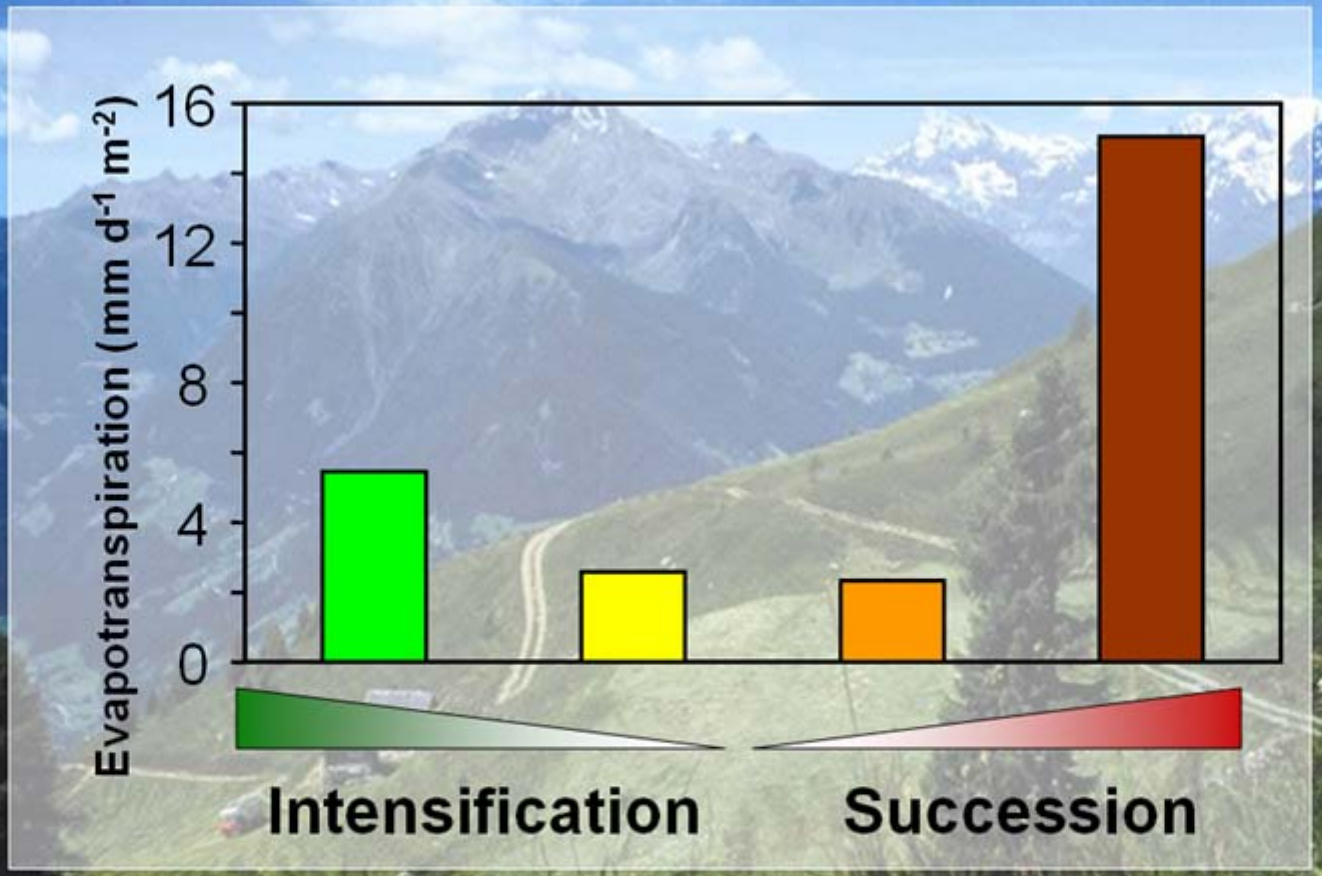
Effects on species, ecosystem and landscape processes :

- Diversity
- Bio-geochemical and hydrological cycles
- Potential risks – natural hazards

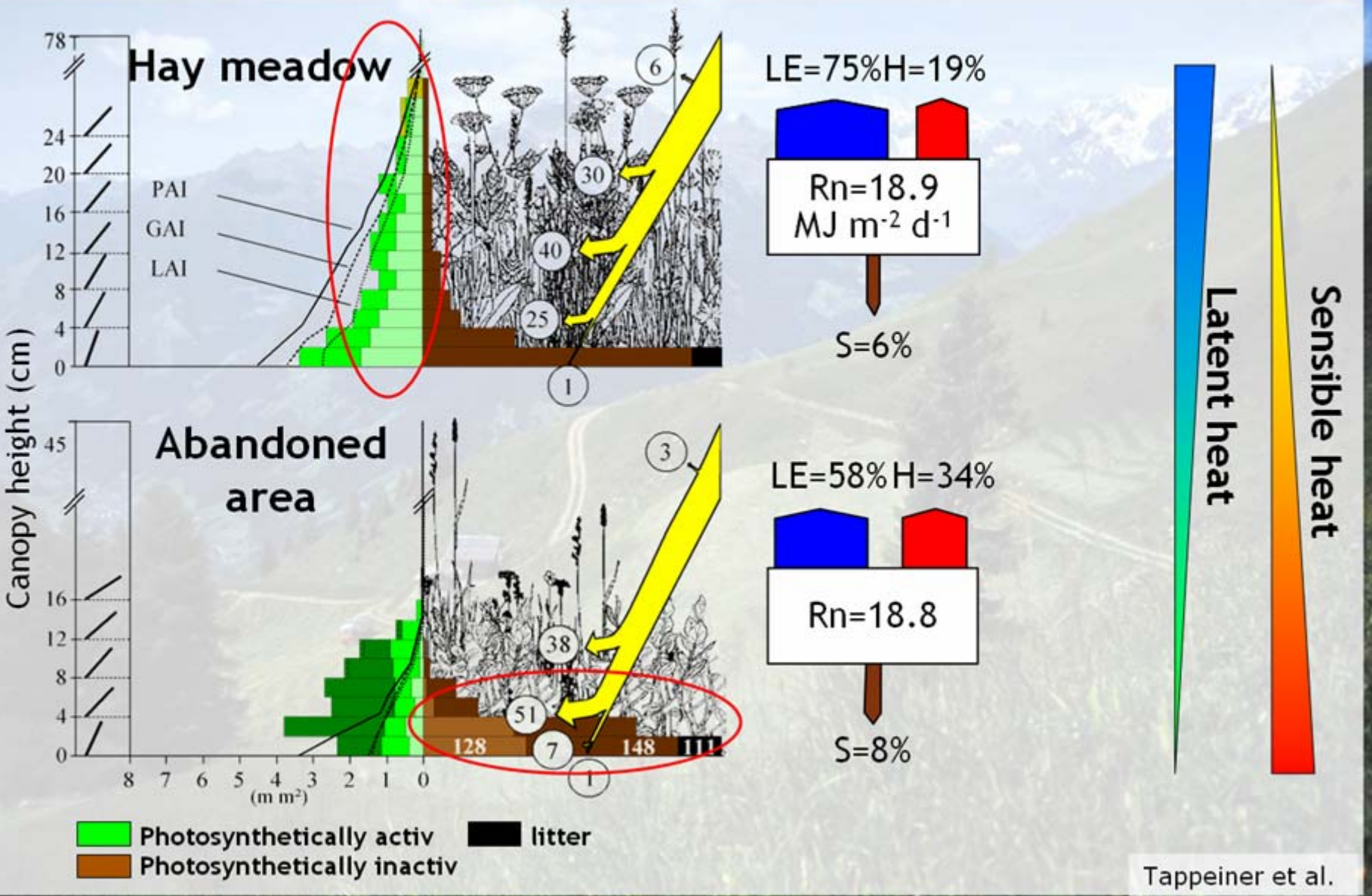
Water balance



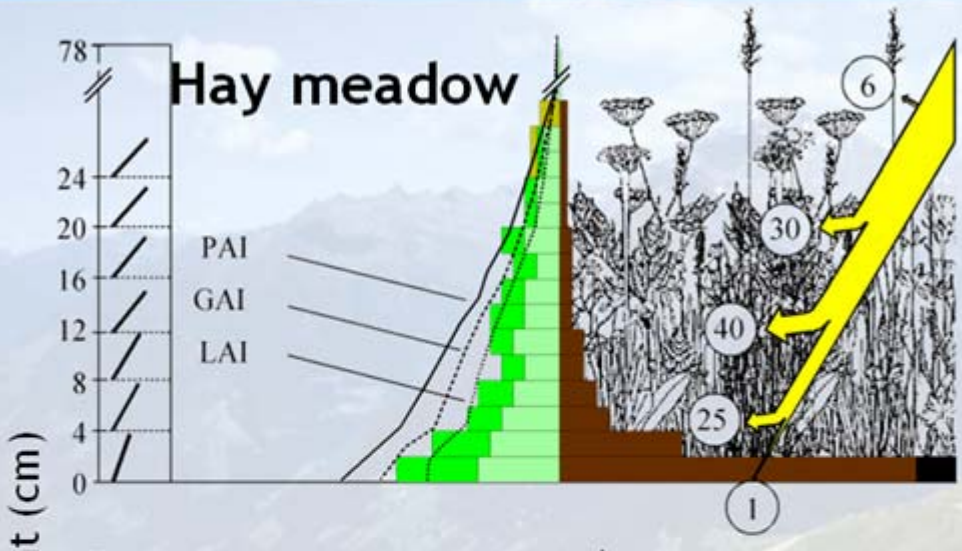
- **Reforestation: 7 - 50% reduction of discharge in single creeks**
- **Lower gain in hydroelectric energy?**

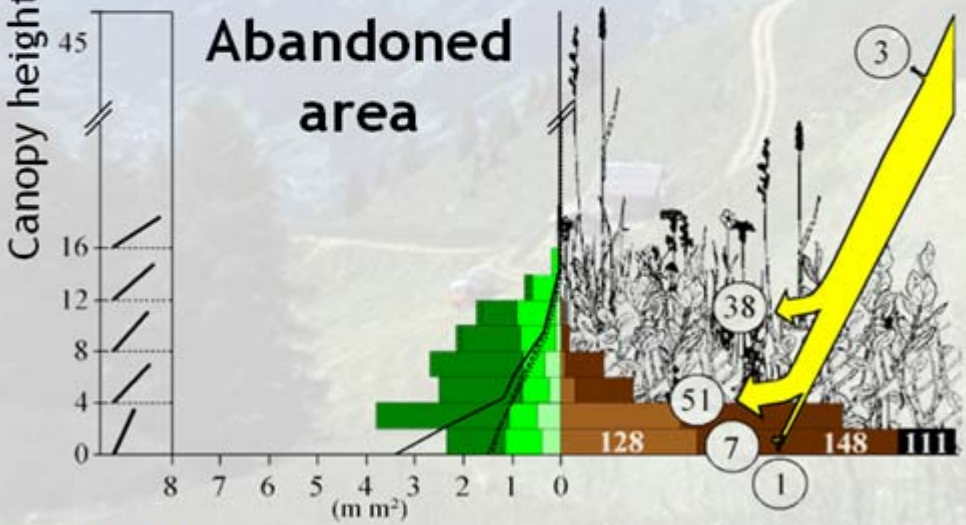
Tasser, Tappeiner, Cernusca (2001)

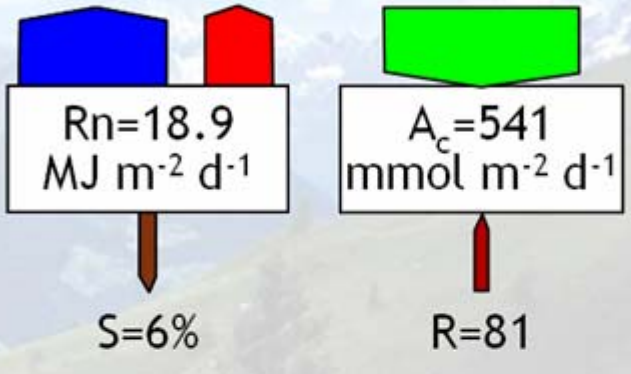
Canopy structure and energy budget

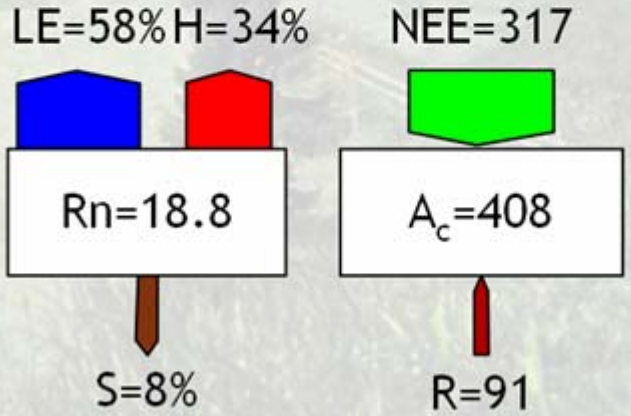


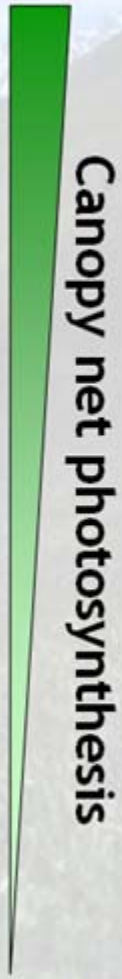
Energy budget and CO2 exchange







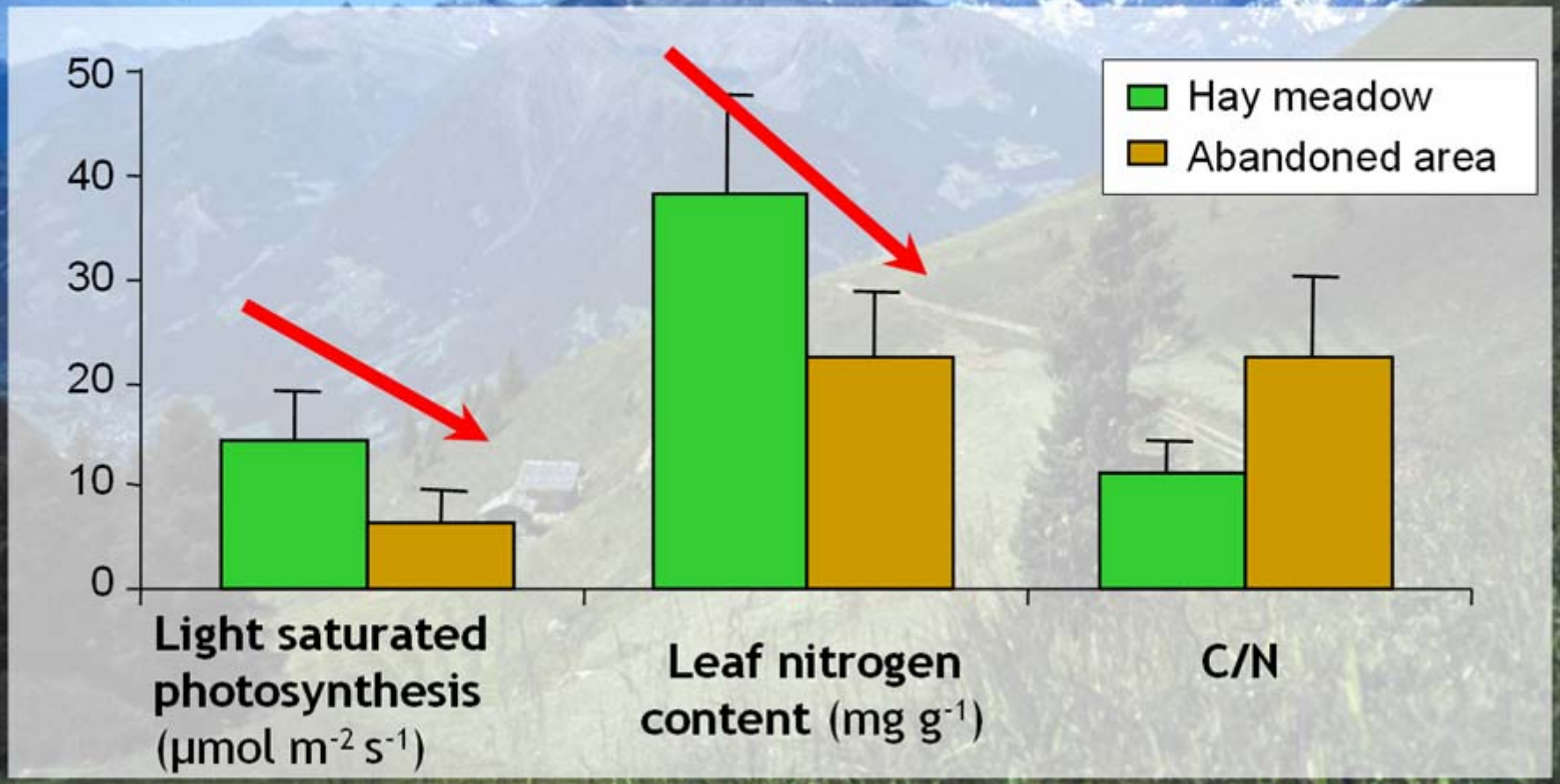




Photosynthetically activ
Photosynthetically inactiv
litter

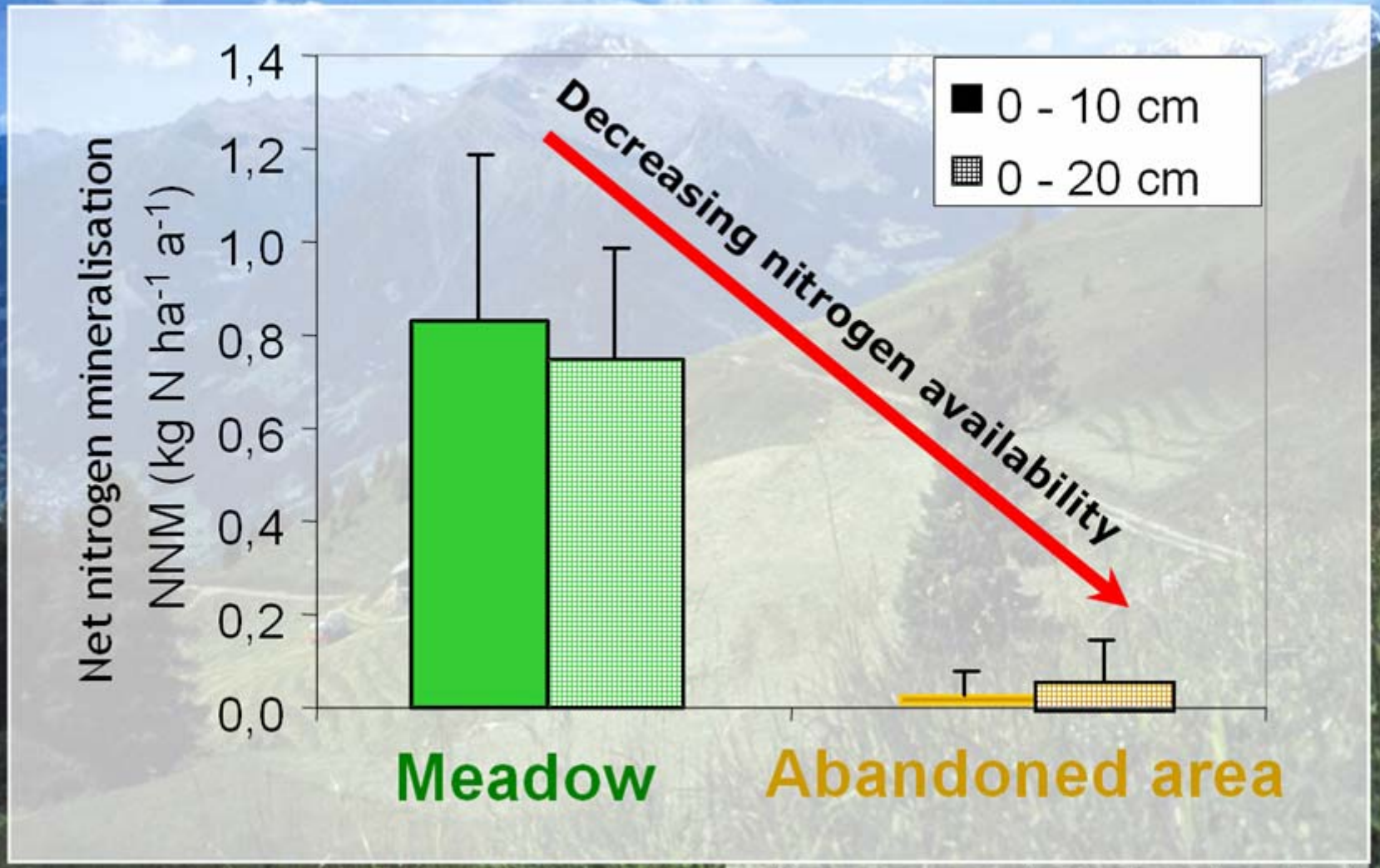
Tappeiner et al.

Leaf photosynthesis and nitrogen content



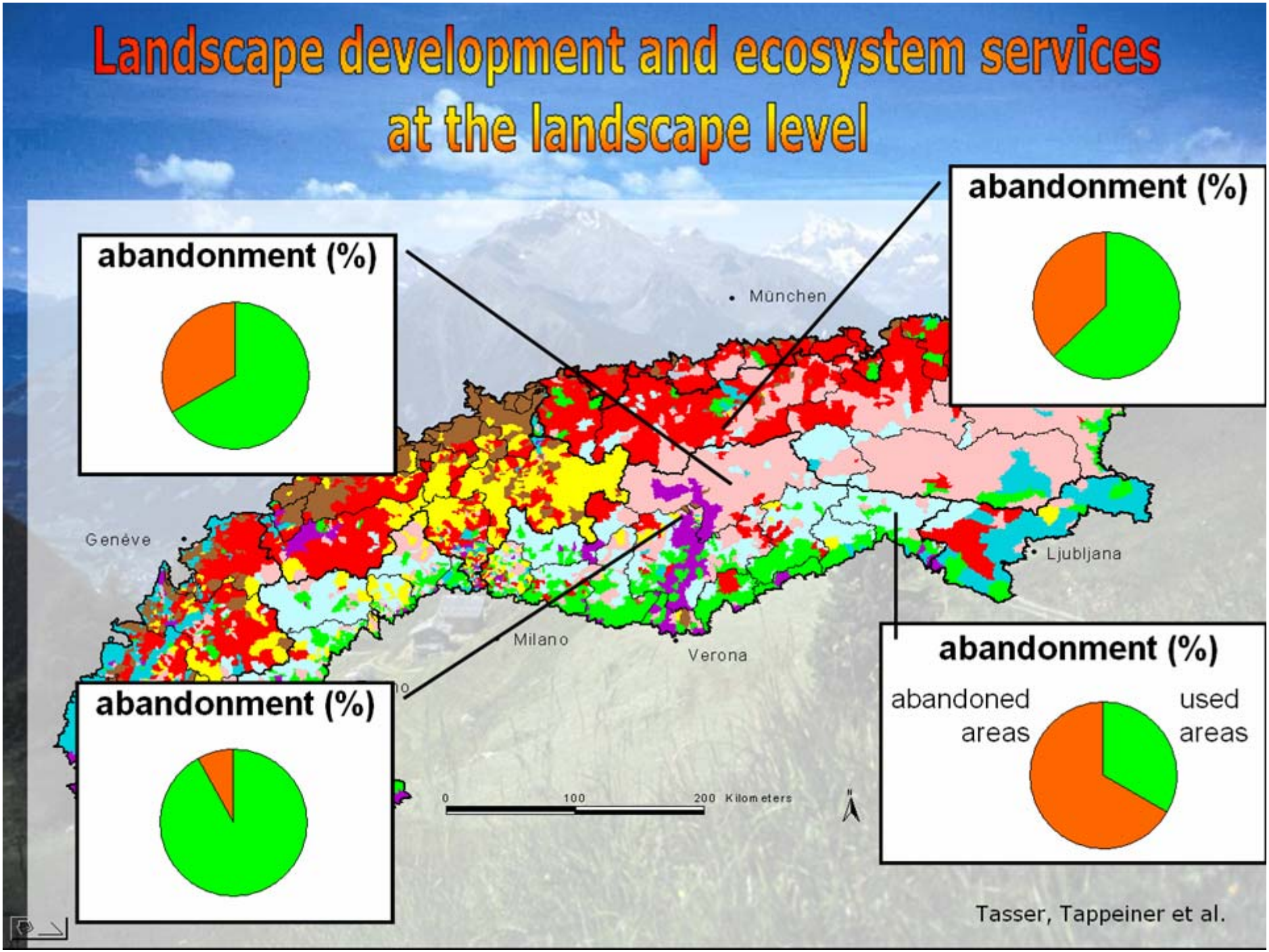
Bahn, et al.

Nutrient supply

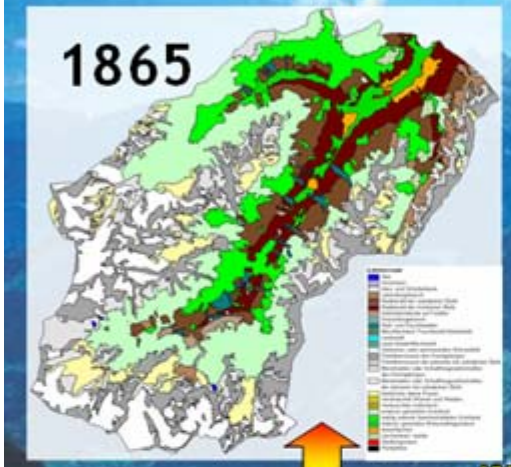


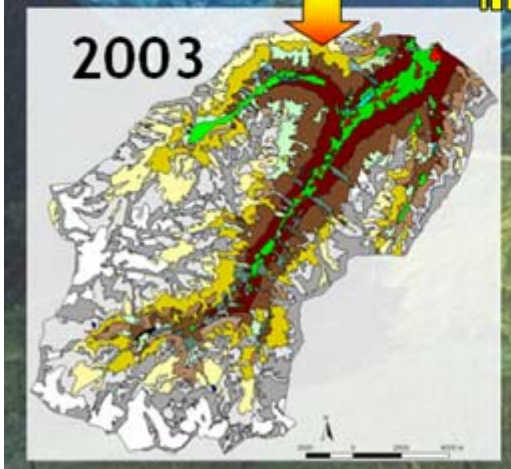
Zeller, Tappeiner et al. (2000), Biol Fertil Soil

Landscape development and ecosystem services at the landscape level



Landscape development and ecosystem services at the landscape level



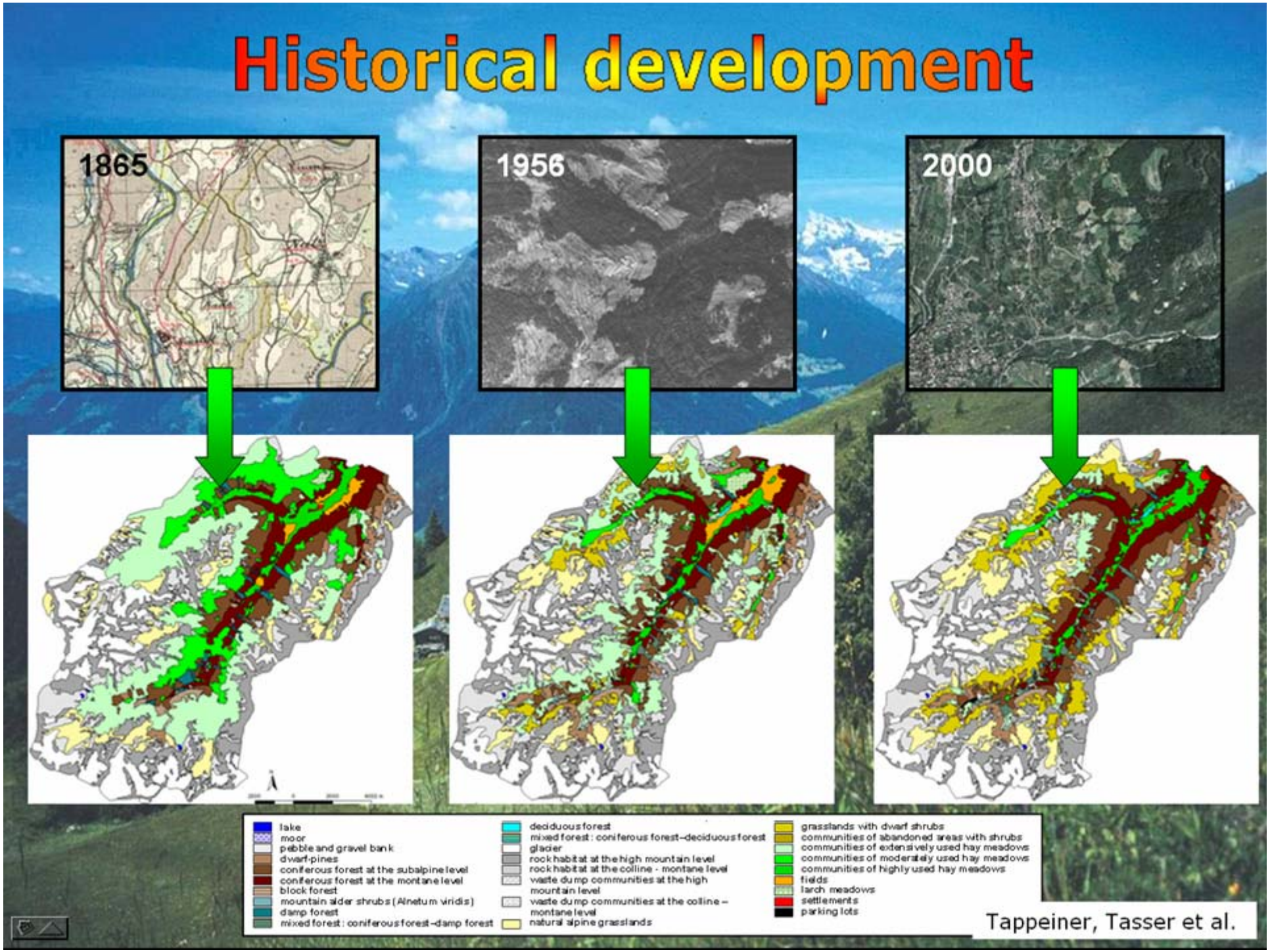


2030 ?

Scenarios of land-use change + GIS-based Ecosystem models

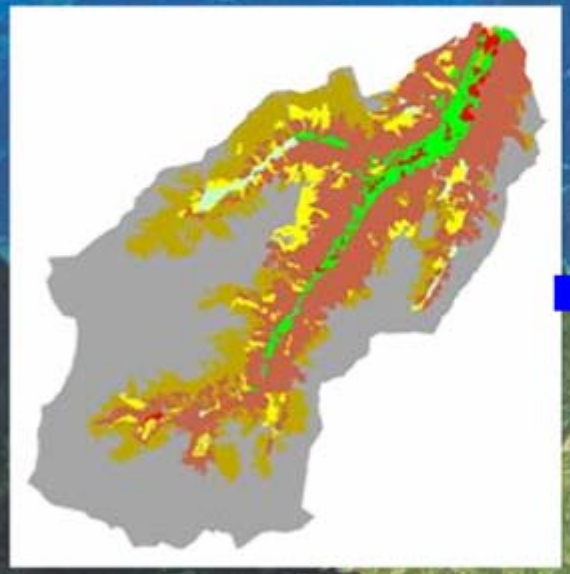
- C-fluxes
- C / N-pools
- Biodiversity

Historical development



Land-use scenarios

2000

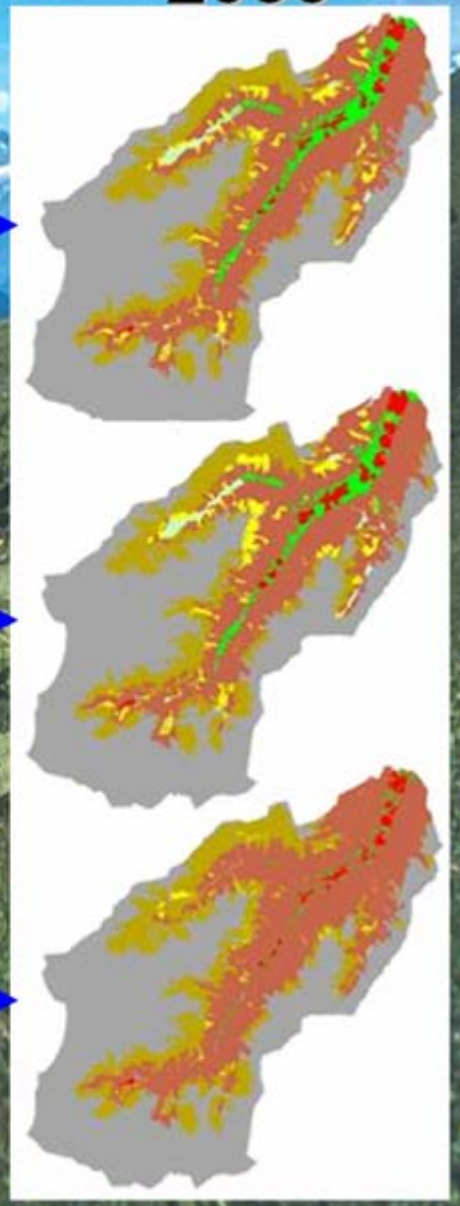


Transition matrices

Stakeholder workshop

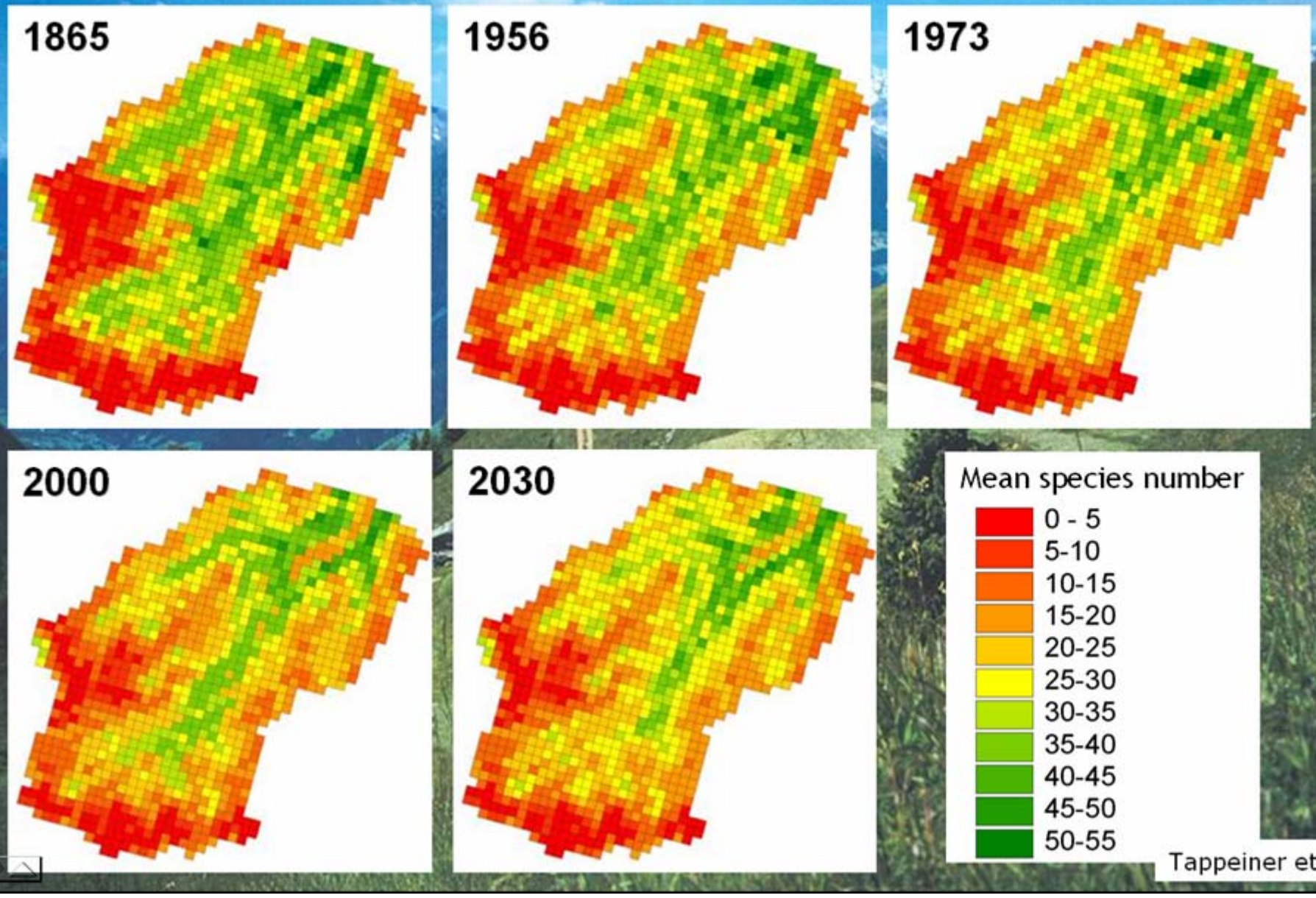
Agro-economic model

2030



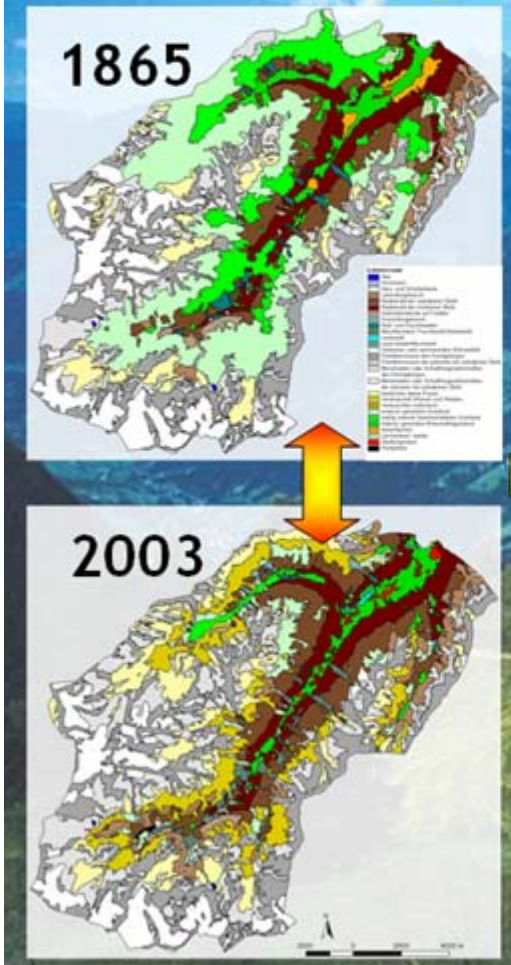
Tappeiner et al.

Changes of biodiversity



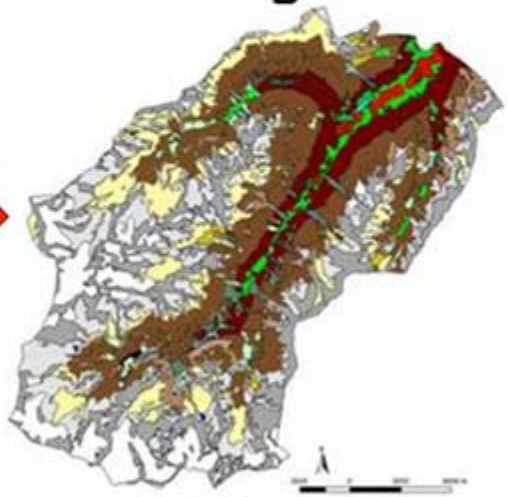
Landscape development and ecosystem services at the landscape level

Land-use changes



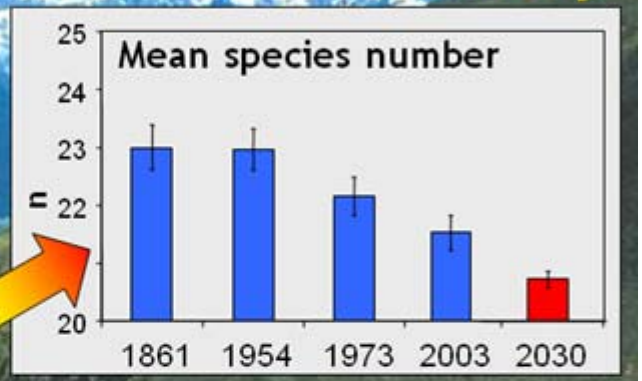
2030 ?

Scenarios of land-use changes

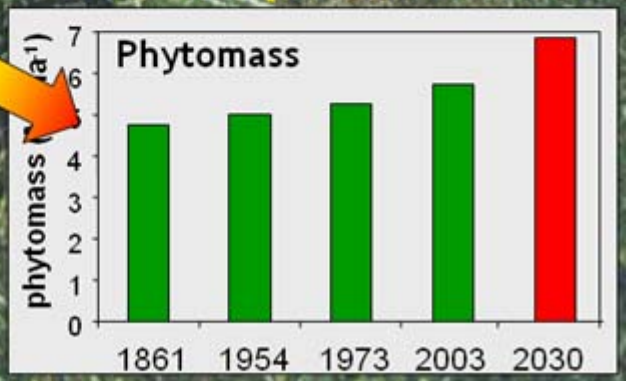


GIS-based ecosystem models

Biodiversity



C-Sequestration



Tappeiner et al.