

MONITORING THE DYNAMICS OF ABANDONED AGRICULTURE, FALLOW FIELDS AND GRASSLANDS



Volker C. Radeloff, N. Rogova, University of Wisconsin-Madison

H. Yin, Kent State University

P. Hostert, and P. Griffiths, Humboldt University, Berlin

LCLUC/MuSLI Science Team Meeting, 10/19/2020



Introduction



Introduction

- Agricultural abandonment is widespread
- Strong environmental effects on biodiversity, carbon sequestration, water quality, etc.
- Strong socioeconomic effects on food security, rural livelihoods, cultural landscapes, etc.
- Scientifically interesting, because the agricultural frontier is very dynamic

Introduction

- Agricultural abandonment is difficult to map
- Conceptually: Fallows versus abandonment
- Spectrally: Grasslands versus abandonment
- Spectrally: Successional pathways towards forests versus grasslands

Goal

Develop methods to monitor abandoned agriculture, fallow fields, and grasslands with Landsat and Sentinel-2 images

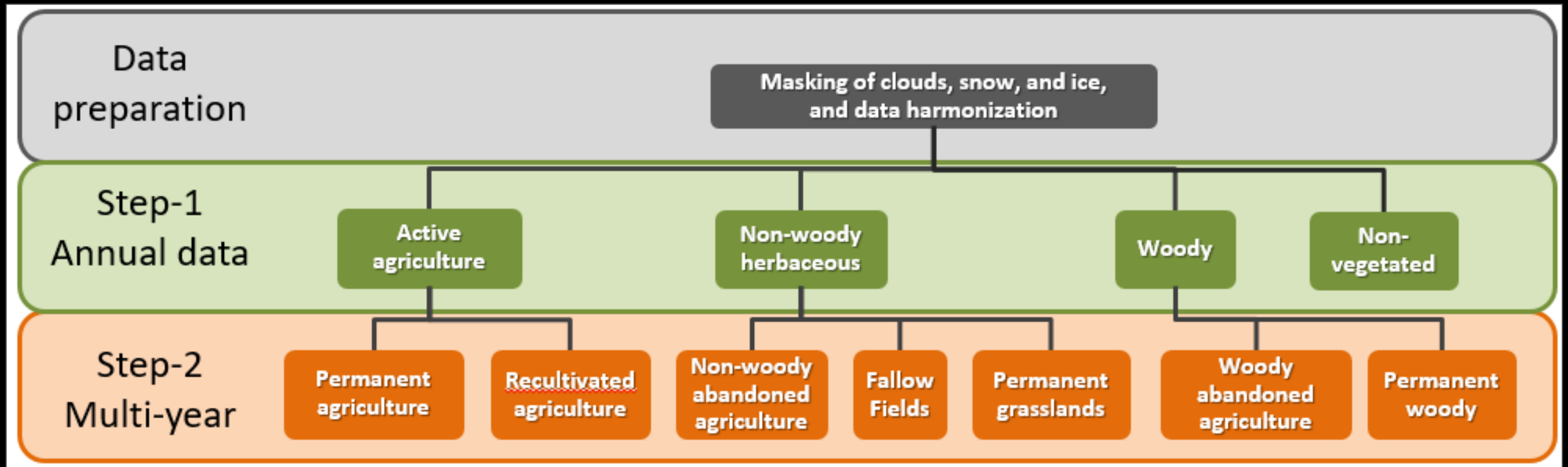
Introduction



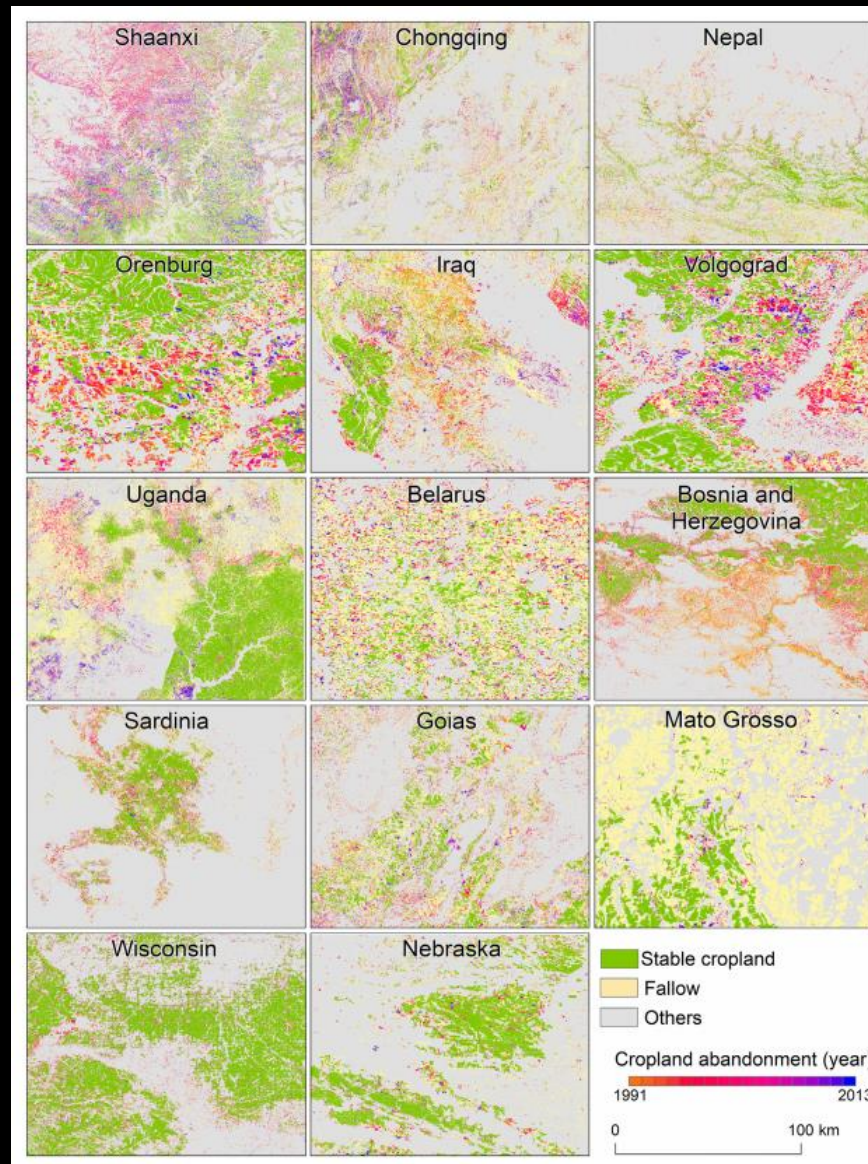
Outline

- I. Method development and 14 global test sites
- II. Grassland abandonment – France
- III. Temperate biome ag. abandonment – E. Europe
- IV. Dryland ag. abandonment – Eurasian Steppe
- V. Conclusions

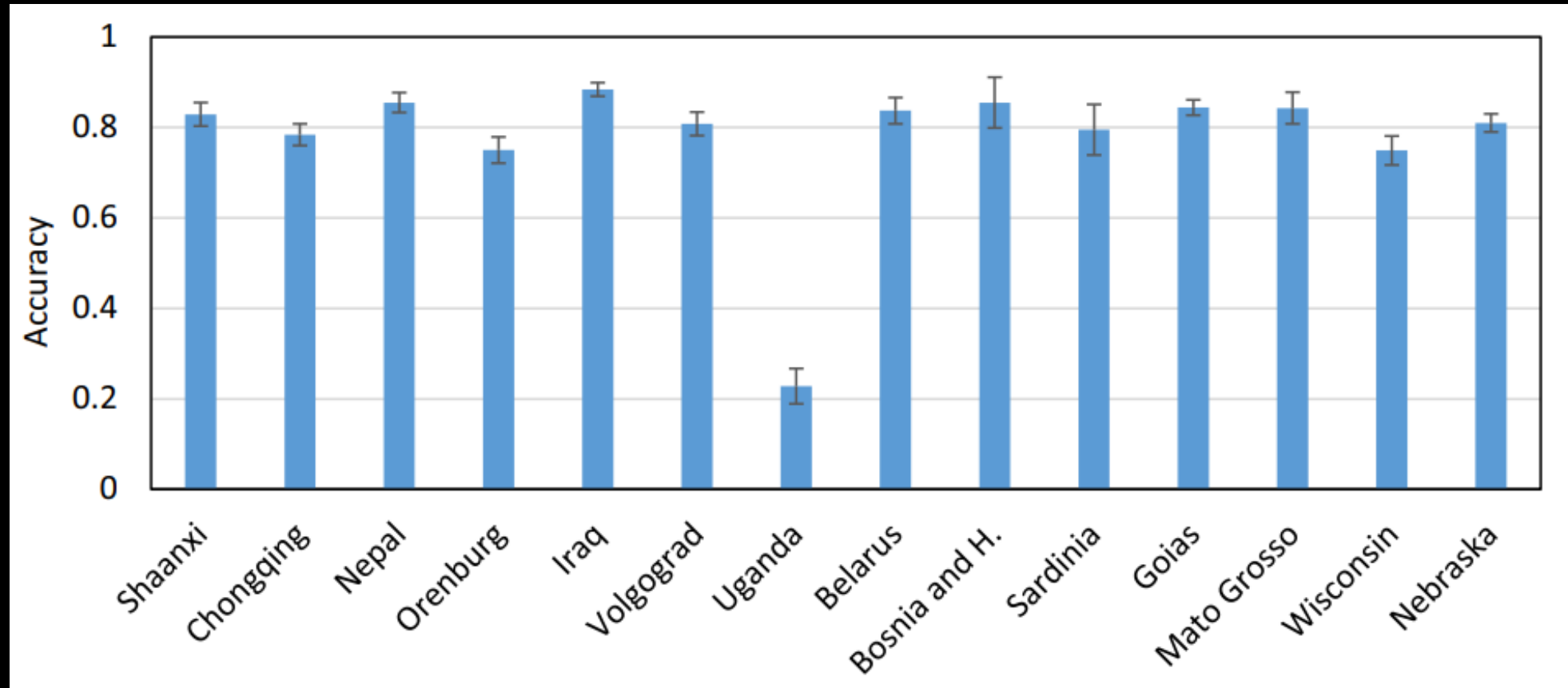
I. Methods and Global Test Sites



I. Methods and Global Test Sites

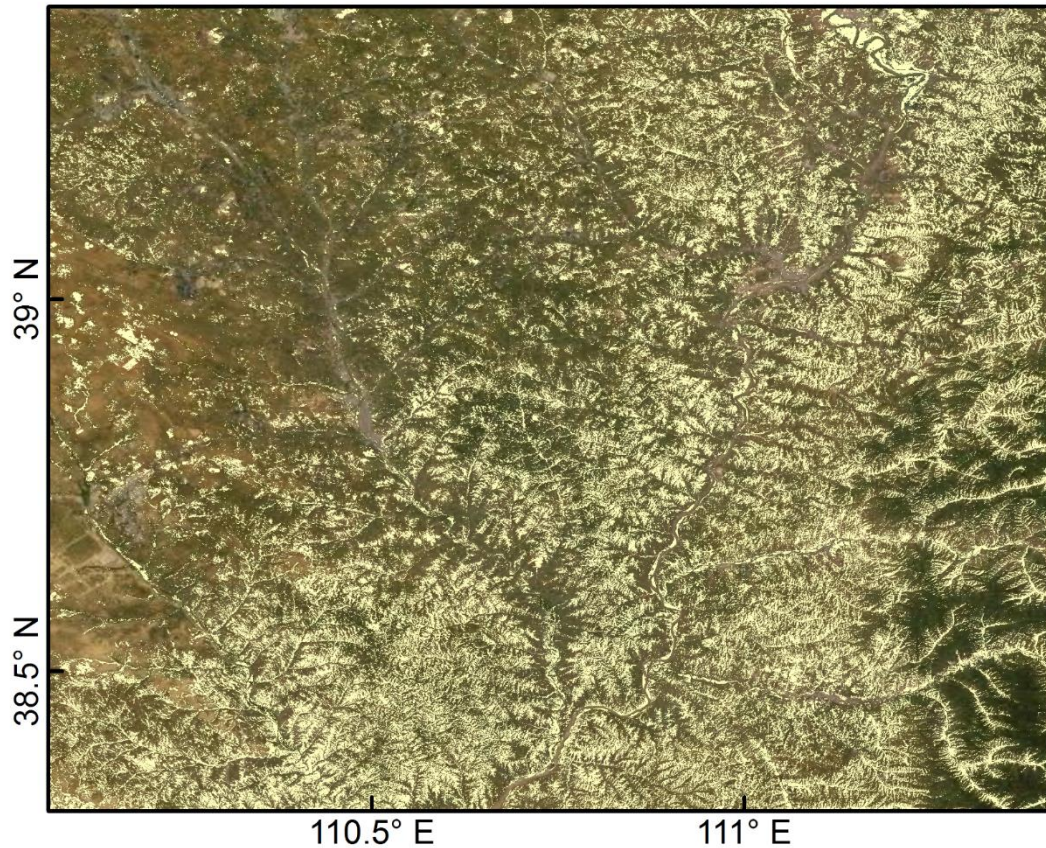


I. Methods and Global Test Sites



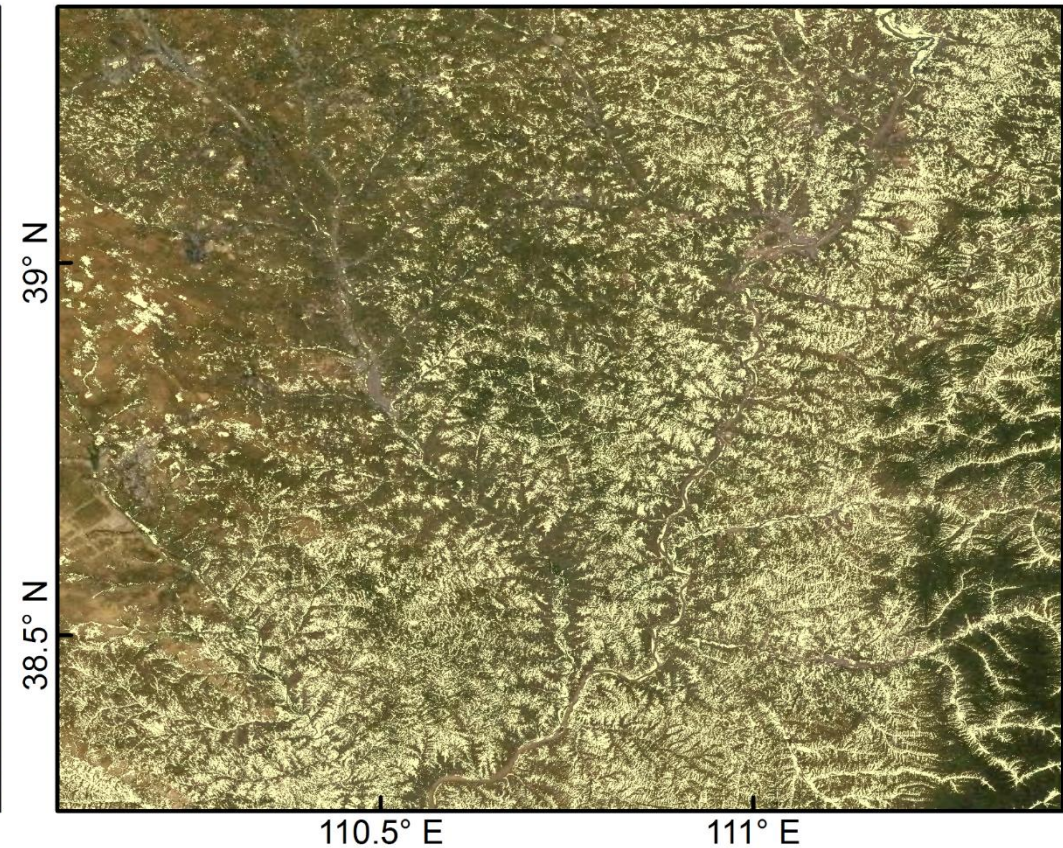
I. Methods and Global Test Sites

Landsat



Overall accuracy: $84 \pm 5\%$

Landsat + Sentinel 2

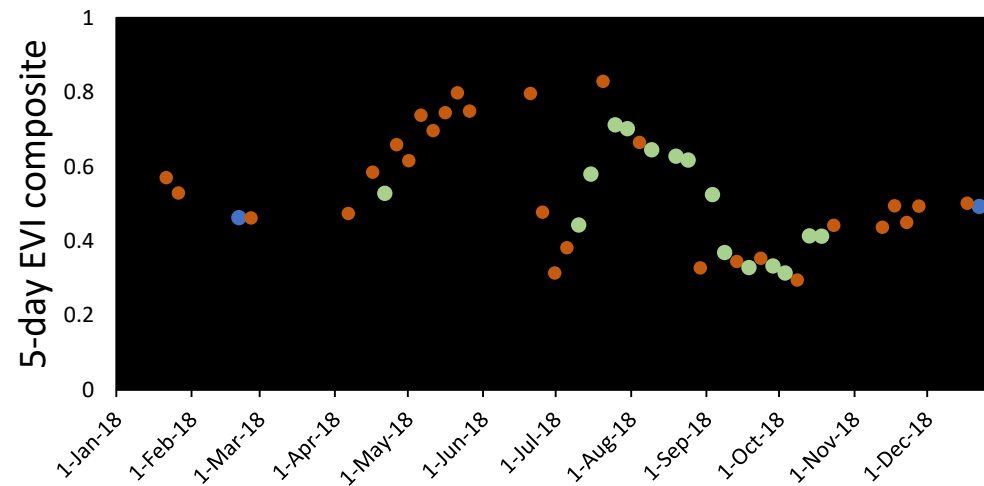
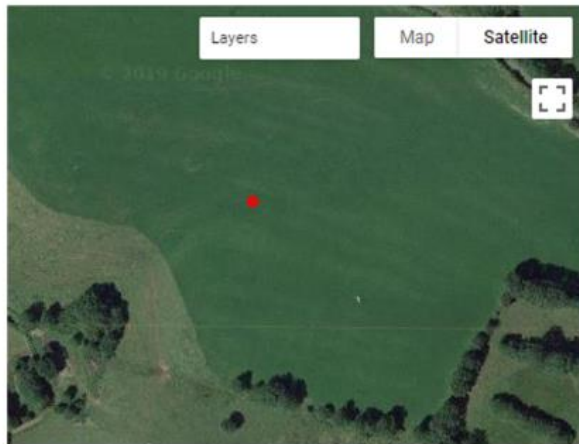
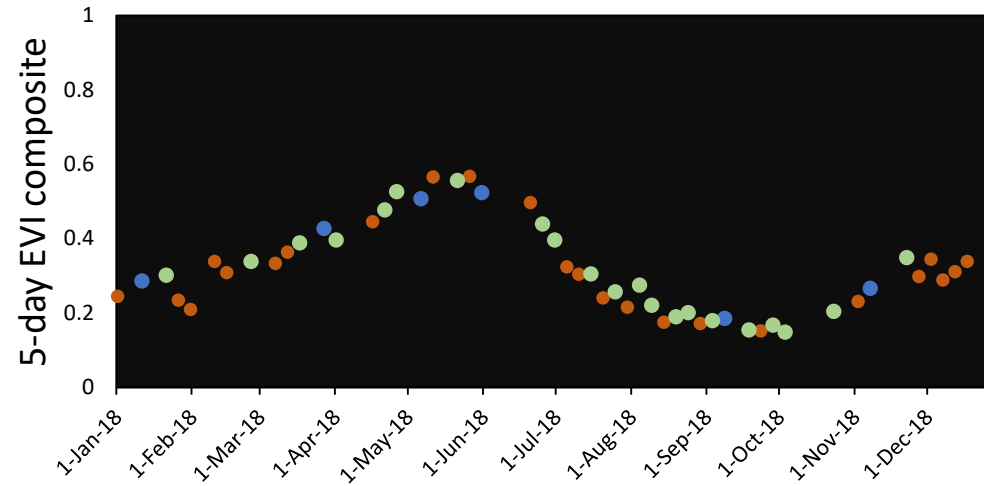
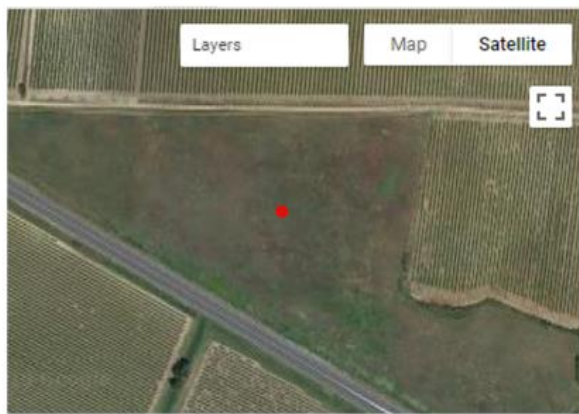


Overall accuracy: $85 \pm 3\%$

Outline



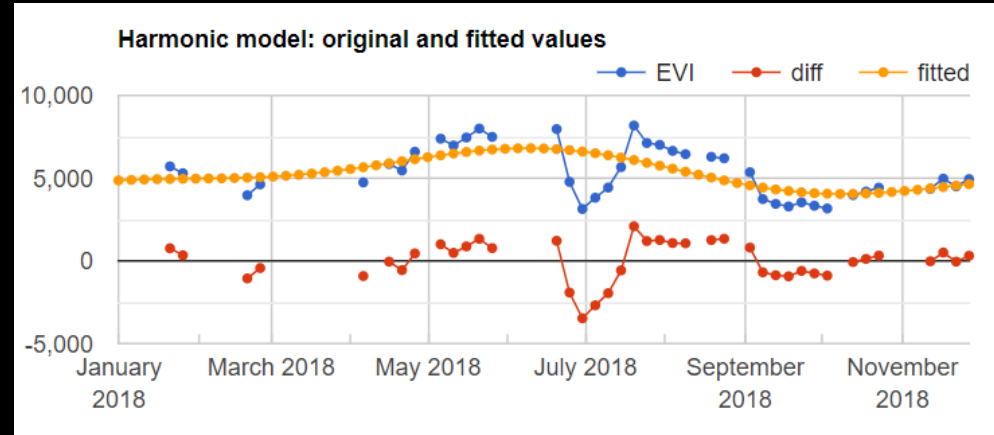
II. Grassland Abandonment - France



● Landsat ● Sentinel 2 ● Landsat+Sentinel2

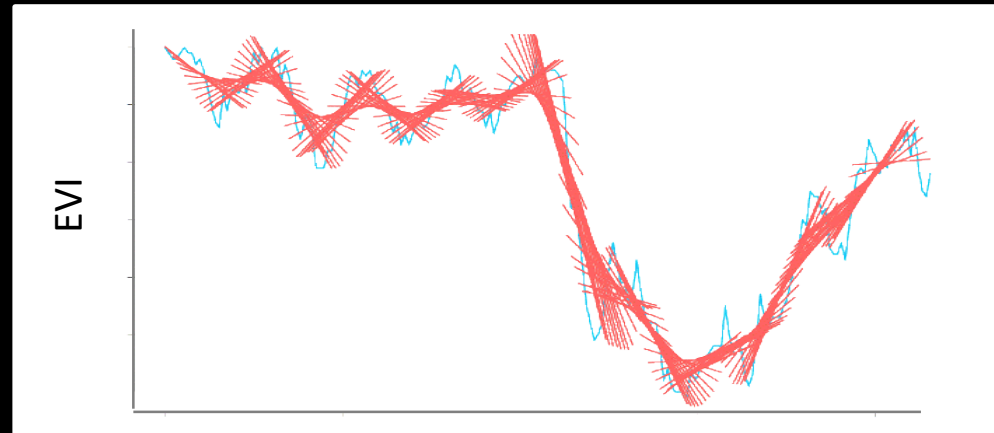
II. Grassland Abandonment - France

Harmonic model



Residuals of fitted model

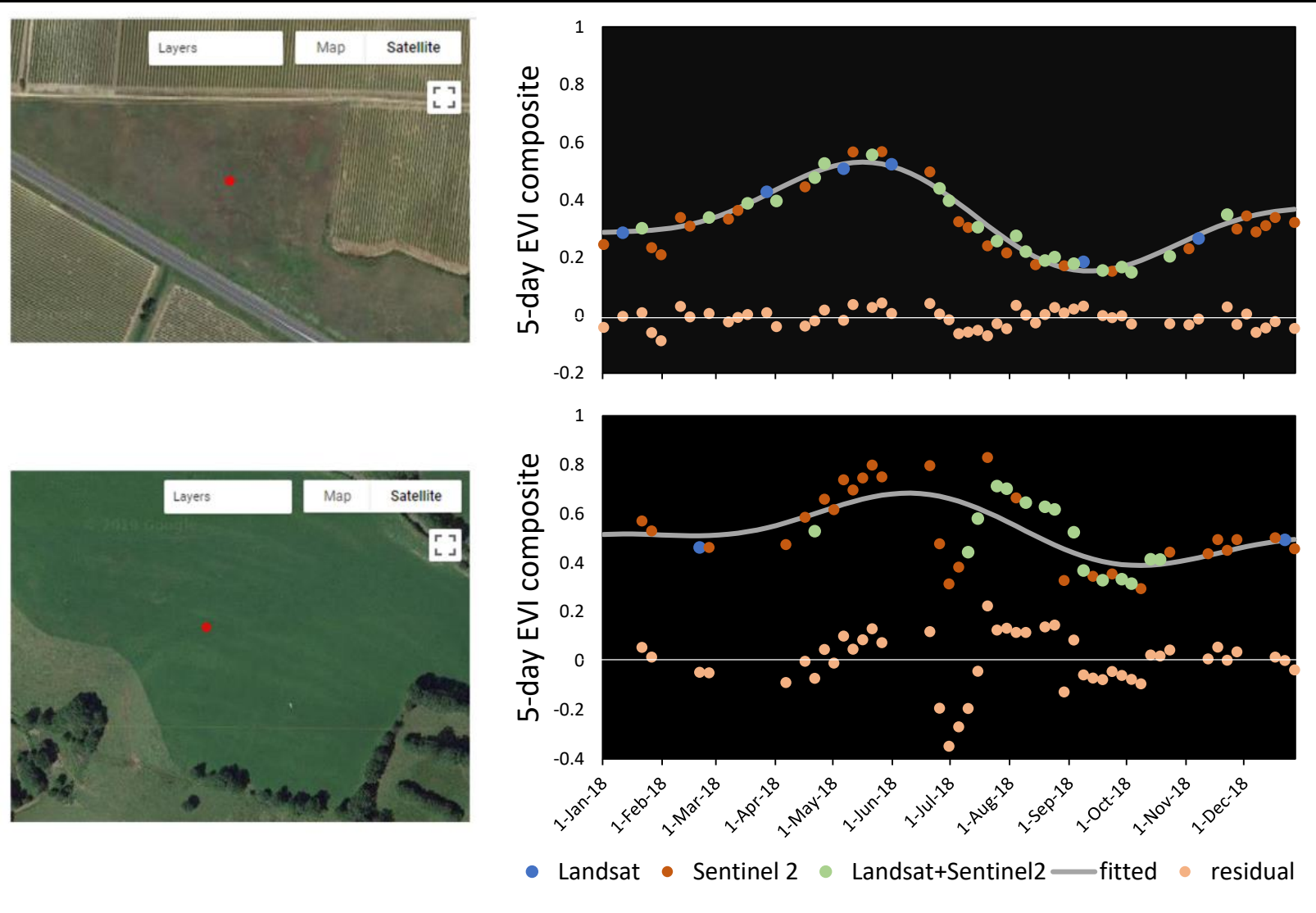
Local trends



Largest EVI decrease from Mar-Jul

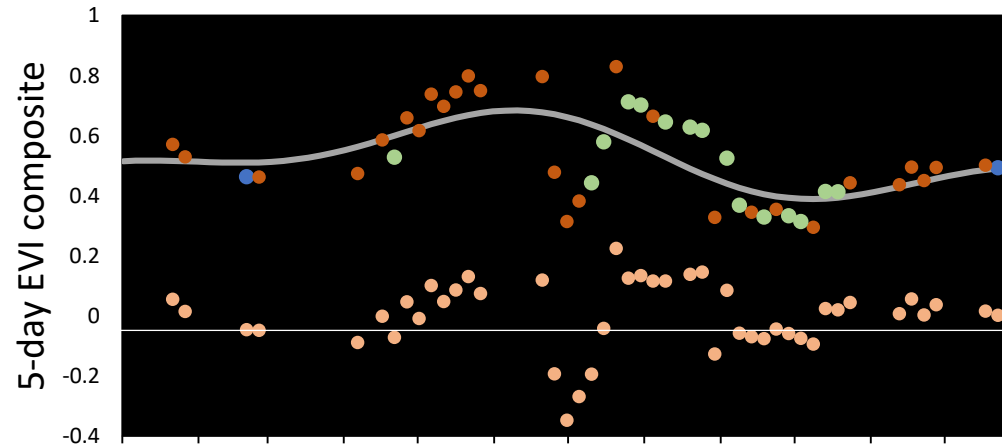
Temporal windows size of 30-day

II. Grassland Abandonment - France

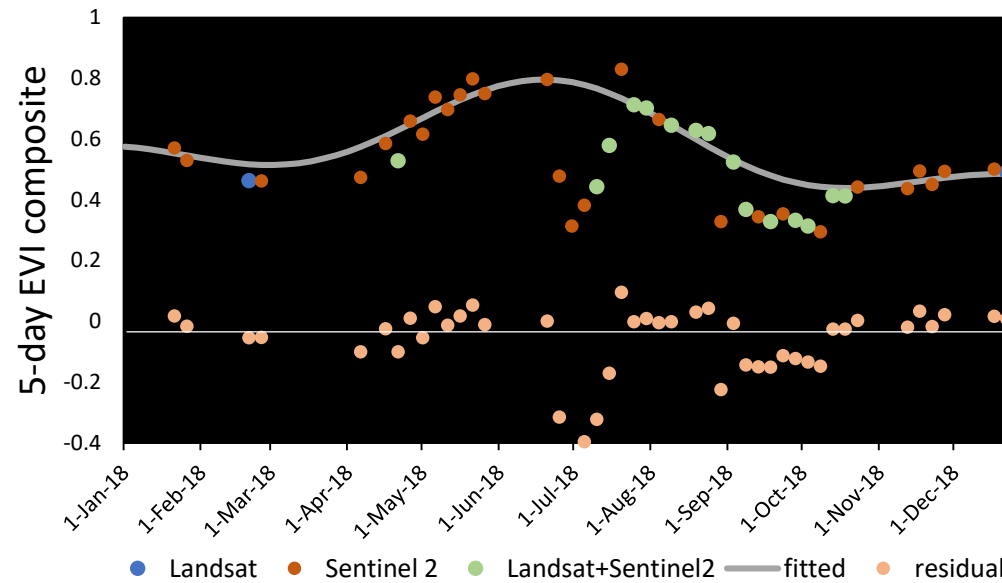


II. Grassland Abandonment - France

Harmonic model fitting

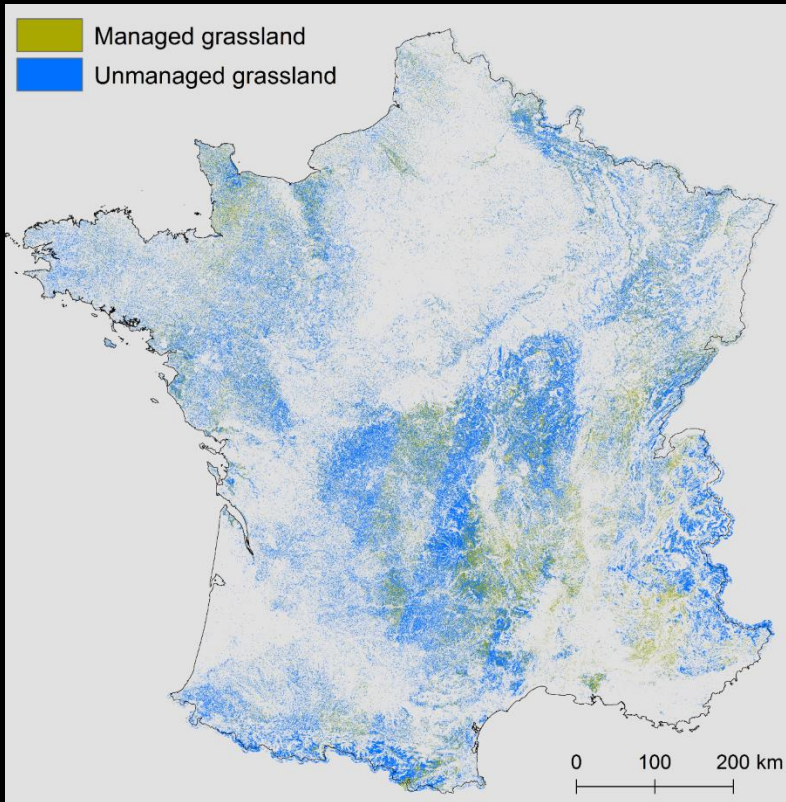


Iterated Harmonic model fitting

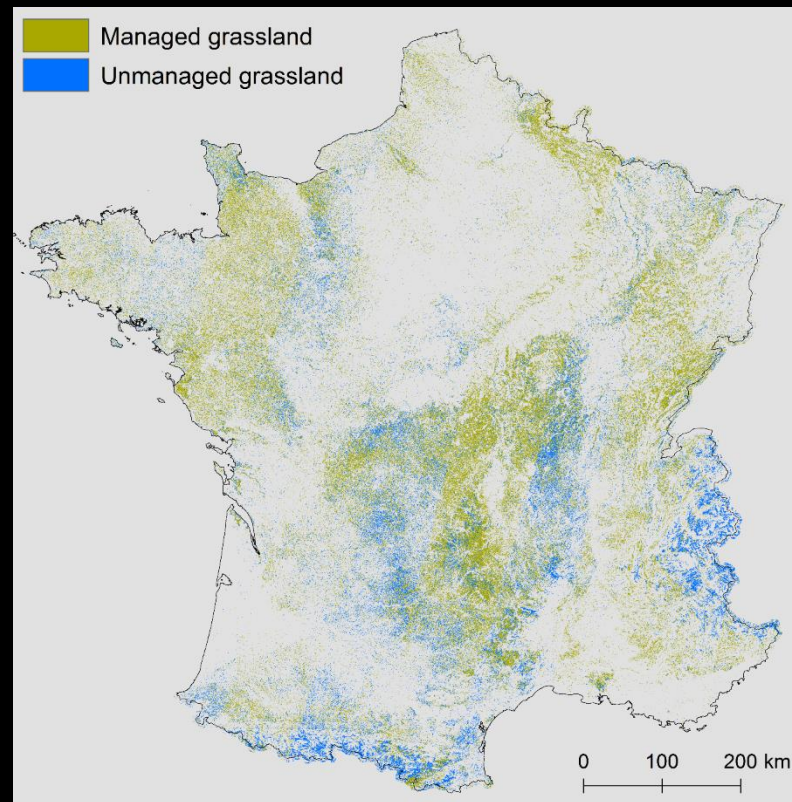


II. Grassland Abandonment - France

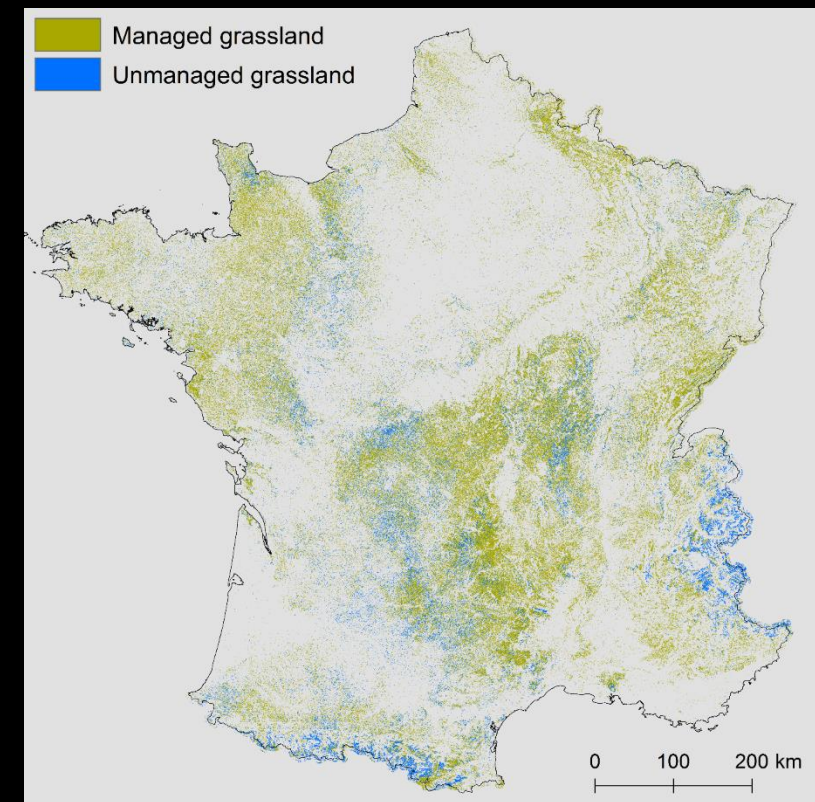
Harmonic analysis



Landsat 7/8



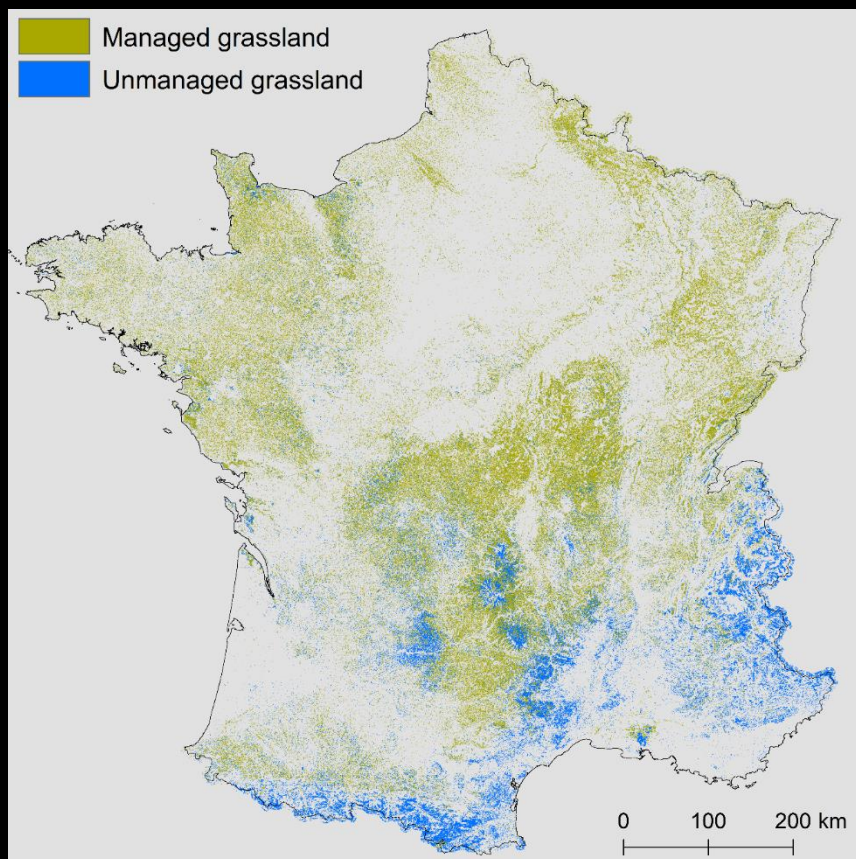
Sentinel-2a/b



Landsat 7/8, Sentinel-2a/b

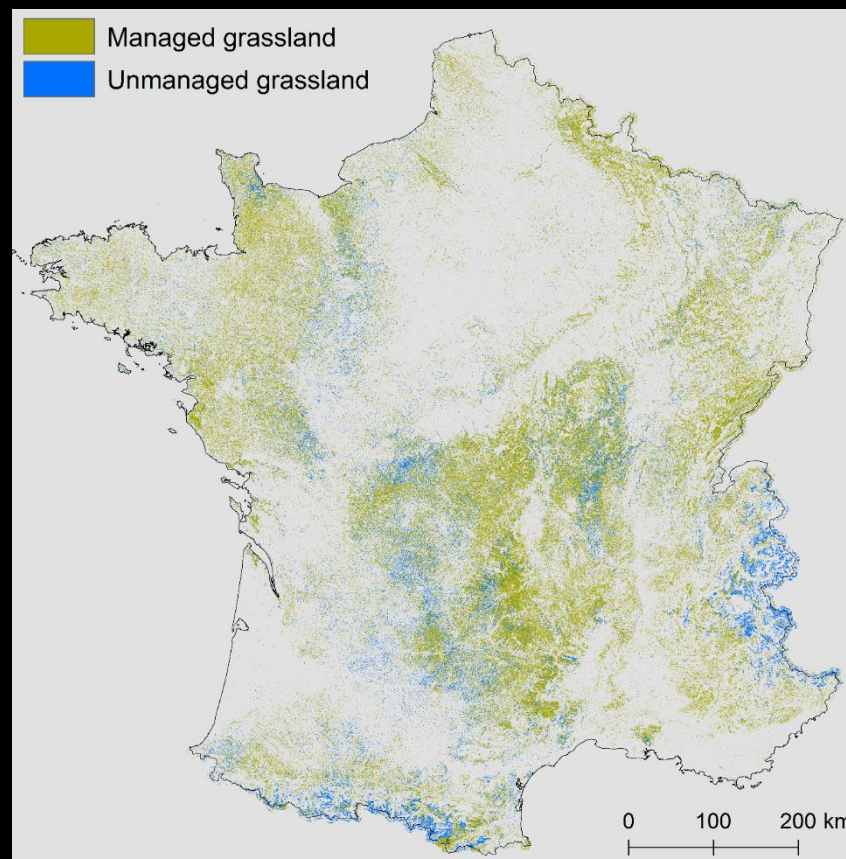
II. Grassland Abandonment - France

Local trends



Landsat 7/8, Sentinel-2a/b

Harmonic analysis

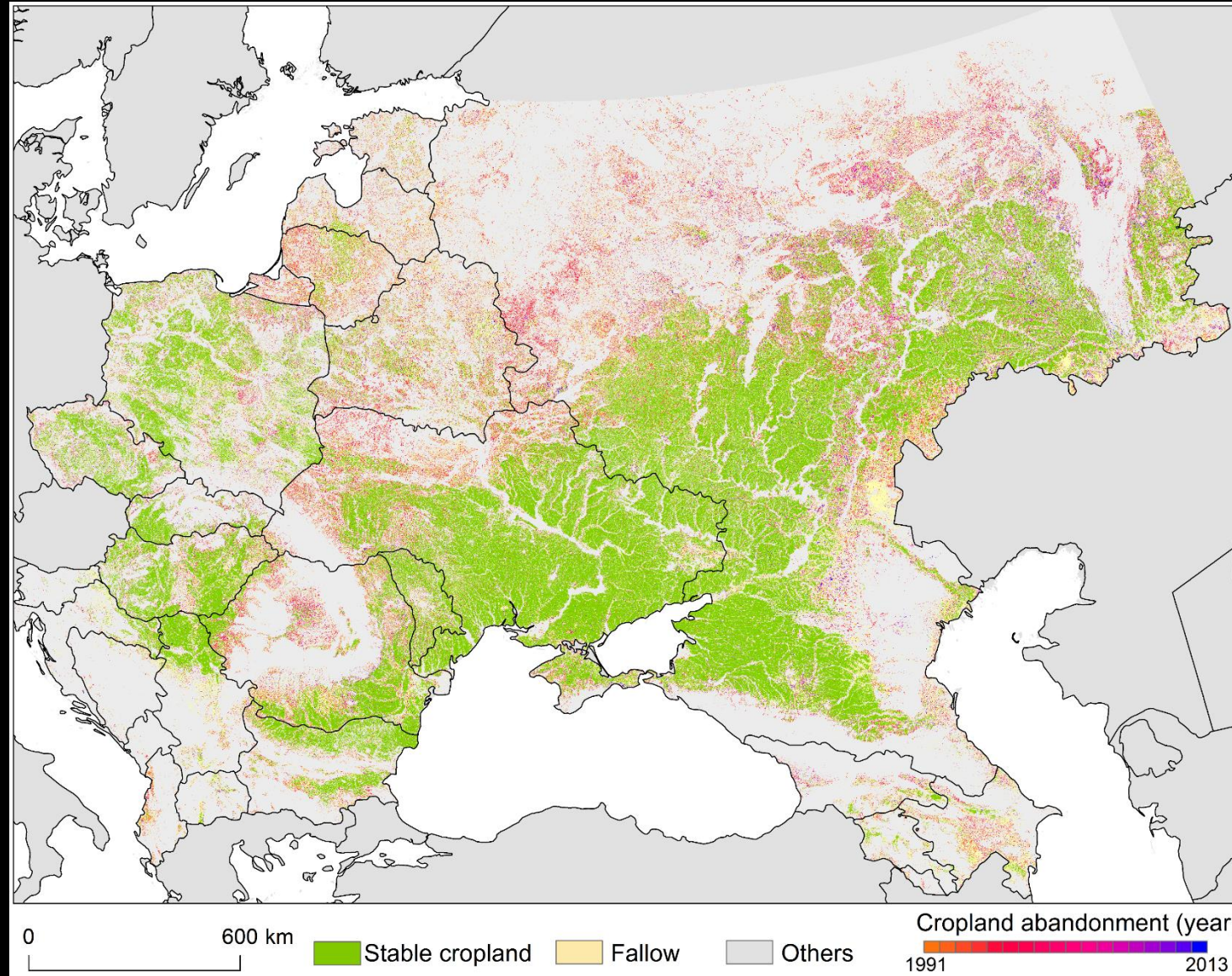


Landsat 7/8, Sentinel-2a/b

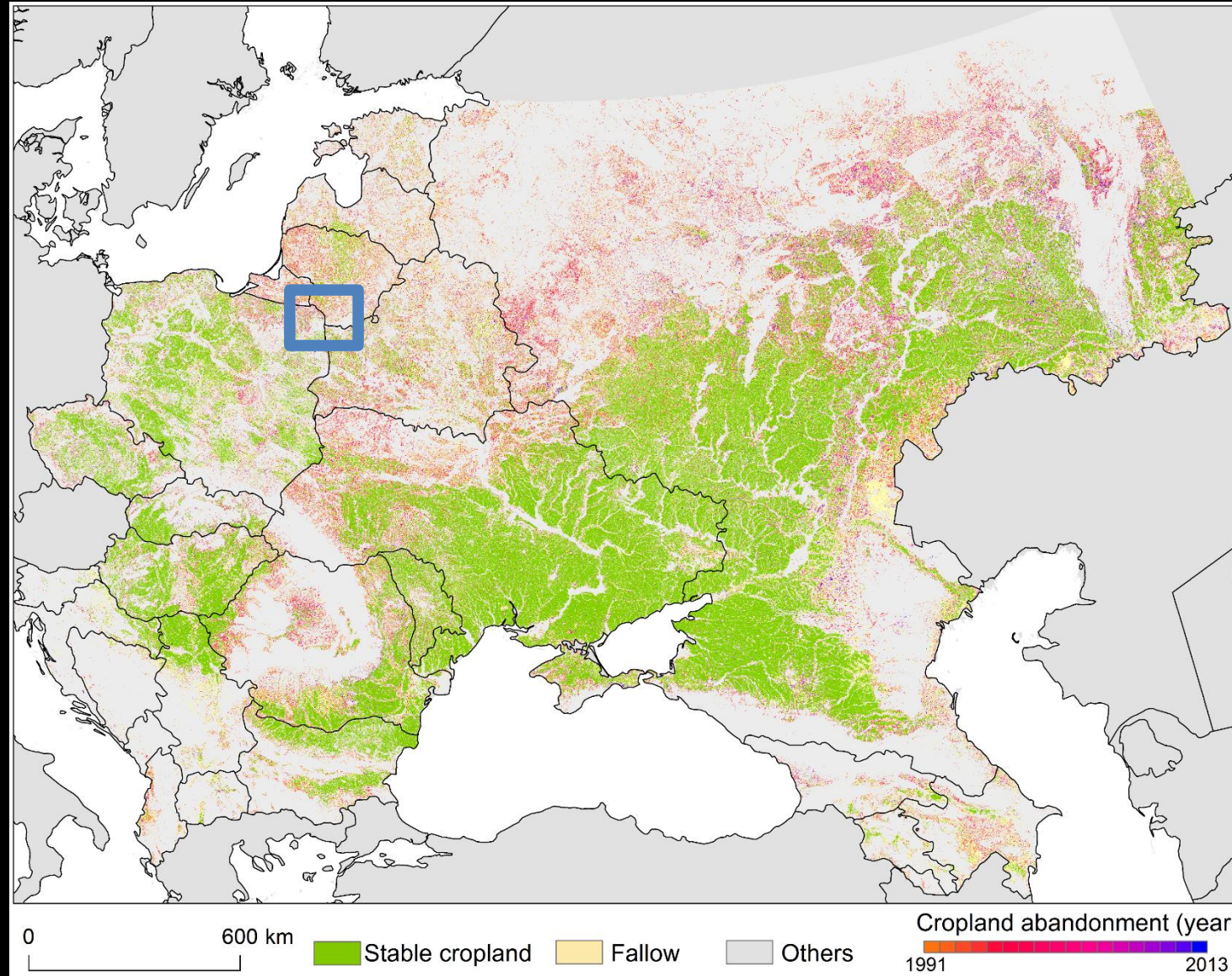
Outline



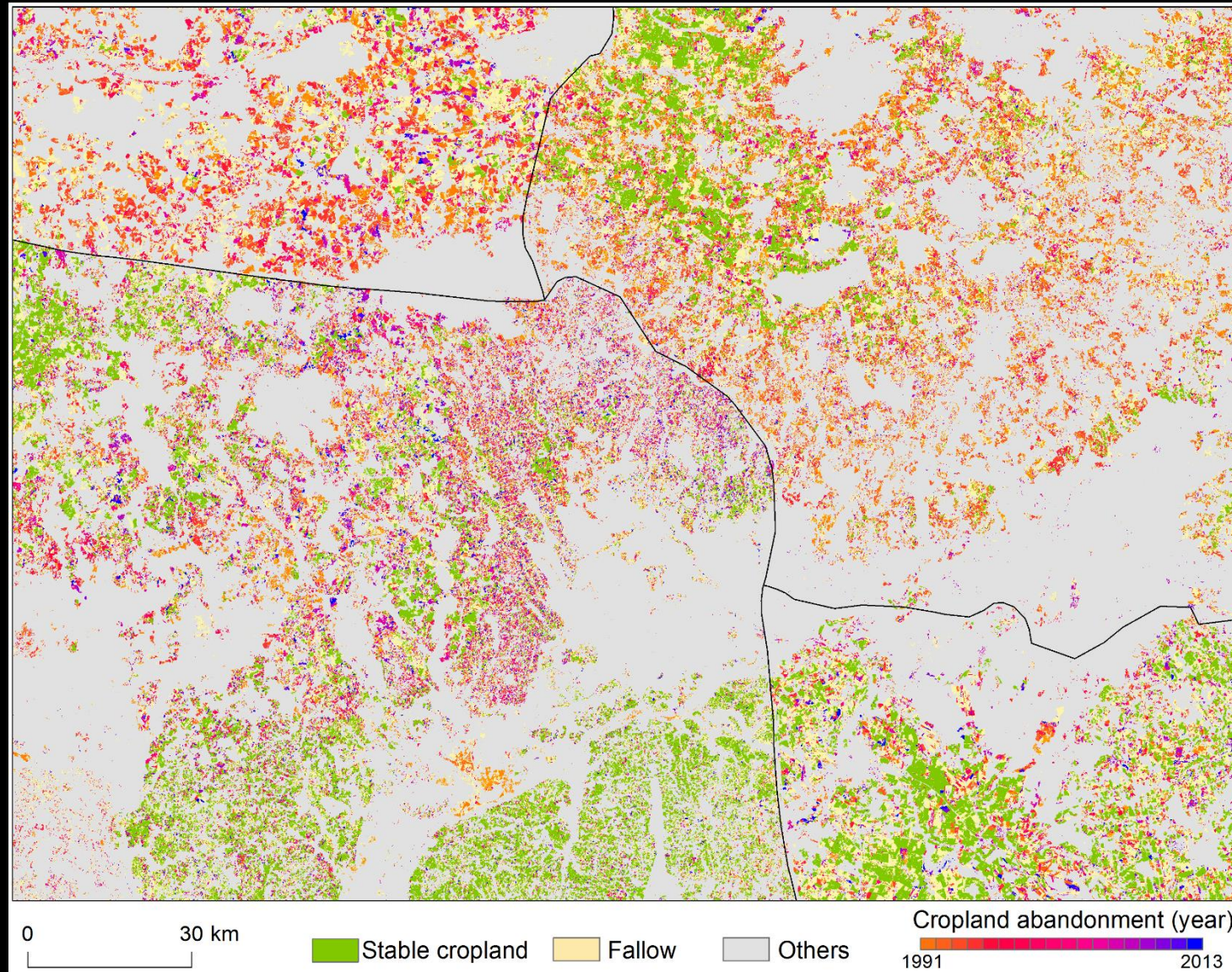
III. Temperate Ag. Abandonment – E-Europe



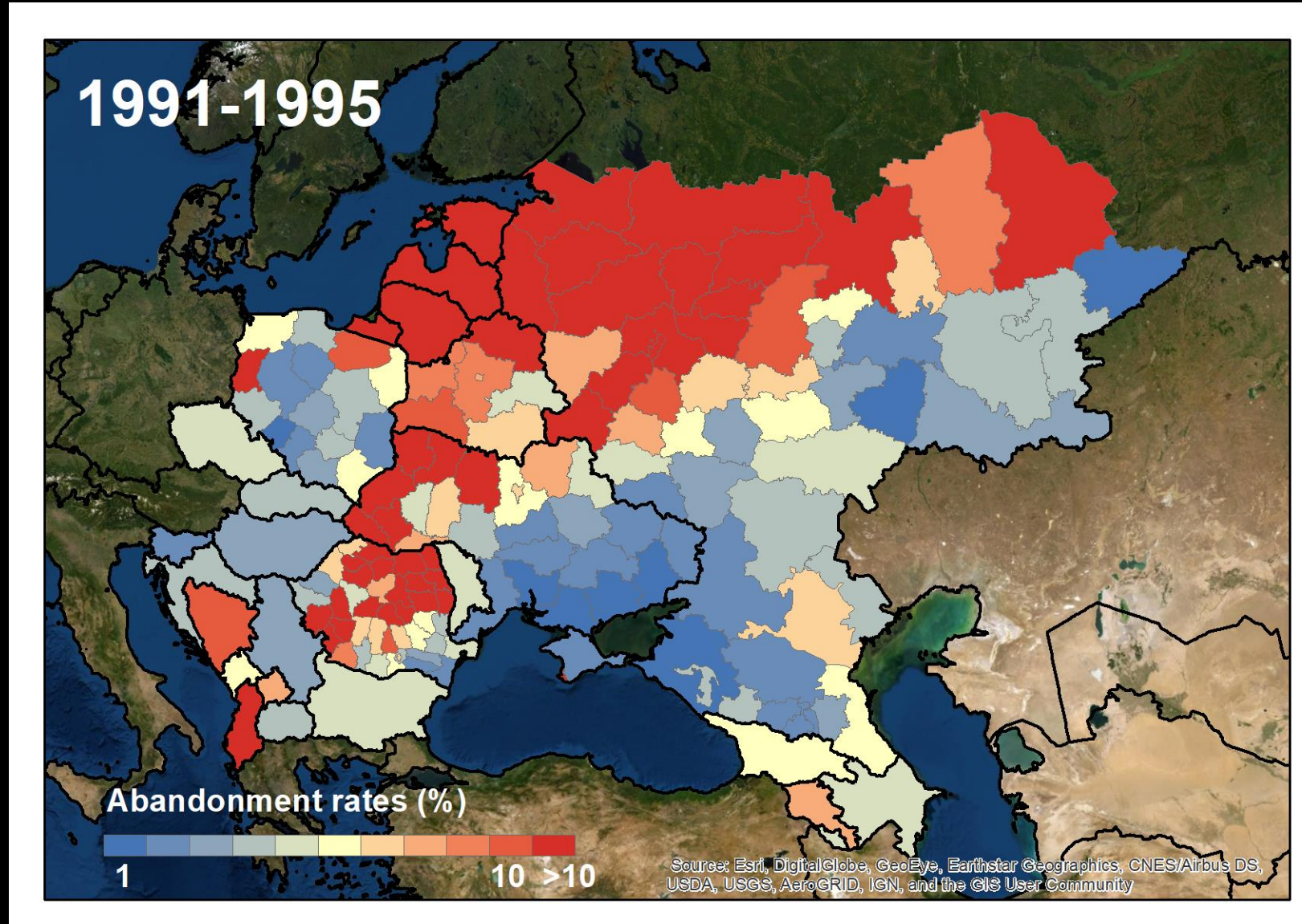
III. Temperate Ag. Abandonment – E-Europe



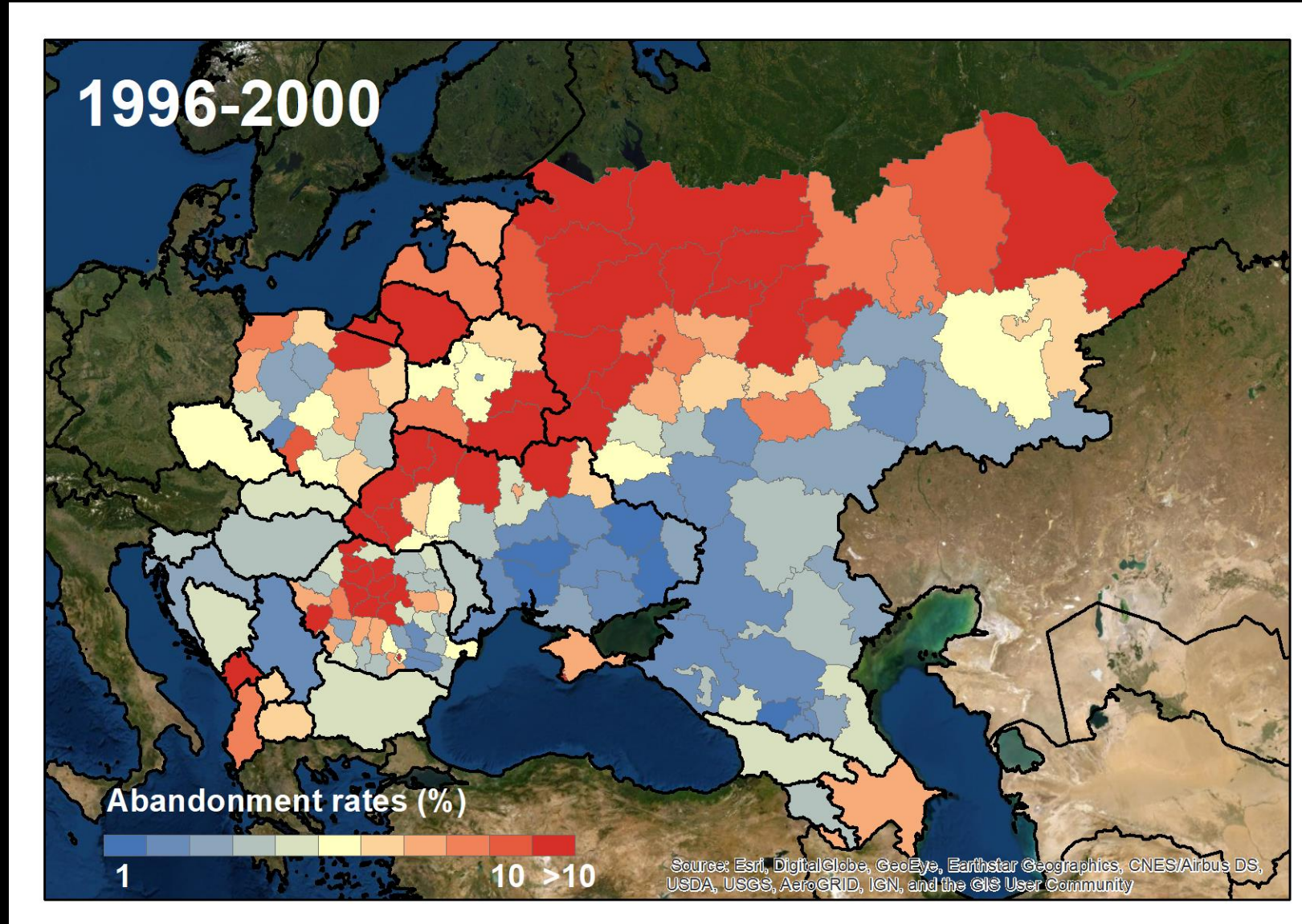
III. Temperate Ag. Abandonment – E-Europe



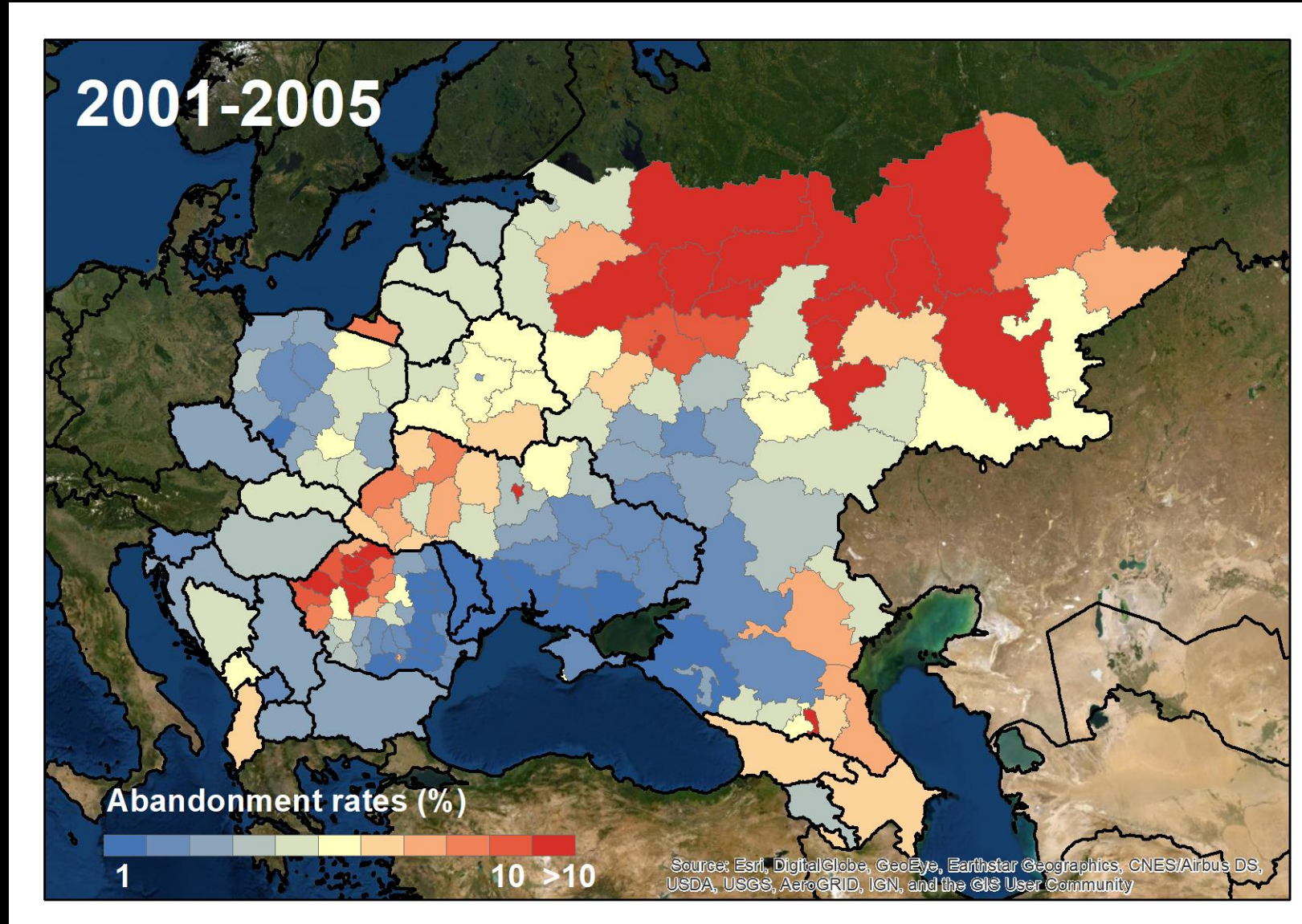
III. Temperate Ag. Abandonment – E-Europe



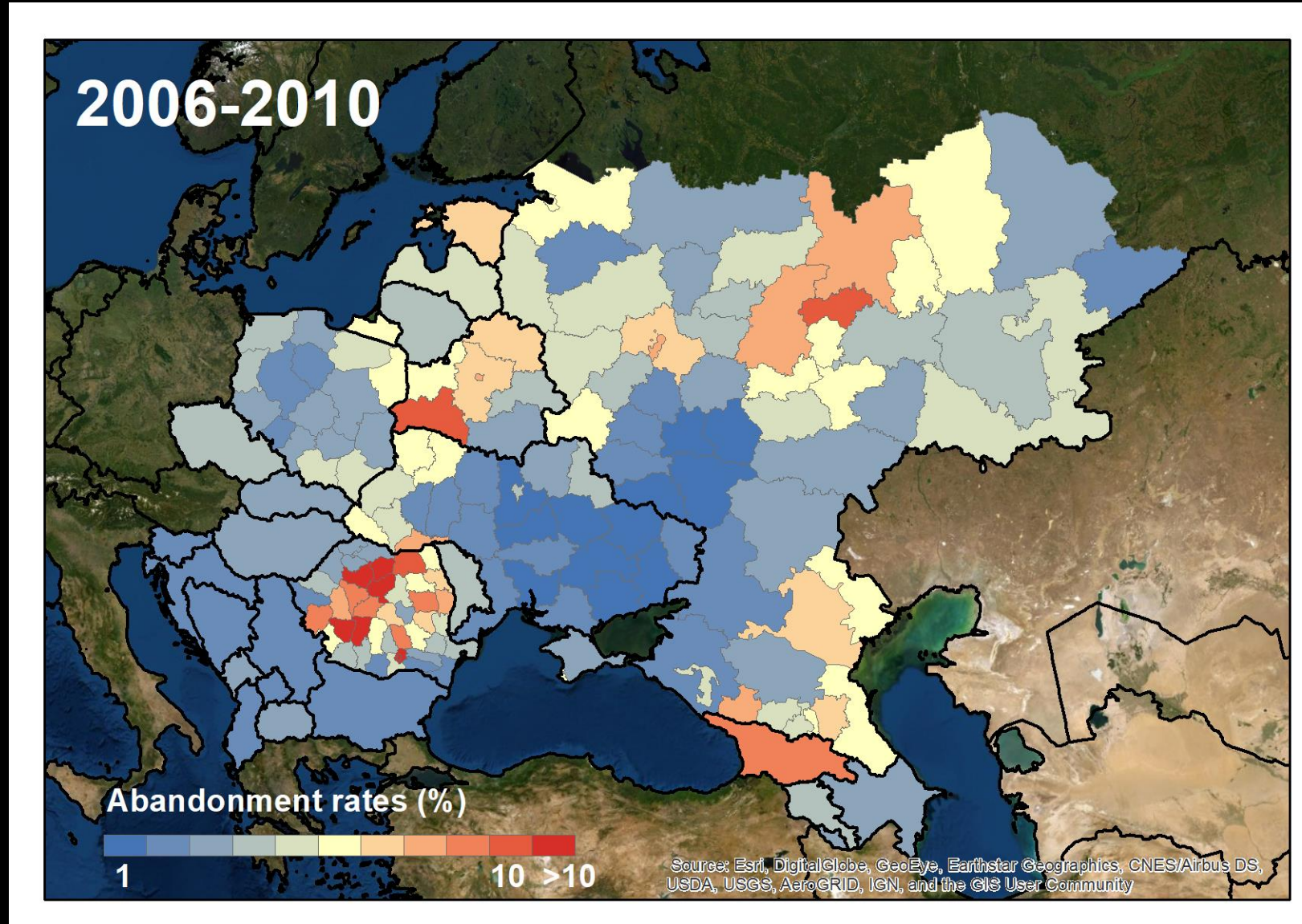
III. Temperate Ag. Abandonment – E-Europe



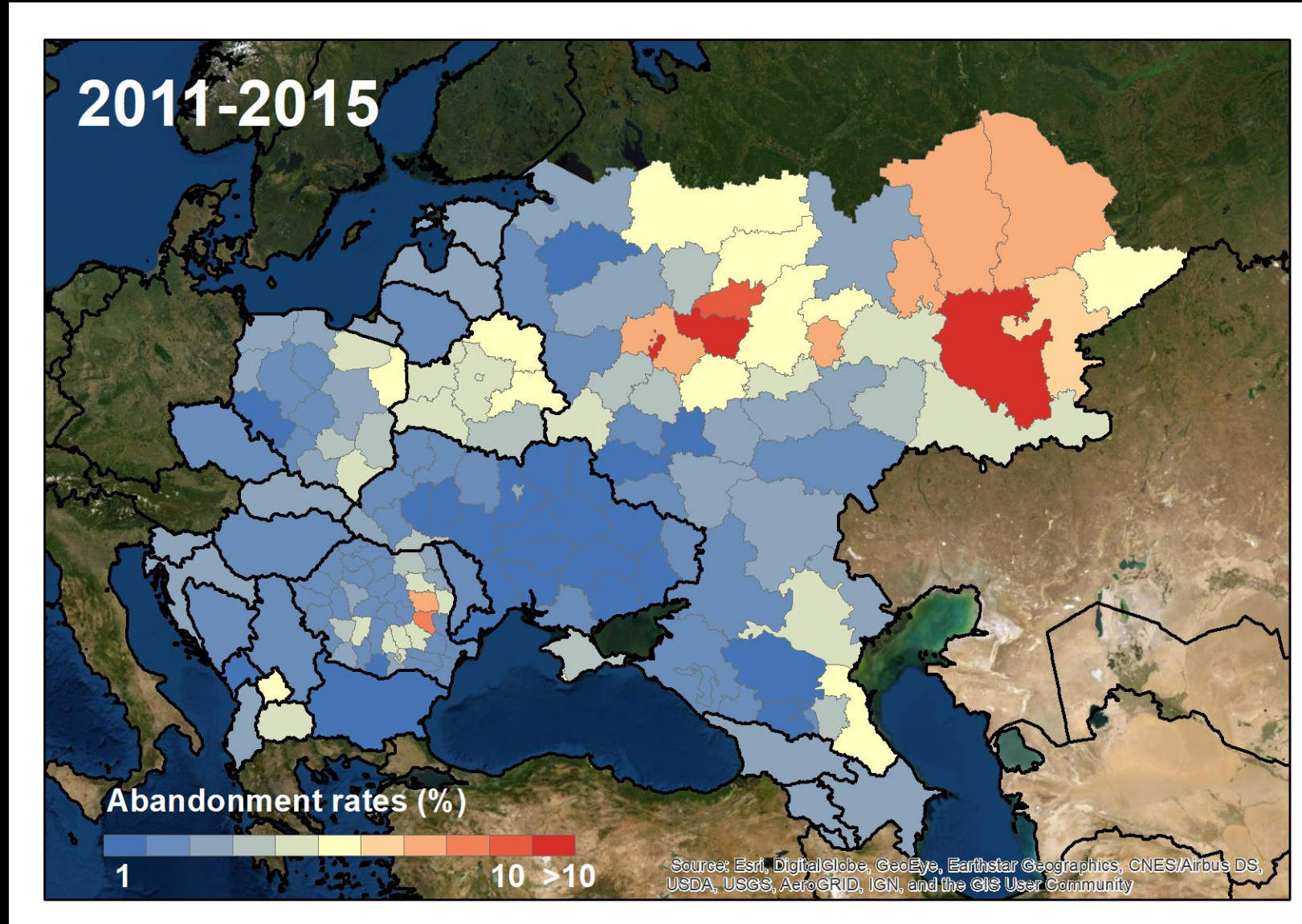
III. Temperate Ag. Abandonment – E-Europe



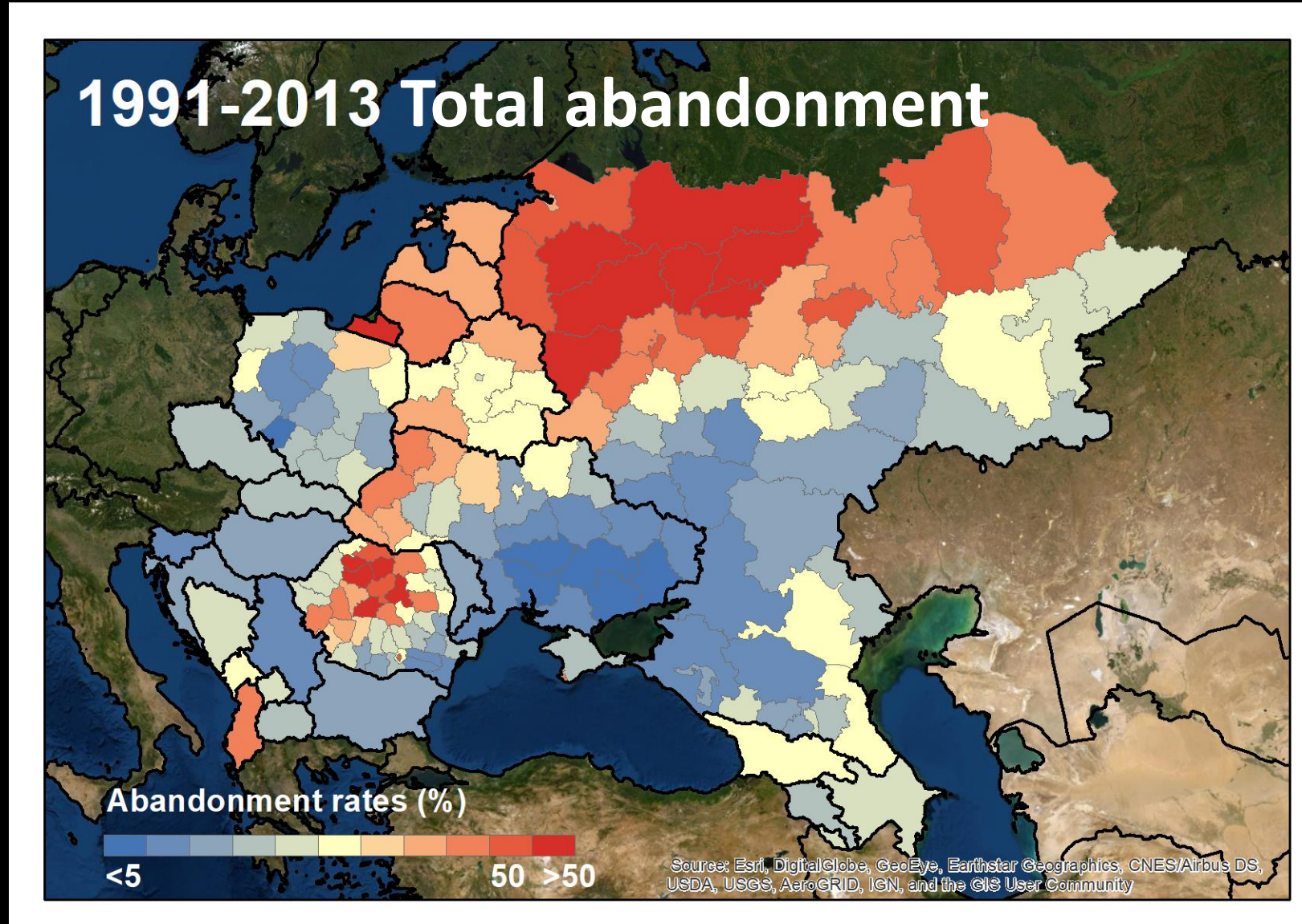
III. Temperate Ag. Abandonment – E-Europe



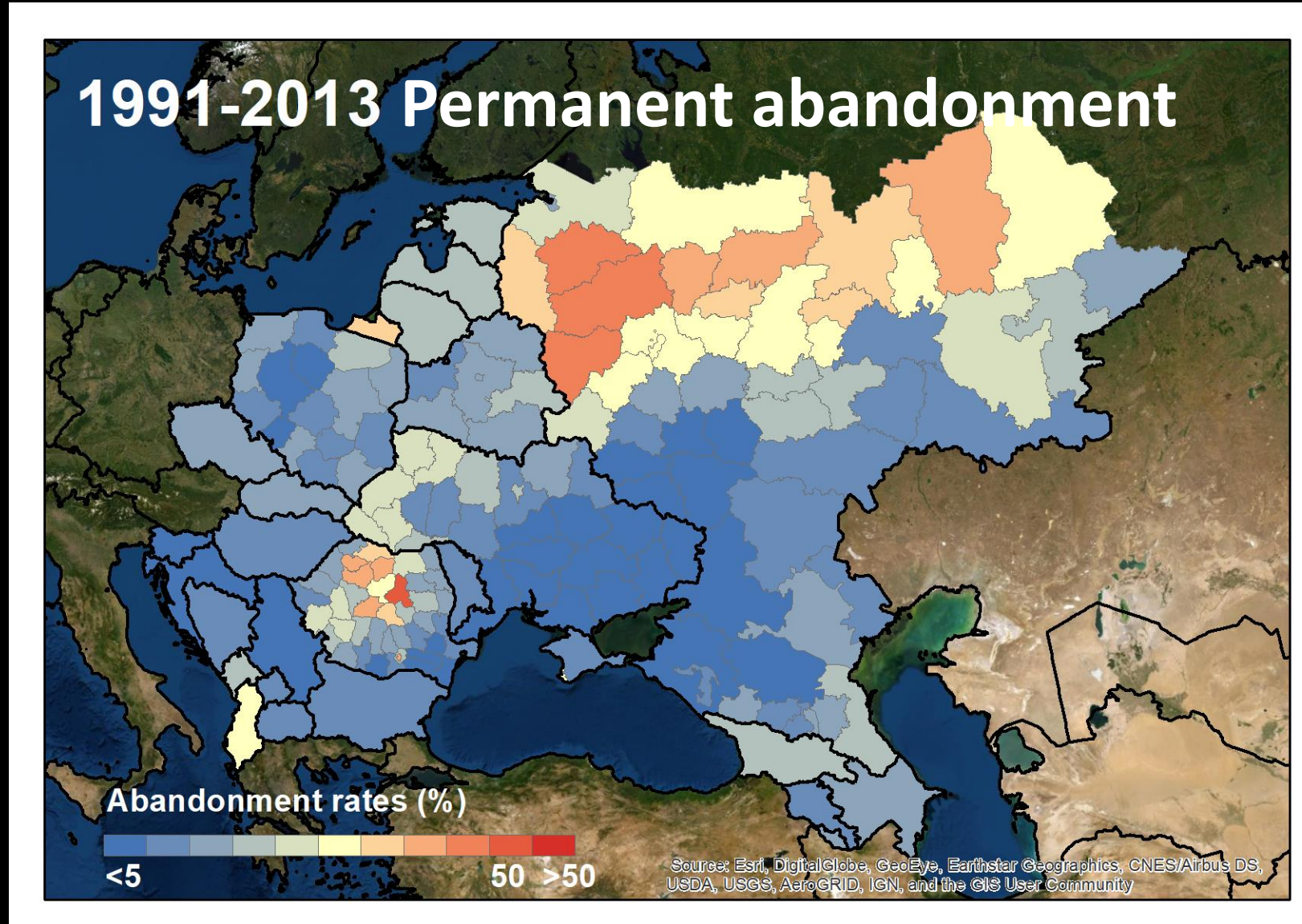
III. Temperate Ag. Abandonment – E-Europe



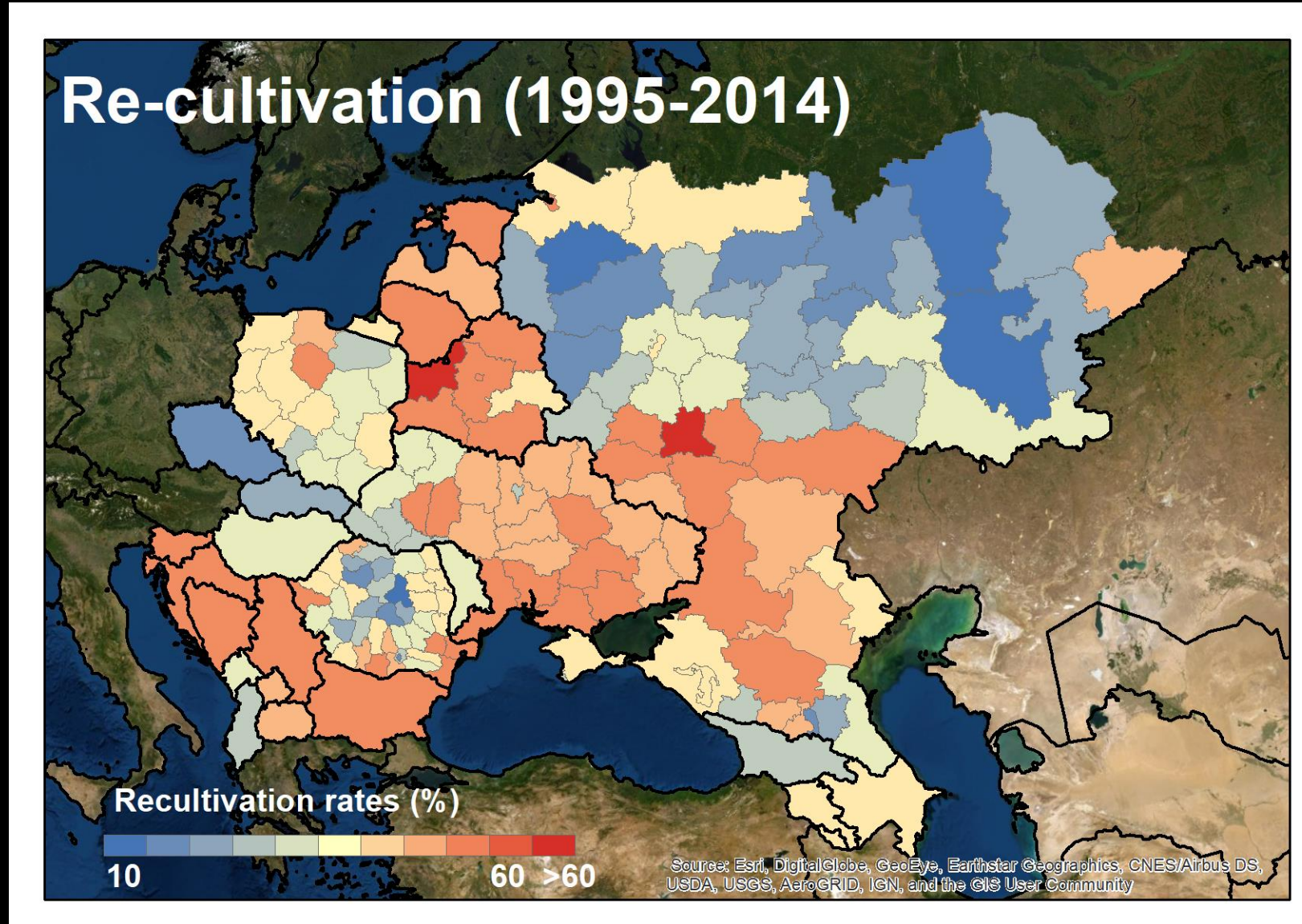
III. Temperate Ag. Abandonment – E-Europe



III. Temperate Ag. Abandonment – E-Europe



III. Temperate Ag. Abandonment – E-Europe



Outline



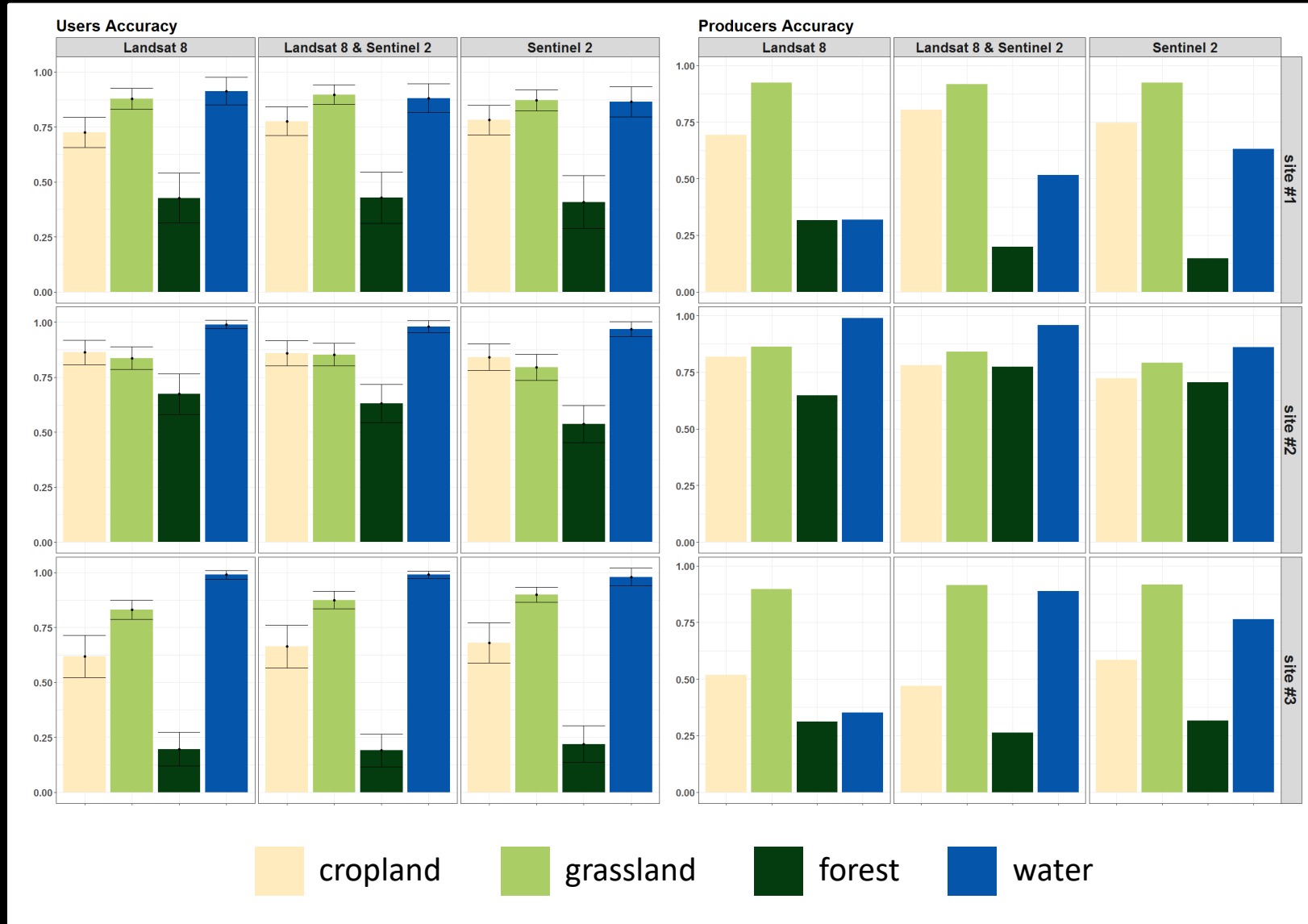
IV. Dryland Ag. Abandonment – Central Asia



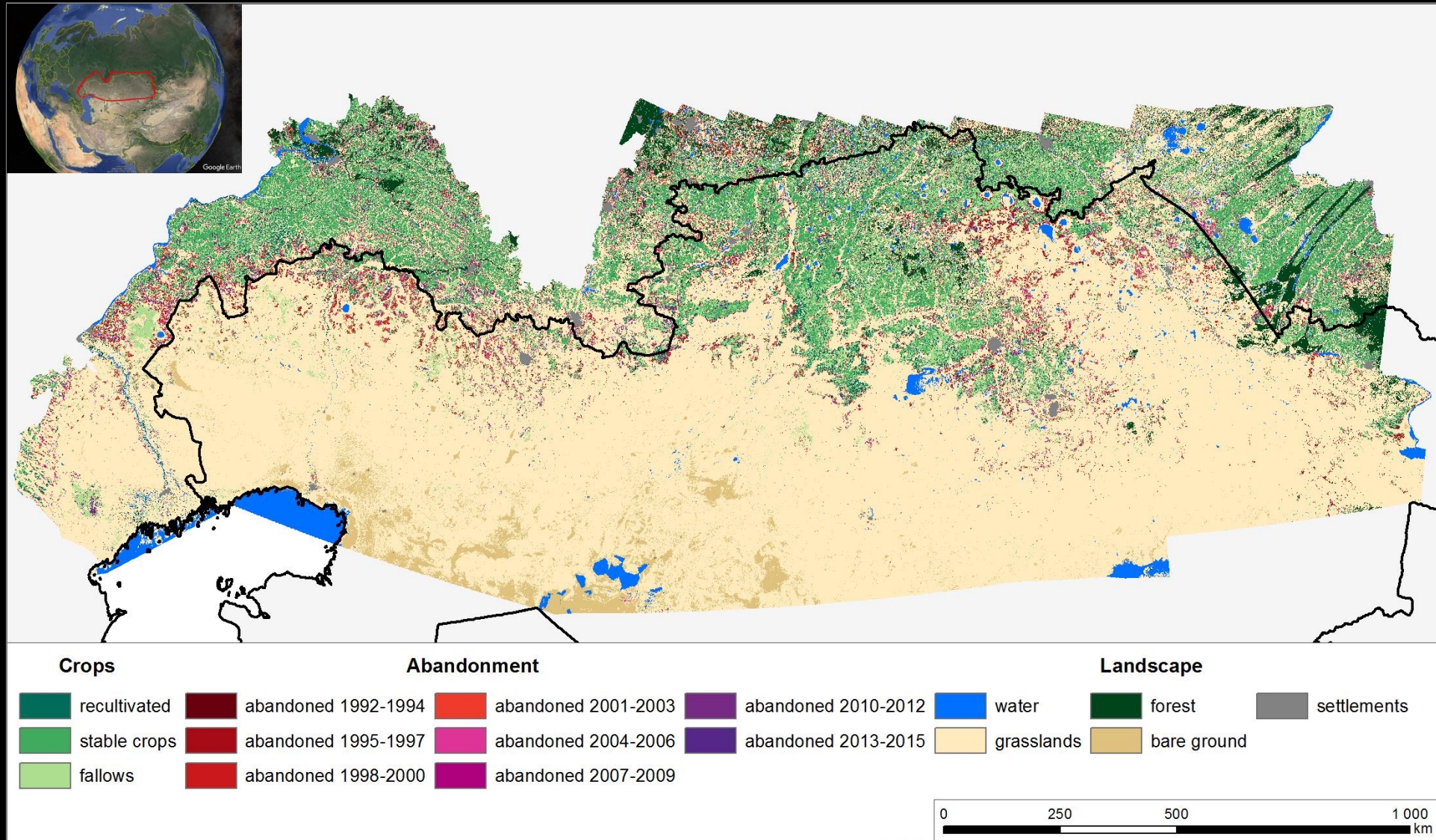
IV. Dryland Ag. Abandonment – Central Asia



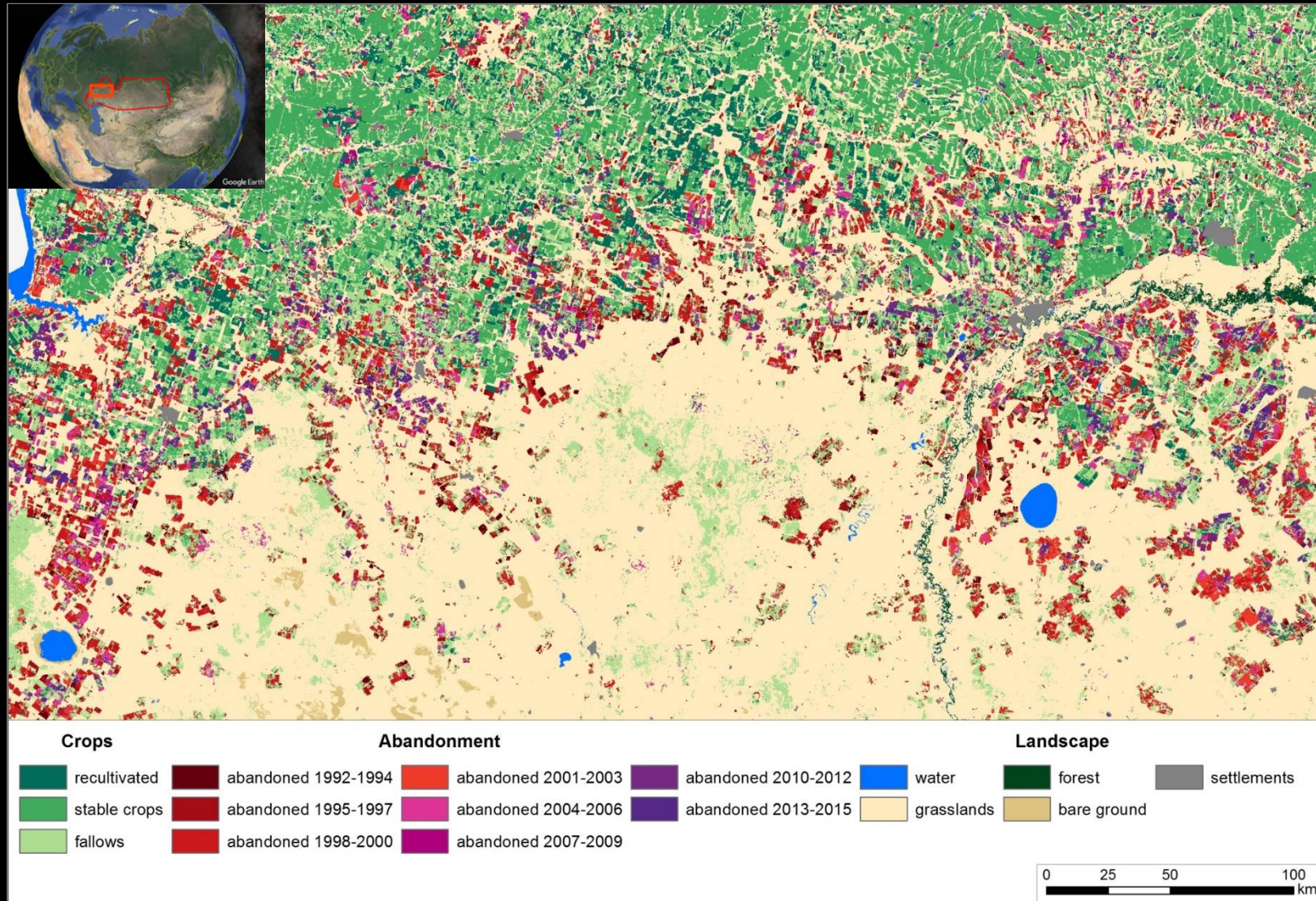
IV. Dryland Ag. Abandonment – Central Asia



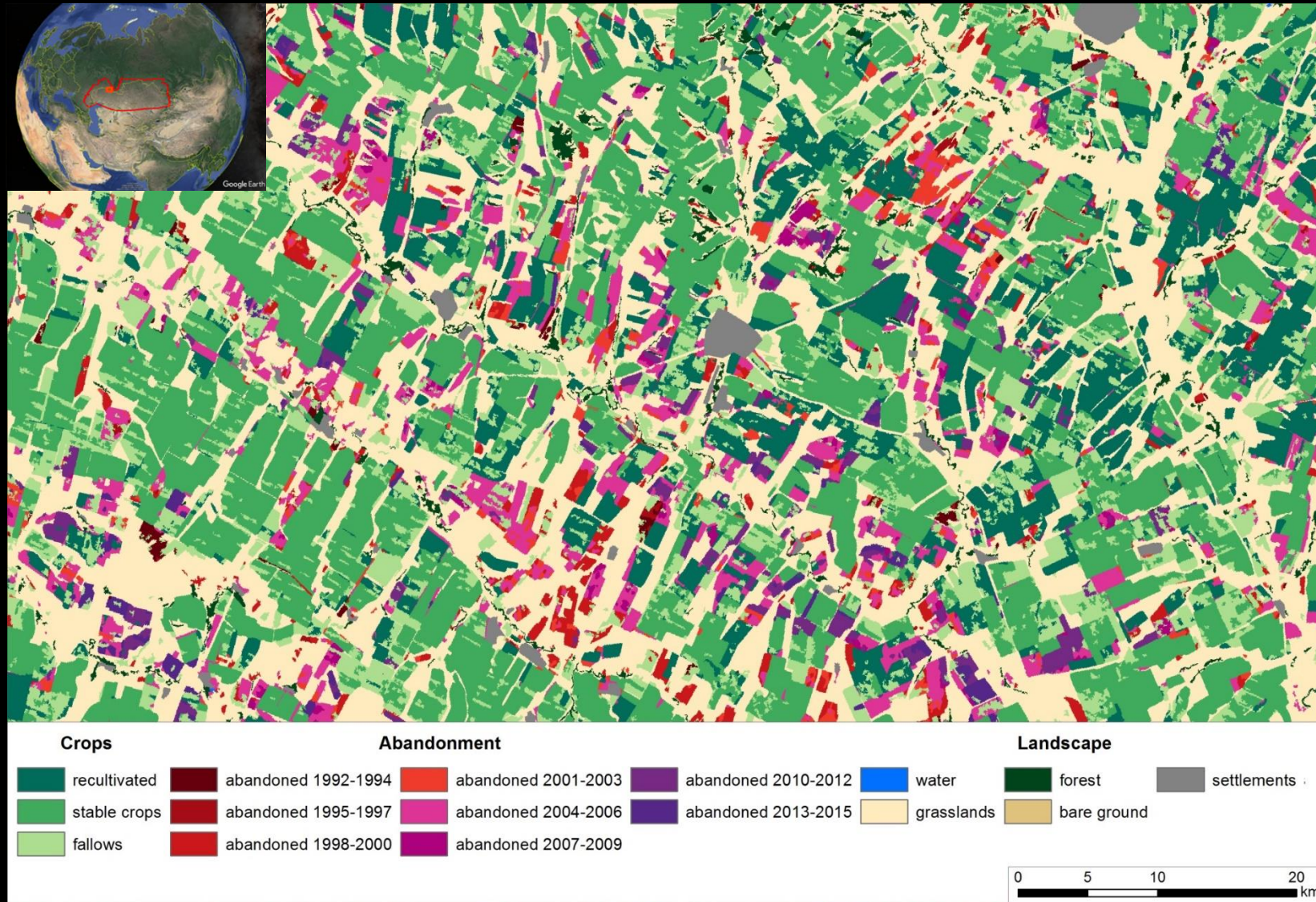
IV. Dryland Ag. Abandonment – Central Asia



IV. Dryland Ag. Abandonment – Central Asia



IV. Dryland Ag. Abandonment – Central Asia



Outline



Conclusions

- I. Method development and global test sites
Annual abandonment mapping for different biomes
- II. Grassland abandonment – France
Landsat + Sentinel-2 essential for managed grasslands
- III. Temperate biome ag. abandonment – E. Europe
Widespread permanent abandonment in the North,
but abandonment followed by recultivation in the South
- IV. Dryland ag. abandonment – Central Asian Steppe
Widespread permanent abandonment near semi-deserts

Thank you!

radeloff@wisc.edu

silvis.forest.wisc.edu