

Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

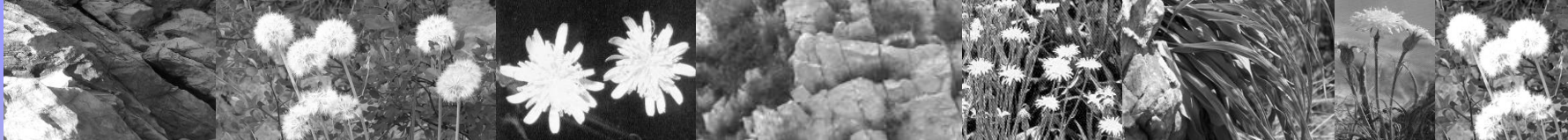
Gozdarski študijski dnevi,  
Ljubljana, 9 april 2014

# Kraška travnišča včeraj, danes in jutri

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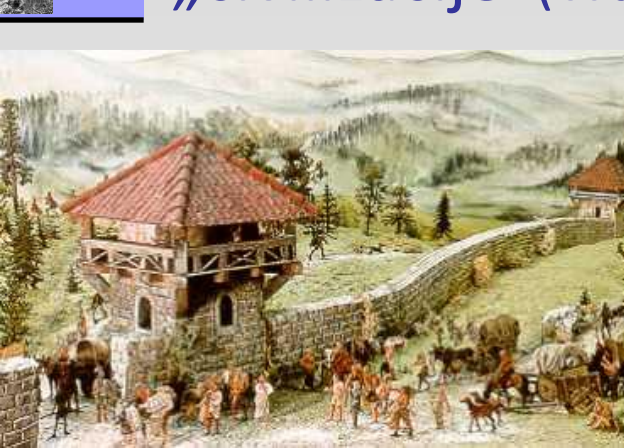
Mitja Kaligarič, Danijel Ivajnsič

- Zgodovina traviščne vegetacije – kdaj so nastala kraška travišča?
- Kakšno je trenutno stanje razširjenosti?
- Kakšne so napovedi za v bodoče?
- Kaj ustavlja zaraščanje?
- Od kod pestrost kraških travišč?
- Kako naj jih ohranjamo?



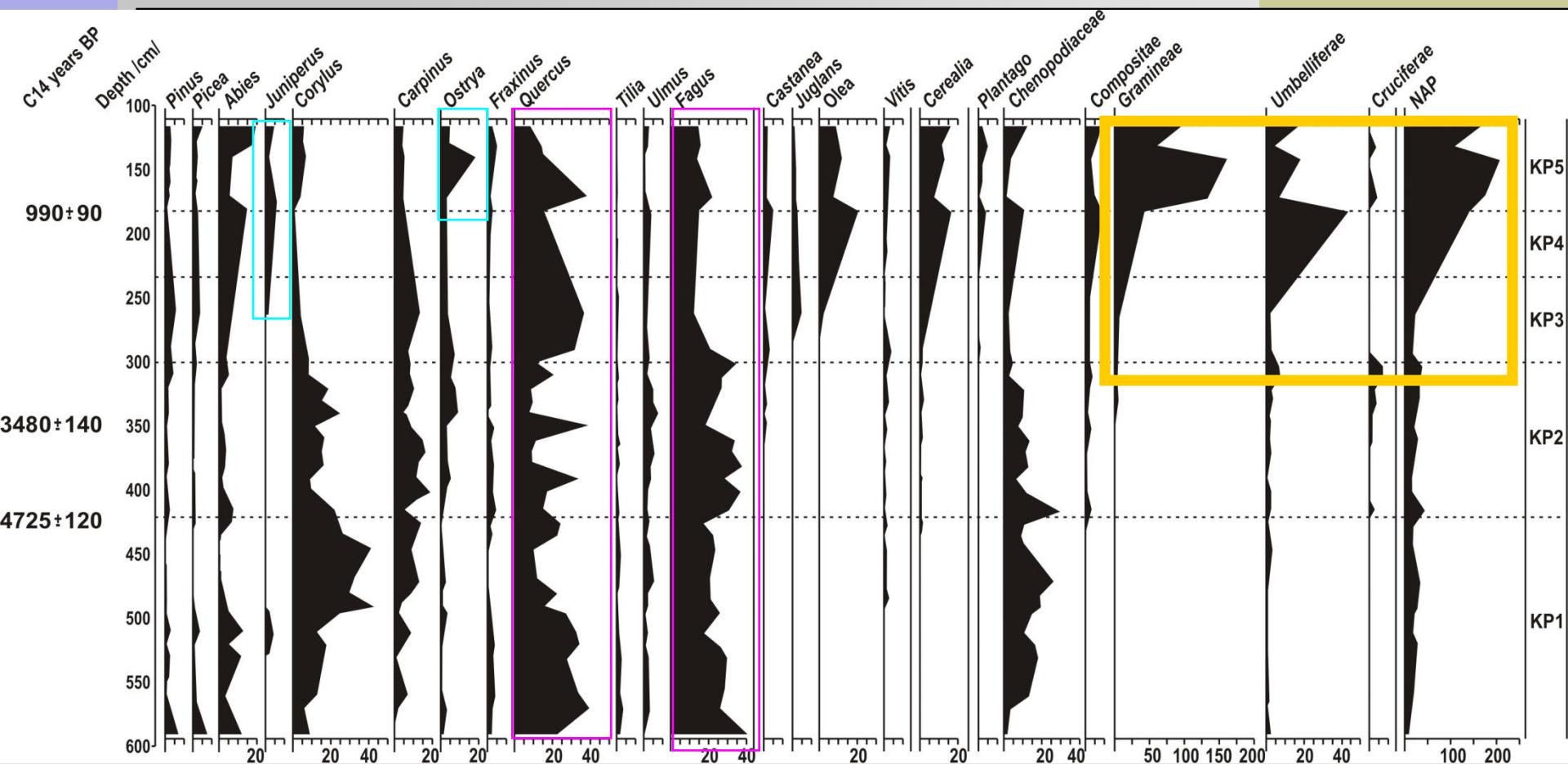
Kras in Istra: prehodno območje, gosto poseljeno že 6000 let BP (Biagi et al. 1993), okrog naselij – gozdna vegetacija spremenjena v pašne površine (Turk et al. 1993). Osteološki dokaz obstoja pašnikov (Turk et al. 1992).

Širjenje „odprtih habitatov“ - romanizacija (prvih nekaj stoletij BC) (Beug 1977). Gozdne čistine – indikator za porast prebivalstva, kmetijsko proizvodnjo in razvoj „civilizacije“ (Watkins & Kirby 1998).





## Pelodni diagram (škocjanski zatok pri Kopru)



*Kaligarič et al., Folia Geobotanica 41: 241-258 (2006)*

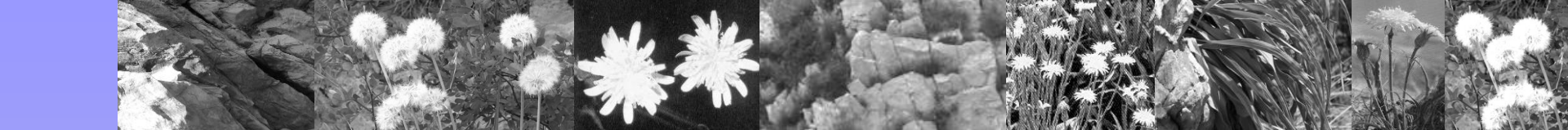


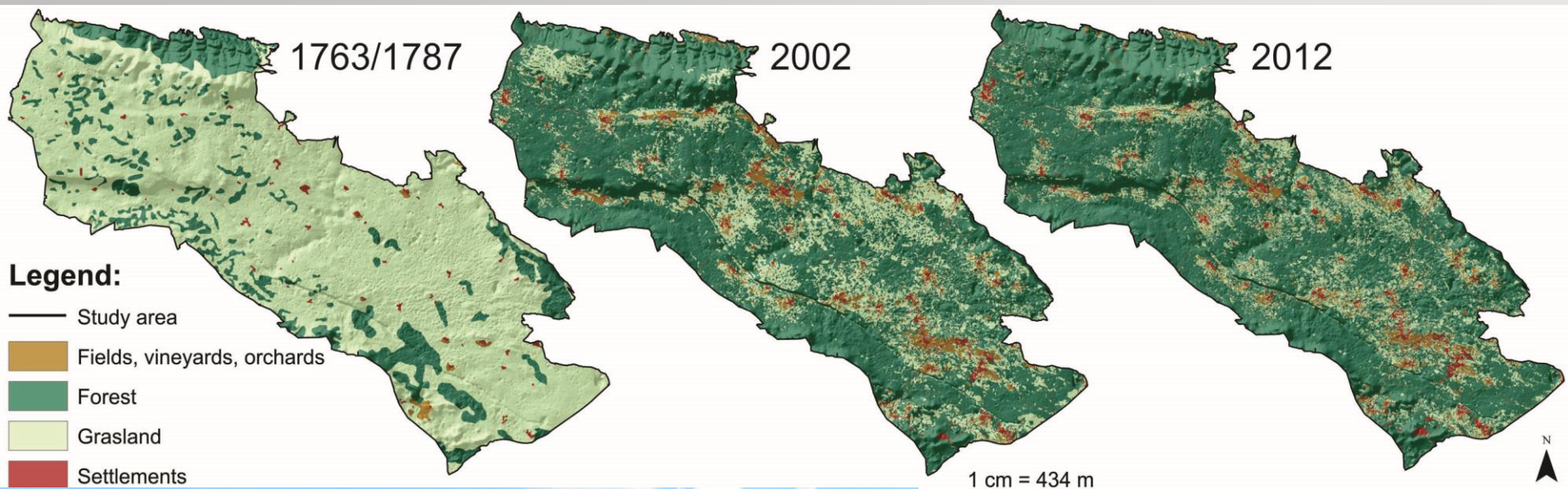
**Pozni srednji vek:** izsekavanje, ogenj, prepašenost → erozija, “dezertifikacija”

**1763-1787:**

**Josephinische  
Landesaufnahme.**









1763/1787

2002

2012

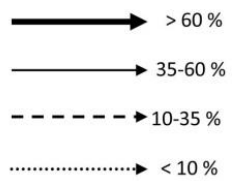
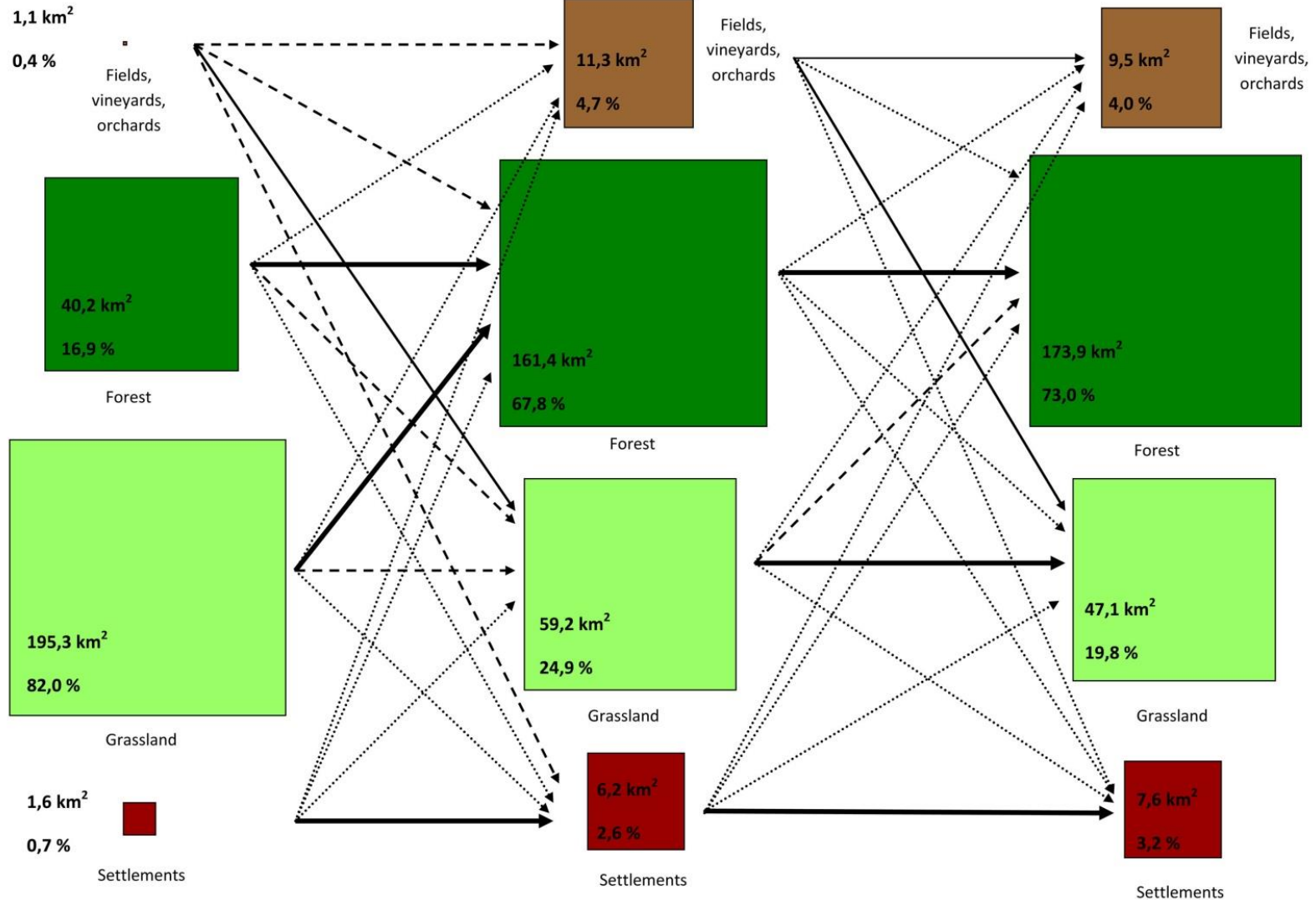


Image Similarity / Association Data

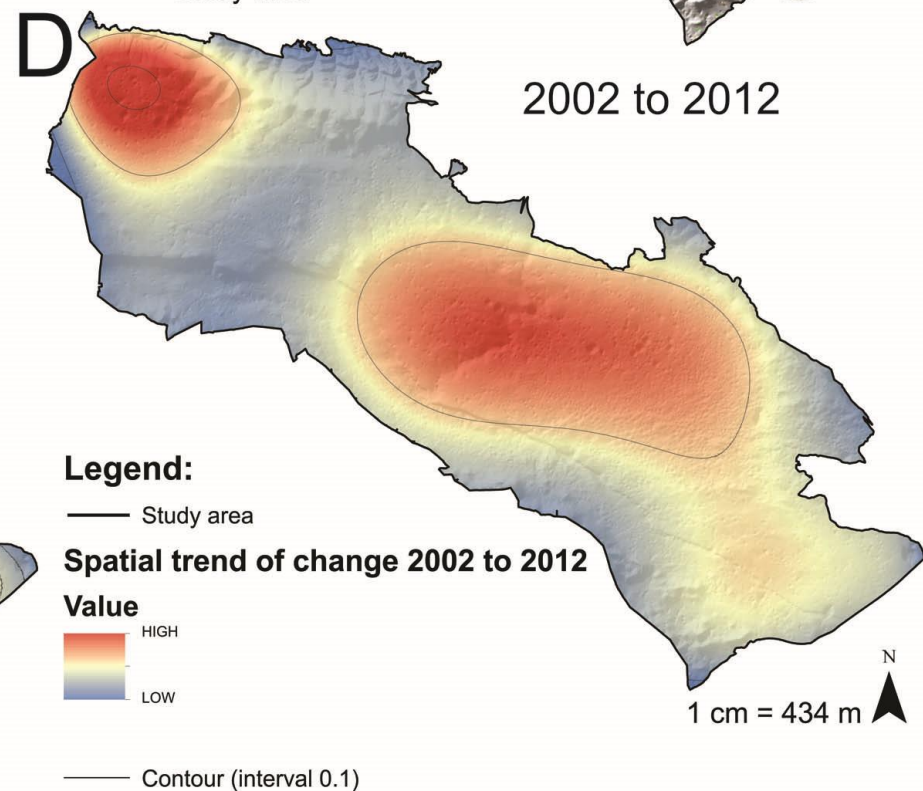
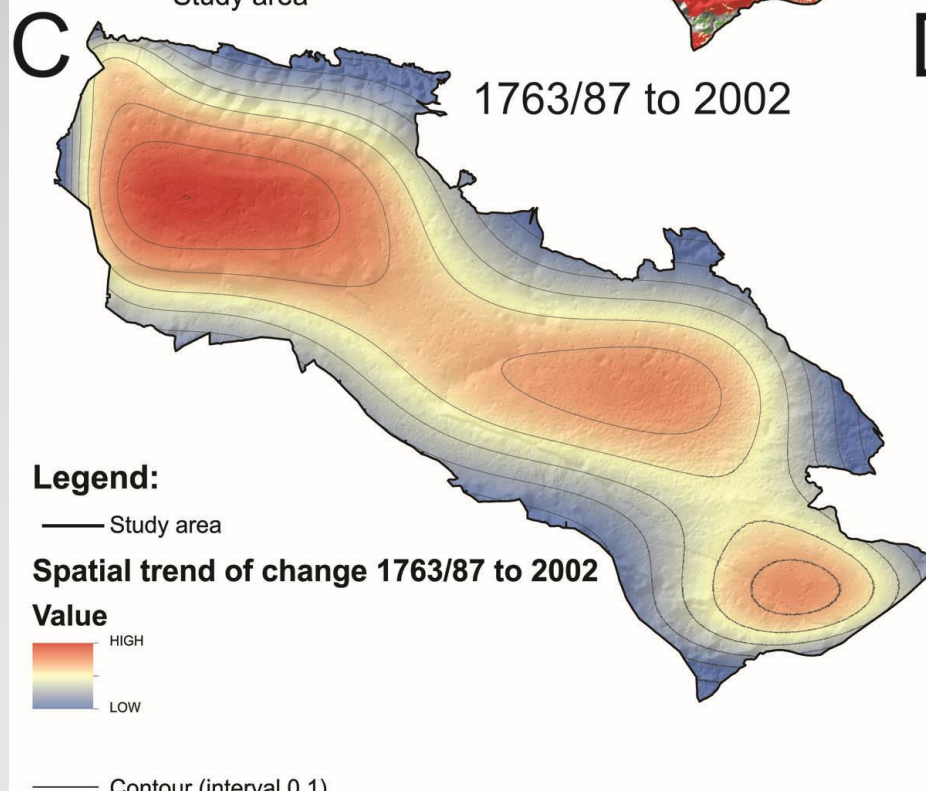
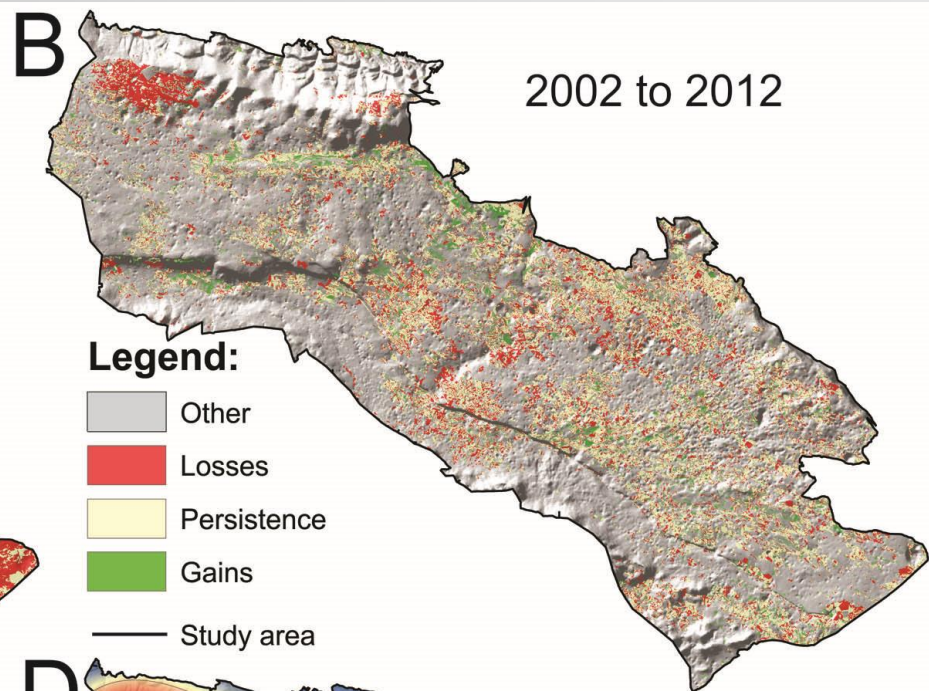
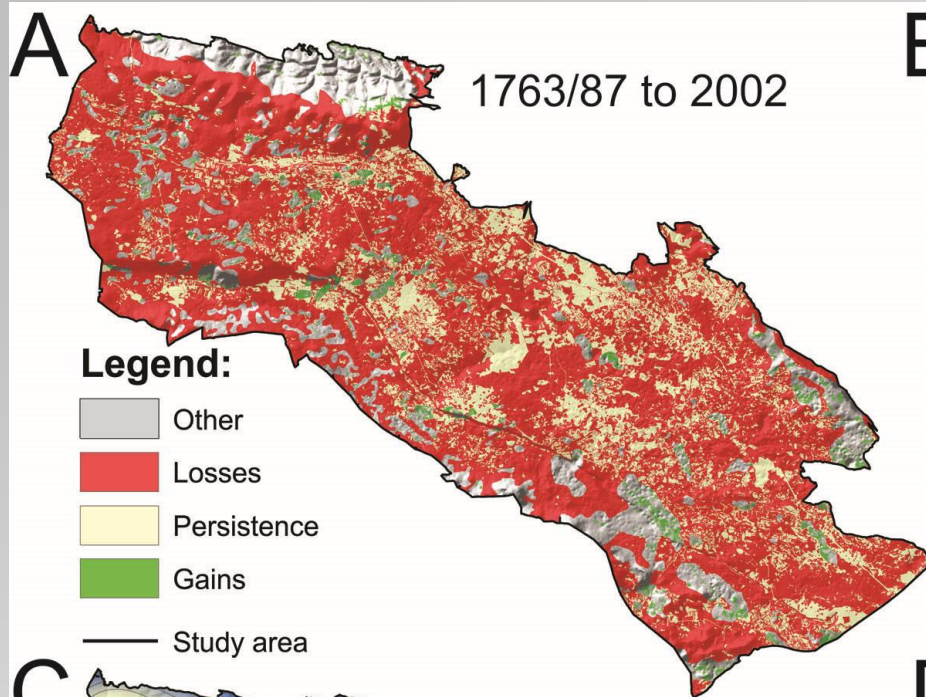
Chi Square = 4363650.50000  
 df = 16  
 P-Level = 0.0000  
 Cramer's V = 0.5437

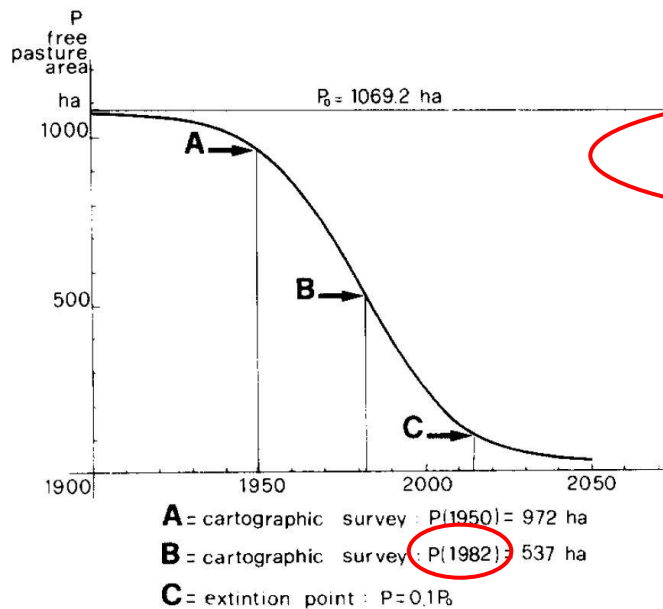
**Kappa = 0.5627**

Image Similarity / Association Data

Chi Square = 9126094.00000  
 df = 16  
 P-Level = 0.0000  
 Cramer's V = 0.7863

**Kappa = 0.8974**





## EXTINCTION TIME OF A SAMPLE OF KARST PASTURES DUE TO BUSH ENCROACHMENT

D. FAVRETTO and L. POLDINI

Section of Geobotanics and Vegetation Ecology, Department of Biology, University of Trieste, Trieste (Italy)

(Accepted 17 July 1985)

### ABSTRACT

Favretto, D. and Poldini, L., 1986. Extinction time of a sample of Karst pastures due to bush encroachment. *Ecol. Modelling*, 33: 85–88.

The purpose of this paper is the calculation of the time of extinction of Karst pastures, caused by bush encroachment, assuming that the spontaneous expansion of the bush follows a logistic pattern.

$$t_e - t_2 = \frac{1}{a} \left[ \ln \frac{P(t_2)}{B(t_2)} + \ln \frac{B(t_e)}{P(t_e)} \right] = 30.78 \text{ years}$$

and therefore:

$$t_e = 2013$$

Thus summarizing, with the logistic model (1), (2) under condition (3), for fixed values of  $P(t_1)$  and  $P(t_2)$ , with ratio  $P(t_1)/B(t_1) = 10$ , we can forecast that in the year 2013 the area under consideration will be completely covered by bush. This forecast could be of some value to people trying to ensure the survivals of such a landscape, important for historical reasons as well as its high biotic diversity.

# Testiranje modela zaraščanja

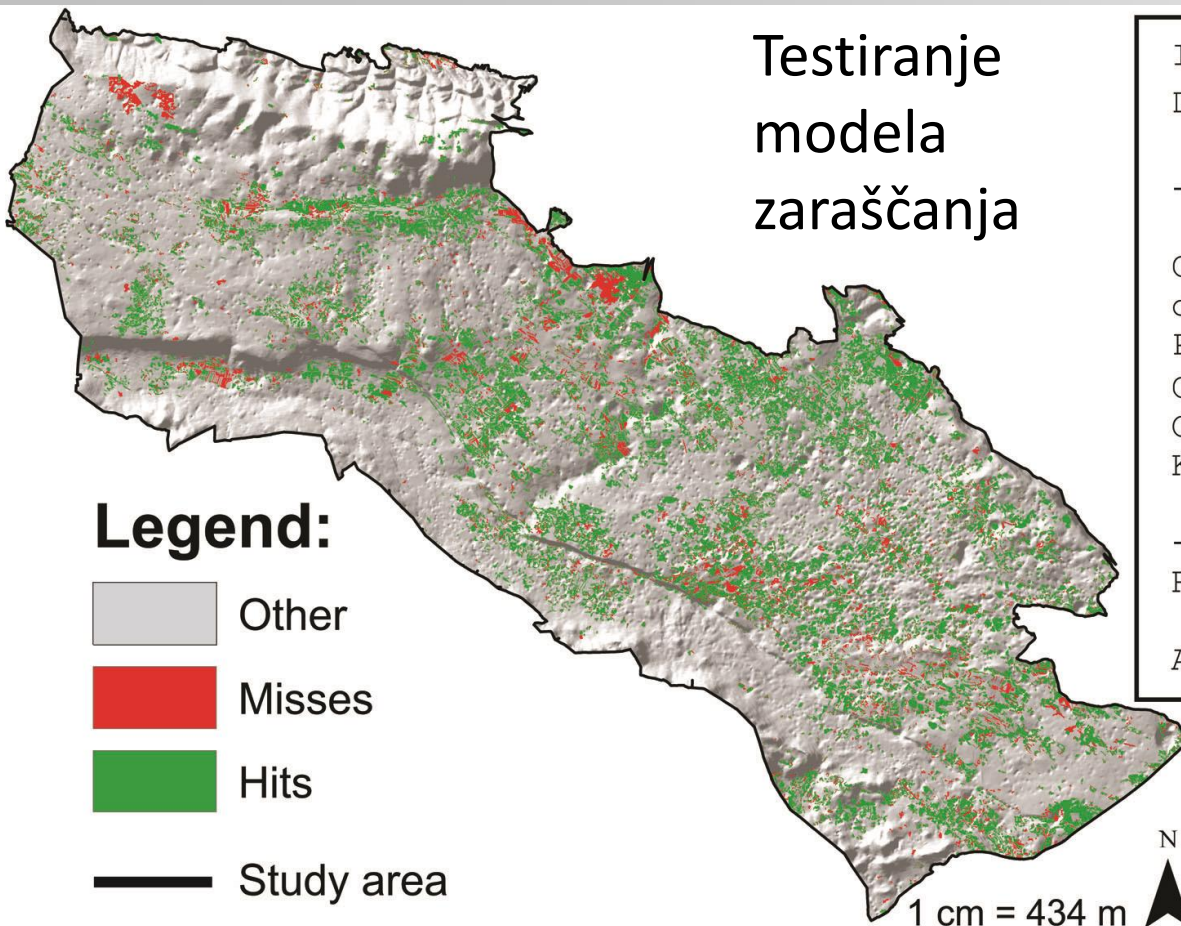


Image Similarity / Association  
Data

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Chi Square = 2998825.75000  
df = 1  
P-Level = 0.0000  
Cramer's V = 0.9014  
Overall Kappa (KIA) = 0.8982  
Klocation = 0.9817

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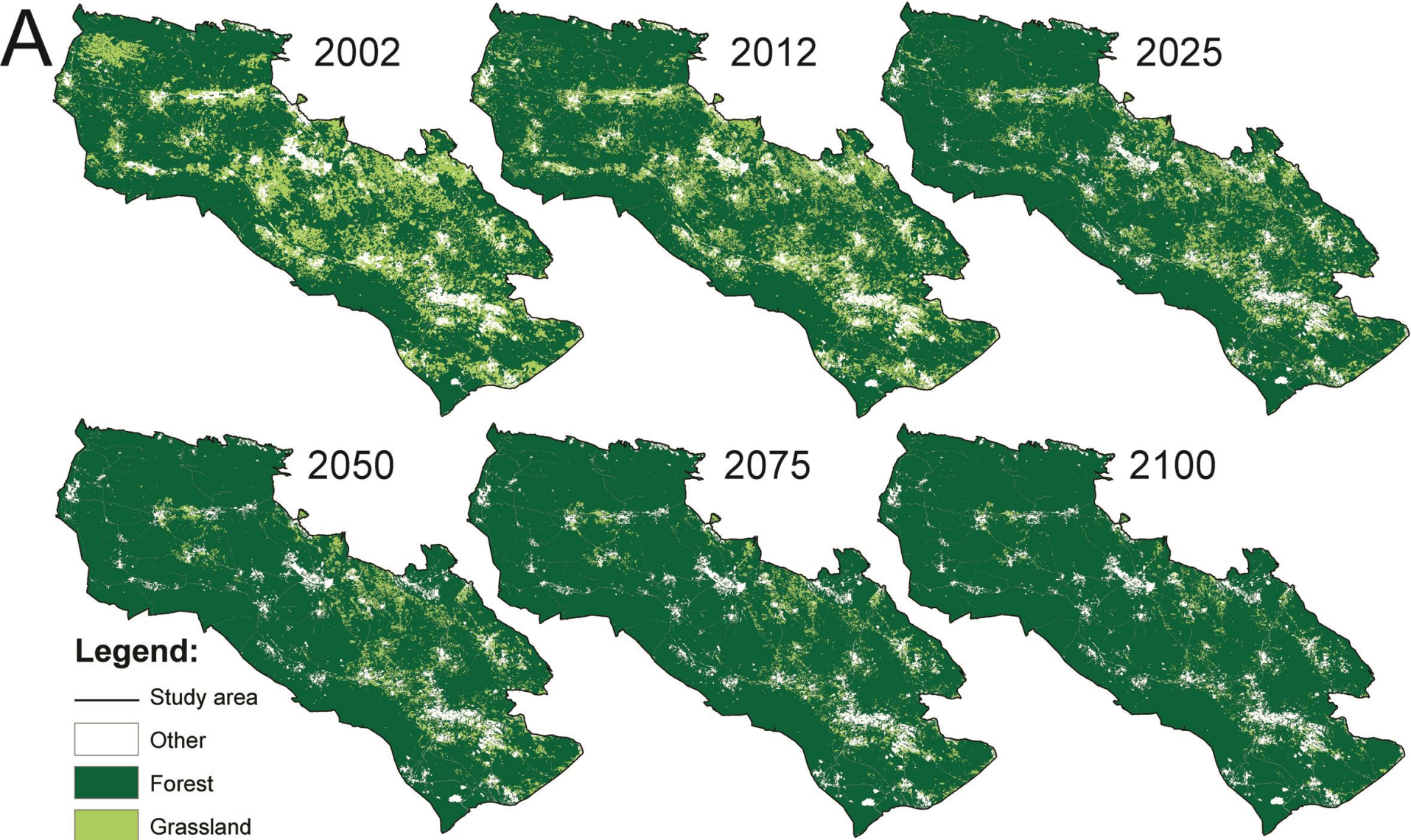
Result of ROC

AUC = 0.904

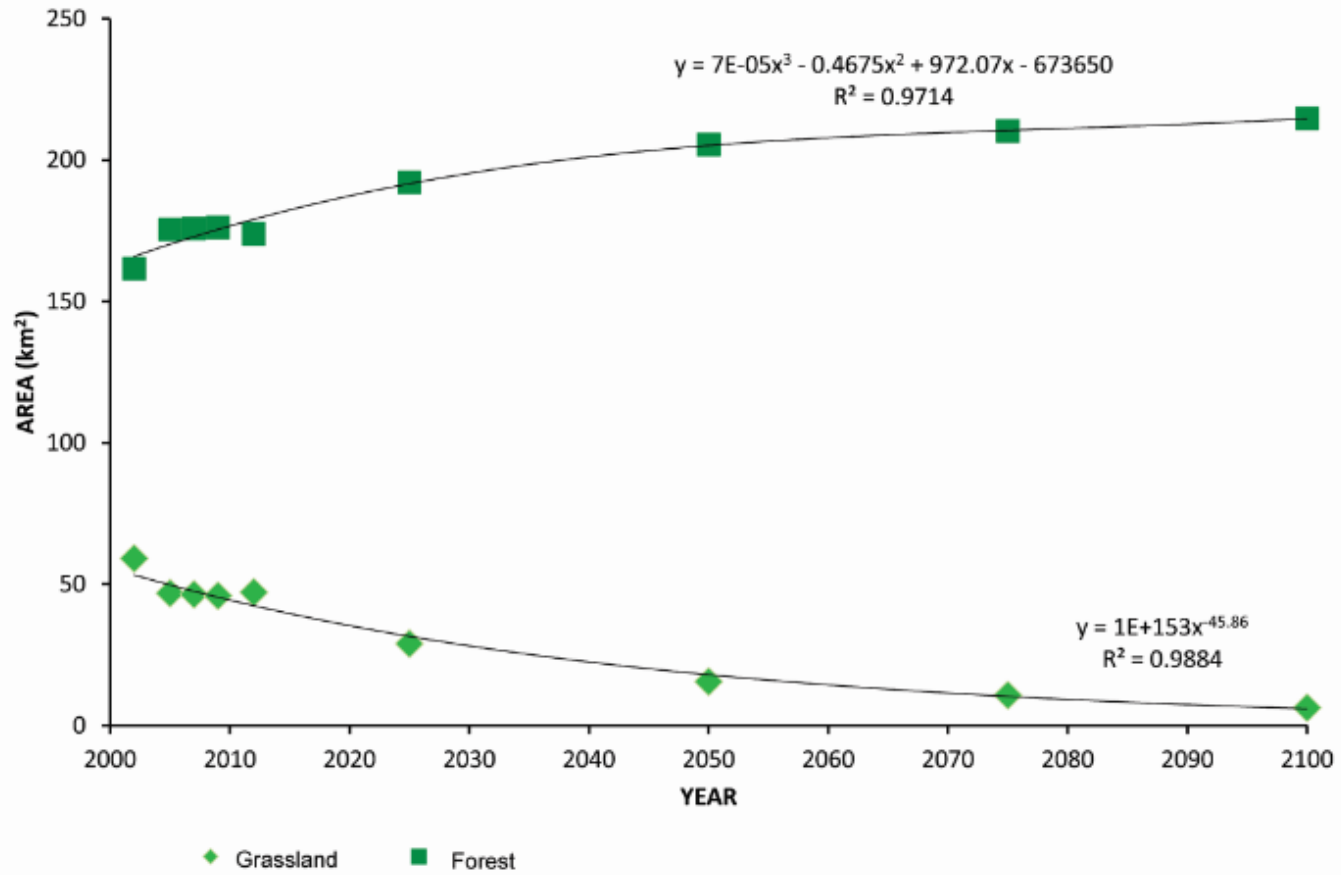
Trend 2001 – 2007 → napoved 2009 (teoretična karta)

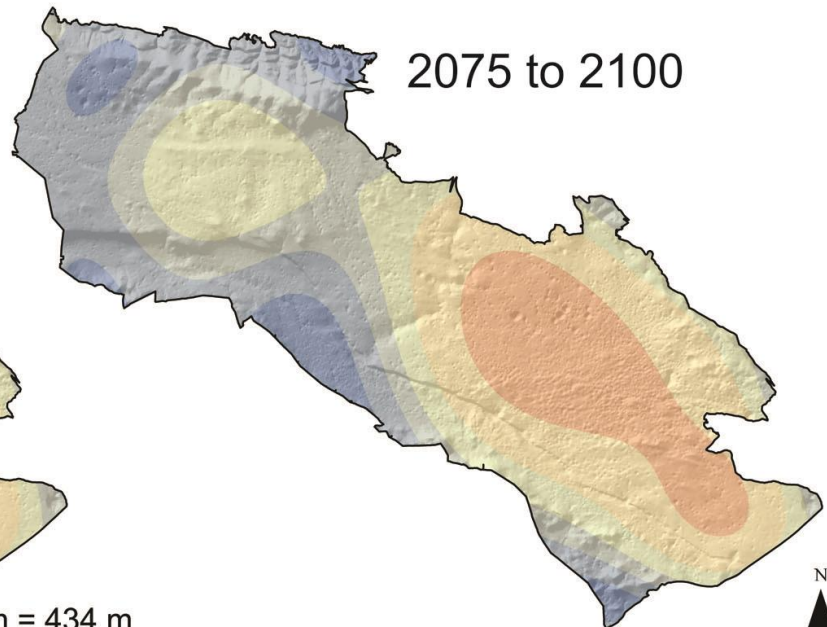
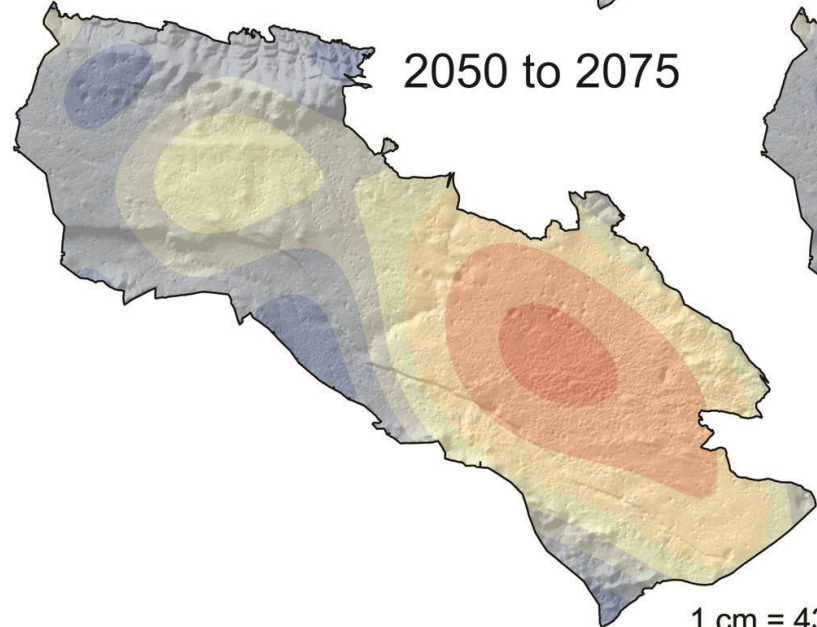
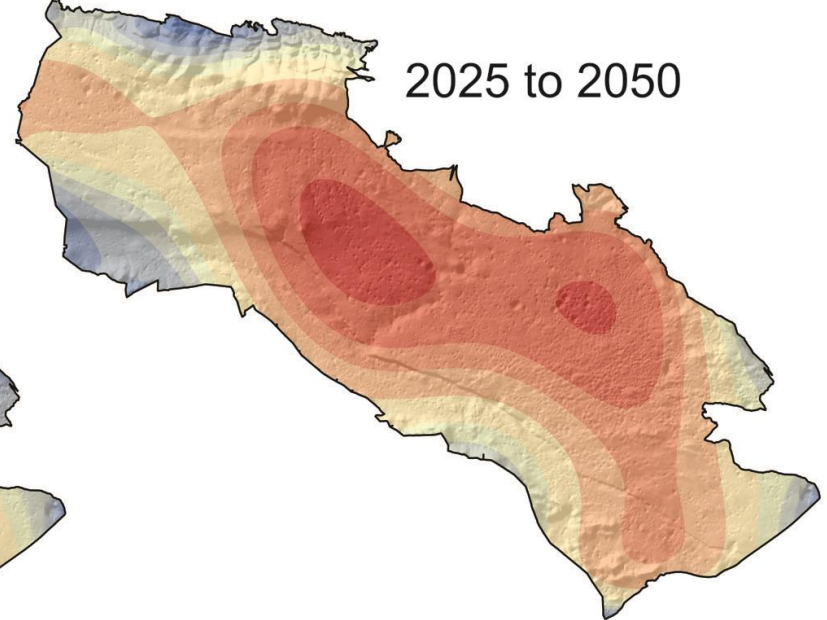
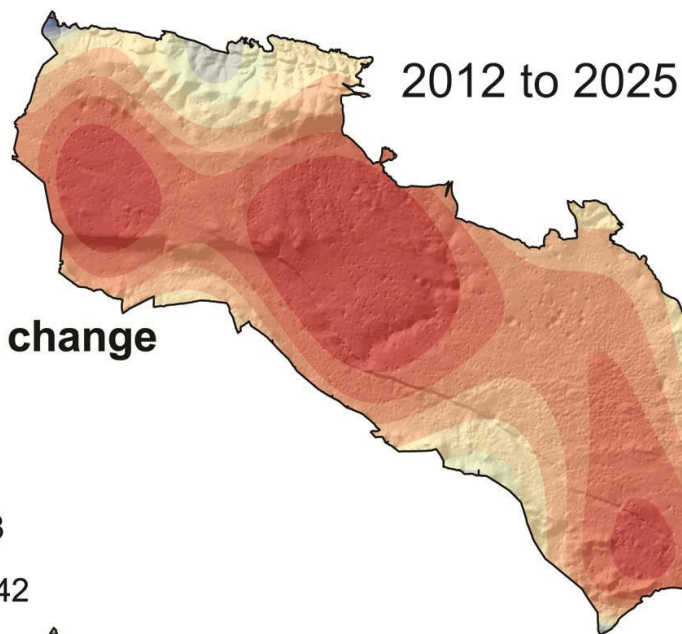
Primerjava 2009 teoretična vs. dejanska karta

Predikcija do 2100: na osnovi validiranega modela 2001-2012



**2025:** travišča manj kot 18km<sup>2</sup>, **2100:** 6km<sup>2</sup> (3%). Hitrost zaraščanja = **2.2 km<sup>2</sup>/leto**. Gozd se bo razširil za 18 km<sup>2</sup> do leta **2025**, glede na 2012. 2075: gozd 88% . **2100:** 90% (doseženo stabilno stanje)

**B**













**Legend:**

— Study area

**Spatial trend of change**

**Value**

-  -0.054 - -0.011
-  -0.01 - -0.0028
-  -0.0027 - 0.0042
-  0.0043 - 0.011
-  0.012 - 0.021
-  0.022 - 0.037
-  0.038 - 0.055
-  0.056 - 0.07
-  0.071 - 0.092
-  0.093 - 0.14

1 cm = 434 m



# Zaraščanje lahko upočasnjeno zaradi visokih kobulnic – *Laserpitium siletr*, *L. latifolium*, *Grafia golaka* ipd.

*Plant Biosystems*, Vol. 145, No. 3, September 2011, pp. 688–698



## SUCCESSION, MANAGEMENT AND RESTORATION OF DRY GRASSLANDS

### Grassland succession is mediated by umbelliferous colonizers showing allelopathic potential

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<sup>1</sup>Biology Department, Faculty for Natural Sciences and Mathematics, University of Maribor, Koroška 160, SI-2000 Maribor, Slovenia, <sup>2</sup>Landhausplatz 1, A-3109 St. Pölten, Austria, <sup>3</sup>Faculty of Agriculture, University of Maribor, Vrbanska 30, SI-2000 Maribor, Slovenia and <sup>4</sup>Wagenmannsgasse 3/2/1 A-1230 Vienna, Austria



696 M. Kaligarič et al.

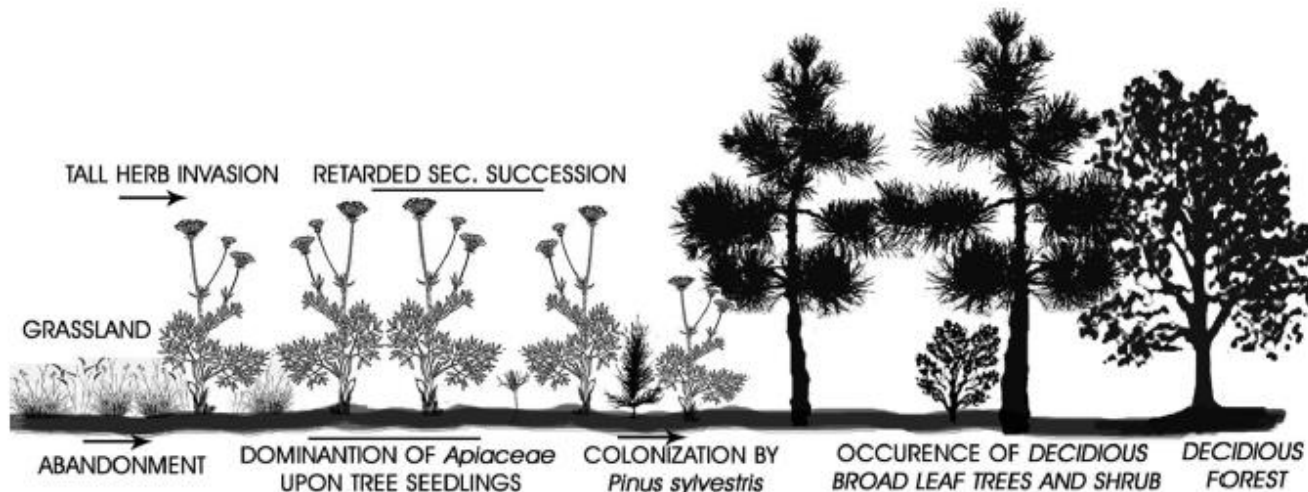


Figure 9. Long-term temporal changes after grassland abandonment.





Od kod pestrost kraških travišč? Od kje so prišle traviščne vrste?



Iznad gozdne meje: *Sesleria albicans*, *S. juncifolia*, *Carex mucronata*... Dovolj ostre razmere so našle tudi pod hozdno mejo: lege izpostavljene vetru, snegu, ledu na skalovju

Migracije ljudstev: *Bromus erectus*, *Chrysopogon gryllus*, *Stipa* spp., *Danthonia alpina* in vrste iz rodov *Pulsatilla*, *Potentilla*, *Paeonia*, *Linum* etc. Vzhodna (stepska) provenienca...

Meditersko skalovje, melišča...: *Helichrysum italicum*, *Salvia officinalis*, *Satureja montana* subsp. *variegata*, *Teucrium montanum*, *Satureja montana* subsp. *subspicata*, *Thymus* spp. etc. → značilne mediteranske rastlinske poteze (*plant traits*), npr. veliko sklerenhimov, trihomov, eteričnih olj, življenjski cikel (enoletnice, nizki grmiči).



Rastlinske poteze (N = 207 traviščnih vrst) nakazujejo na termofilnost:

Geofiti	8,7%
Terofiti (enoletnice)	6,3%
Rastline s trni	3,9%
Gosta dlakavost	25,1%
Redka dlakavost	28,1%
Listna obstojnost – spomladi zeleni	3,9%
Listna obstojnost– pozimi zeleni	2,9%
Listna obstojnost– vednozeleni	27,5%
Listna anatomija – sukulentni	0,5%
Listna anatomija – skleromorfni listi	45,2 %
SLA < 10 mm <sup>2</sup> /mg	16%
LDMC > 250mg/g !!!	62,8%



## Migracije ljudstev

# Transhumanca do 1987

Vremščica – Center za  
sonaravno rekultiviranje  
(CSR )Vremščica



Metoda izločevanja diaspor (semen,  
plodov) iz ovčje kože in določitev  
semen s priročniki ali s kalitvijo.

(Poschlod et al. 1996,1998; Tackenberg s  
sod. (2006))



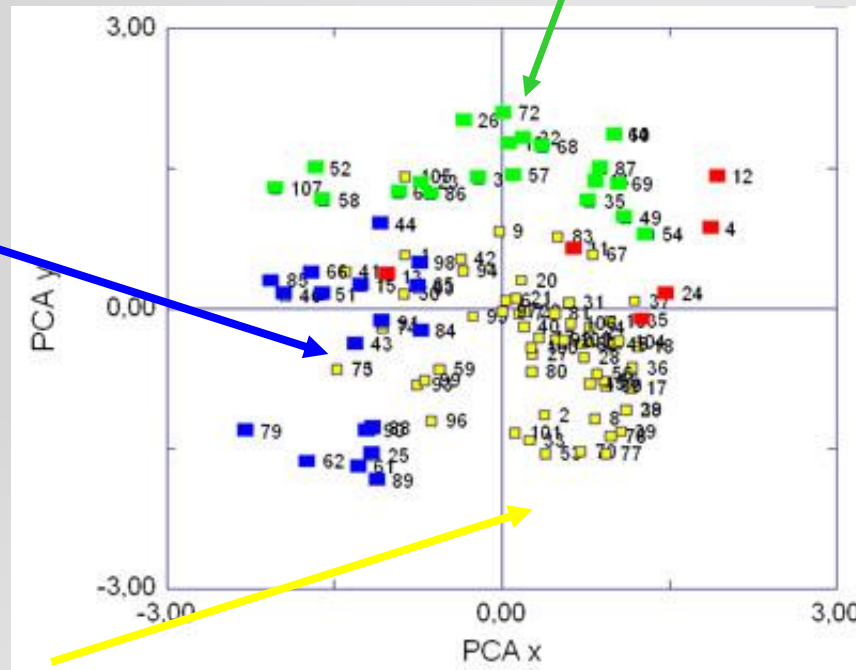
10 ovčjih kožuhov (vsak je en vzorec): **25.389**  
diaspor, ki pripadajo **134** taksonom, **105**  
določenih do vrste (največ trav: *Bromopsis*  
*erecta* (2860), *Dactylis glomerata* (3095),  
*Festuca rupicola* agg. (1422) *Arrhenatherum*  
*elatius* (1054). Nekaj od njih izvira iz zimske  
krme



klasifikacija in ordinacija **107**  
**vrst** na podlagi **9 MFP**  
diaspor

Težke, velike diaspore z  
velikim volumnom (**21**)

Ozke in lahke diaspore brez  
oprijemalnih struktur (**19**)



Diaspore z nitastimi  
izrastki in oprijemalnimi  
strukturami (**61**)



## Transhumanca na Balkanu (19.-20.stol)

Rekonstr. po E.Petrovici, M.Marković, I.Smerdelj in lastnih raziskavah

The outline in the northwest is a geographic border separating Alps from Dinaric Mountains. Alternative historical or cultural borders are marked with ..... lines.

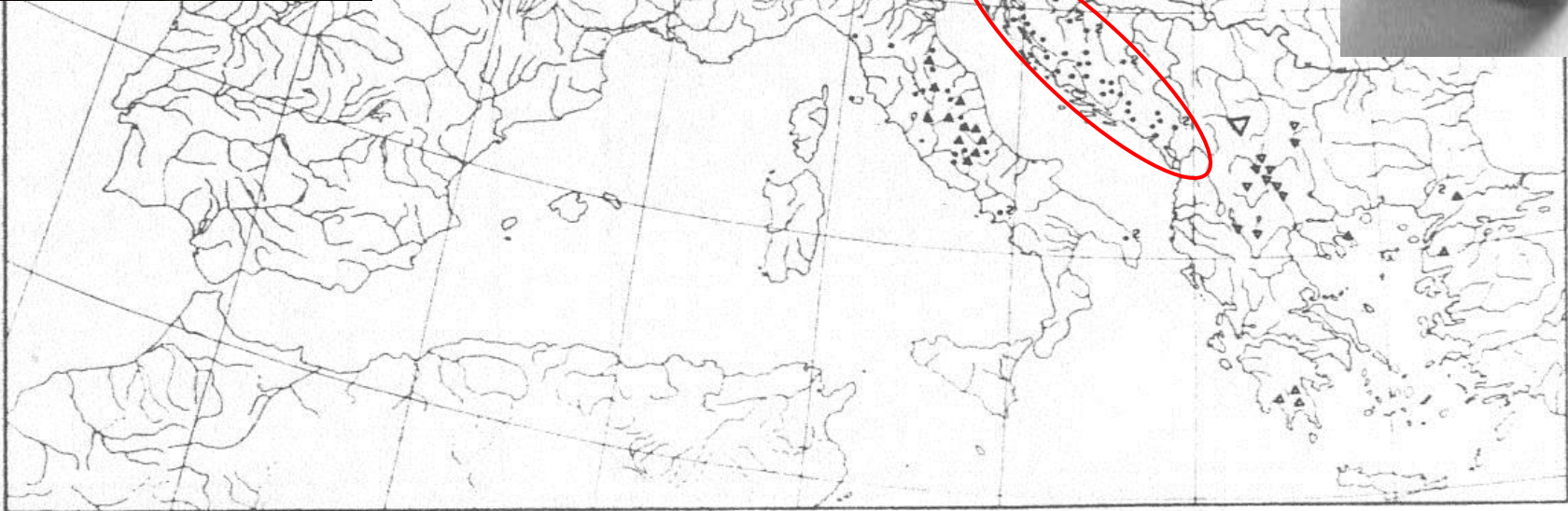
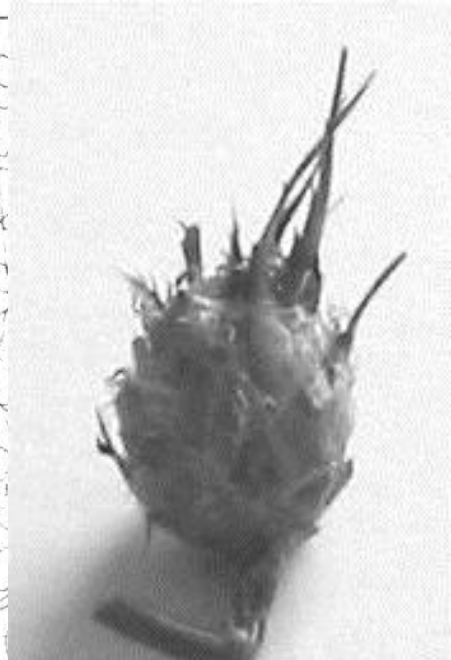
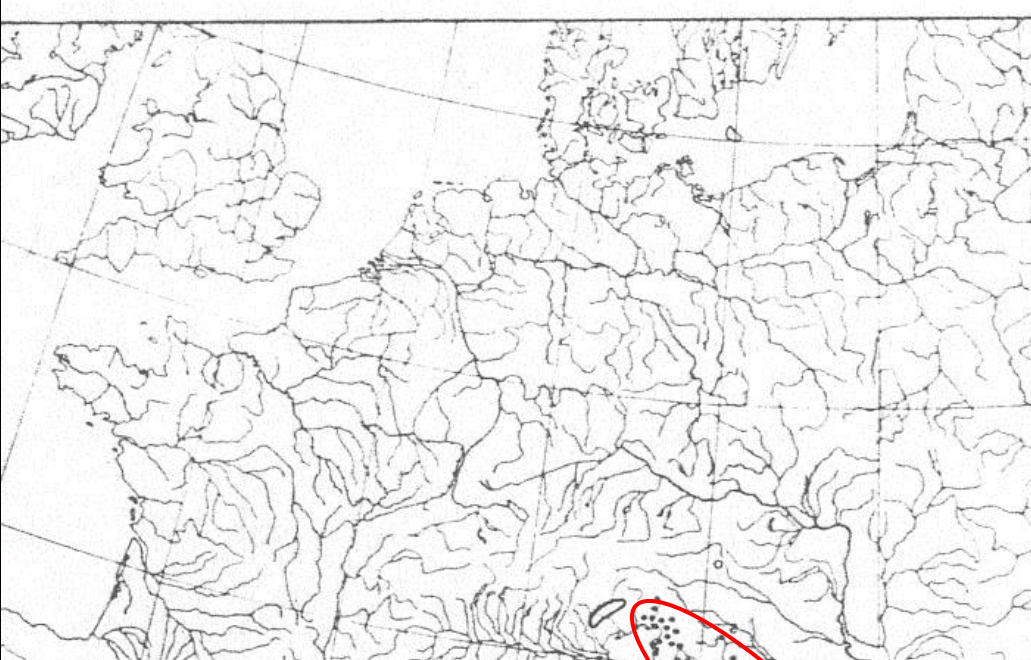


Dve najbolj razširjeni traviščni asociaciji na Zahodnem Balkanu v submediteranskem pasu:

- asociacija nizkega šaša in skalnega glavinca *Carici-Centaureetum rupestris* (*Centaurea rupestris*)
- asociacija oklasnice in dlakavega gadnjaka *Danthonio-Scorzoneretum villosae* (*Scorzonera villosa*)



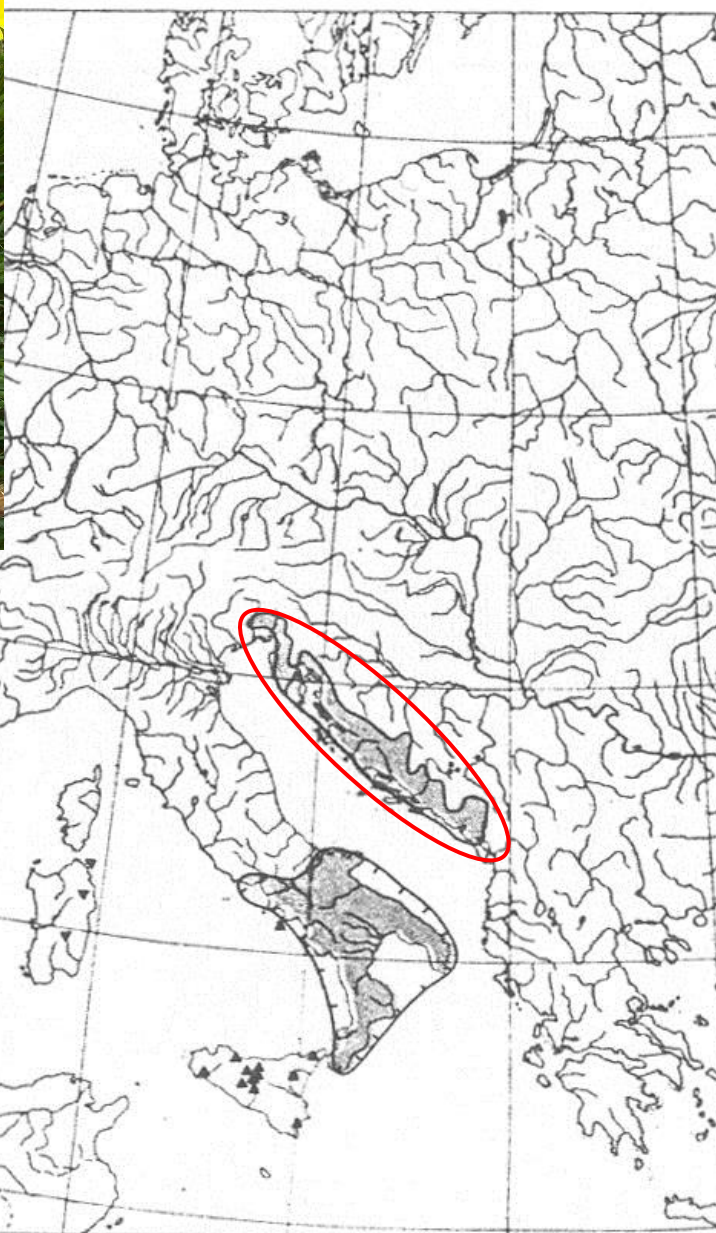




*Centaurea rupestris* L.

- ssp. *rupestris* o synanthrop
  - ▲ ssp. *ceratophylla* (TEN.) GUGLER
  - ▼ ssp. *finazzeri* (ADAMOVIĆ) HAYEK
  - ▲ ssp. *athoa* (DC.) GUGLER
- ▽ ungenau lokalisiert

*Centaurea rupestris*



*Scorzonera villosa* SCOP.

- ssp. *villosa*
- ▲ ssp. *columnae* (GUSS.) NYM.
- ▼ ssp. *callosa* (MORIS) CHATER

## *Scorzonera villosa*



## Varovanje kraških travišč:

- Ne moremo ohraniti vseh, samo vzorce
- Ohranjati trajnostno rabo kulturne krajine, ne “vrtičkov”
- Skrbeti za pravilno upravljanje (košnje, paša) travišč, ki ima tudi ekonomski smisel
- Ne zanemariti negativne genetske procese v fragmentiranih traviščih
- Ohranjati ne le majhne, ogrožene populacije, temveč tudi prav nasprotno: velike, nefragmentirane površine

All photos: A. Gogala



Hvala za pozornost!