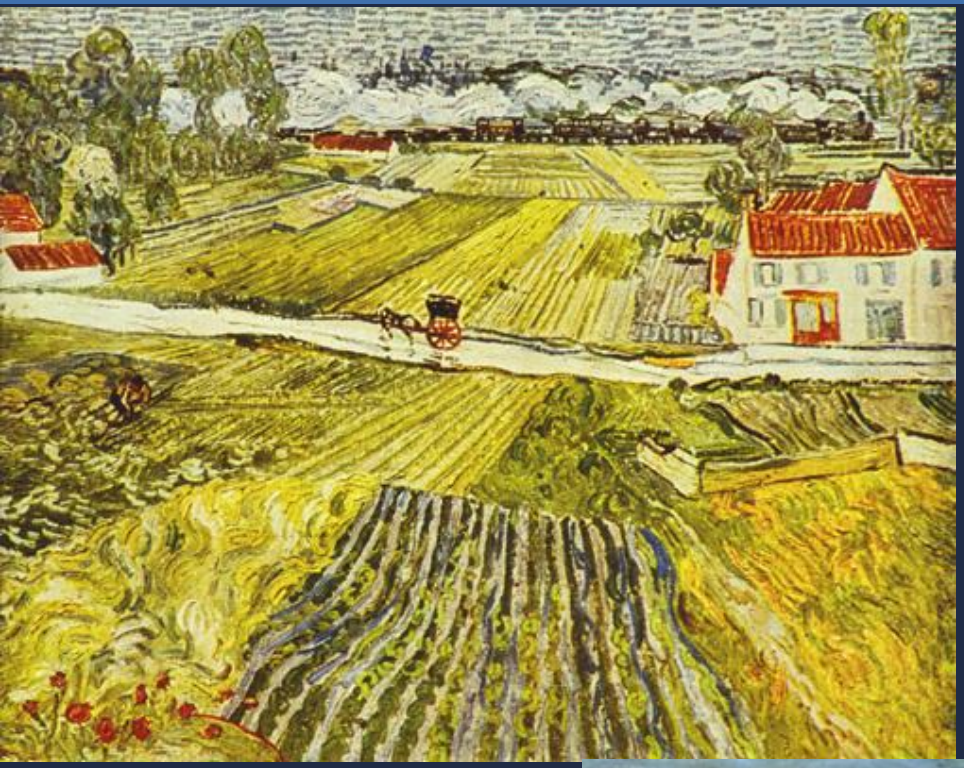
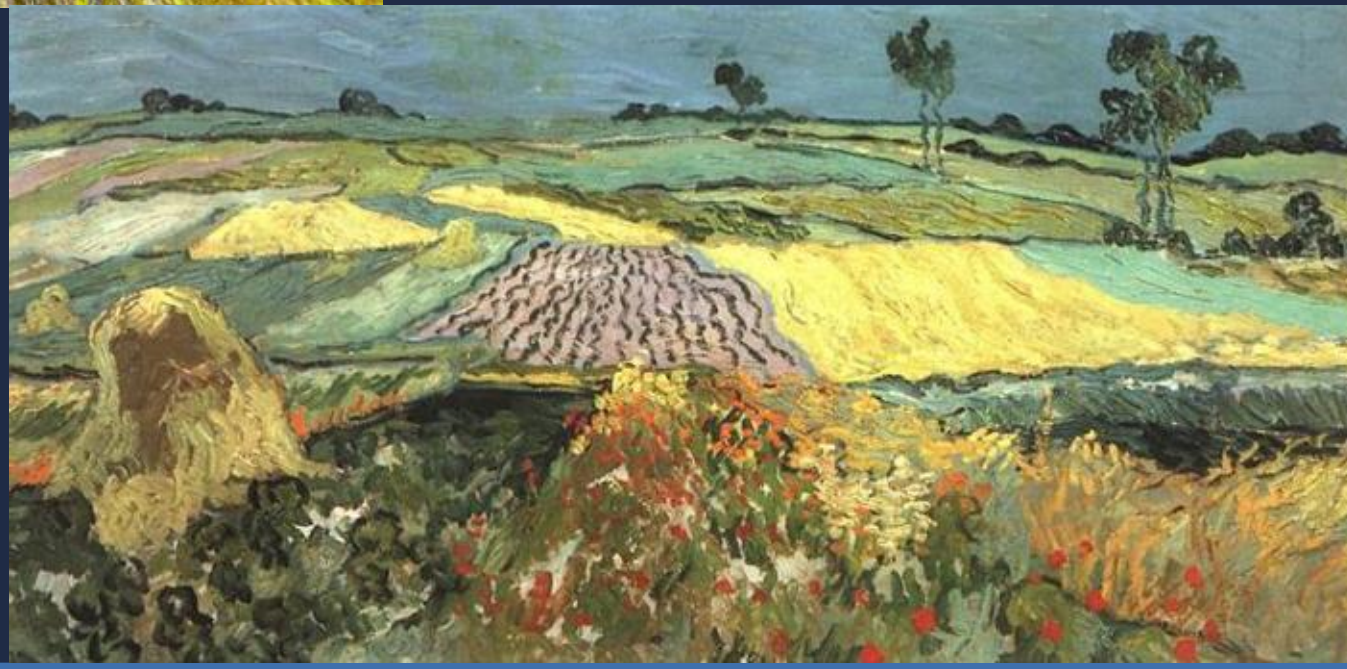
Do hornworts in Switzerland benefit from environmentally-friendly arable farming?

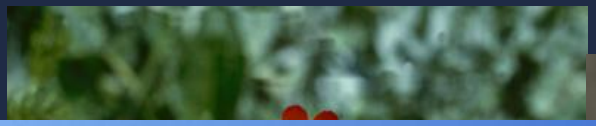
Irene Bisang
Swedish Museum of Natural History, Stockholm



Van Gogh: Wheat fields in Provence



Van Gogh:
Wheat field near Auvers, 1890




Agri-environmental schemes AES

Rewards / financial compensations to farmers for environmentally-sensitive land management

Trade-independent; decoupled from agricultural output

Marked variety across states!

Objectives:
- protecting biodiversity
- reducing nutrient and pesticide emissions
- preserving and /or restoring landscape elements
- preventing rural depopulation

Switzerland: AES effectual launch 1999

Payments to farmers linked to respecting ecological / environmental requirements

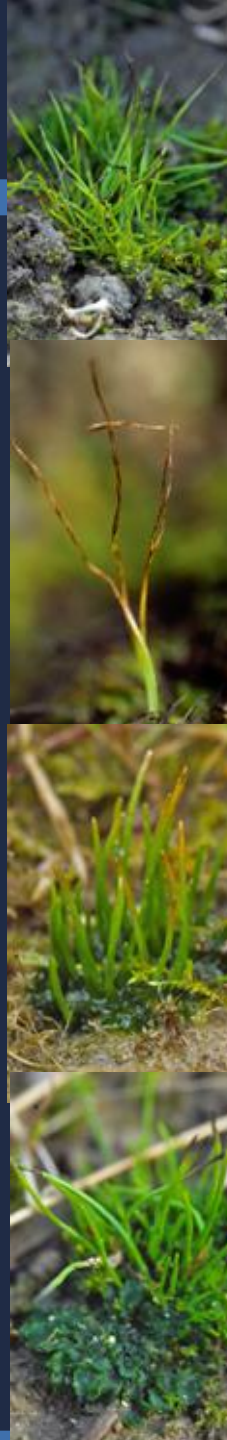
Directives regulate ecological compensation areas, soil nutrient status, pesticide applications, crop rotation, animal welfare, etc

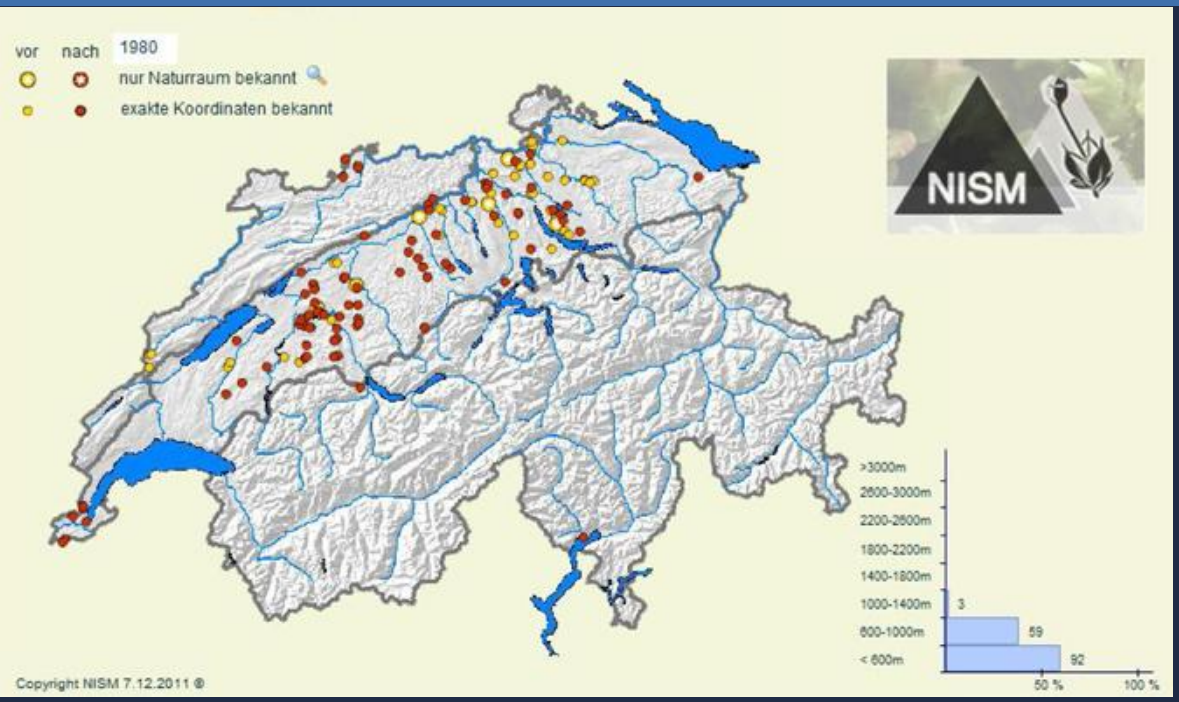
Outline

- Effects of AES on occurrence and performance
  of arable bryophytes,
  examplified by hornworts in the Swiss Plateau

  Soil Conservation Directive, amended 2005

- Ephemeral plants,
  interactions of weather conditions
  with management effects



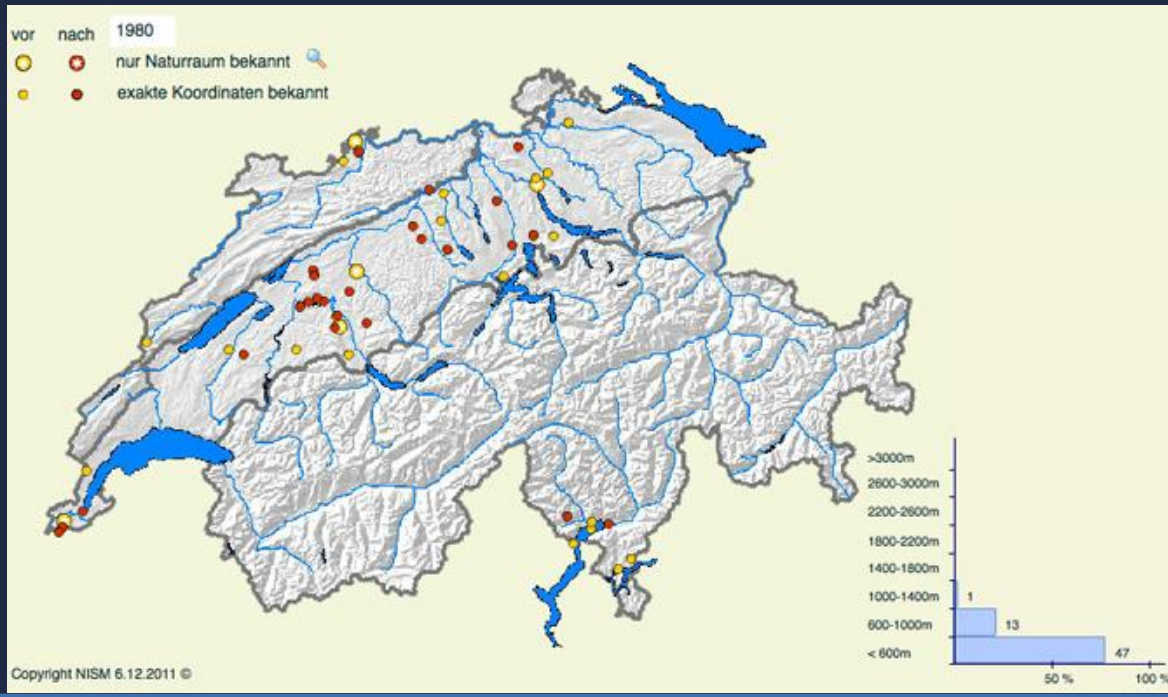


Anthoceros agrestis

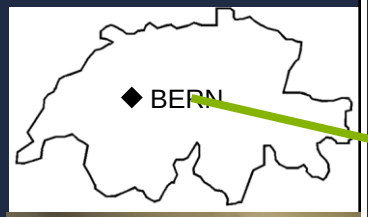
L. Hedenäs

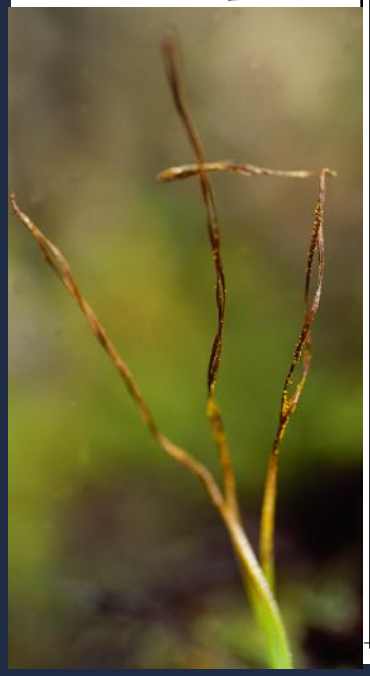
Phaeoceros carolinianus

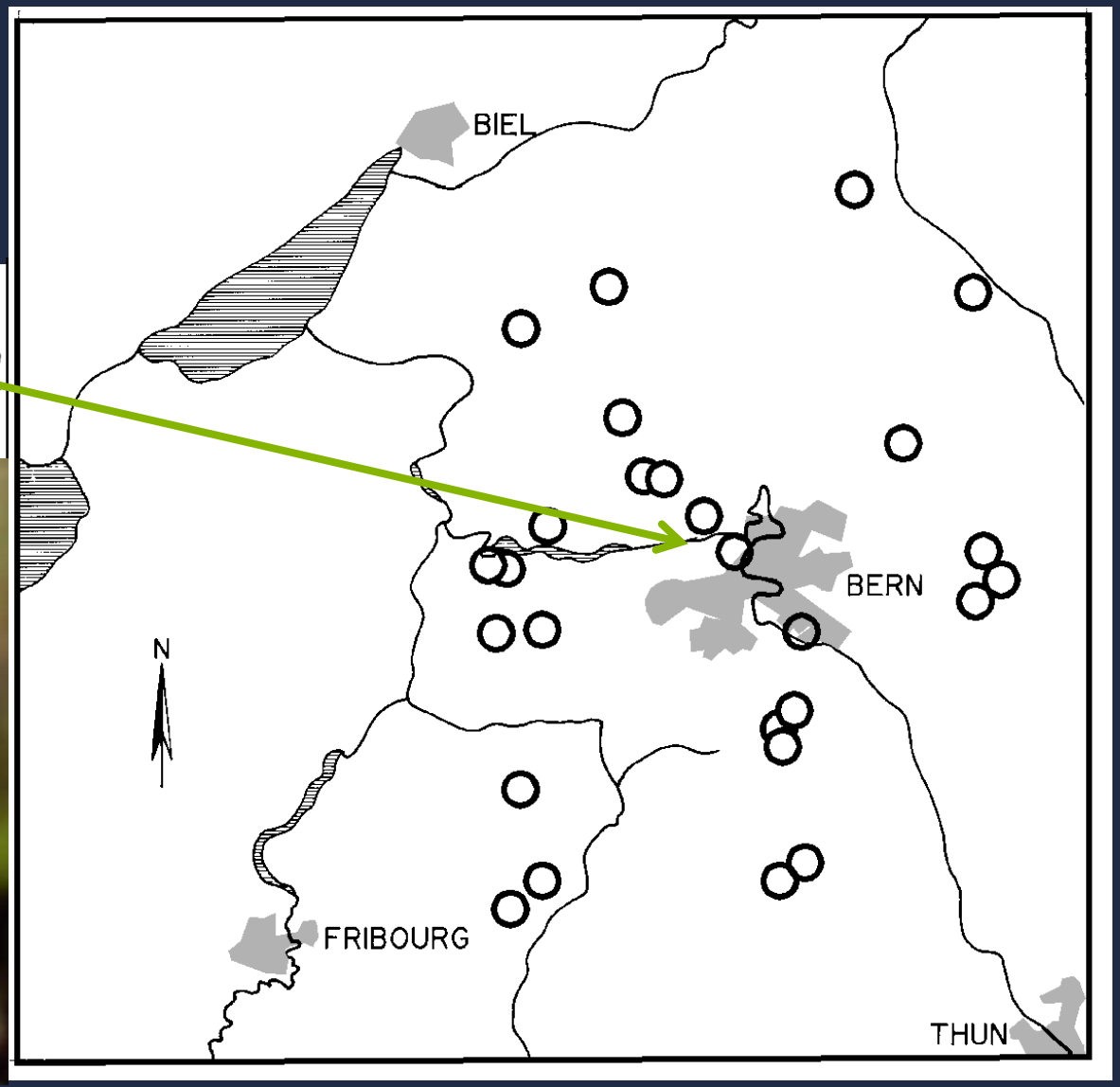
L. Hedenäs



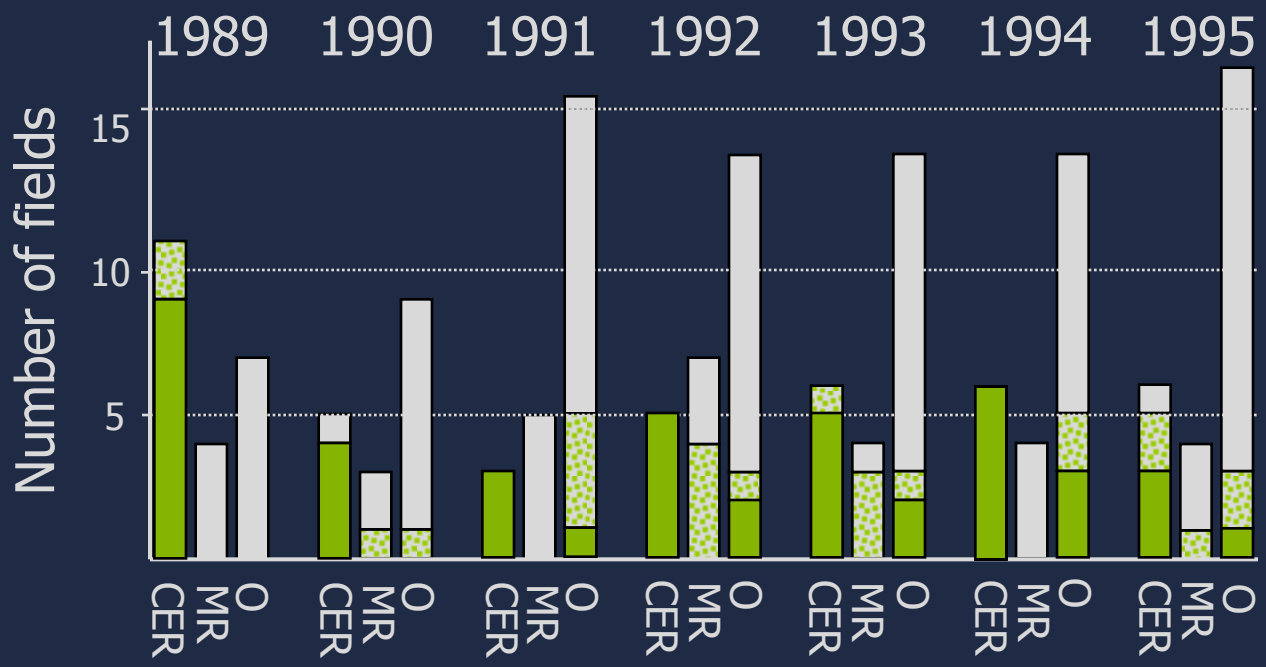
1989 - 1995







Results of the repeated survey 1989 - 1995



CER, cereal excluding maize

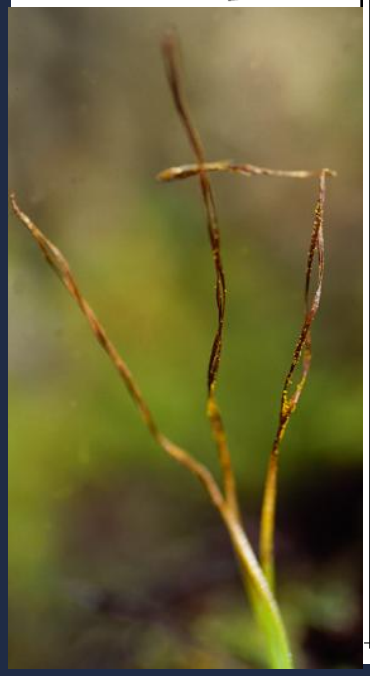
MR, Maize, root crops

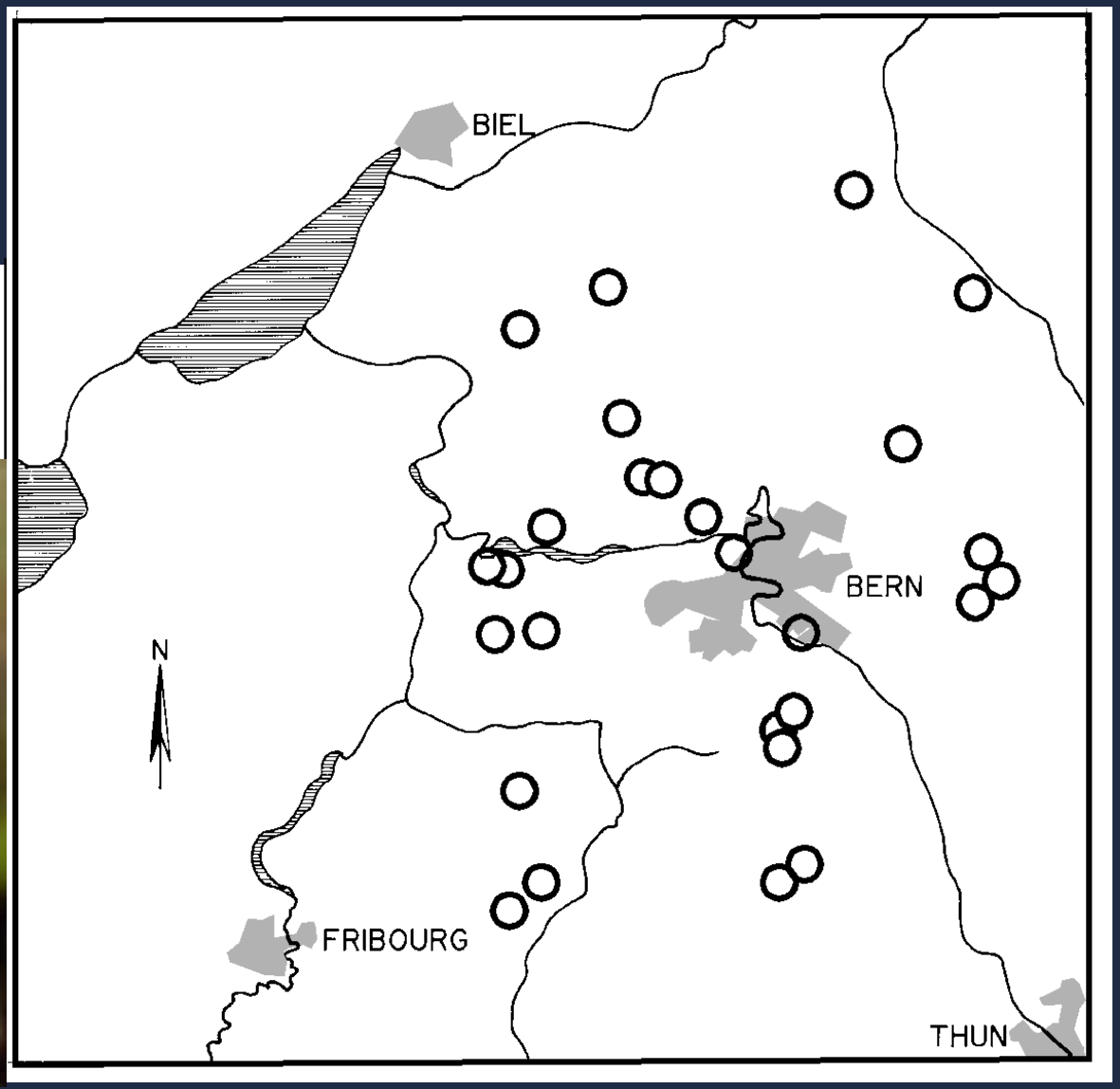
O, Other crops

with hornwort gametophytes
(sparse, marginal only)

without hornwort gametophytes

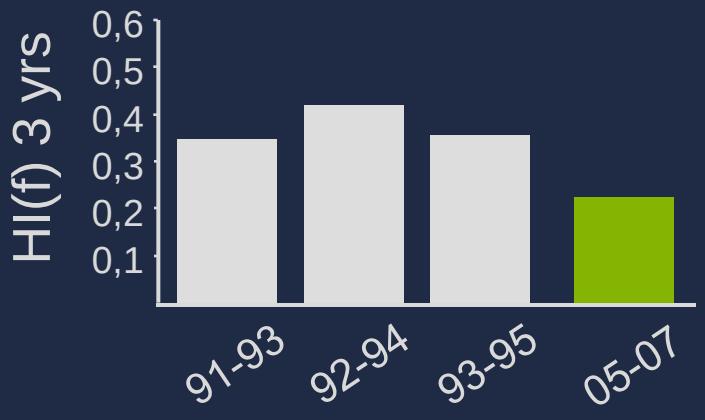
Ten years later : 2005 - 2007

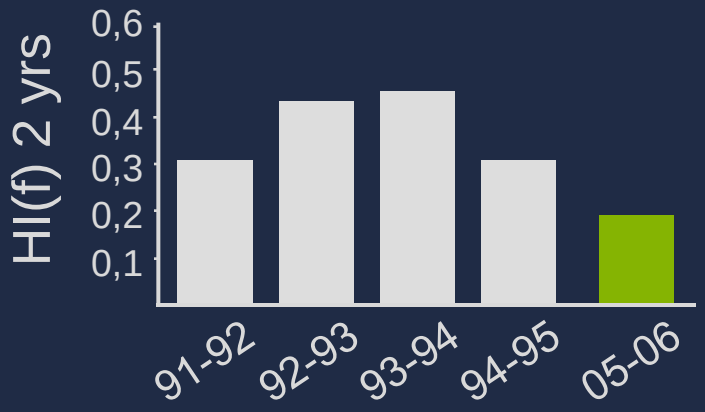


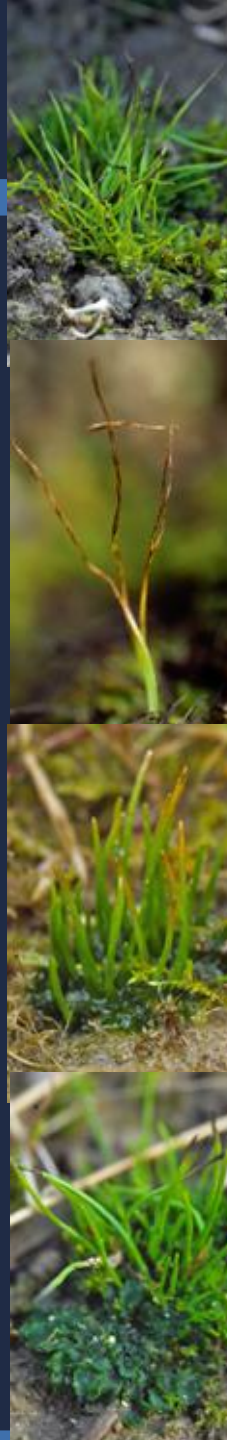


Hornwort abundance 1991 – 2007 (1)

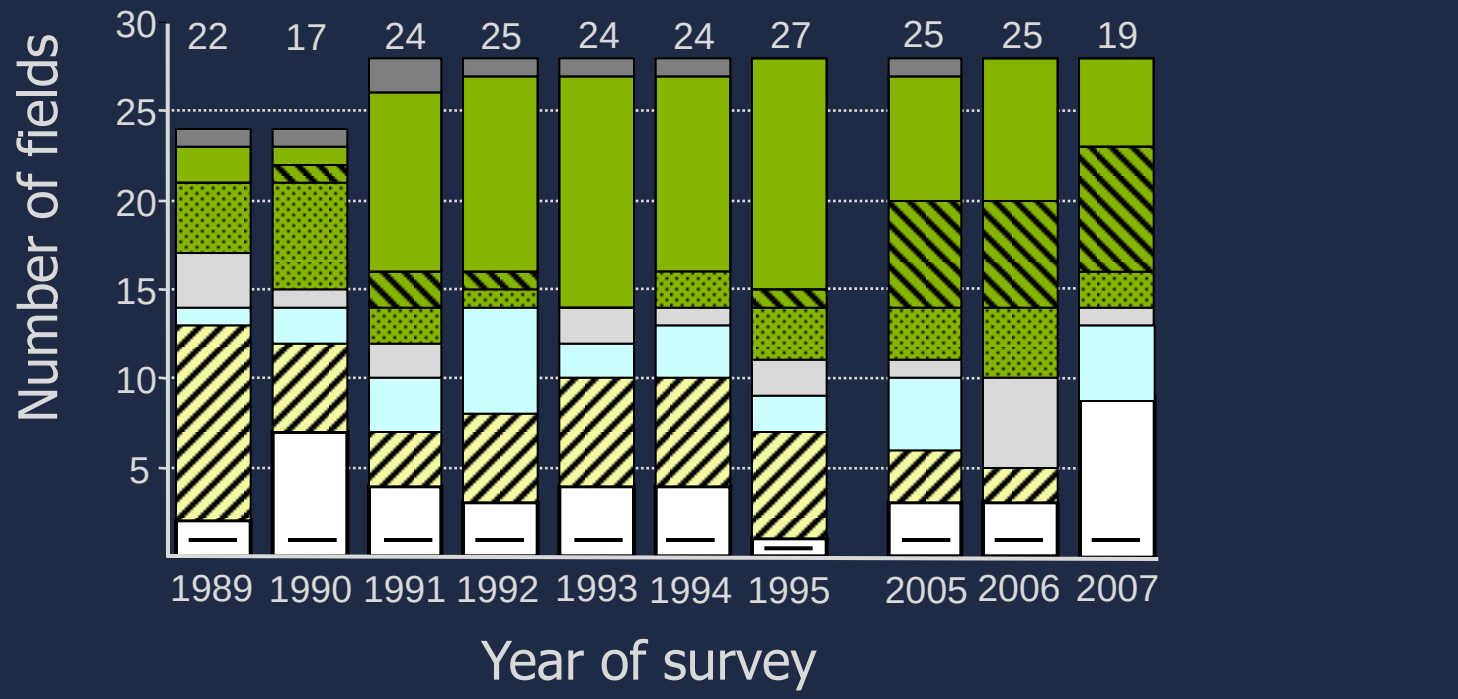
Hornwort abundance index HI(f) per field and period



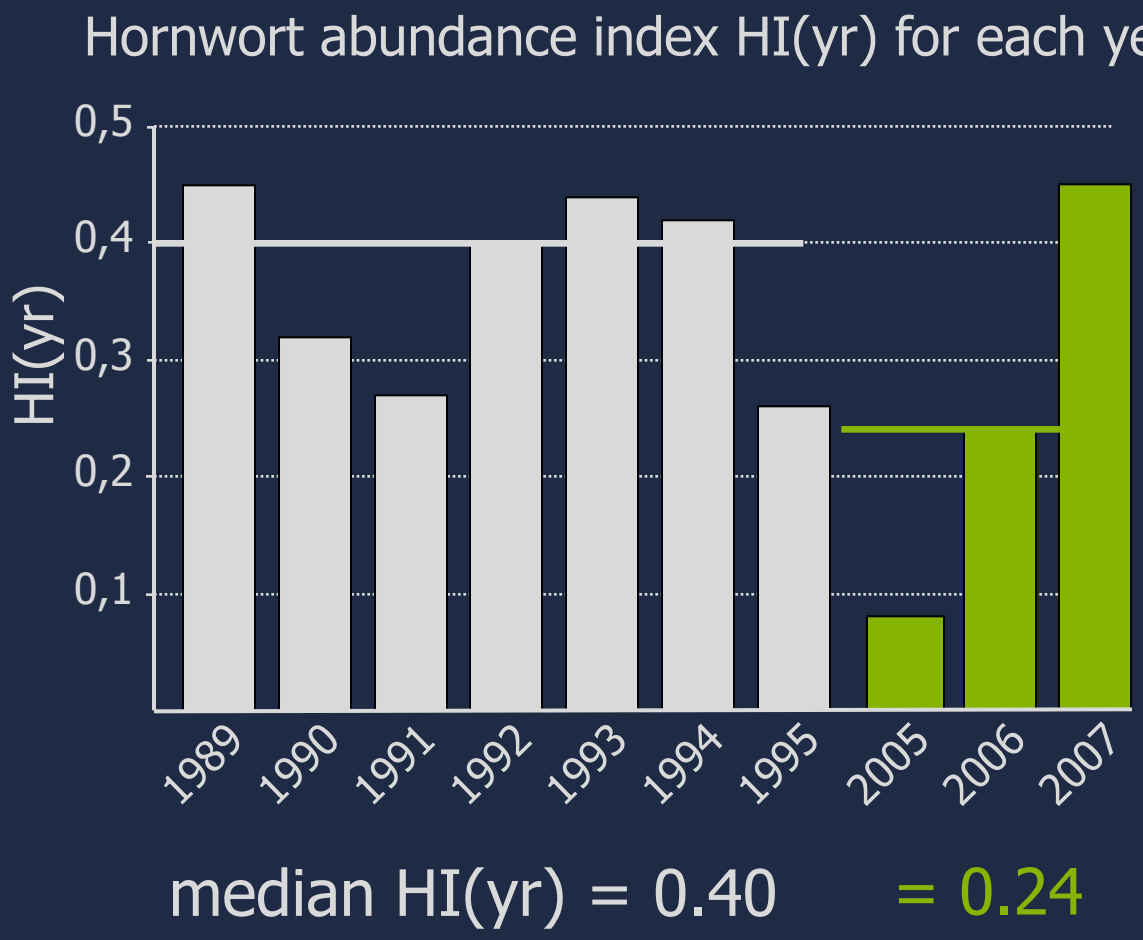




Crops 1989 – 1995 vs. 2005 – 2007



Hornwort abundance 1991 – 2007 (2)



median HI(yr) = 0.40 = 0.24

Relative air humidity June to September: significant effect on HI (yr)

Establishment phase; indirect effects

What can we learn from these results?

AES do not promote hornwort occurences in Switzerland

Conflict of interest among objectives

AES moderately support biodiversity in agroecosystems

Variable effects depending on region, organism group, species

Rare and / or threatened species

Kleijn et al. 2006, Knop et al. 2006, Roth et al. 2008, Schaub et al. 2010

?

Small-scale and targeted modifications of current AES to support organisms with specific requirements

Adaptations of AES in the case of Swiss hornworts

In fields with known occurrence of hornworts (*Phaeoceros carolinianus*)

- Tailored conservation headlands in selected cereal fields (1)
- Autumn stubble-fields (2)
- Field margin strips sown with arable flora but without crop plants (3)

www.wsl.ch

Possible: in the scope of traditional crop rotations, i.e. temporarily discontinuous (diaspore bank!)

Success control monitoring necessary

Benefits, synergies and costs

Hardly decreased yield, limited additional efforts & costs (1,2)

Promote (new) elements in AES (3)

Boerlin 2008, Eggenschwiler et al. 2010, Eggenschwiler 2011

Previous studies demonstrate positive effects on weed flora

e.g., Richner 2006, Eggenschwiler et al. 2007, 2010

Beneficial for other arable ephemeral bryophytes, other organism groups

L. Hedenäs

wikipedia

fugleocgnatur.dk

Perspectives

Take home messages

AES: mixed or marginal to moderately positive delivery for biodiversity

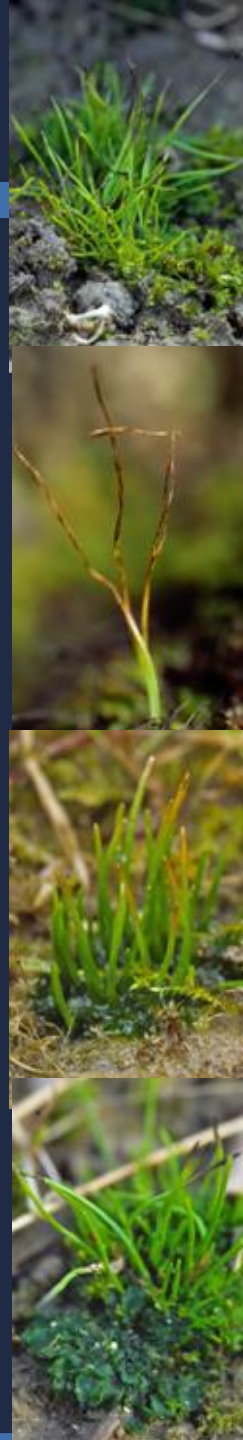
Swiss hornworts not promoted

— conflicting objectives

Modifications of existing AES limited and feasible

with benefits on various organisms

Challenge



Thanks

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Lars Hedenäs, Swedish Museum of Natural History, Stockholm

National Inventory of Swiss Bryophytes, NISM