What is the effect of a perennial invasive species (Asclepias syriaca) on the regeneration of sandy grassland?

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1. Introduction: regeneration of grasslands

- Different regeneration ability of grassland
- Hungary: good examples on old-fields

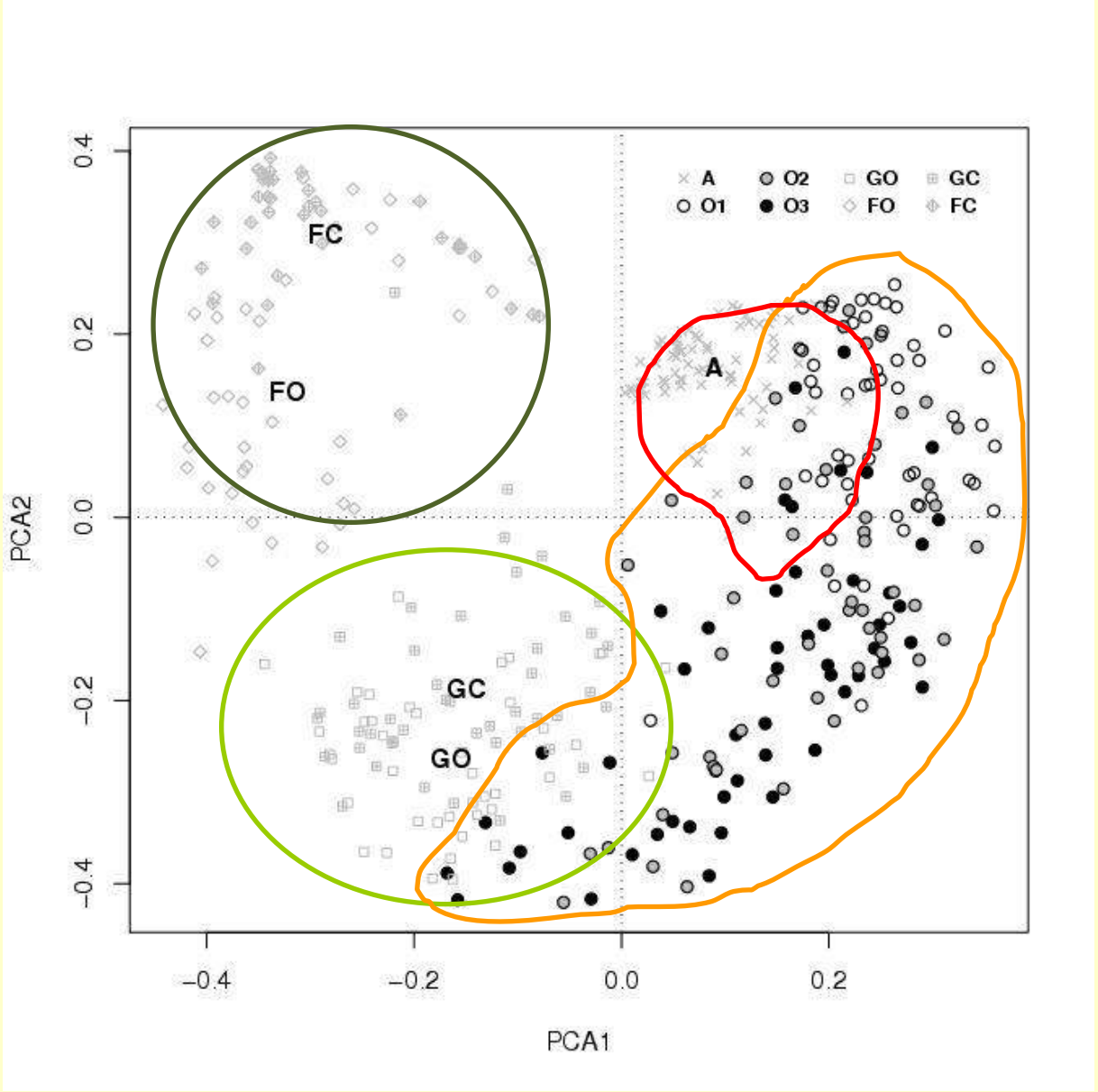
(e.g Halassy et al 2001, Csecserits et al 2011, Török et al. 2011, e.g. Kazakhstan: Brinkert et al. 2015, Czech Rep.: Prach et al 2014., Romania: Ruprecht 2006)

- Probably good propagule sources, proper land-use

An example from the sandy region of Hungary

PCA of the releve's

- A: arable field, fruit and vineyards,
- O1, O2, O3: age-group of old-fields
- GO: open grassland, GC: closed grassland, FO: open forest, FC: sandy closed forest



In: Csecserits et al 2011, Plant Biosystems

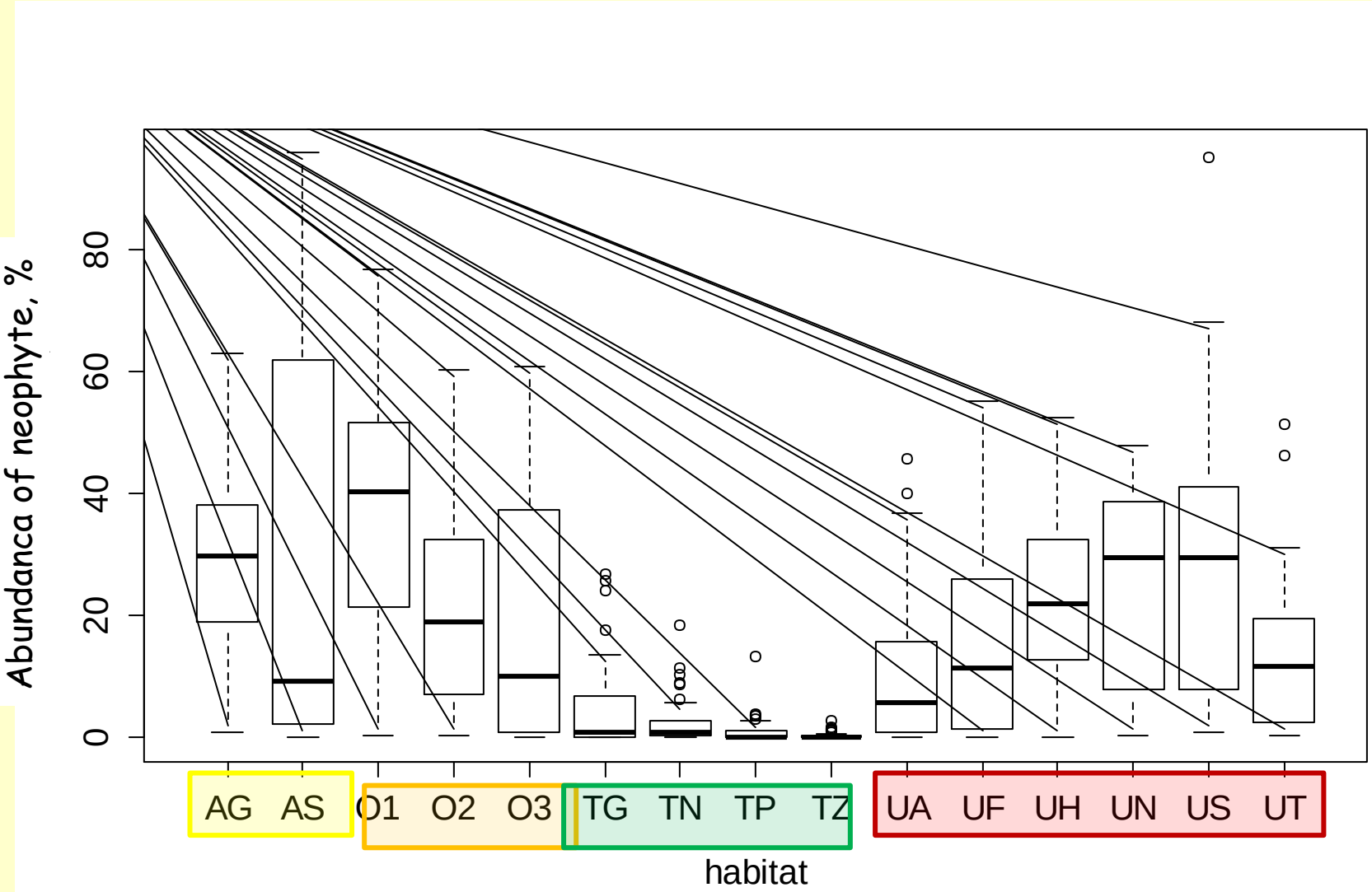
However:

the invasion of alien species

- Species without dispersal barriers
- One of the main reason for the biodiversity loss
- **Level of invasion** (Catford et al., 2012, Richardson and Pyšek, 2006):

  „Number or proportion of alien species in a given habitat"
- The actual level of invasion in a given habitat is a result of: surrounding landscape, propagule pressure + habitat invasibility
- **Habitat invasibility:** inherent characteristic of the habitat

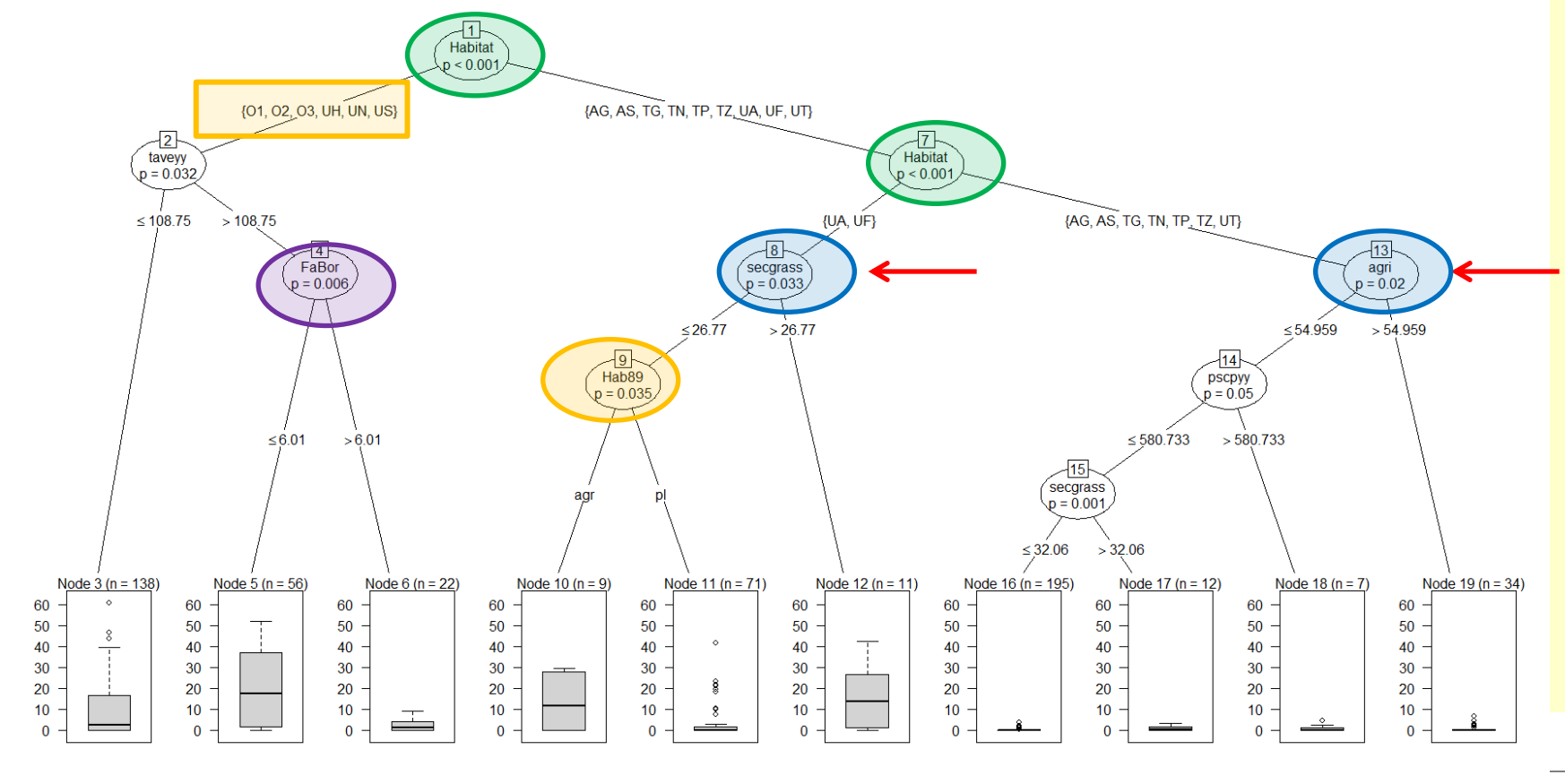
Level of invasion (abundance of neophytes)



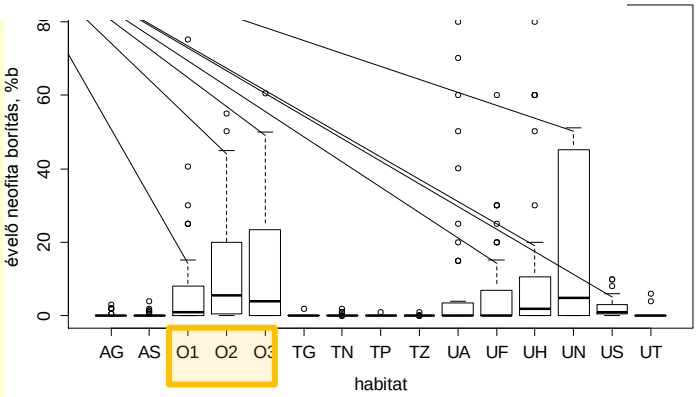
AG, AS: Agricultural fields, O1, O2, O3: old-fields
TG, TP: semi-natural forest,TN, TZ: semi-natural grasslands
UA: black locust, UF: Pinus sp., UH, UN: poplar plantation,US: young tree plantation, UT: oak plantation

- Landscape-scale presence of neophyte species - good propagule soure
- Annual, perennial and woody neophyte are different – e.g. Csecserits et al. 2016

Perennial neophyte species



- most important factor: habitat
- Largest level of invasion: old-fields, tree plantation
- Csecserits et al . 2016 AGEE



Who is this perenial neophyte?
Asclepias syriaca L.

Perennial, clonal herbaceous species from North-America

Studies on the effect of this species e.g.:

- Kelemen et al. 2016:

no effect on the total species richness
negativ effect on grassland species cover

- Szitár et al. 2016:

no effect on the regeneration of grassland species,
marginal effect on the dominant grasses

- Gallé et al. 2015:

mixed effect on arthropods – positive on ants, negative on diplopods

Contradictory results?

Effect(s) of invasive neophyte species

3 level of impact (Vila et al. 2011, Pysek et al. 2012):

- species level (plant or animal)
- community level (plant or animal)
- ecosystem level (e.g. soil nutrient content, water content, fire frequency)

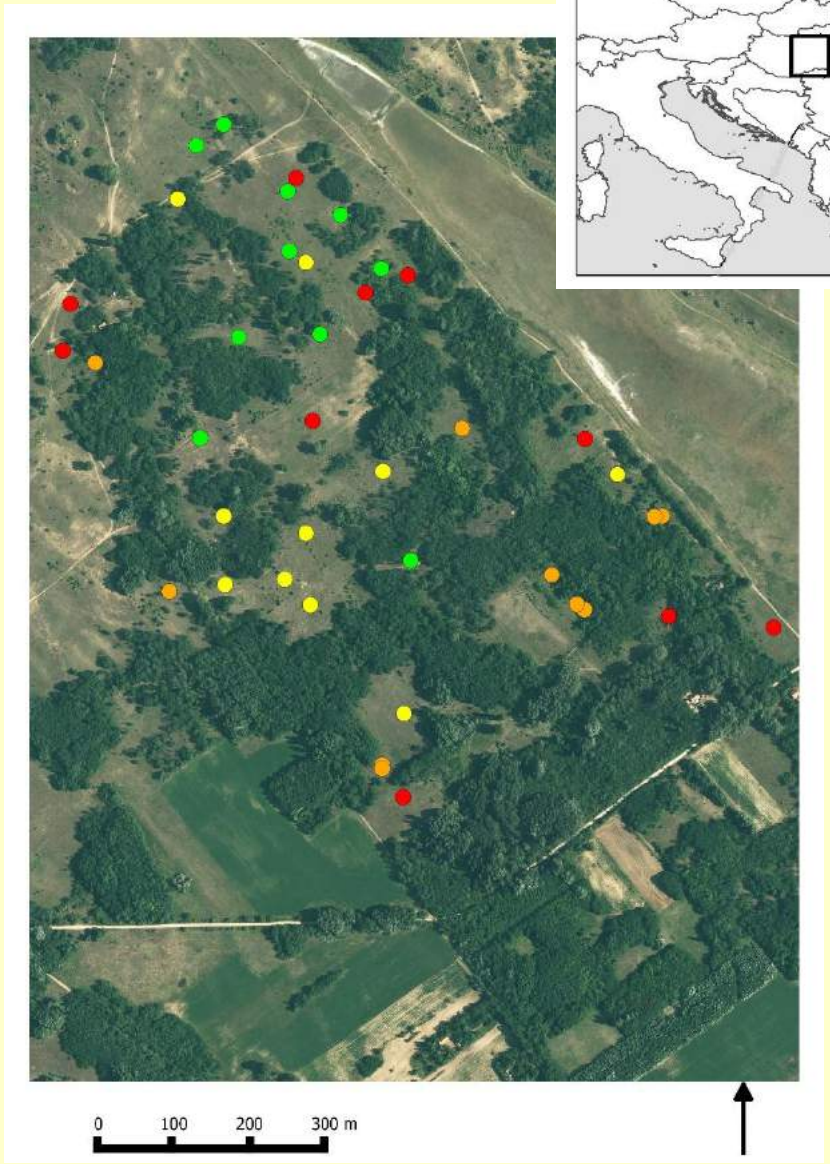
Effects can be negative and positive in the same time
on different level and on differrent species
Effects can change with the abundance

Question

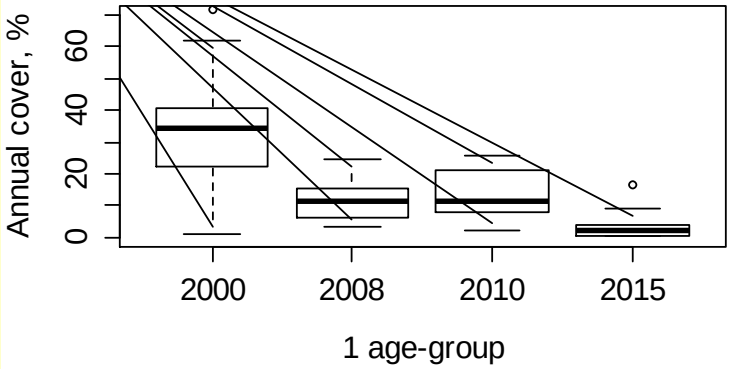
- Has any effect the *Asclepias* on the plant community of old-fields?
- Are there correlations between the changes of different species groups and *Asclepias* during the succession?

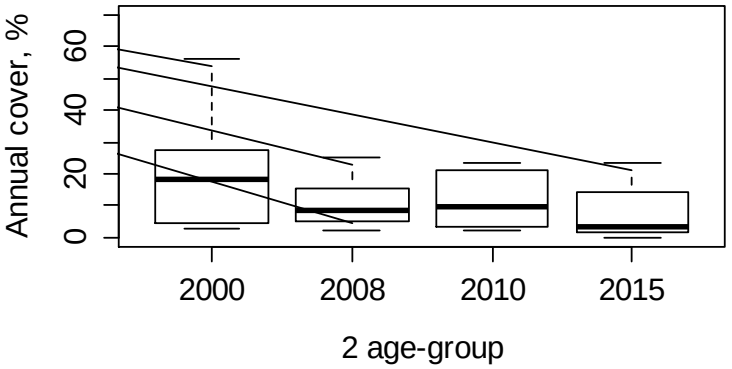
Methods

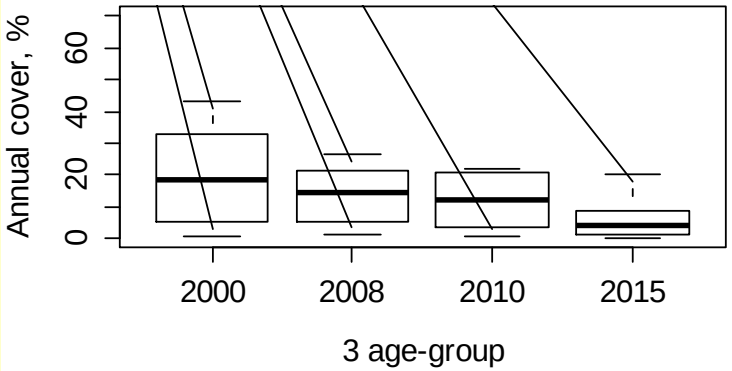
- Kiskun-longterm field site network
- 40 permanent plot, 4x4 m large,
- 4 age - group,
  - abandoned between 1994-1999
  - abandoned between 1994-1989
  - abandoned between 1988-1975
  - abandoned between 1965-1974
- 2000, 2008, 2010, 2015
- spontaneous occurence of neophyte species
- Linear mixed effects modells - age, year, *Asclepias* effect
- correlation between changes of *Asclepias* cover and other species richness and cover

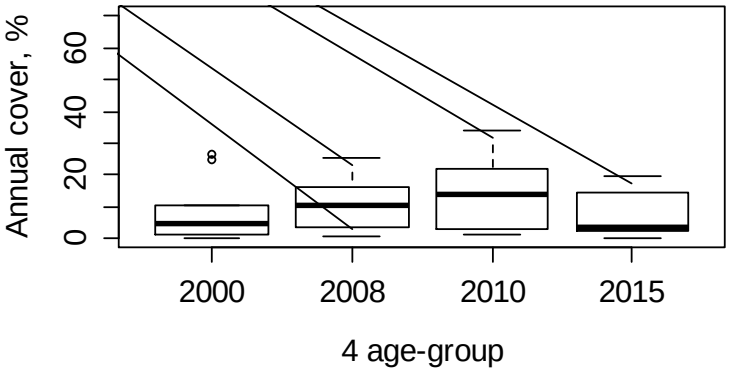


Cover of annuals

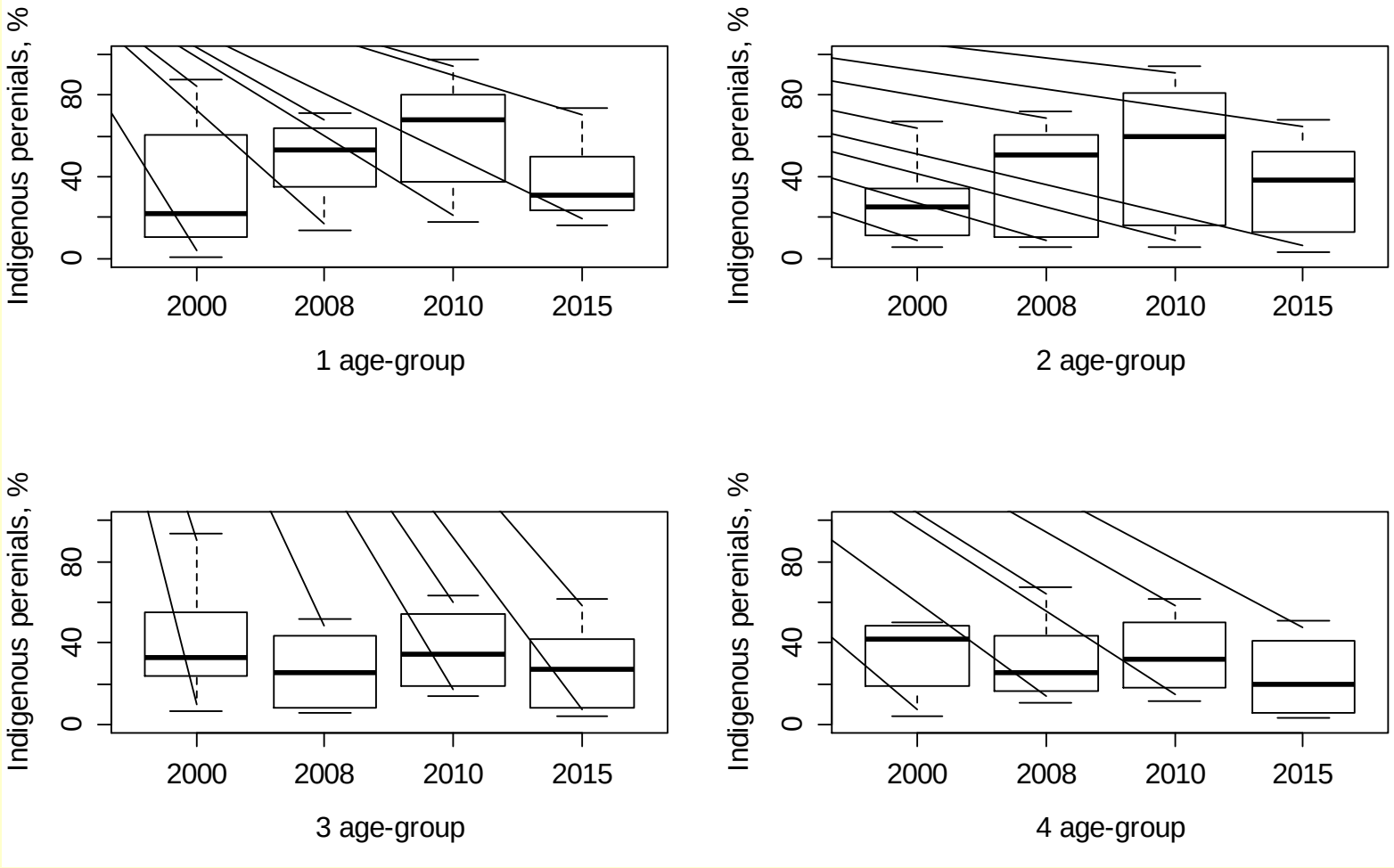




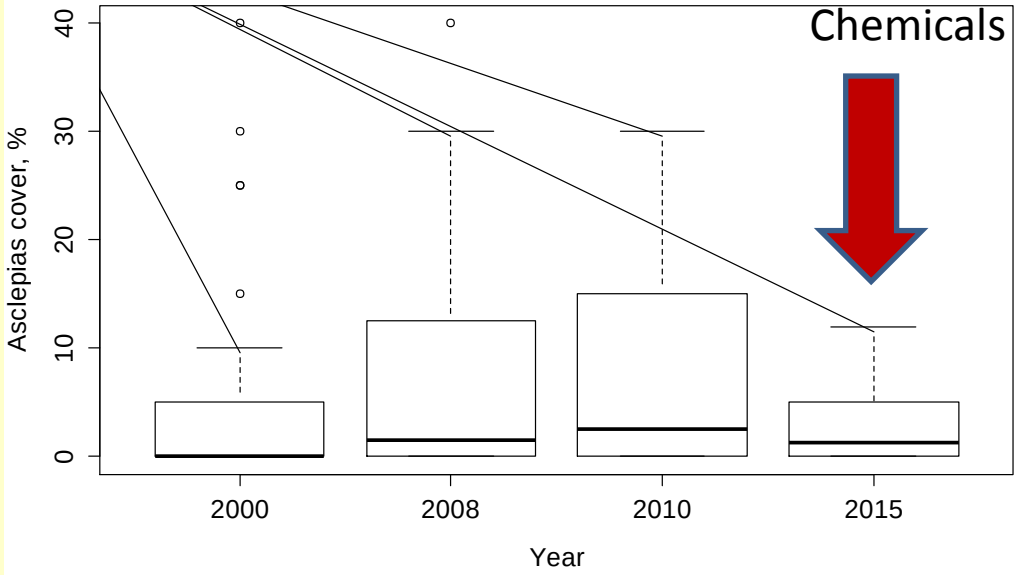


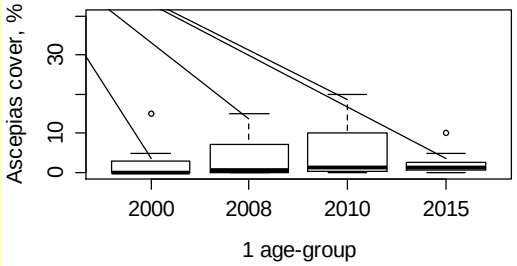


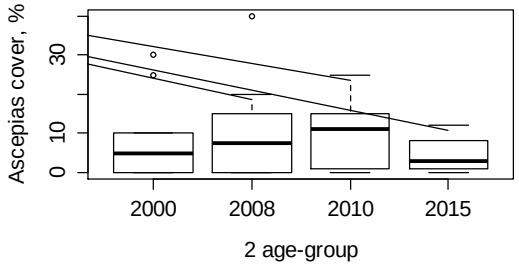
Cover of perennials

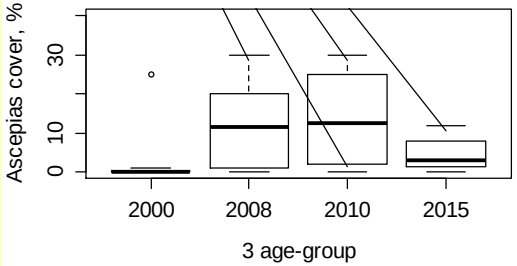


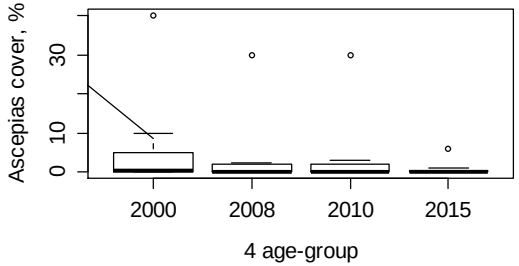
Changes in *Asclepias* cover







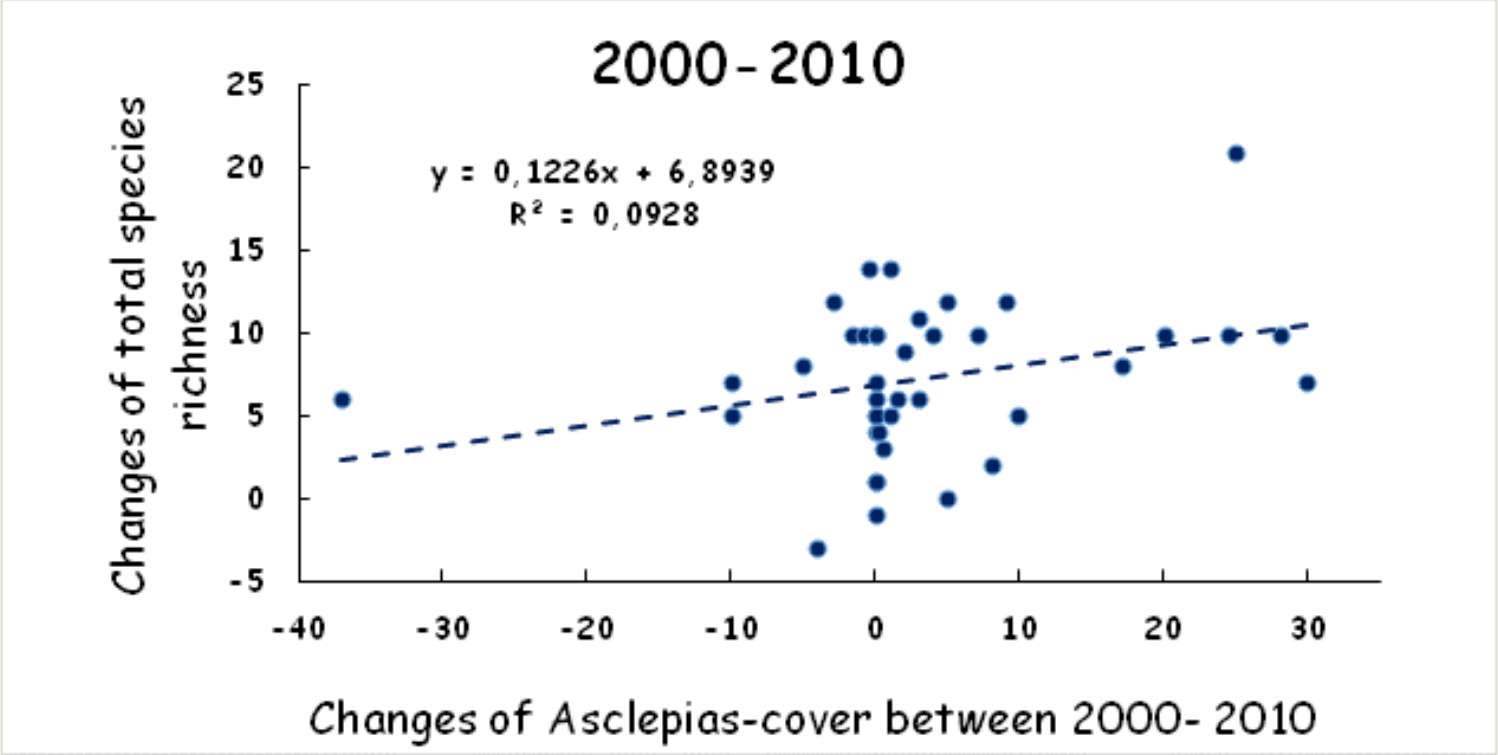




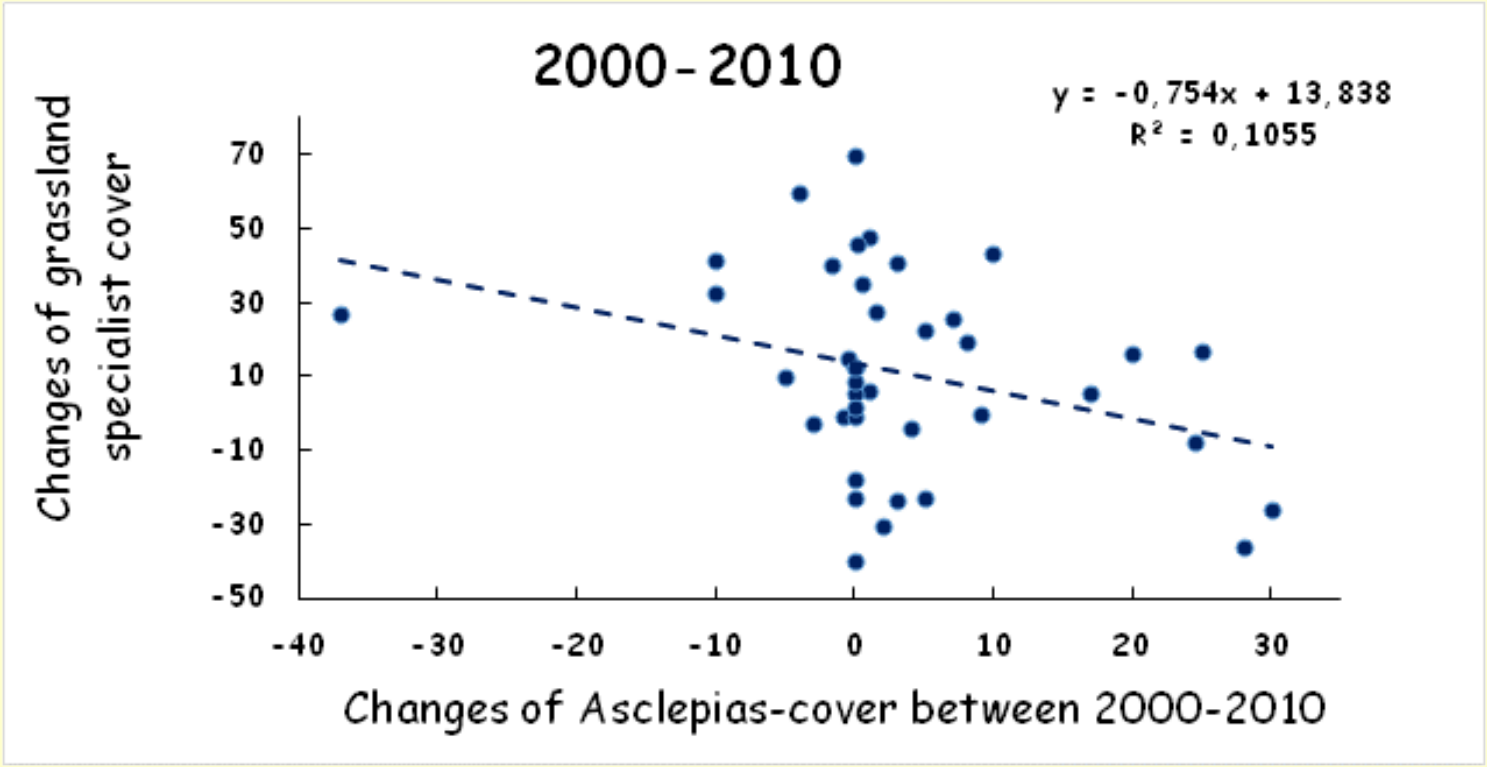
Result of the modells

- Total species richness – Age and Asclepias +
- Annuals – Age x Year, no Asclepias effect
- Grasses of natural habitats – Age x Year, no Asclepias effect
- Perennials of natural habitats – Year and Asclepias effect

Changes of total species number

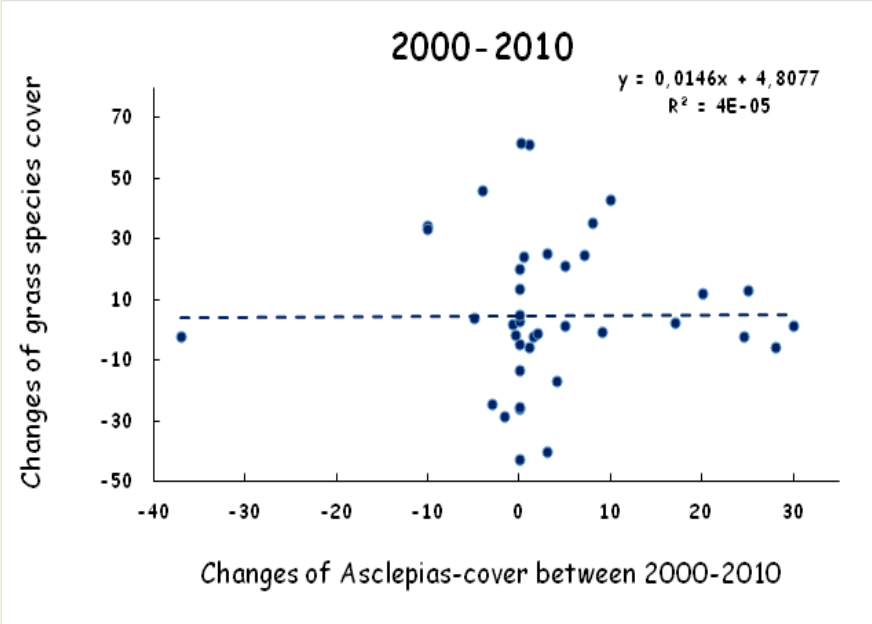


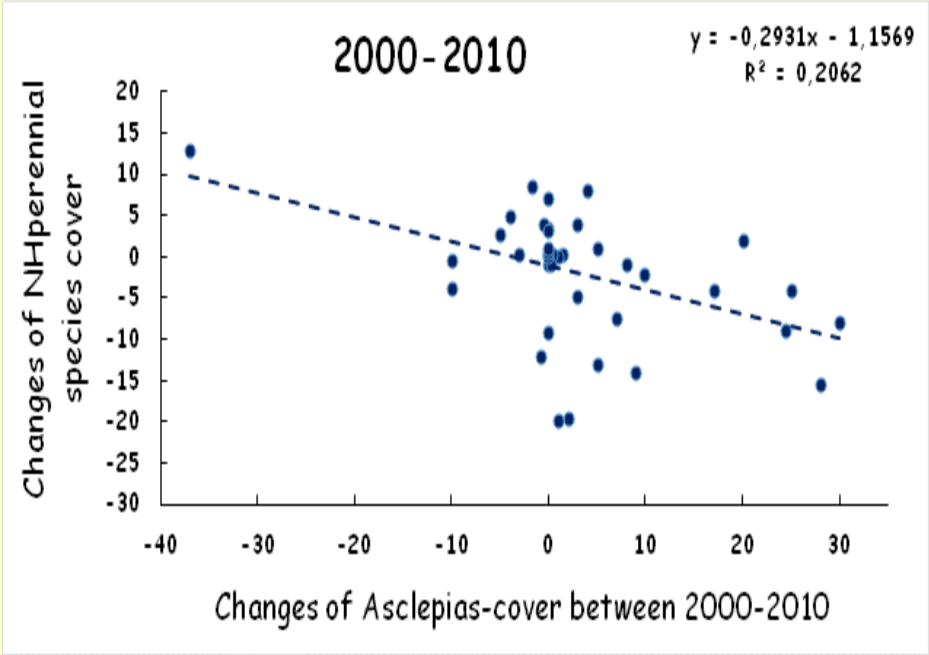
Changes of natural habitat (grassland specialist) species



Negative effect of Asclepias on natural habitat speies, independent on the age and year

Changes of grasses and other perennial species





Summary

Invasive species can have contraditary effects – also *Asclepias syriaca*
- Positive correlation with the total species richness
- Negative with the other non grass perennial species

Probably:
- Shadow,
- Roots in deep - less water concurence
- Place
- Leaf allelopathy

Further studies needed!
Effect depends on the soil?
On the species already present?
On the management?
Similar to a shrub or tree?

Conclusion

- Invasion is everywhere, regeneration of grassland is hampered by invasive species
- More study needed about the effect in order to focus on the really problematic situations
- Recent propagule sources are different –should be the recent grassland be also?

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Thank you for your attention!
Multumesc!