Long-term disturbance patterns in Romanian forests

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Introduction

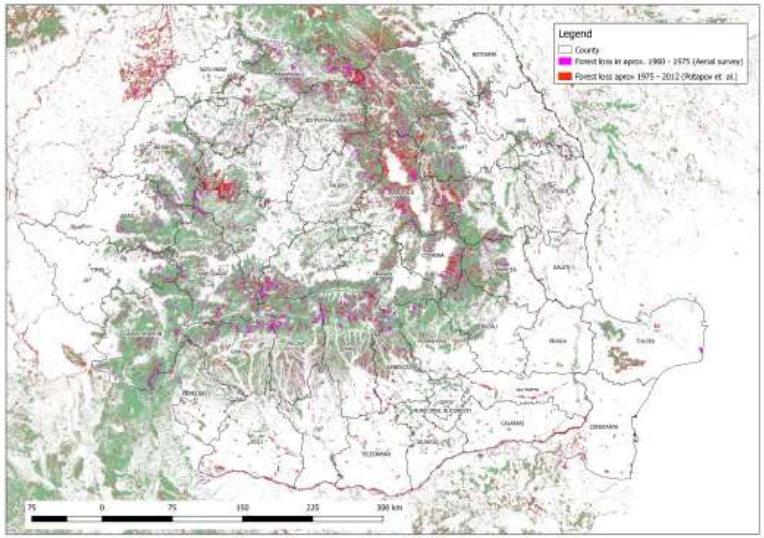
Forest disturbance and recovery are critical ecosystem processes and an improved monitoring of changes in forest structure is needed to quantify natural and human impact on forest systems. The influence of size, fragmentation of disturbances to the ecosystem is directly proportional to the covered area. Long-term changes, in particular, have major consequences for ecosystem functioning, carbon storage, climate regulation and biodiversity.

Our goal was to create a spatial database with the location, fragmentation and shape of forest disturbances in the last 60 years

Results

Following WWII, and especially after 1975, Soviet policies increased forest cover by establishing forest plantations outside the historical range of forests. We observed a peak in harvest around 1965, partly due to war reparations paid to Russia in oil and timber.

Disturbance peaked again in 1982–1985 when Romania was paying off loans to the International Monetary Fund. Following the collapse of the Soviet Union, disturbance rates were also high in Romania especially following major privatization laws in 1991, 2000, and 2005.



Spatial distribution of disturbances in Romanian forests

Methods

In this study, we created a spatial database by combining geographic data on forest disturbances maps extracted from different products and studies.

For the period 1960 – 1975, we digitized the forest disturbances using the second edition of Military Topographic map of Romania which was based on the first aerial survey which covered the entire teritory of Romania.

For the period 1975 – 2012, the forest disturbances were extracted from a previous study (Potapov et al, 2014) which is based on several Landsat historical and recent scenes collected from USGS archive.

Conclusions

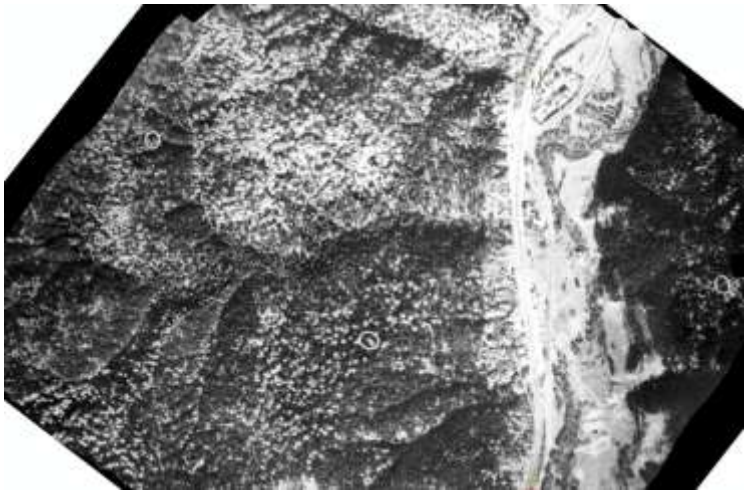
The results revealed that fusing cartographic data and Landsat's temporal and spatial coverage, provides an unique opportunity for characterizing vegetation changes. On macro level, this kind of method offers a large view on forest disturbances which occur during a management cycle.

This database is an important starting point in identifying the valuable ecosystems and old-growth forests, by identifying islands of undisturbed forests in the context of forest ownership in Romania

An important finding of this study is highlights that rates of forest harvesting after 1990 were lower than pre-1990, a fact that is missed by most post-socialist studies.

Methodology

1960 – 1975
Topographical Map from Aerial Survey



1975 – 2012
(Potapov et. al, 2014)

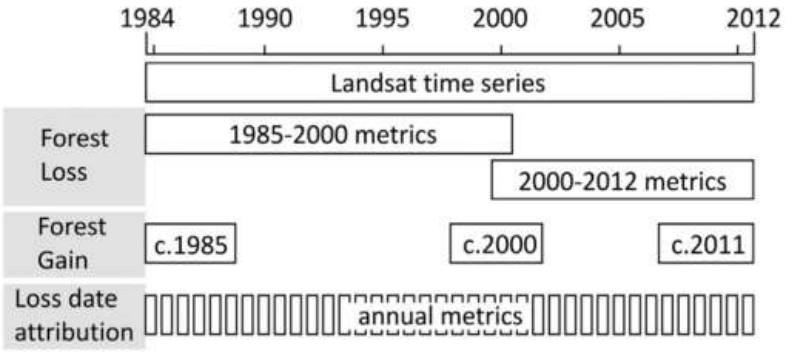
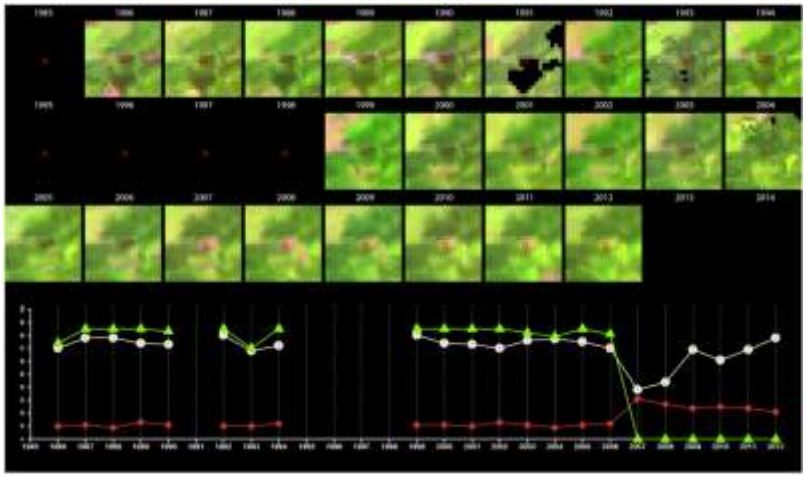
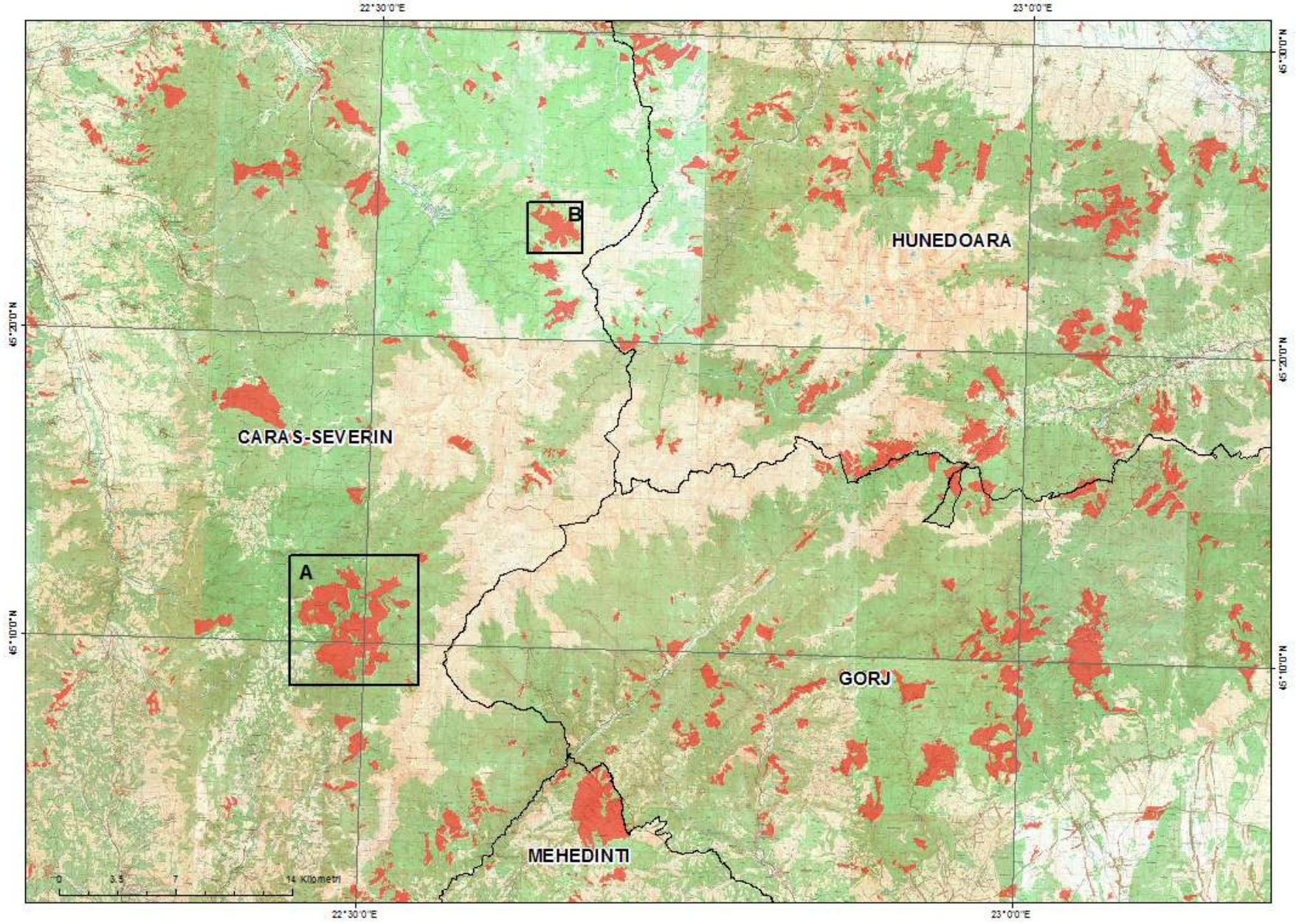


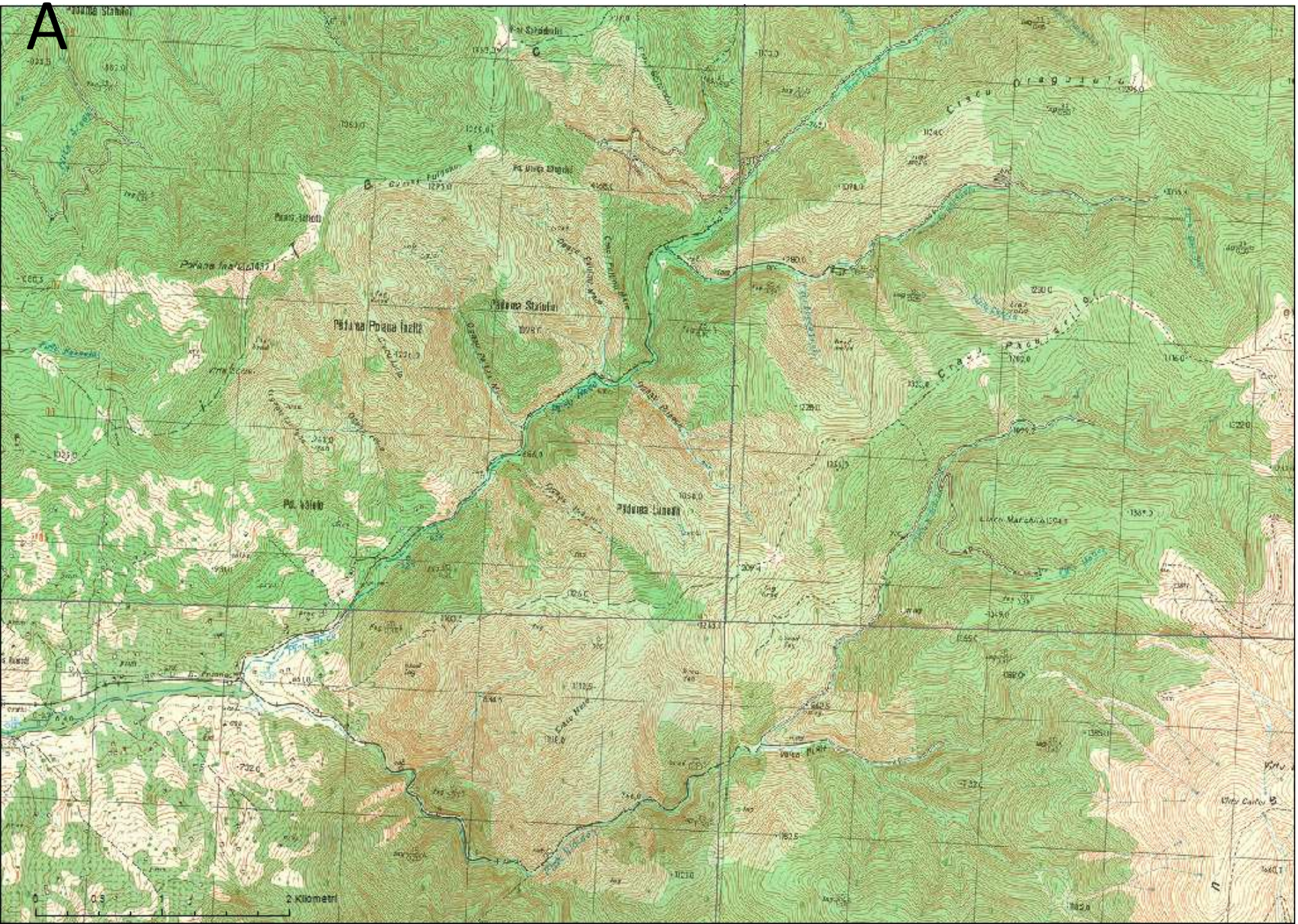
Fig. 1. Landsat time series and multi-temporal metric sets.



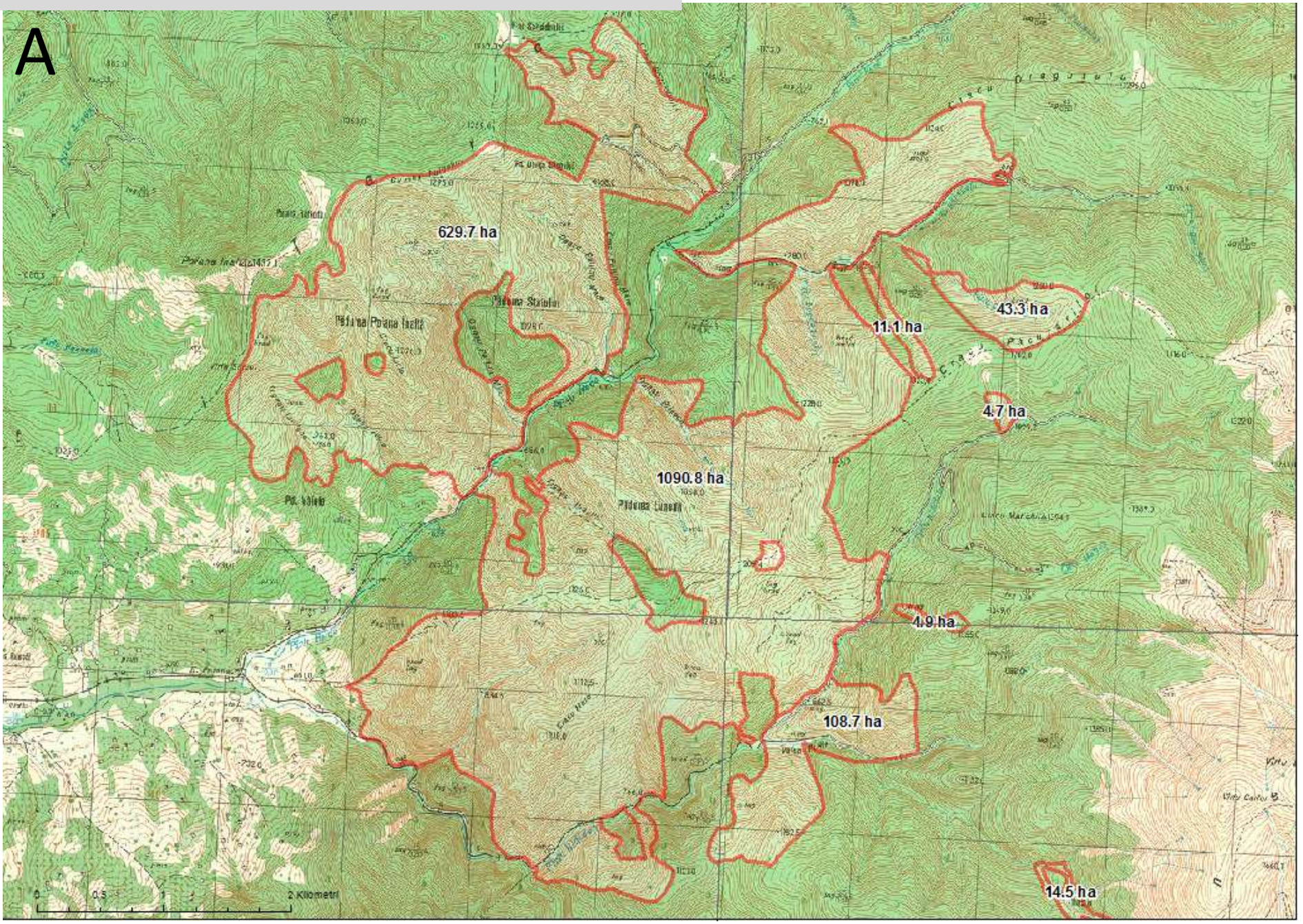
Methodology – disturbance digitization



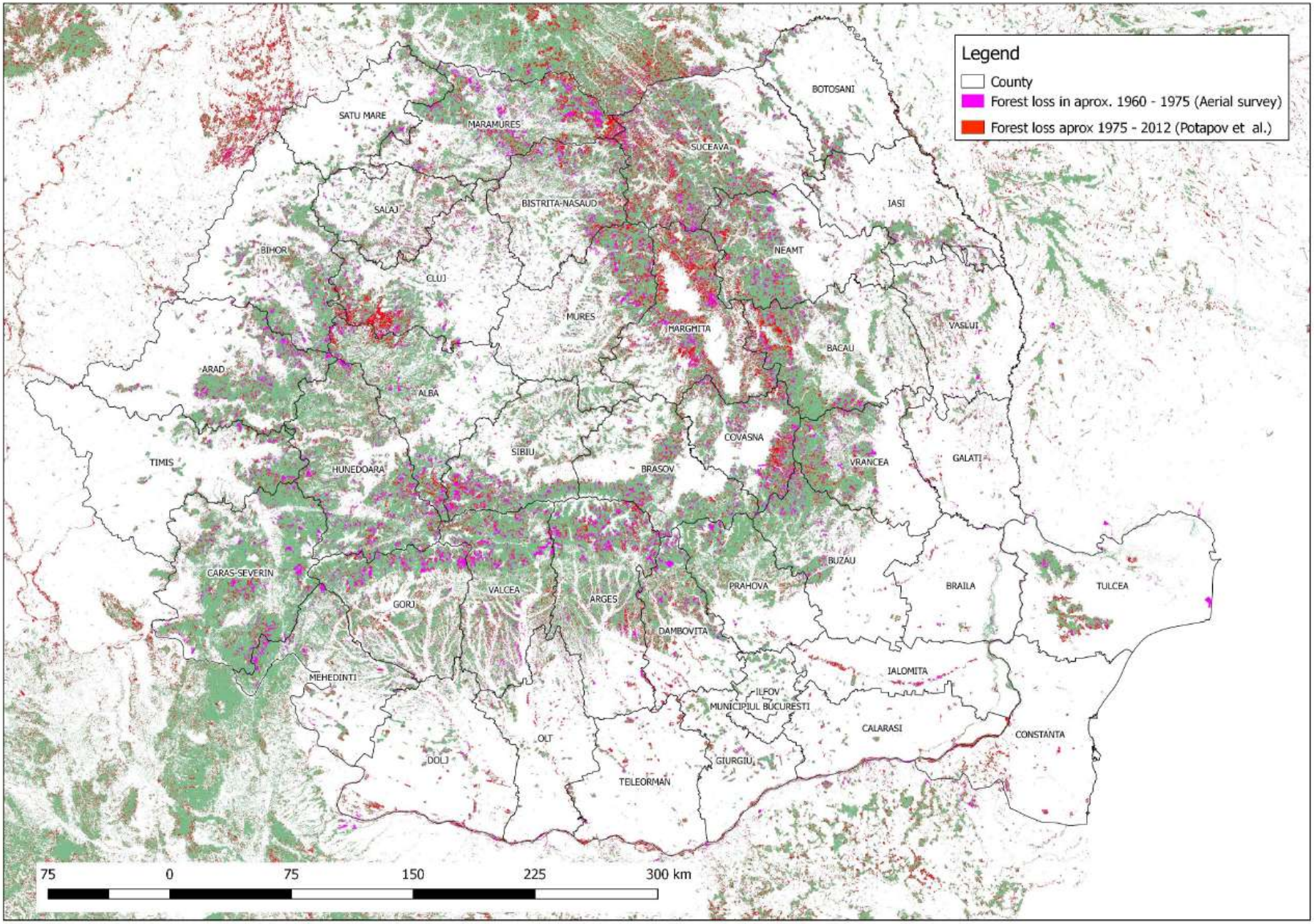
Poster 5: Nita, SCERIN 4, Zvolen, 2016



Poster 5: Nita, SCERIN 4, Zvolen, 2016

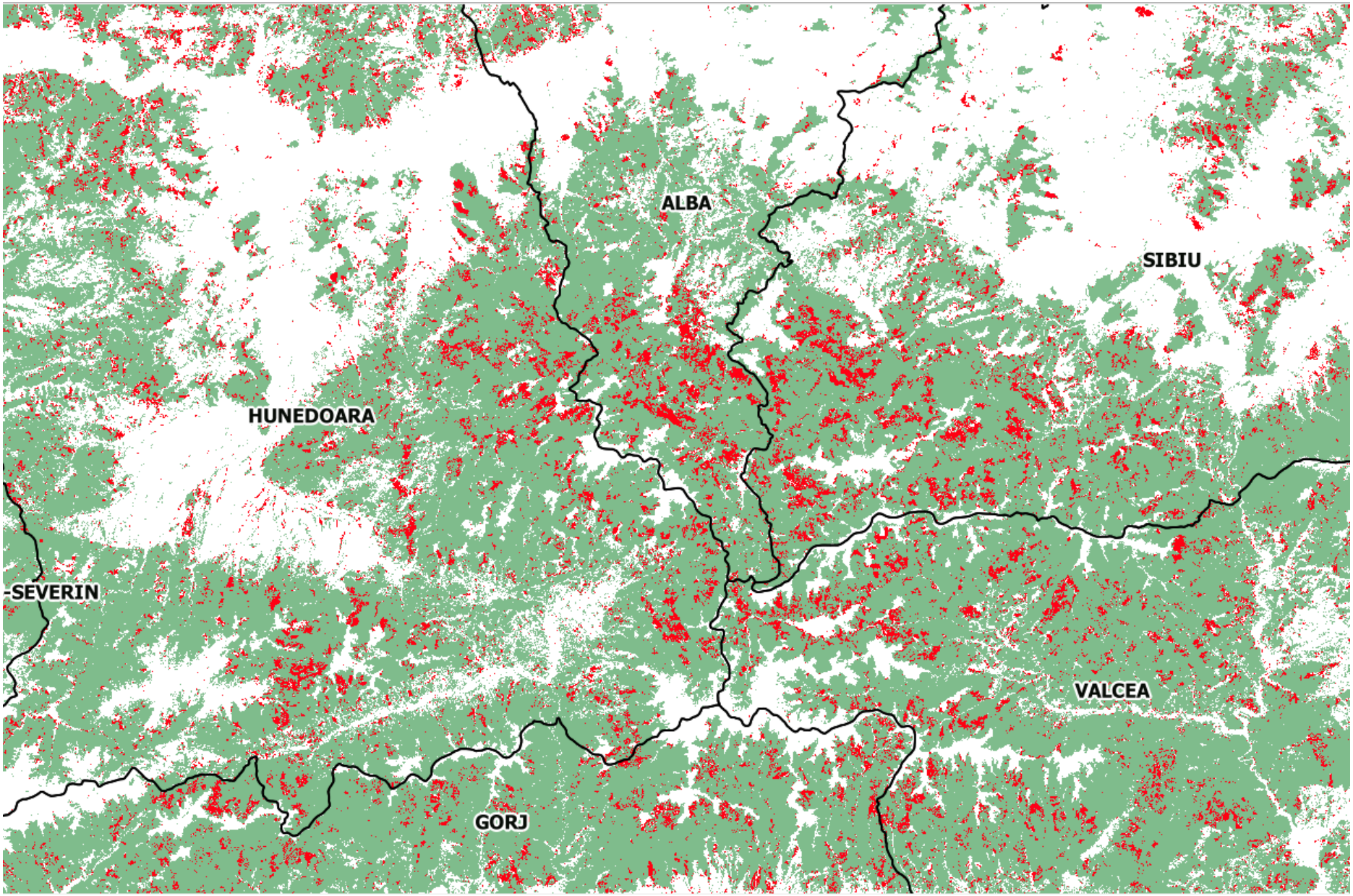


Results


Legend
County
Forest loss in aprox. 1960 - 1975 (Aerial survey)
Forest loss aprox 1975 - 2012 (Potapov et al.)
BOTOSANI
SATU MARE
MARAMURES
SUCEAVA
IASI
SALAJ
BISTRITA-NASAUD
NEAMT
BIHOR
CLUJ
MURES
MARGHITA
VASLUI
BACAU
ARAD
ALBA
COVASNA
SIBIU
VRANCEA
GALATI
TIMIS
HUNEDOARA
BRASOV
BUZAU
CARAS-SEVERIN
PRAHOVA
BRAILA
TULCEA
VALCEA
ARGES
GORJ
DAMBOVITA
IALOMITA
MEHEDINTI
ILFOV
MUNICIPIUL BUCURESTI
CALARASI
CONSTANTA
OLT
GIURGIU
DOLJ
TELEORMAN
75 0 75 150 225 300 km

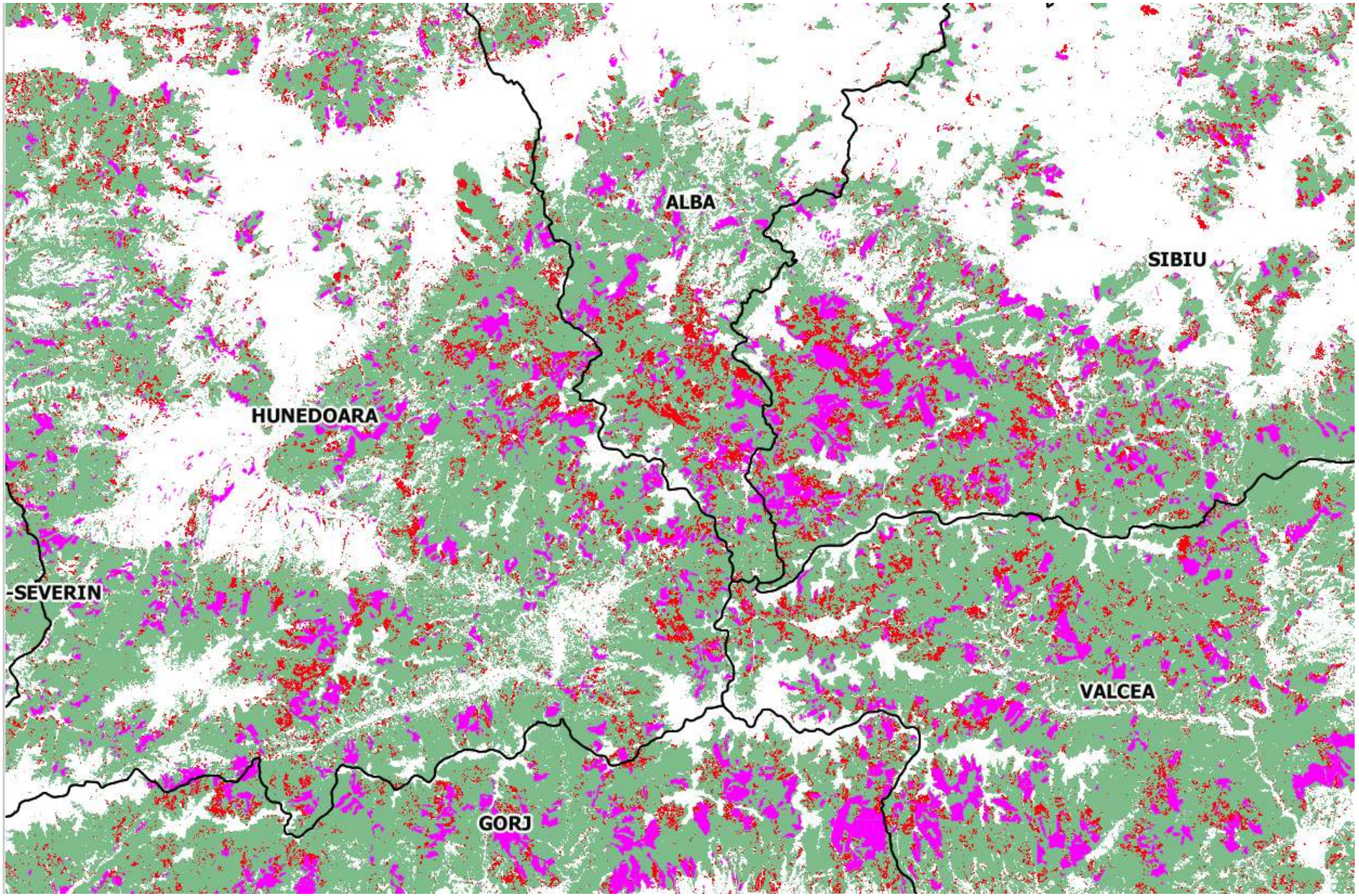
Results

1980 - 2012



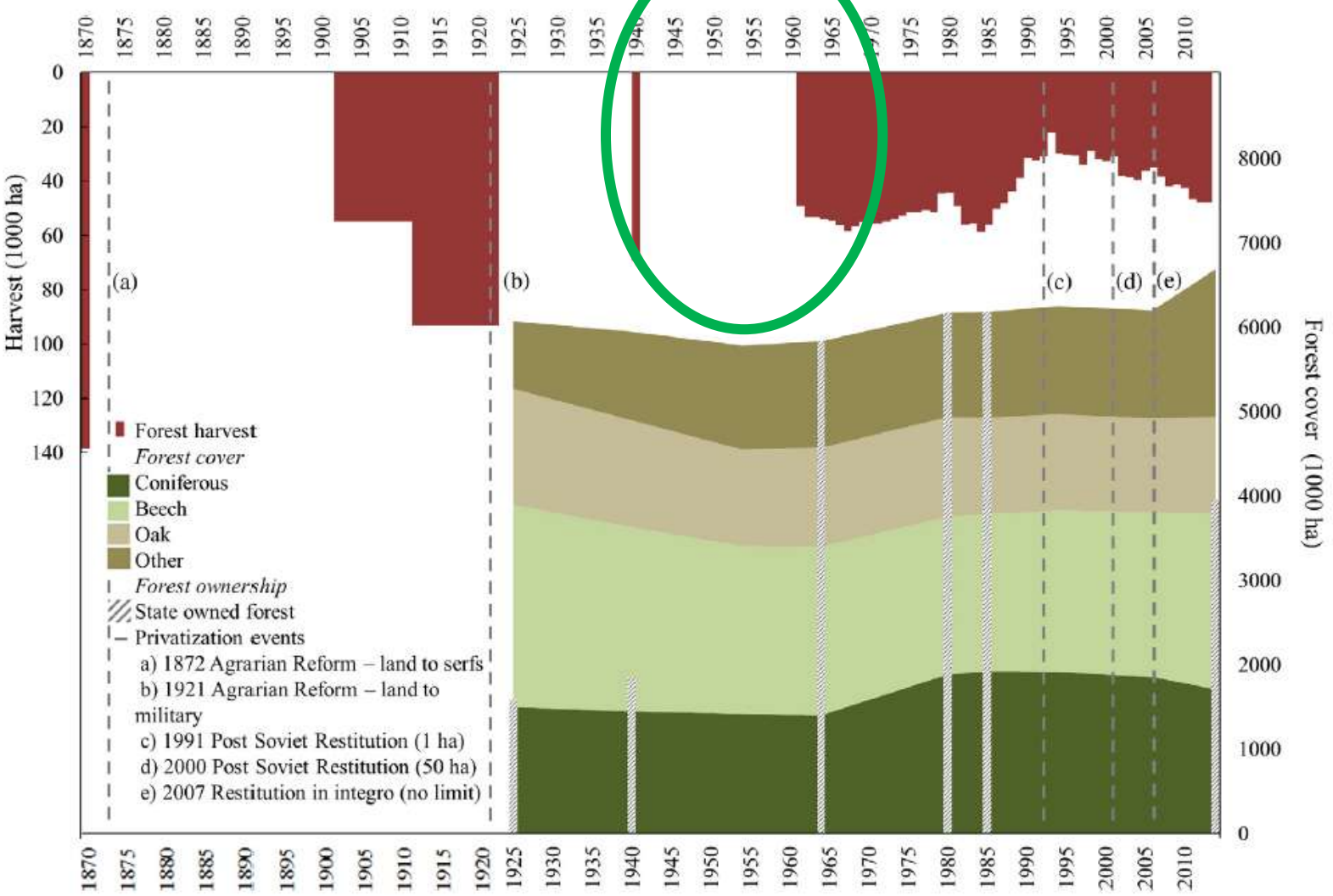
Results

1960 - 2012



Expectations

Filling the gaps



Overview of the evolution of forest cover, species composition, disturbance and ownership patterns in Romania between 1870s and 2010, in the context of major land tenure changes (Munteanu et al, 2016)