



MODELLING OF LAND COVER CHANGE IN ABANDONED LANDSCAPE USING TIME SERIES OF AERIAL PHOTOGRAPHY

Josef Brůna

INSTITUTE FOR ENVIRONMENTAL STUDIES

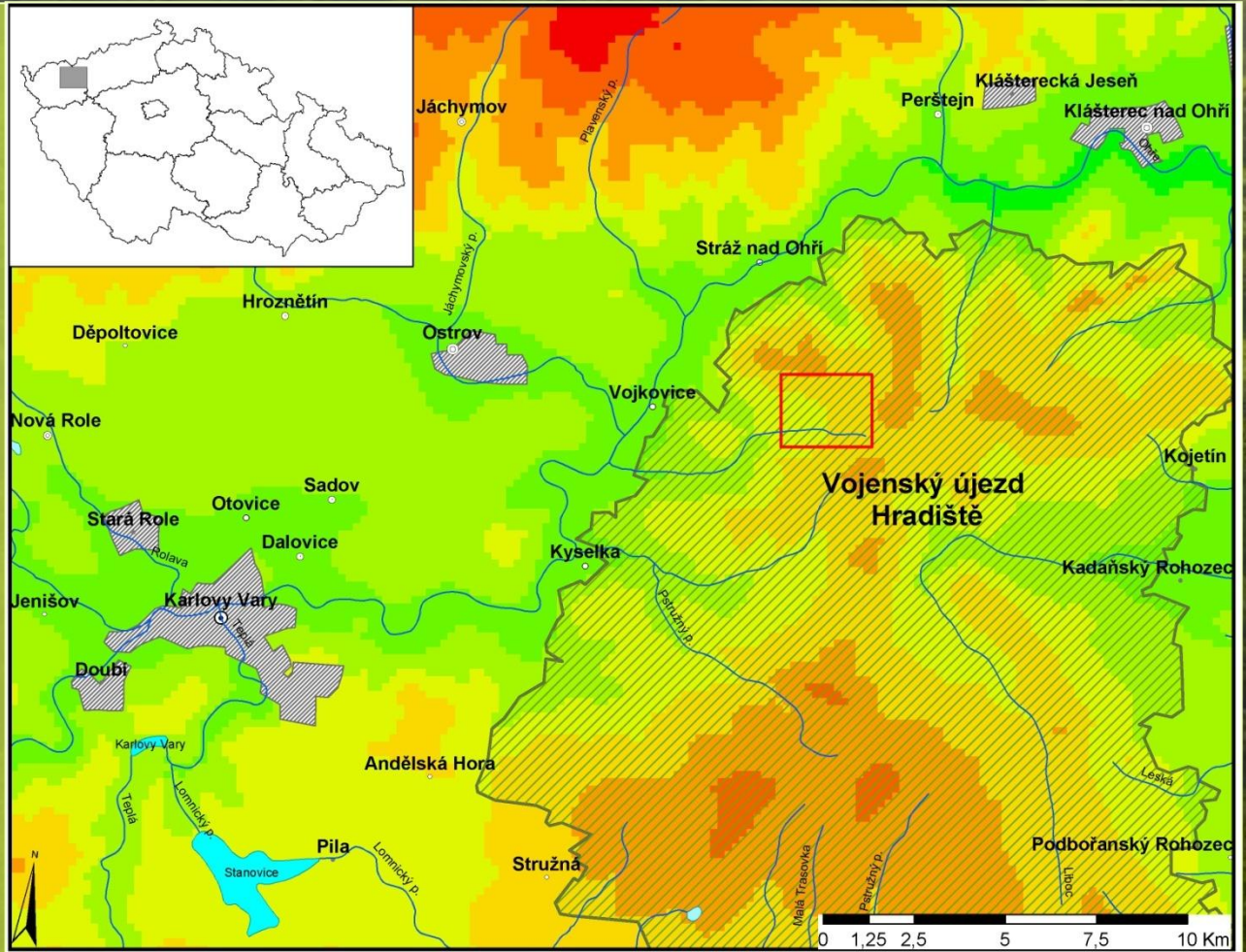
Faculty of Science

Charles University in Prague

Research team of Jaroslav Vojta

Study site

- Doupovské hory
- Military area Hradiště
- In a part abandoned in 1953 and not in use



Study site



- 2 x 2,5 km
- Around former village Tocov
- Common agricultural landscape left for 58 years of succession

Research goals

- Assess landscape change during >50 years of abandonment
- Try to identify main driving forces of succession

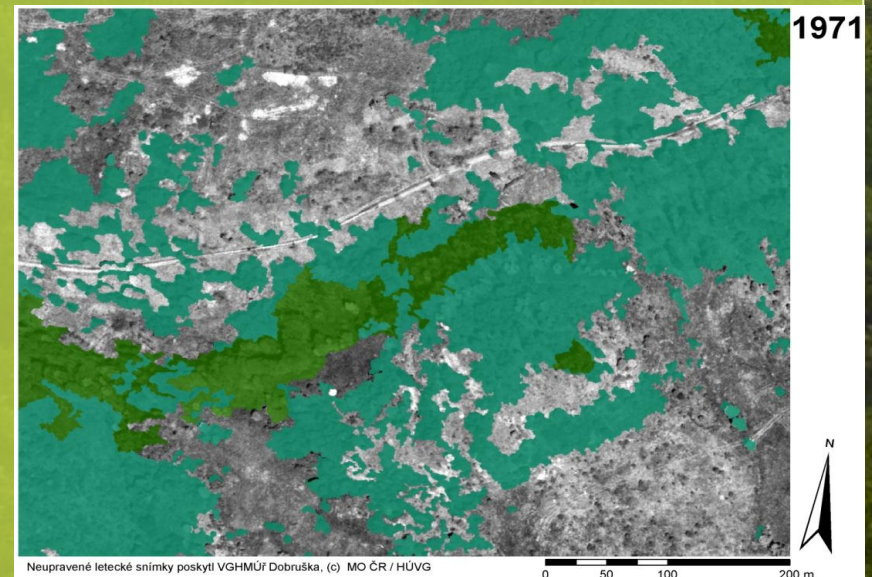


Materials

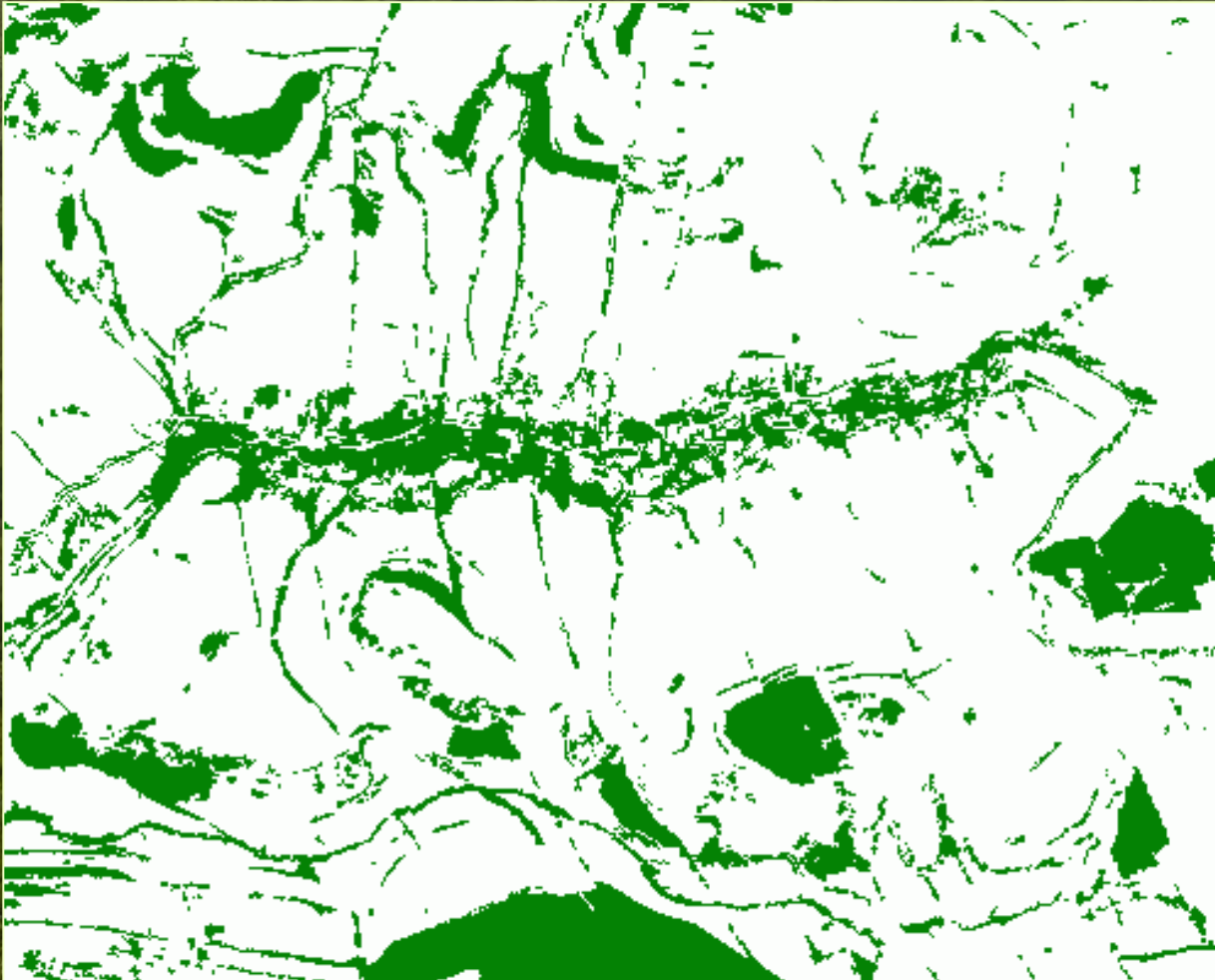
- Aerial photography from 1952, 1962, 1971, 1984, 1992 from military archive in Dobruška and 1999, 2005 from ČÚZK
- Cadastral map from 1950
 - former landuse
- DEM
 - derived data
 - slope, aspect (HLI)
 - WTI
 - TSI 50, 250, 1000

Methods

- Orthorectification of aerial photographs
 - PCI Geomatica 10 (Institute of Botany, AS CR)
- Object oriented image analysis
 - Definiens developer 7
 - (Institute of Botany, AS CR)
 - 2 classes
 - Grasslands
 - Woodlands

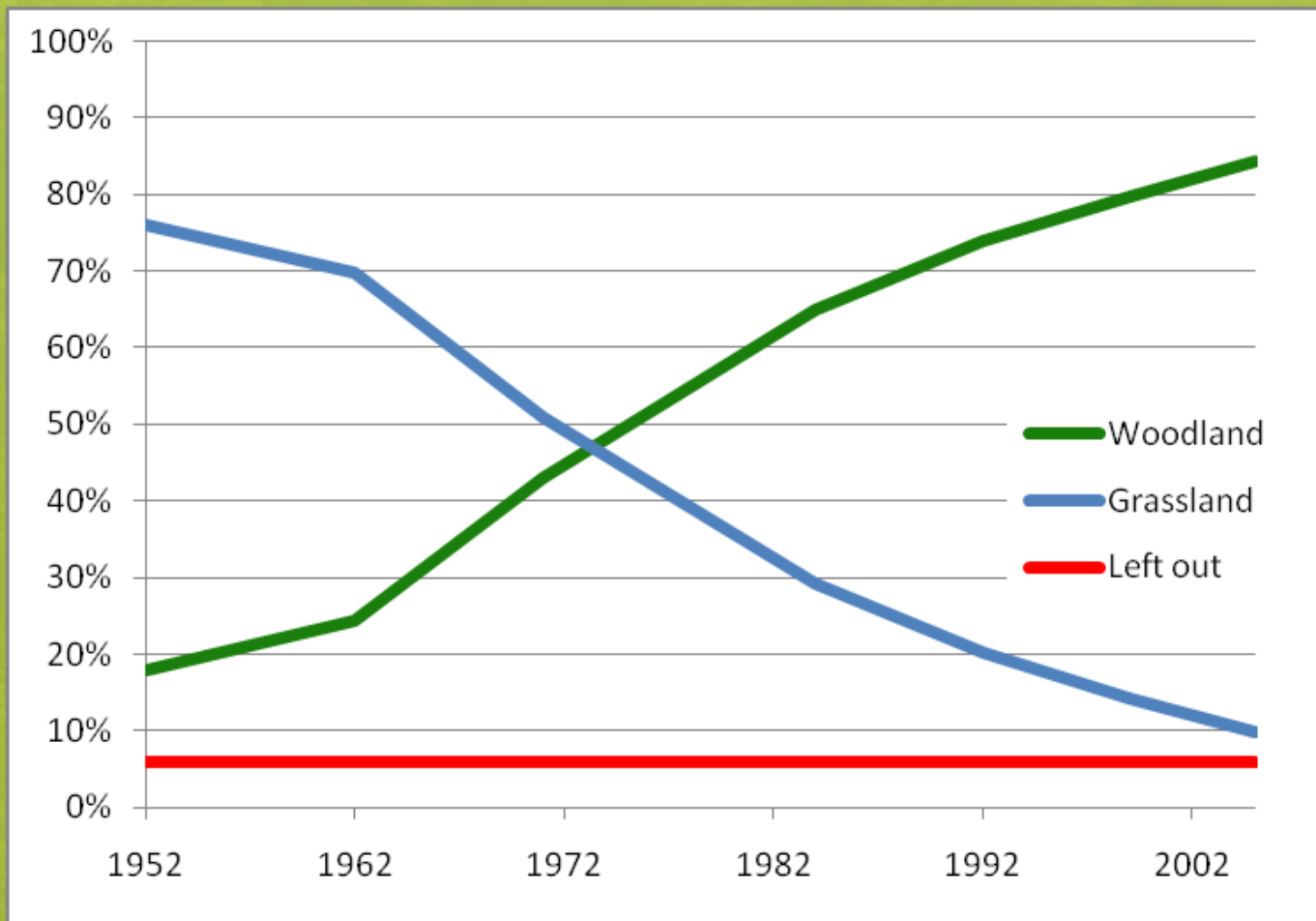


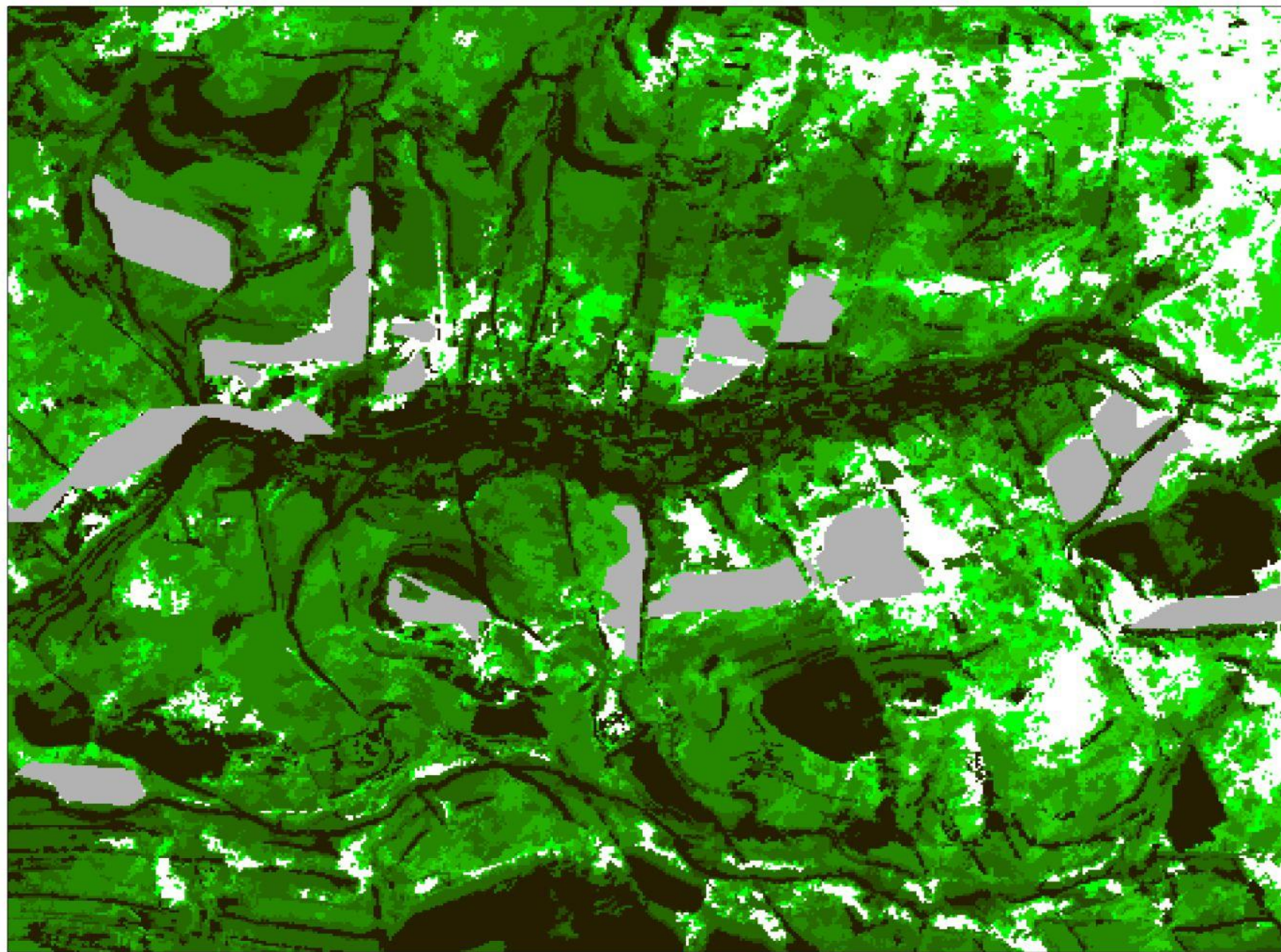
Monitored change



- Rapid succession in abandoned landscape
- Change of connectivity
- Most of the grasslands are gone
- Some grasslands still remain
- Management found in early 70's

Monitored change





Legend

- Left out
- 1952
- 1962
- 1971
- 1984
- 1992
- 1999
- 2005



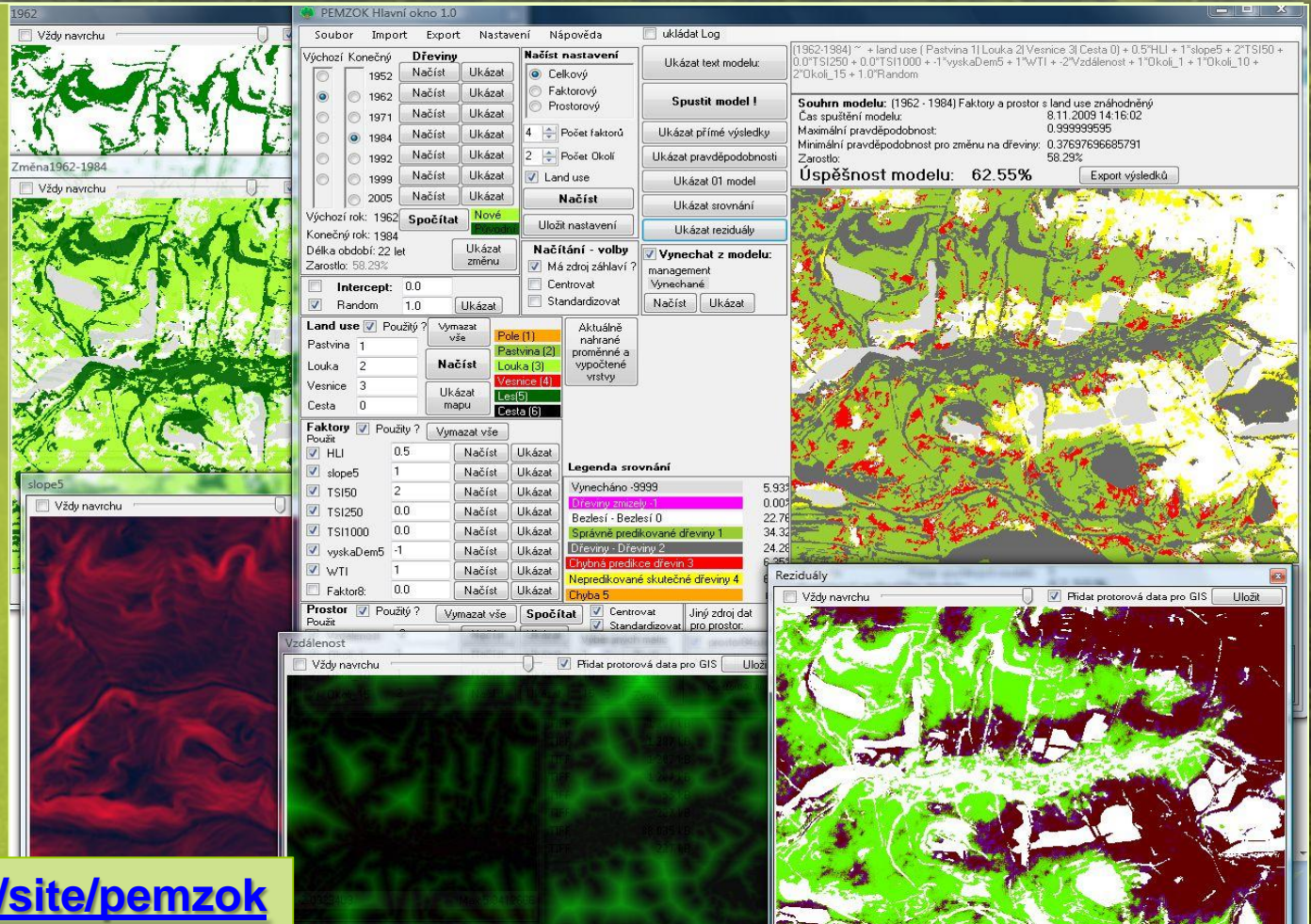
Analysis and models

- Linear mixed effects models (lmer) in R
- For each 10 years
- 4 Different types
 - **DEM derived factors and landuse (factors)**
 - Spatial information and a landuse (spatial)
 - **DEM derived factors and spatial information with landuse (full)**
 - **DEM derived factors and spatial information** (distance from forests and density in neighborhood) (full without landuse),
- Problem – no visualization of spatial results

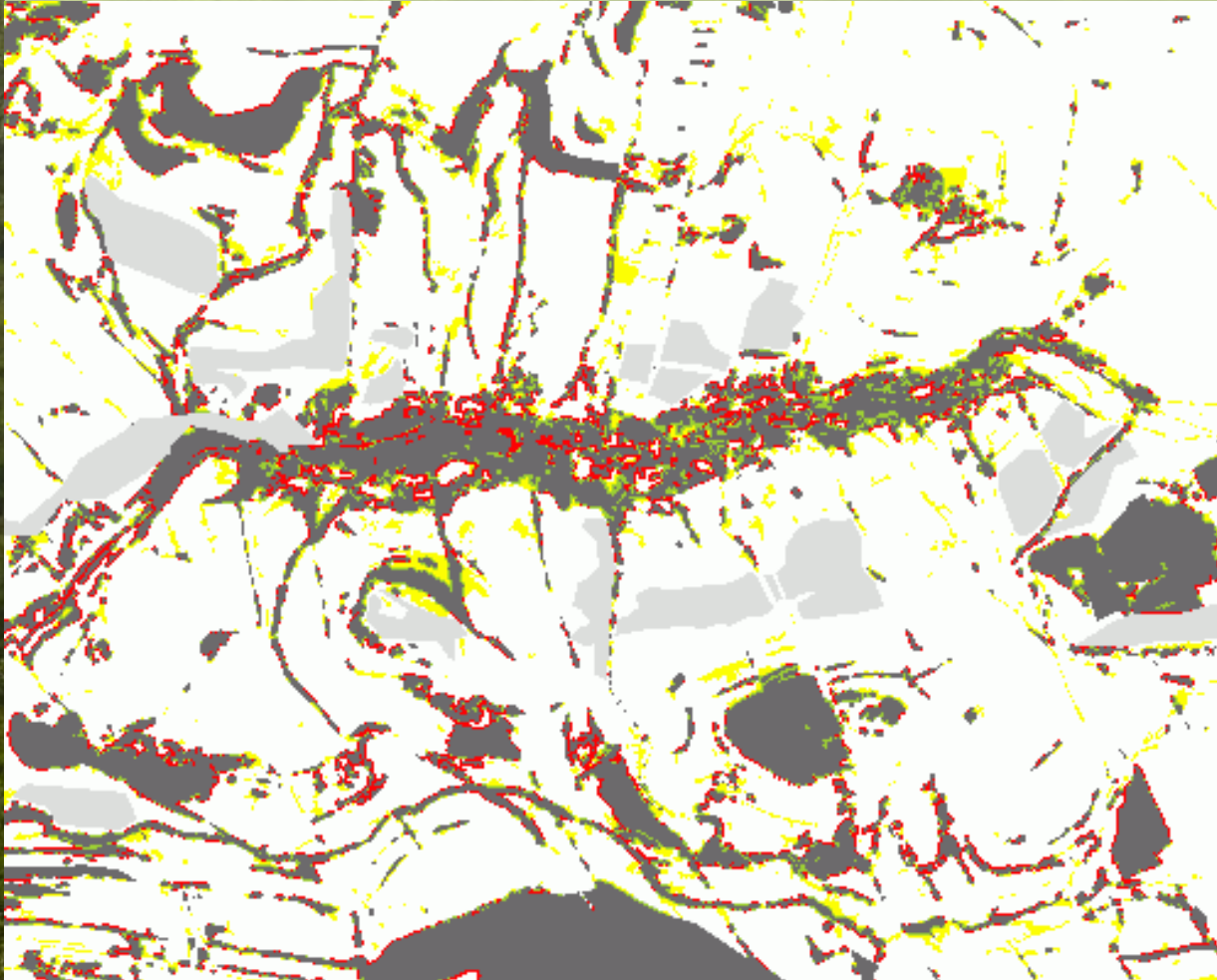
Application PEMZOK

- C# . NET
- Preparation of datasets
- Spatial data management
- Visualization of Imer model results
- Import and export to GIS (images and ascii data)

<http://sites.google.com/site/pemzok>

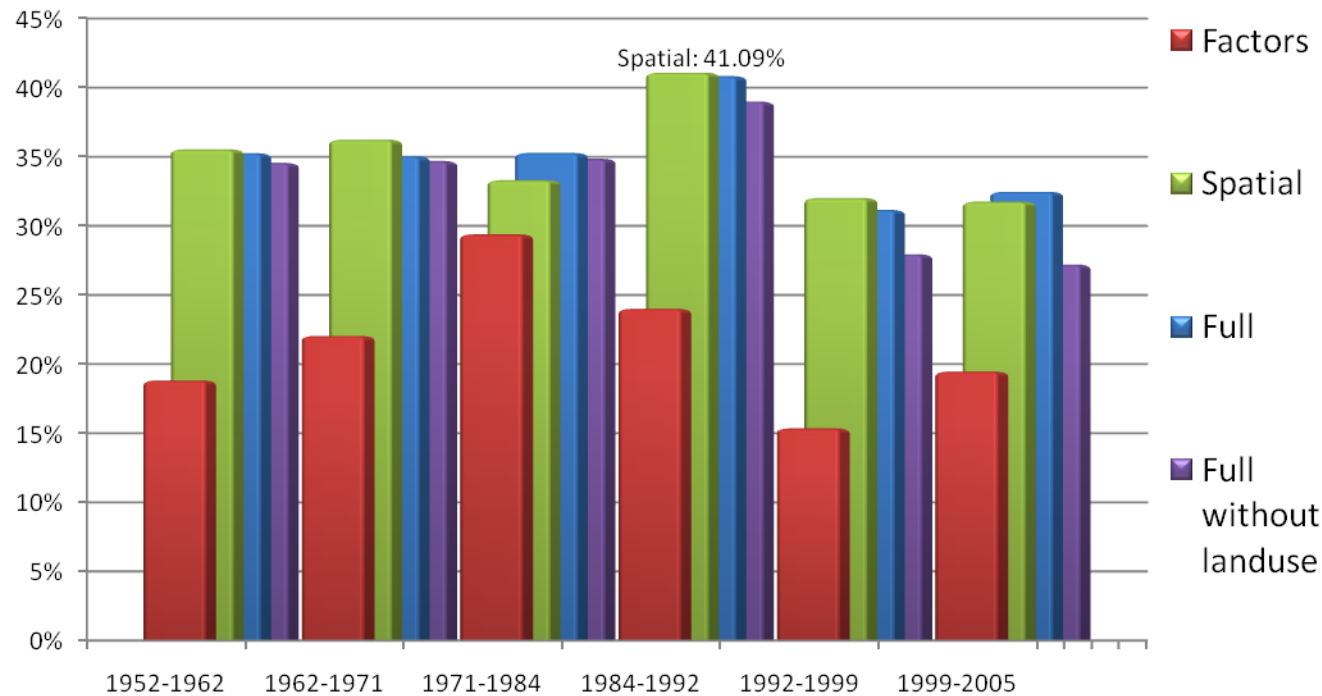


Results - model



- **Model of succession in abandoned landscape**
- Grid based model
- Up to 42 % success
- Best predictors
 - Distance to woodland
 - Density of woodland
 - Elevation and slope
 - Influence of landuse is growing
- Hawthorn spread was not modeled correctly
 - New study based on satellite imagery

Comparison of model success

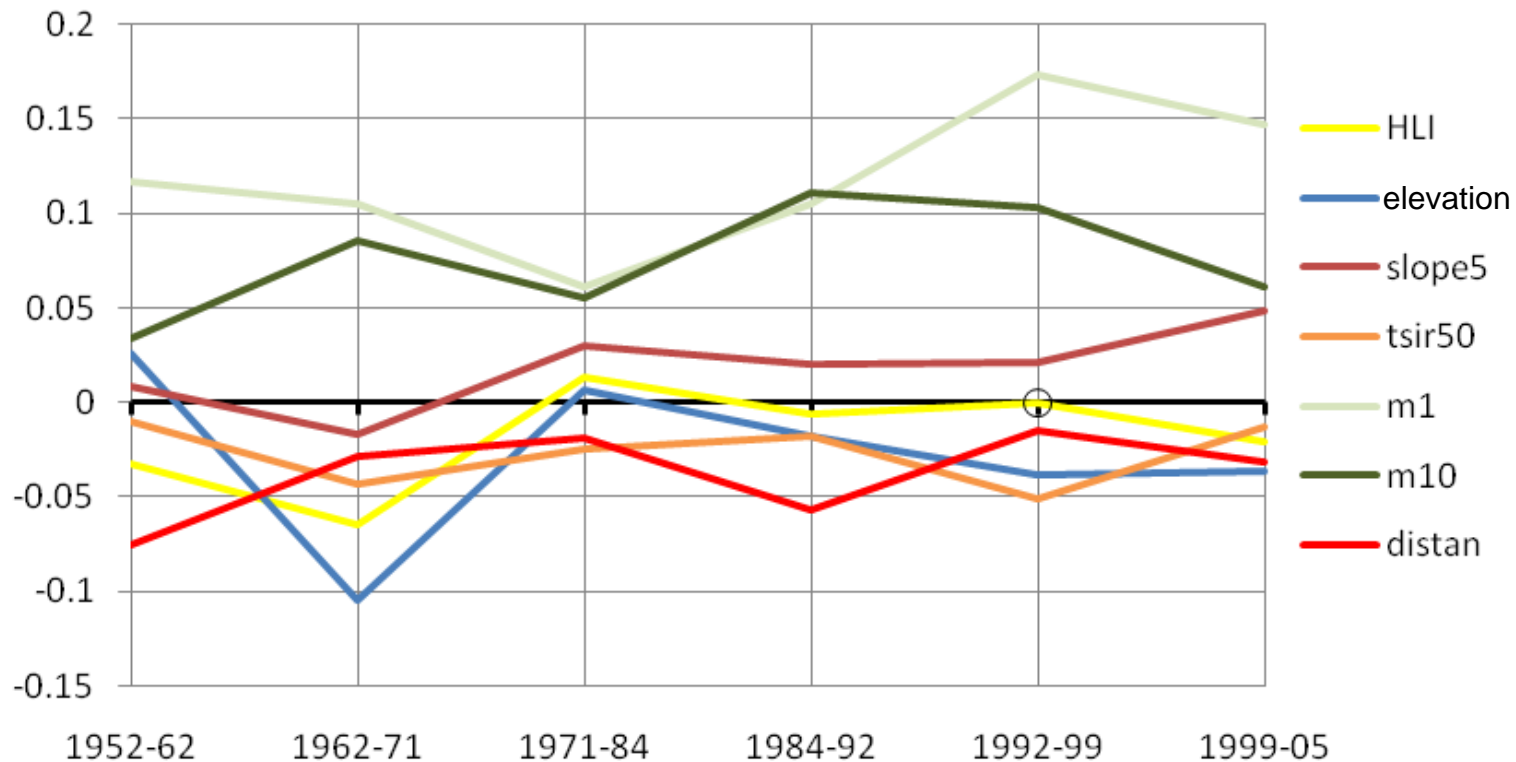


- modified so that a null model has 0% success
- significant contribution of spatial information
- influence if landuse grows

Significant factors

■ Standardized and centered

Full models



Conclusions

- Woodland is spreading rapidly
- Distance from forest is a best predictor
- Some grasslands still persist
 - on top of hills, in higher areas and on places with higher HLI
- Influence of landuse grows
- Hawthorns (*Crataegus sp.*) behave different and are not predicted by the model
 - Should be modelled separately



Thank you for your attention