

Anthropogenic Fires in Central Europe

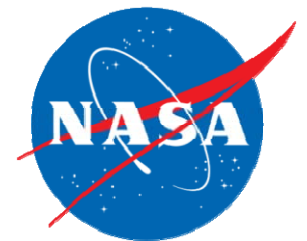


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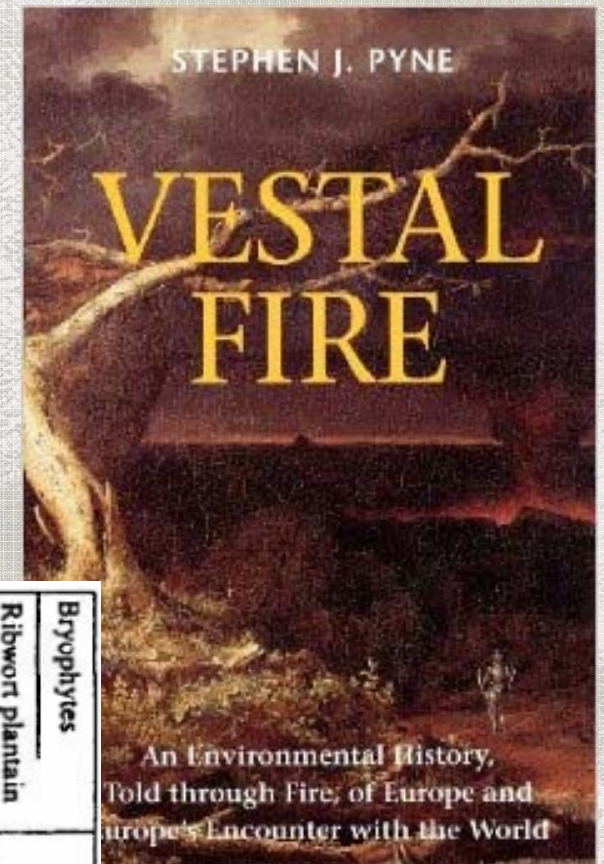
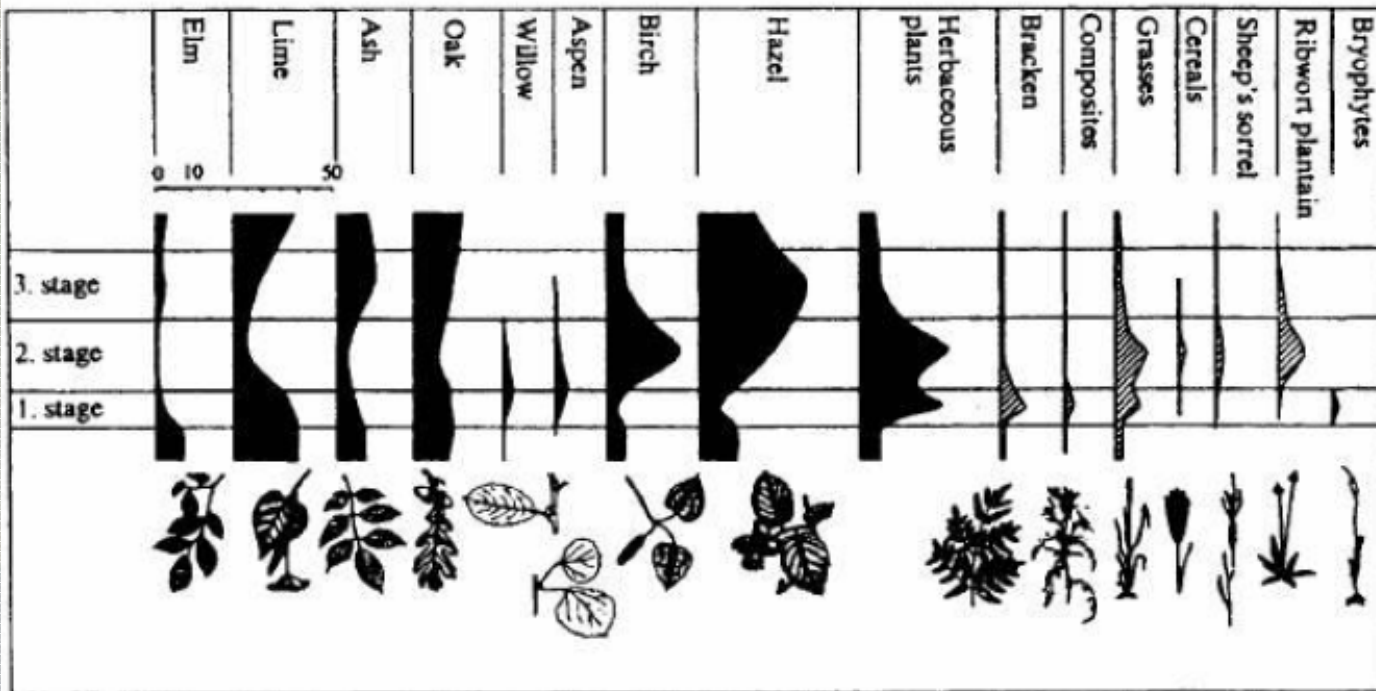


A satellite-style image of Earth showing the Western Hemisphere, including North and South America, the Atlantic Ocean, and the Pacific Ocean. The text "HISTORY OF ANTHROPOGENIC FIRES" is overlaid in the center in a bold, black, sans-serif font.

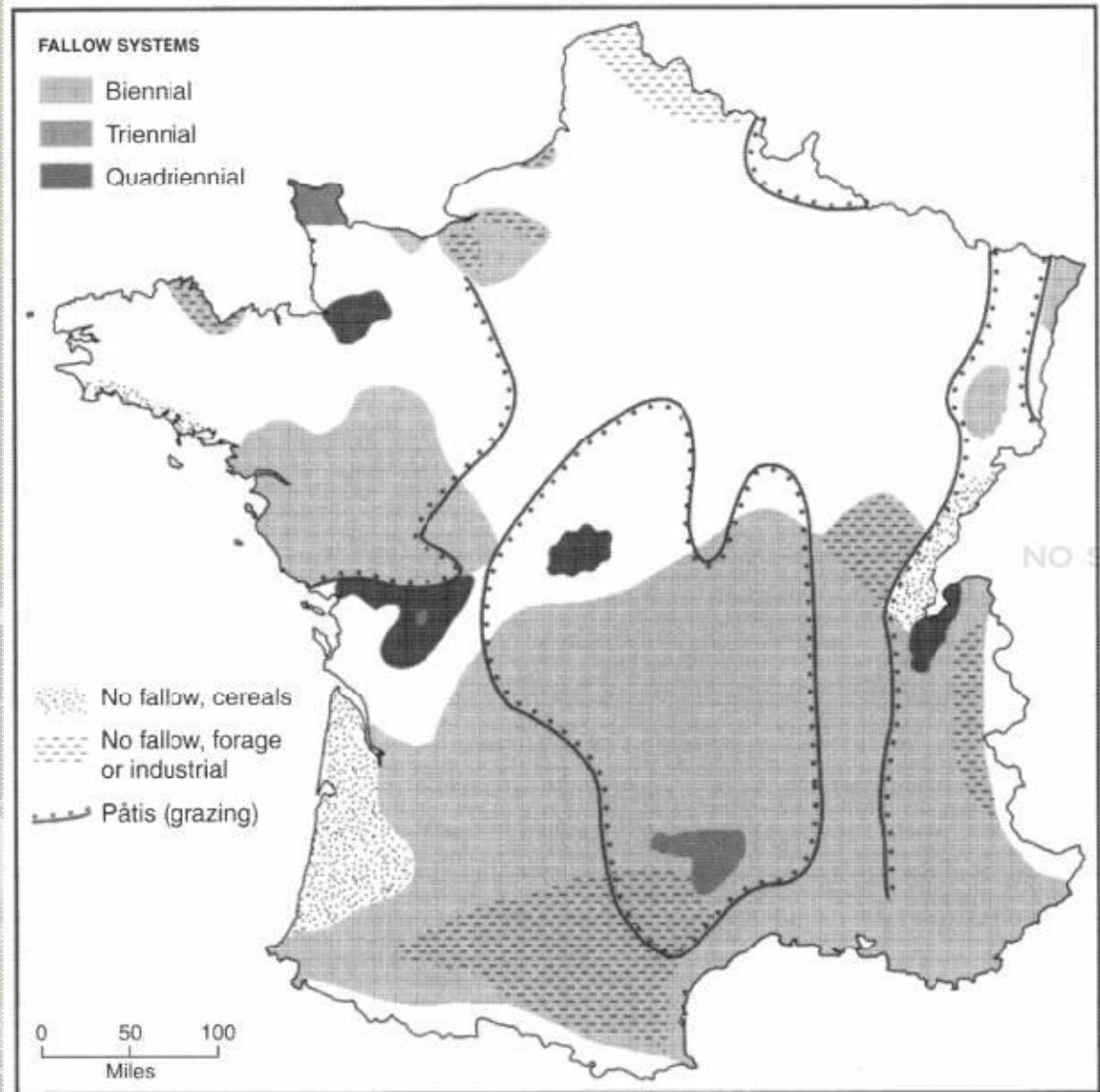
HISTORY OF ANTHROPOGENIC FIRES

Landnam

~3000 B.C.E.



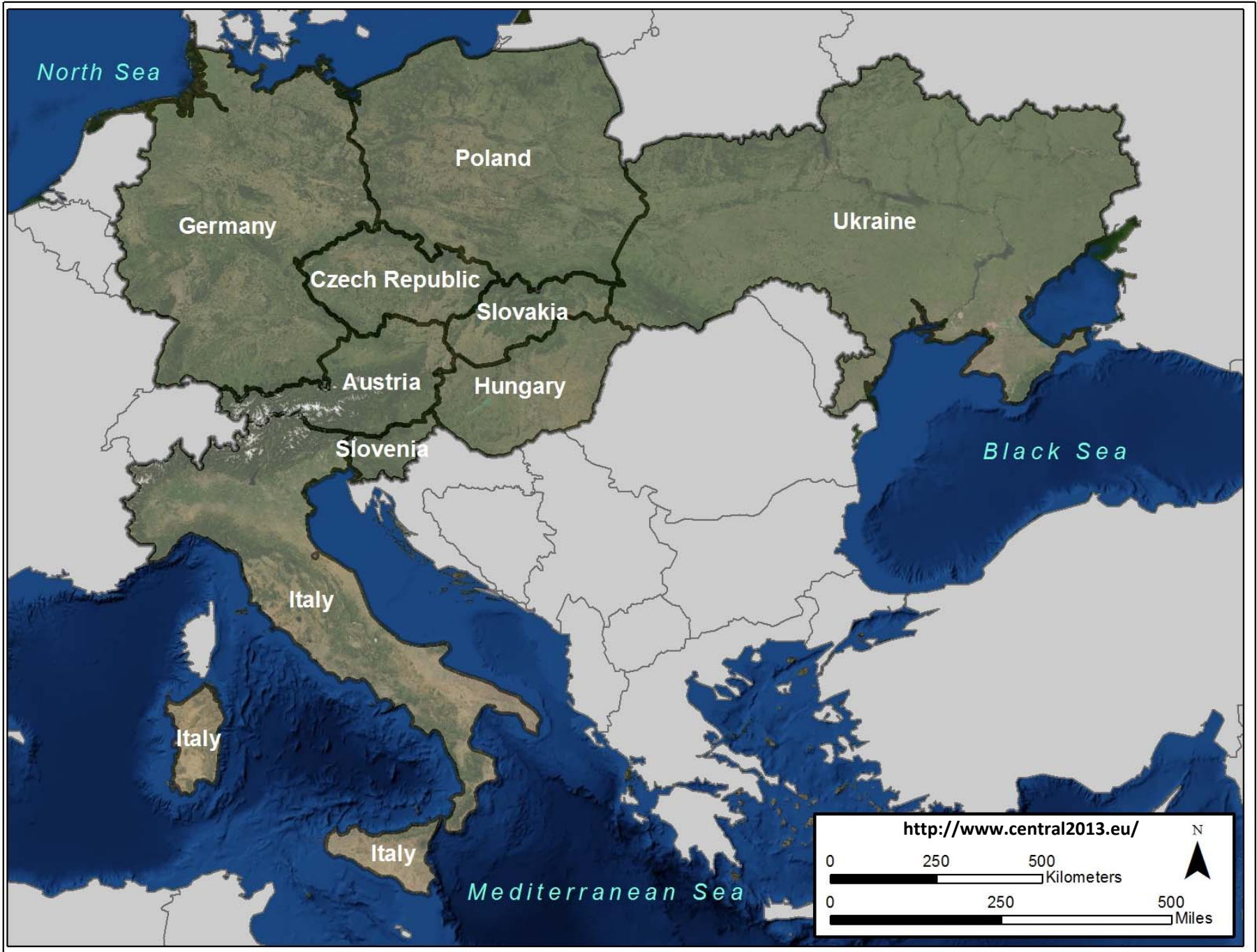
Fire Follows Fallow



Fire-fallow agriculture. (Left) Crop rotation systems in France in the early nineteenth century. (Adapted from Braudel 1988 by the University of Wisconsin Cartographic Lab) (Right) "Burning the Fields in the Black Forest" by C. Rour, mid-nineteenth century. (Photo courtesy J. G. Goldammer)

A satellite-style topographic map of the Mediterranean region. The map shows the Mediterranean Sea, the Alps, and the surrounding landmasses. The text 'STUDY AREA' is overlaid in the lower-left quadrant. The terrain is color-coded by elevation, with greens for lower elevations and browns for higher elevations. Snow-capped peaks are visible in the mountainous regions.

STUDY AREA



GOFC-GOLD

GLOBAL OBSERVATION OF FOREST AND LAND COVER DYNAMICS



Home > Regional Networks > SCERIN

SCERIN - South Central and Eastern European Regional Information Network

The goals of SCERIN are to promote and coordinate the production and provision of Earth System observations for the user communities in South Central Europe. We plan to work together with the regional forest and land management agencies to ensure continuous, high quality observations for operational and management applications, facilitating feasible and sustainable natural resources management practices.

SCERIN geographic domain encompasses Central Eastern and South Eastern Europe, the [Danube watershed and western Black Sea coast](#). It is an informal network of scientists and other professionals based in the region or with scientific interests in the region. SCERIN contributes to [GOFC-GOLD](#) and has strong linkages with the Northern Eurasia Earth Science Partnership Initiative ([NEESP](#)), which are programs of internationally supported Earth System Science research.

- [GTOS HOME](#)
- [GOFC HOME](#)
- [OVERVIEW](#) >
- [CALENDAR](#)
- [ORGANIZATION](#) >
- [LAND TEAM](#)
- [FIRE TEAM](#)
- [NETWORKS](#)
- [WORKING GROUPS](#)
- [PARTNERS](#) >
- [DATA](#) >
- [DOCUMENTS](#) >
- [SITEMAP](#)

Thematic focus of SCERIN

Activities and Status

Resources

and Sources (under development) - Information regarding the datasets available to support and facilitate the research in the region (resources, content, quality, condition, and other characteristics).

Cross-cutting Thematic Issues

Publications

Projects/Activities

Contacts

History (under development) - links to working groups and participants.

For more information and additional details

Comments and suggestions please contact: [Petya Campbell](#) (SCERIN coordinator).



Context

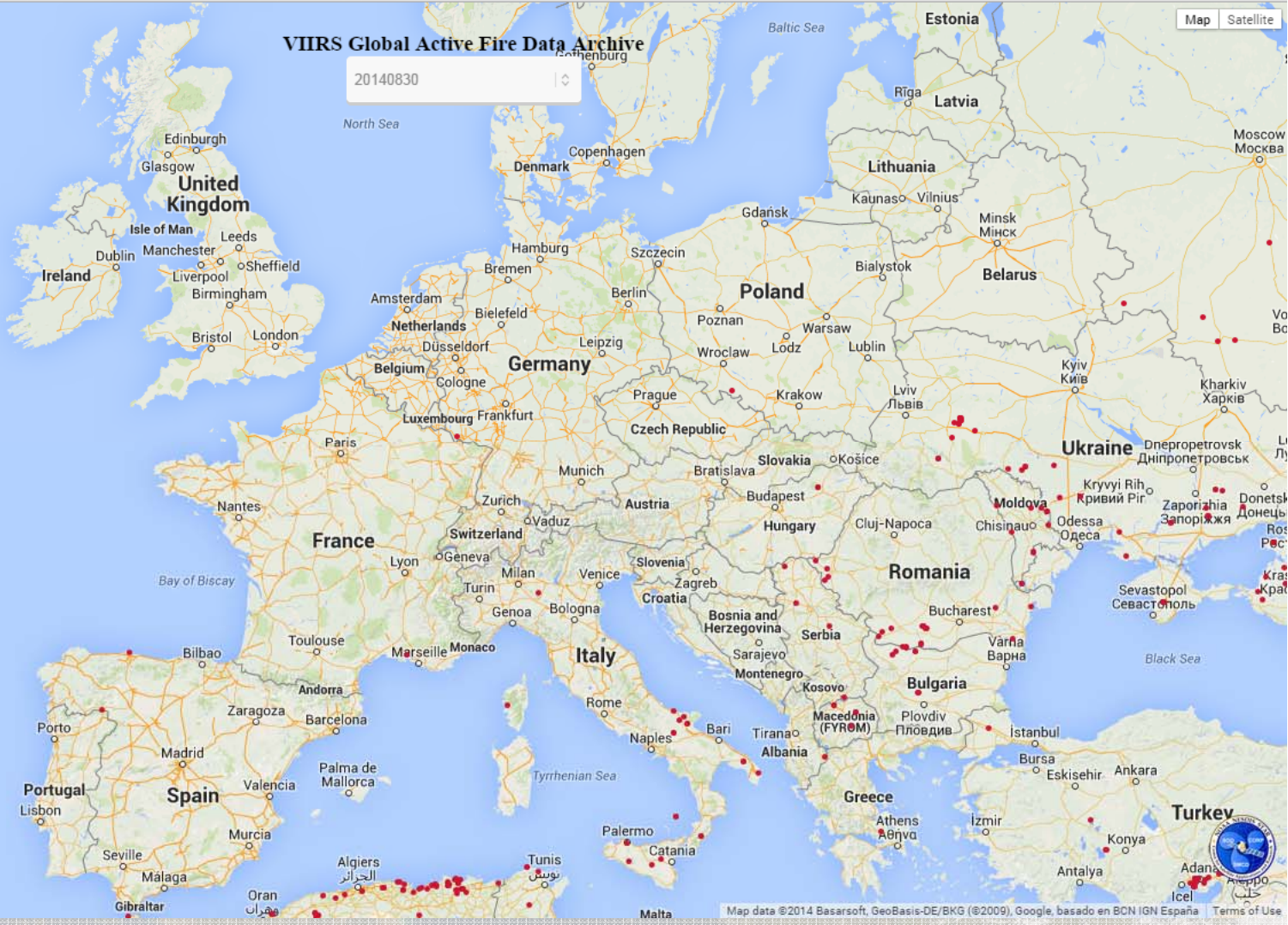
- European Union has largely banned agricultural burning
 - Exceptions: Cyprus, France, Ireland, Slovenia
 - Other member states have national bans



VIIRS Global Active Fire Data Archive

20140830

Map Satellite



Earth Engine

Workspace saved 0s ago ▾

Home

Data Catalog

Workspace

Data

+

Fusion Table: firms central europe 6-14 sep 2014 🔍

⋮ Computed layer: NBR L8 8-Day 6-14 Sep 2014 🔗

⋮ Landsat 7 Annual NBRT Composite 🔗

⋮ Computed layer: NBR L8 8-Day 8-14 Jul 2014 🔗

⋮ Landsat 8 8-Day Raw Composite 🔗

[Add data](#) [Add computation](#)

Classes

+

■ Fire

[Add class](#) [Get palette](#)

Analysis: None ▾



Search

Search

ex: Museums in New York, NY

Get Directions History

Places

My Places

Sightseeing Tour
Make sure 3D Buildings layer is checked

Temporary Places

Terrestrial Biomes (Olson et al. 2001)
Citation: Olson, D. M., E. Dinerstein, E. D. Wikramanayake, N. D. Burgess,
Anthromes (v2) 2000AD
Citation: Ellis, E. C., K. Klein Goldeewijk, S. Siebert, D. Lightman,

Legend Levels

Navigation icons

Layers

Earth Gallery

Primary Database

- Borders and Labels
- Places
- Photos
- Roads
- 3D Buildings
- Ocean
- Weather
- Gallery
- Global Awareness
- More

Anthromes (v2)

Used

Dense Settlements
Urban
Mixed settlements

Villages

Rice villages
Irrigated villages
Rainfed villages
Pastoral villages

Croplands

Residential irrigated croplands
Residential rainfed croplands
Populated croplands
Remote croplands

Rangelands

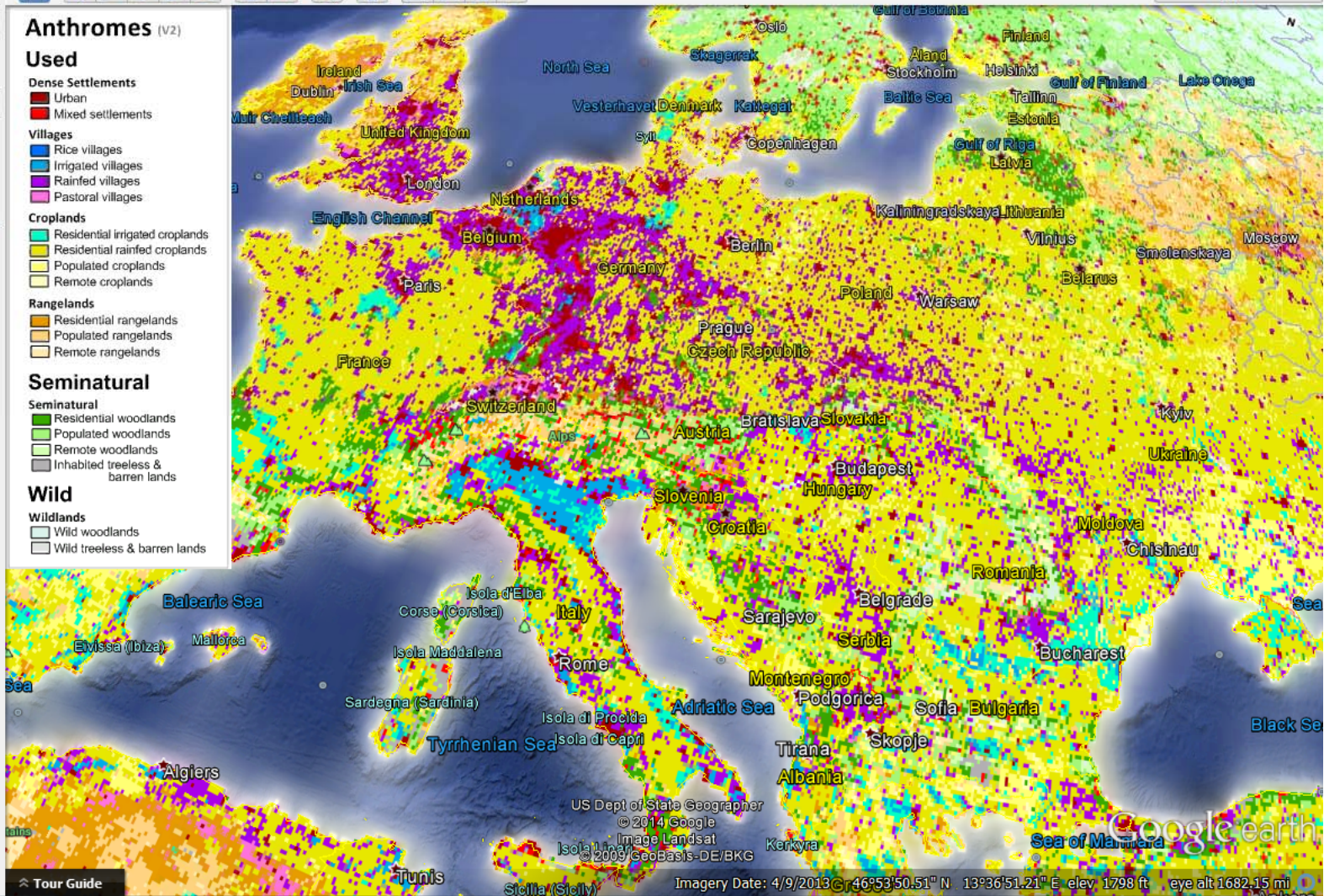
Residential rangelands
Populated rangelands
Remote rangelands

Seminatural

Seminatural
Residential woodlands
Populated woodlands
Remote woodlands
Inhabited treeless & barren lands

Wild

Wildlands
Wild woodlands
Wild treeless & barren lands





Fire regime and land abandonment in European Russia: Case Study of Smolensk Region



Alexander Krylov¹, Jessica L. McCarty², Peter Potapov¹, Svetlana Turubanova¹, Alexandra Tyukavina¹, Alexander Prishchepov¹, Alexander Manishev¹, Vladimir Romanenkov³, Dmitry Rukhovich⁴, Polina Koroleva⁵, Matthew C. Hansen⁶

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⁵ S.A.R. Southern Institute for Agroecology, Puzanovskaya Street 3/1a, 127550 Moscow, Russia, kugoseva@gmail.com
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Background

Fires in anthropogenically-dominated landscapes are generally attributed to ecosystem management, agriculture, and policy drivers. In European Russia, fire in non-forested areas is the dominant fire type, mainly occurring on agricultural lands, both actively managed and abandoned, and wetlands. In the agricultural practice in Russia prescribed fires are used as a means of increasing pasture and hay productivity, suppressing tree and shrub expansion, and reducing fire hazard. Large-scale socio-economic transition since the collapse of the Soviet Union has led to significant changes in land use and land management, including land abandonment. Attempts has been made to characterize the extent of agricultural land abandonment in European Russia using remotely sensed data and map forest regeneration on the abandoned lands (Vicentini et al 2012, Koenen et al 2011, Saarnanen et al 2012, Prishchepov et al 2013). The most recent Landsat-based study (Potapov et al., 2014) provides a map of afforestation (forest regeneration on former agricultural lands) in the region between 1985 and 2012. However, the extent of not yet afforested abandoned agricultural lands remains unclear. Thus, the objective of the current field study was to estimate the area of abandoned and active agriculture, and the differences in their fire regime. We selected Smolensk region for a field case study. Smolensk region is located approximately two hundred kilometers west of Moscow on the border with Belarus (see Figure 1).



Figure 1 Study area location



Figure 4 Sampling

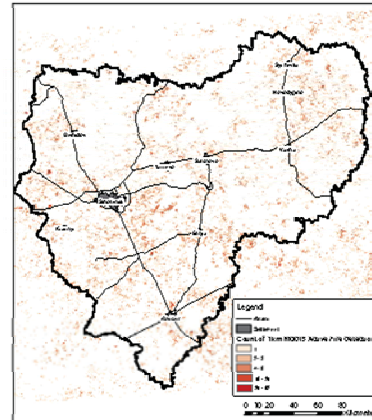


Figure 5 MODIS Active Fire Detection

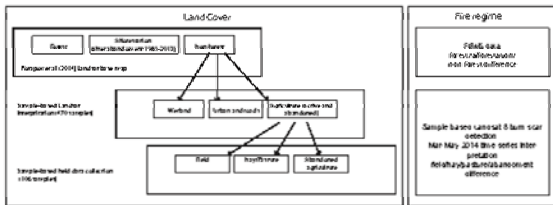


Figure 2

Method

Land cover

We used Potapov et al. (2014) 1985-2012 forest cover and forest cover change map to classify stable forest and non-forest areas, and the area fire- and afforestation since 1985. To disaggregate non-forested land into land cover classes we used sample-based approach. 470 random points were allocated within 1985-2012 stable non-forest. For each sample point the uniform land cover patch (e.g. field) was identified. Each land cover patch was attributed as wetland, urban/road, agricultural land (both active and abandoned using Landsat time-series and Google Earth high resolution data). In the field portion of the study we targeted agricultural lands aiming to estimate the area of active and abandoned agriculture. We sampled 100 points within this class and identified the corresponding fields on the ground. Each sample field was attributed as actively managed cropland, hay field/pasture, or abandoned land.

Fire regime

We characterized the regime in the study region using two different datasets: MODIS-based active fire hotspots (FIRMS) for the years 2000-2014 and Landsat fire scars. Coarser resolution FIRMS data were used to assess the difference in fire regime between the major land cover types (stable forest, afforested and stable non-forested land). For a more detailed characterization of the regime within agricultural lands, we used sample-based approach with Landsat time series as reference data. Higher resolution of Landsat data (30 m vs. 1 km for FIRMS hotspots) allowed for a more precise attribution of the scars to sample fields. Landsat 8 Operational Land Imager (OLI) data for the Spring 2014 (March-May) were visually analyzed within the same 106 sample fields to estimate the rate of spring burning (% of field burnt) within field-identified active and abandoned agriculture classes.

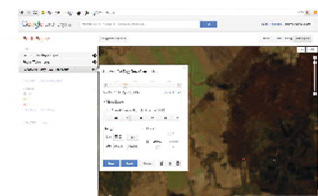


Figure 3 Burn scar detection using Landsat 8



Figure 9 Field data collection



Figure 10 Active agricultural land example



Figure 11 Abandoned agricultural land example

Land cover dynamic

According to Potapov et al. (2014) map, stable forest comprises 46% of the region, 4% of forest was logged in 1985-2013, 3% was reforested. It's a relatively low intensity of forest use comparing to other regions of European Russia. 7% of 1985 agricultural areas were afforested by 2012. According to our sample-based estimation (Figure 6), 1% of the region is wetland, 4% - urban lands and road, 6% - active croplands, 11% - hay and pasture, 21% - abandoned agricultural land (not forested by 2012). Most of afforested and abandoned agricultural lands is located in the adjacency with stable forests. Agricultural land abandonment is a major land cover dynamic in the region since 1985.

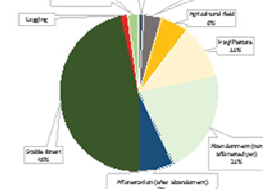


Figure 6 Land cover

Fire regime

FIRMS data show that non-forested land burned 2.6 times more frequently than forests (Figure 7). However, Landsat-based land cover data shows that the majority of 161 km MODIS active fire points are located on the boundary between forest and non-forest classes, which is an indicator of elevated fire frequency near forest boundary.

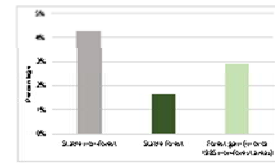


Figure 7 Annual Burned Area (FIRMS)

Sample-based Landsat time series fire detection results show a ten times higher fire frequency than FIRMS data for the non-forested land. Actively managed croplands have lower burn frequency compared to the abandoned lands (Figure 8), presumably due to the greater fuel loads on abandoned lands and a common belief in rural Russia that fire is an efficient way to suppress tree and shrub expansion and keep abandoned croplands from afforestation. Fire frequency was significantly higher on wet soils than on dry soils (soil moisture was identified in the field survey). No relationship was found between the abandonment stage (e.g. % of shrub and tree cover on abandoned lands) and fire frequency.

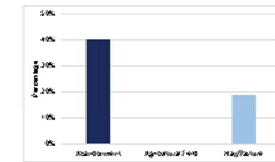


Figure 8 Annual Burned Area Derived From Landsat 8 OLI Burn Scars

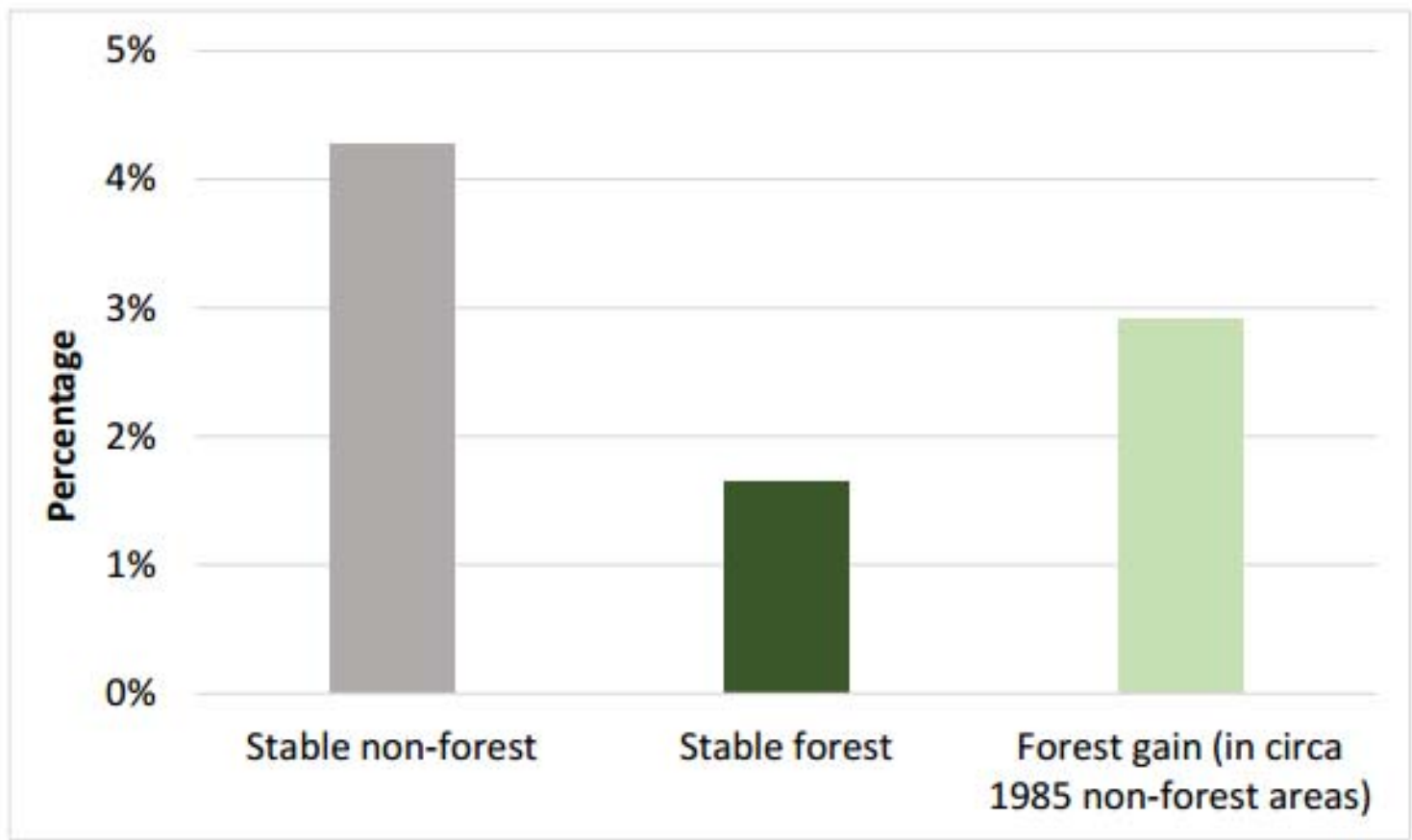


Figure 7 Annual Burned Area (FIRMS)

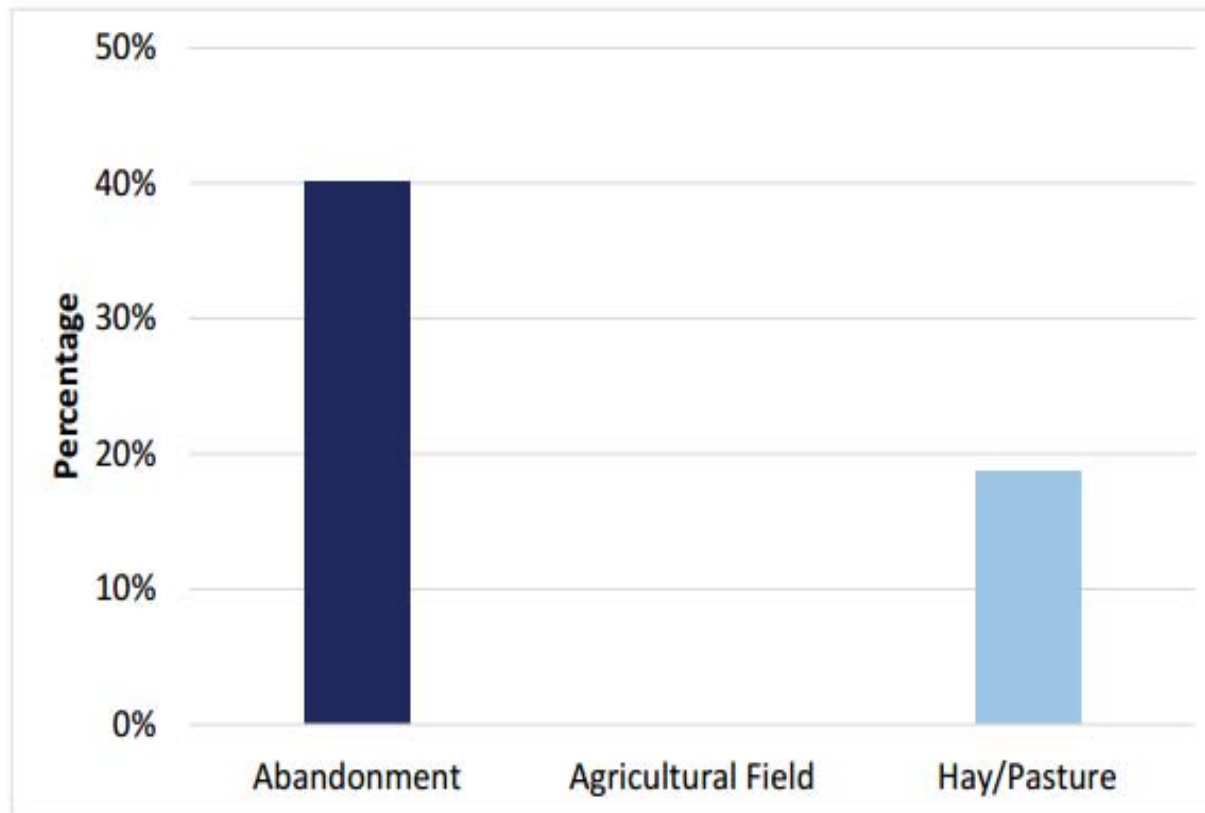


Figure 8 Annual Burned Area Derived From Landsat 8 OLI Burn Scars

Anthropogenic Fires in Hungary

- Grassland fires common in all National Parks in Hungary.
 - Majority = anthro fires
- Many negative impacts on biodiversity.
- Improves micro-habitats and suppress invasive species.
- Need for prescribed burning experiments.

Deák et al.: Grassland fires in Hungary—Experiences of nature conservationists on the effects of fire on biodiversity
- 267 -

GRASSLAND FIRES IN HUNGARY – EXPERIENCES OF NATURE CONSERVATIONISTS ON THE EFFECTS OF FIRE ON BIODIVERSITY

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Abstract. Fire as a natural disturbance has been present in most European grasslands. Controlled burning was also an important component of the traditional landscape management for millennia. It was mainly

A satellite-style map of the Earth, showing topography and cloud cover. The map is centered on the Indian subcontinent and the surrounding oceans. The text "REGIONAL ESTIMATES FROM GLOBAL MODELS" is overlaid in the center of the map.

**REGIONAL ESTIMATES FROM
GLOBAL MODELS**

Unpacking Method for Modeling Global Distribution of Fire by Land Cover Type

- Sam Rabin, Doctoral Candidate, Steve Pacala, PhD, Advisor
Department of Ecology & Evolutionary Biology,
Princeton University
- Aim: Quantify *net* impact of land cover on total burning
 - Sum of any burning on that LC_x type minus amount of burning from other $LC_{y,z}$ types *suppressed* by the presence of LC_x type in question



Rabin et al., *in prep.*

“Unpacking” (multiple regression)

Where: $A_{k,i}$ = Area of land type k in grid cell i
 F_k = Fraction of k that burns...

$$BA_{i,est.} = \boxed{F_c A_{c,i}} + \boxed{F_p A_{p,i}} + \boxed{F_o A_{o,i}}$$

Cropland Pasture Other

Parameterize each region & month separately!

e.g., July 2008 in the Southeastern U.S.

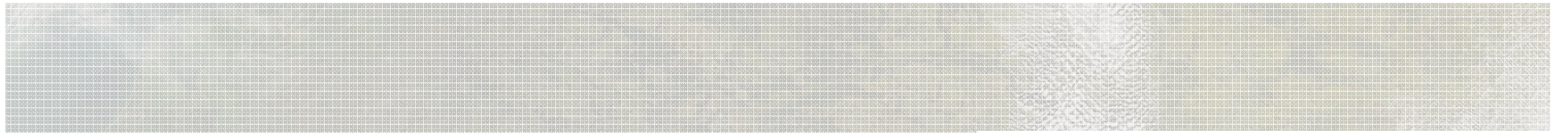
Land cover: HYDE (Klein Goldewijk et al., 2010)

Fire: GFED4 (Giglio et al., 2013)

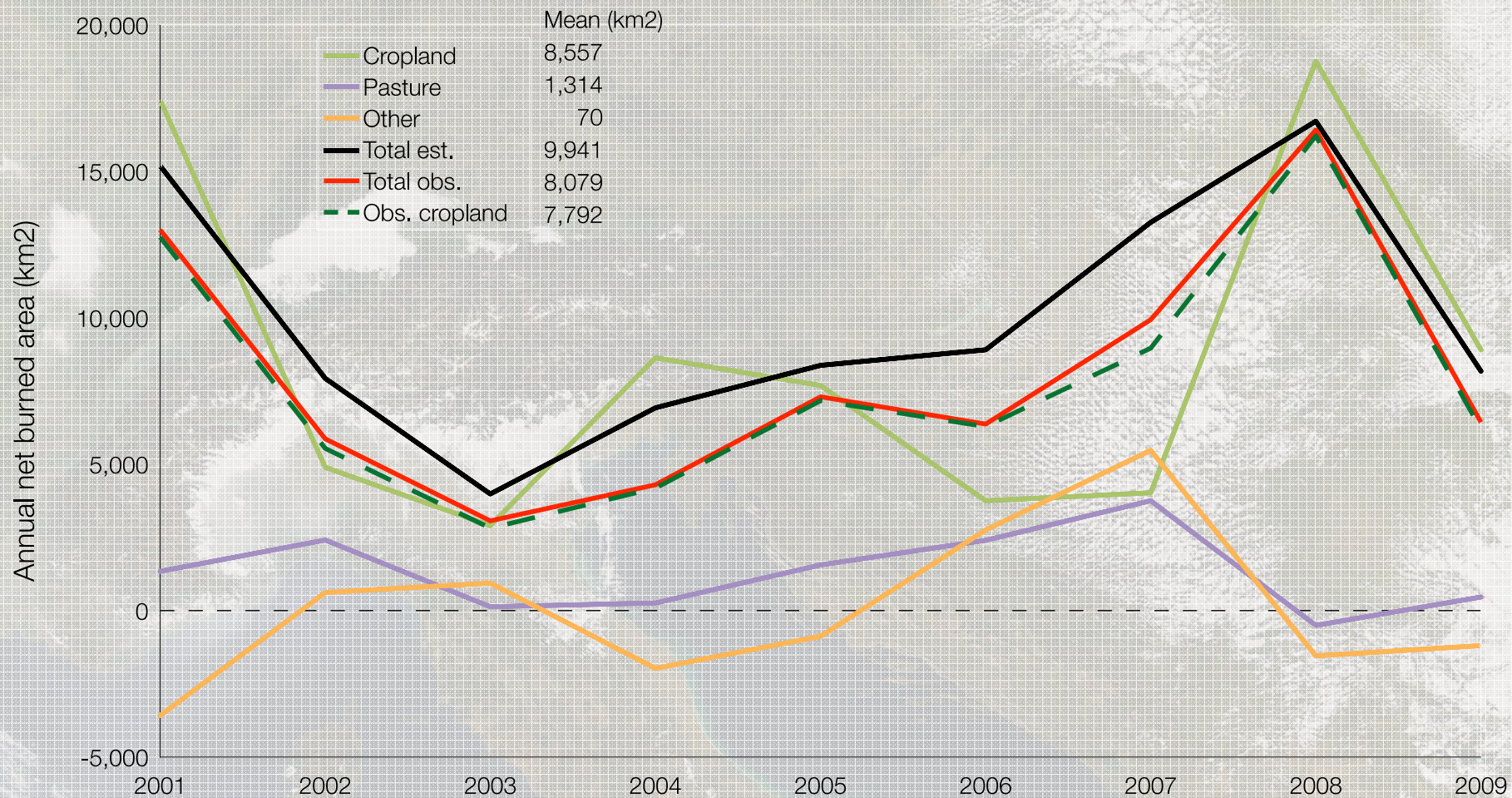
Rabin et al., *in prep.*

Regions used (134)

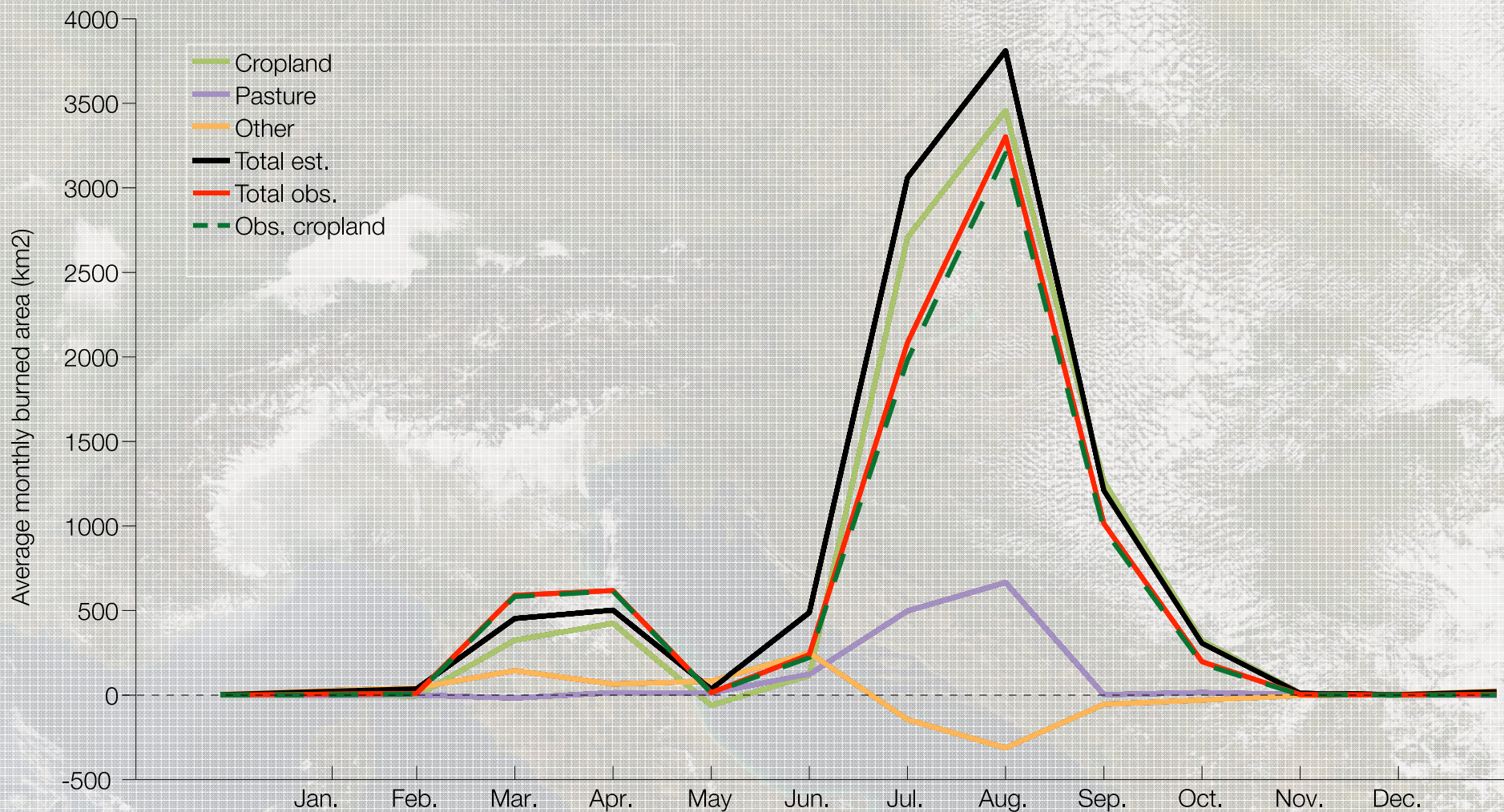




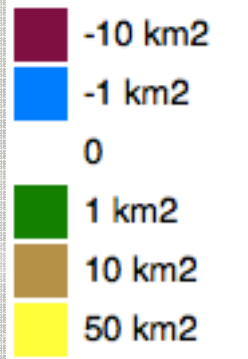
Interannual Variability



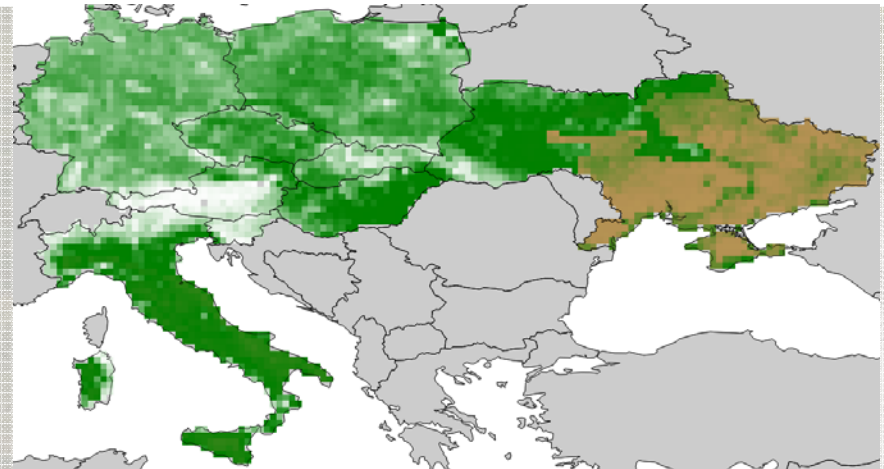
Seasonality



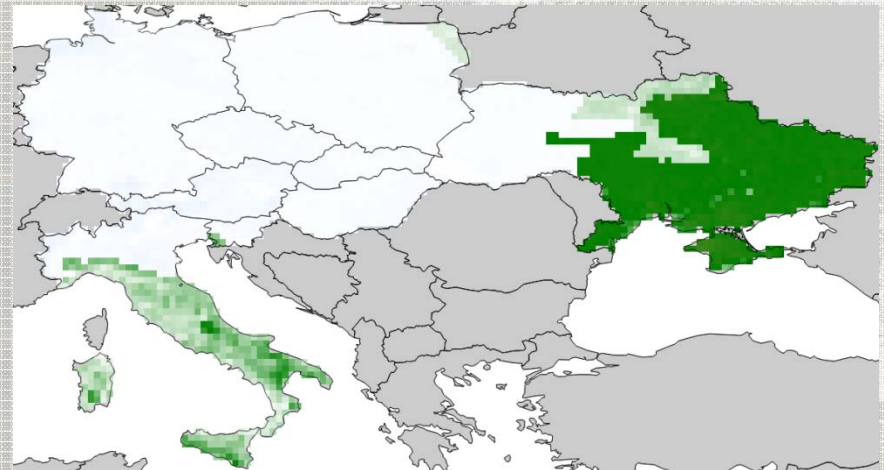
Mean annual burned area (km²)



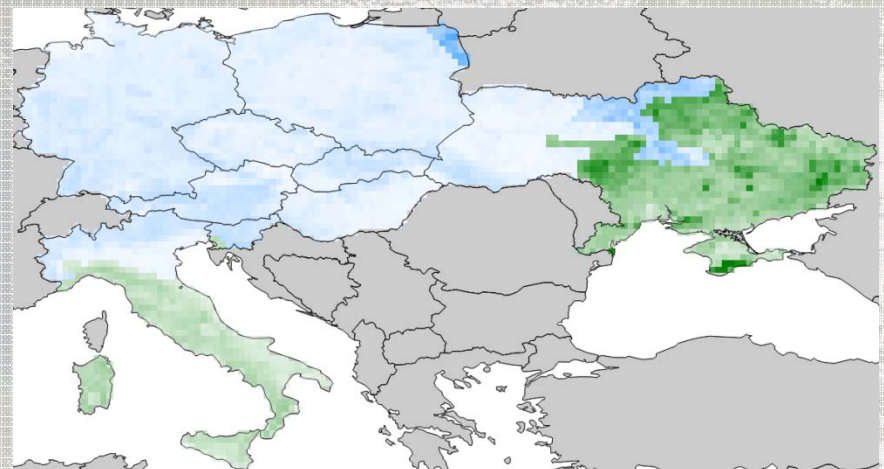
Cropland



Pasture



Other



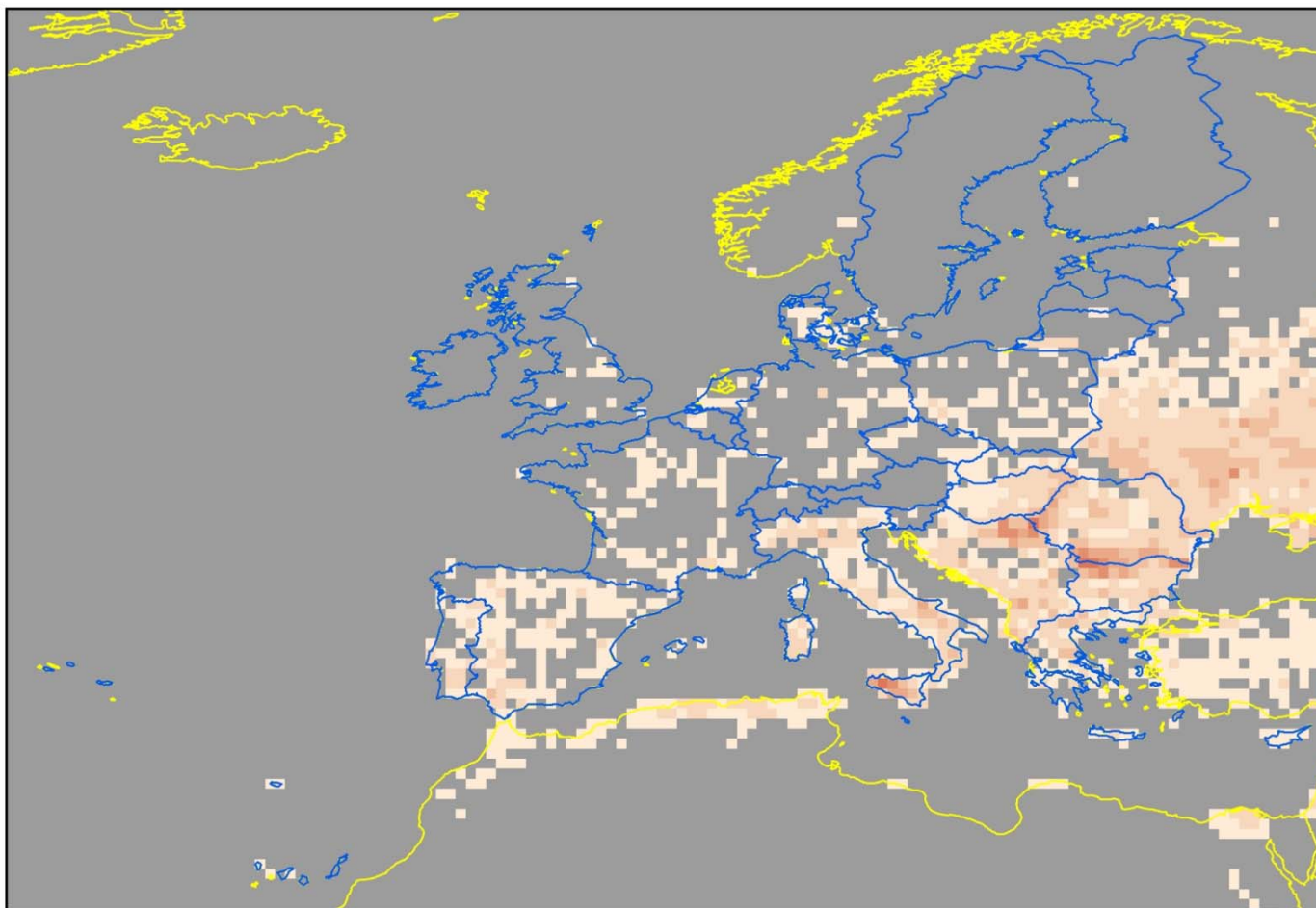
Rabin et al., *in prep.*

Hemispheric Transport of Atmospheric Pollution

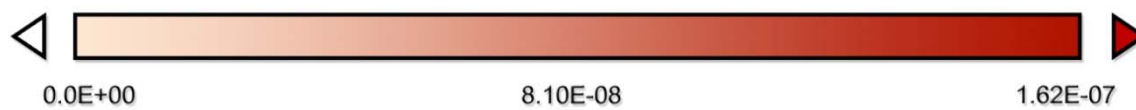
- <http://www.htap.org/>
- Improve understanding of intercontinental transport of air pollution across Northern Hemisphere.
 - Anthropogenic fire
- organized in 2005 under the auspices of the [UNECE Convention on Long-range Transboundary Air Pollution](#) (LRTAP Convention)

EU27– Agricultural Burning, 2012

Emission Source FINNv1



BC – Agriculture Burning Emissions (Mt/year)



0.0E+00

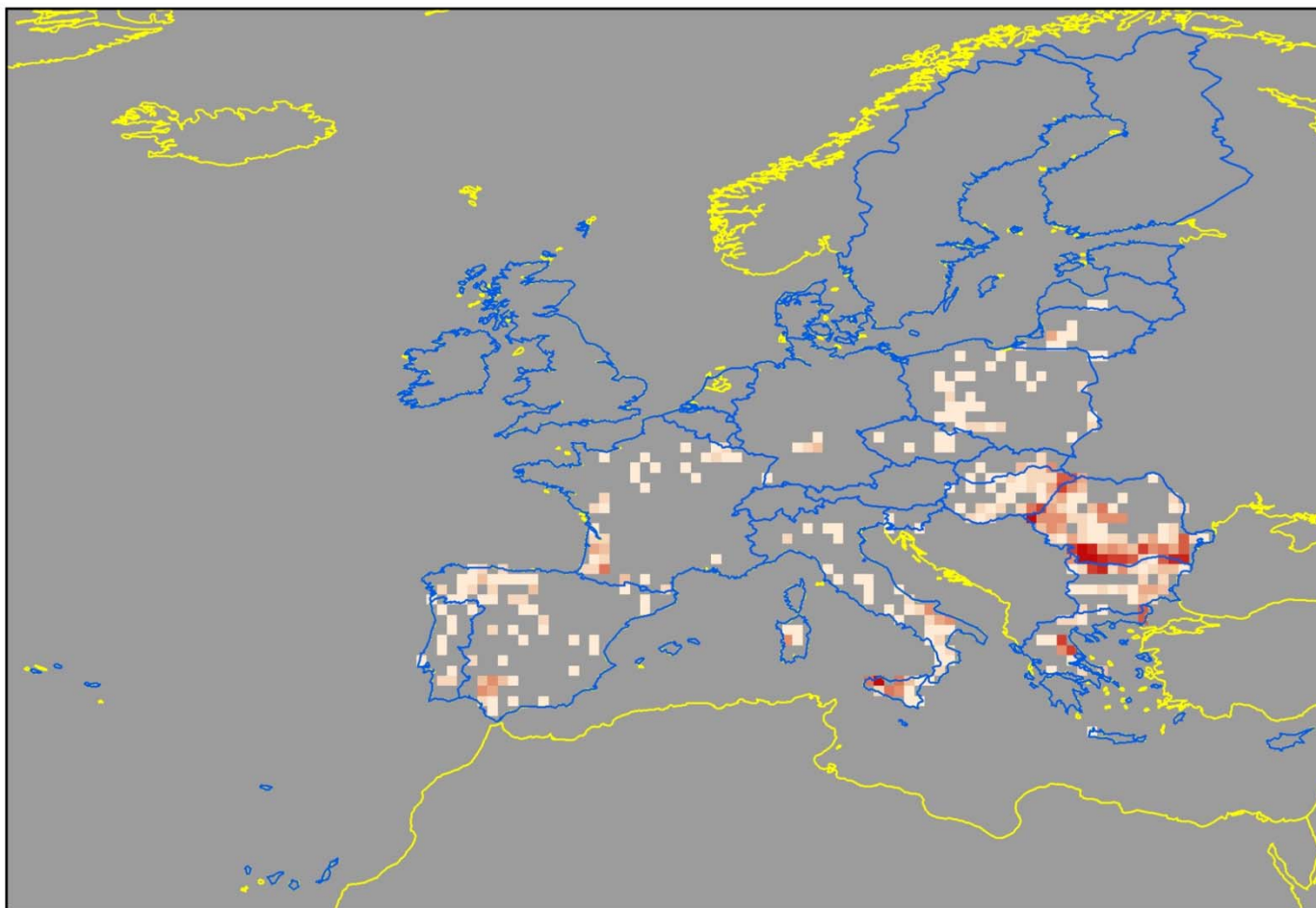
8.10E-08

1.62E-07

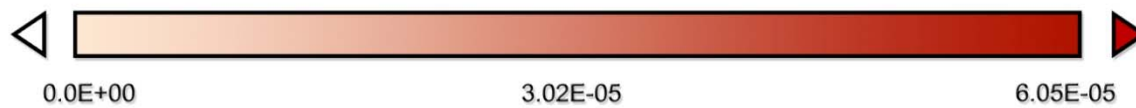
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EU27– Agricultural Burning, 2012

Emission Source GFEDv3



BC – Agriculture Burning Emissions (Mt/year)



0.0E+00

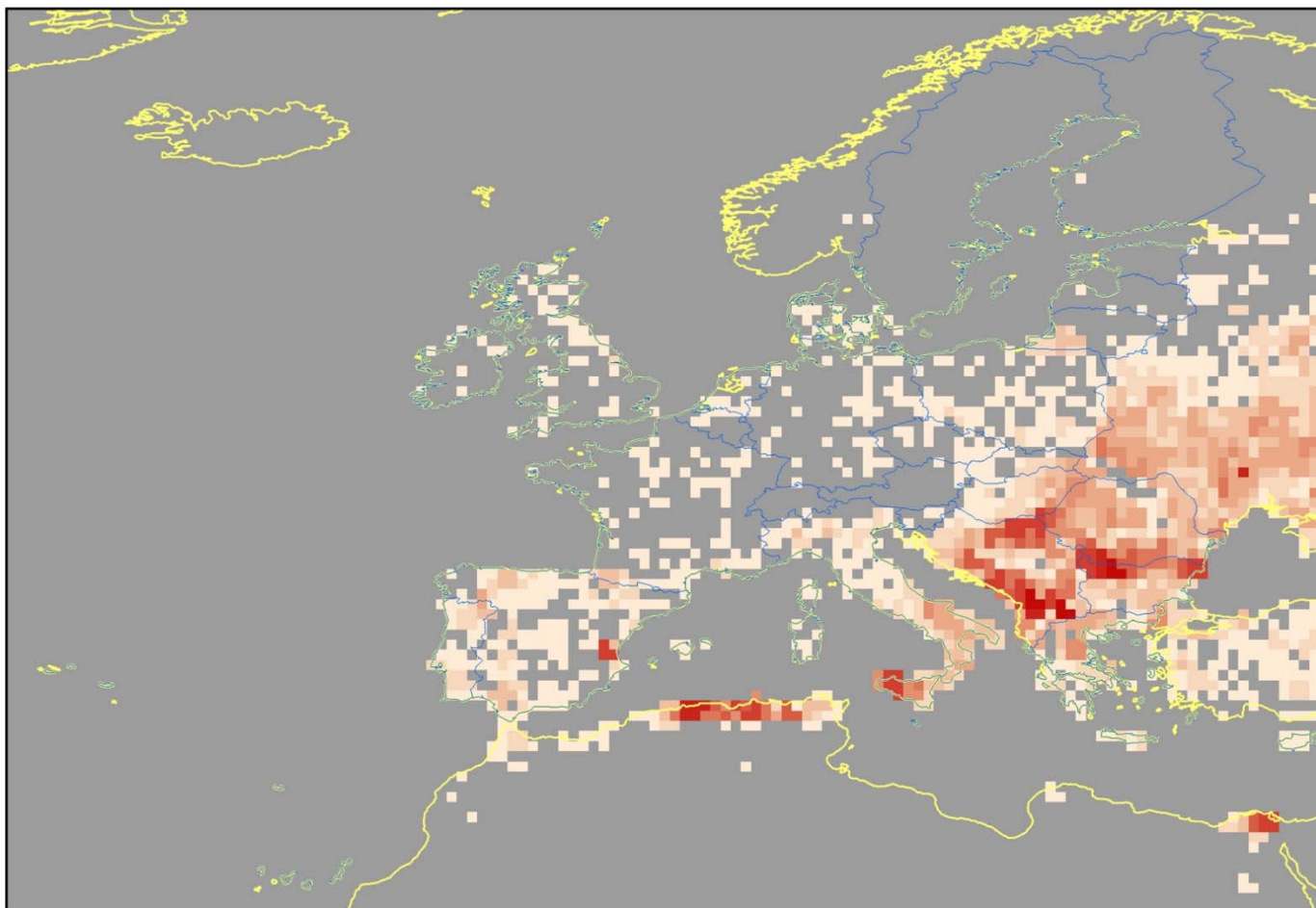
3.02E-05

6.05E-05

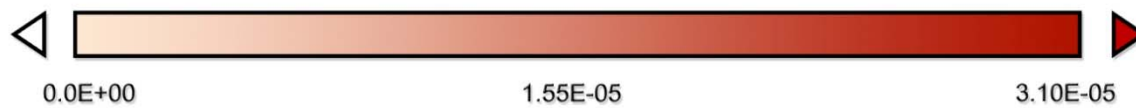
Data min.= 4.25E-08 max.=6.05E-05

EU27– Agricultural Burning, 2012

Emission Source McCarty Agriculture



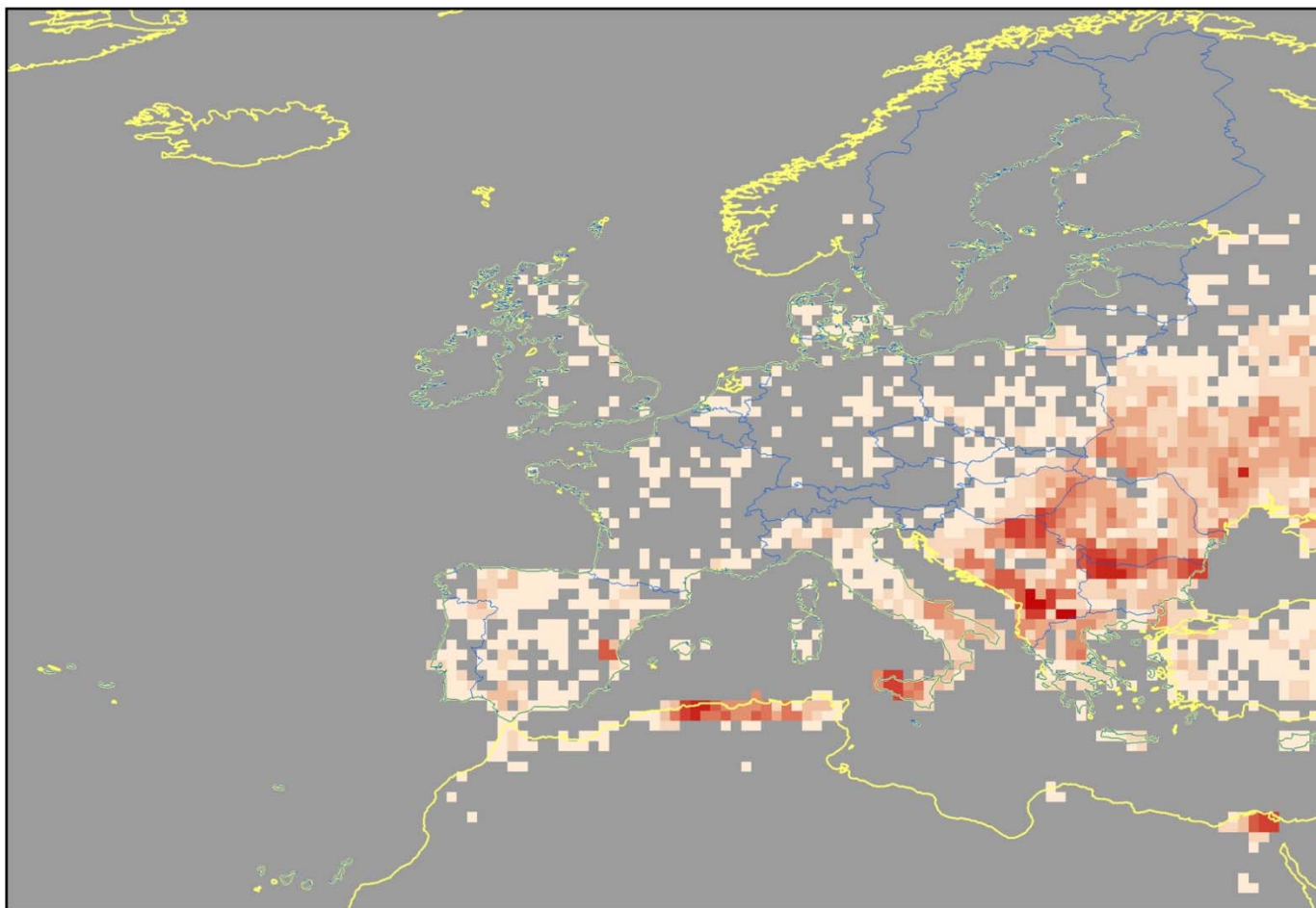
BC – Agriculture Burning Emissions (Mt/year)



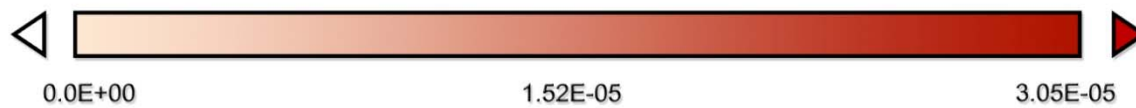
Data min.= $5.71E-08$ max.= $3.10E-05$

EU27– Agricultural Burning, 2012

Emission Source McCarty Cropland



BC – Agriculture Burning Emissions (Mt/year)



0.0E+00

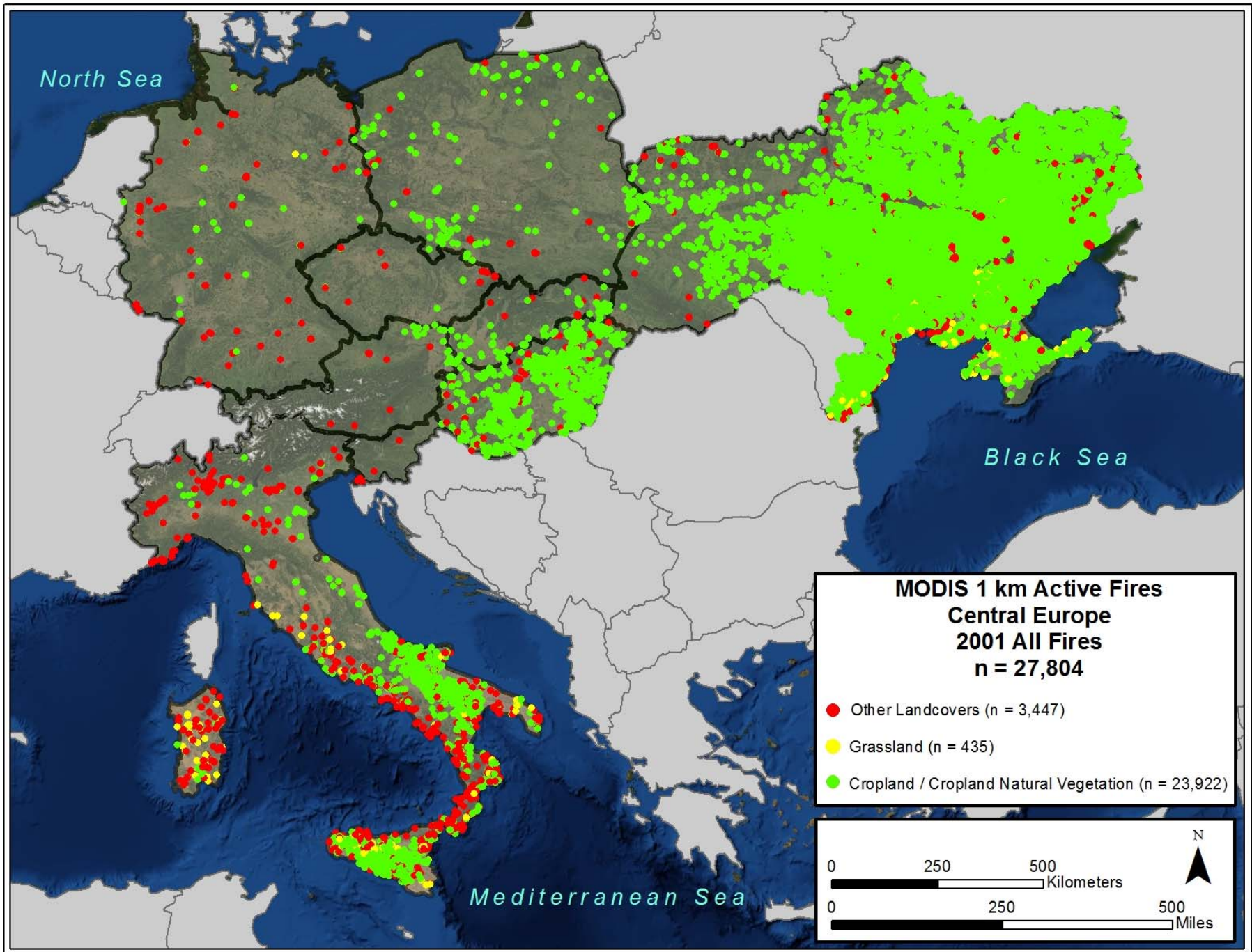
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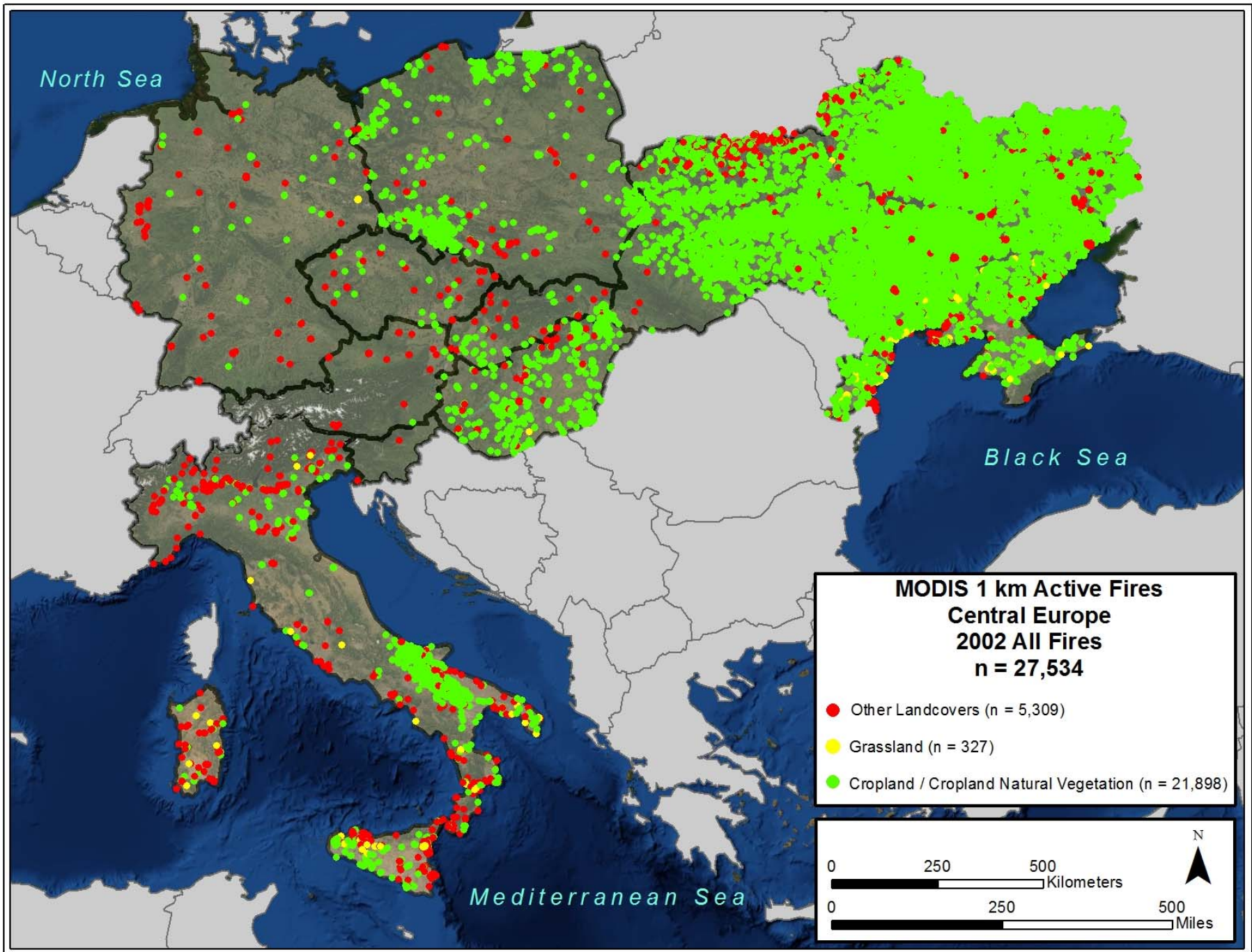
3.05E-05

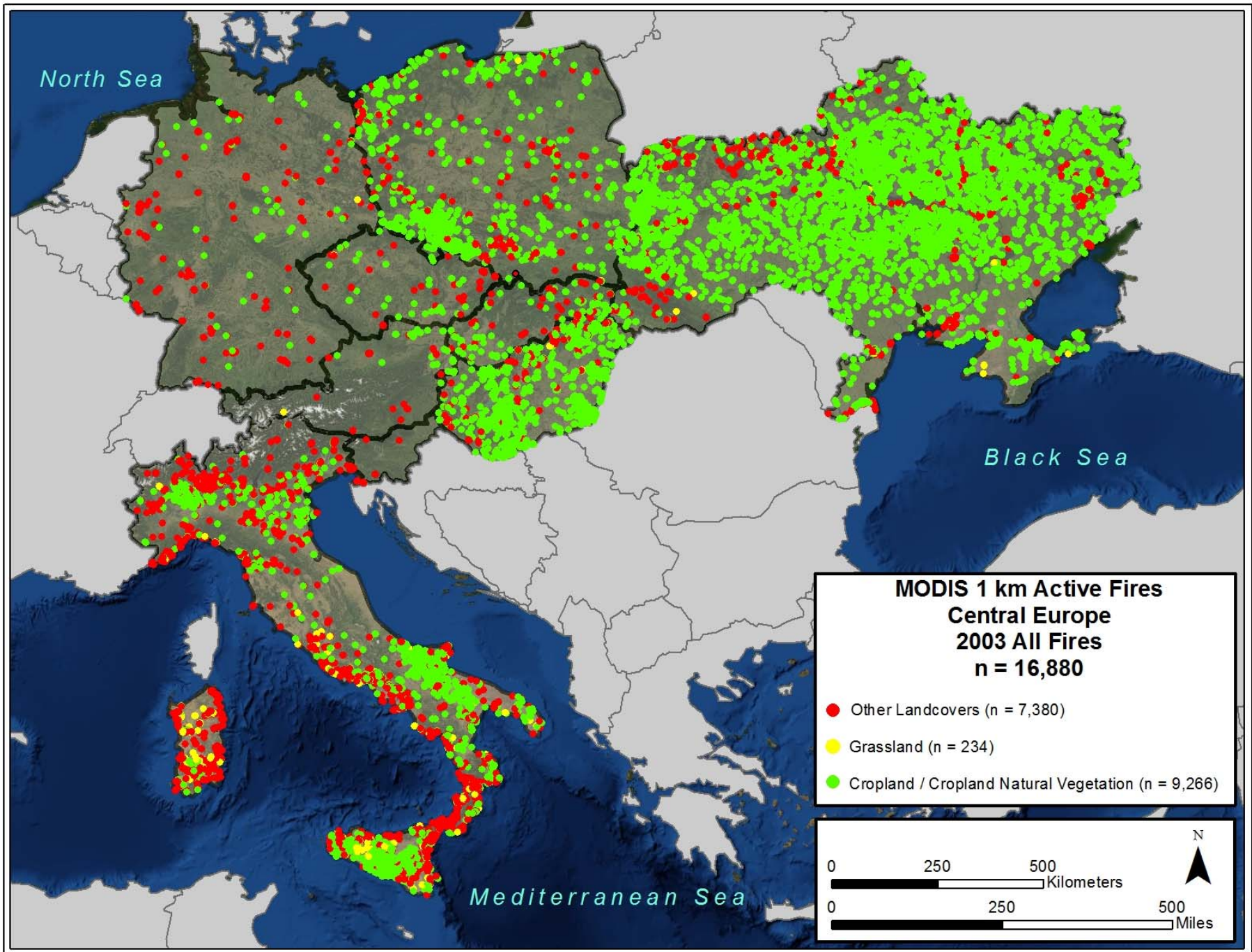
Data min.= 5.71E-08 max.=3.05E-05

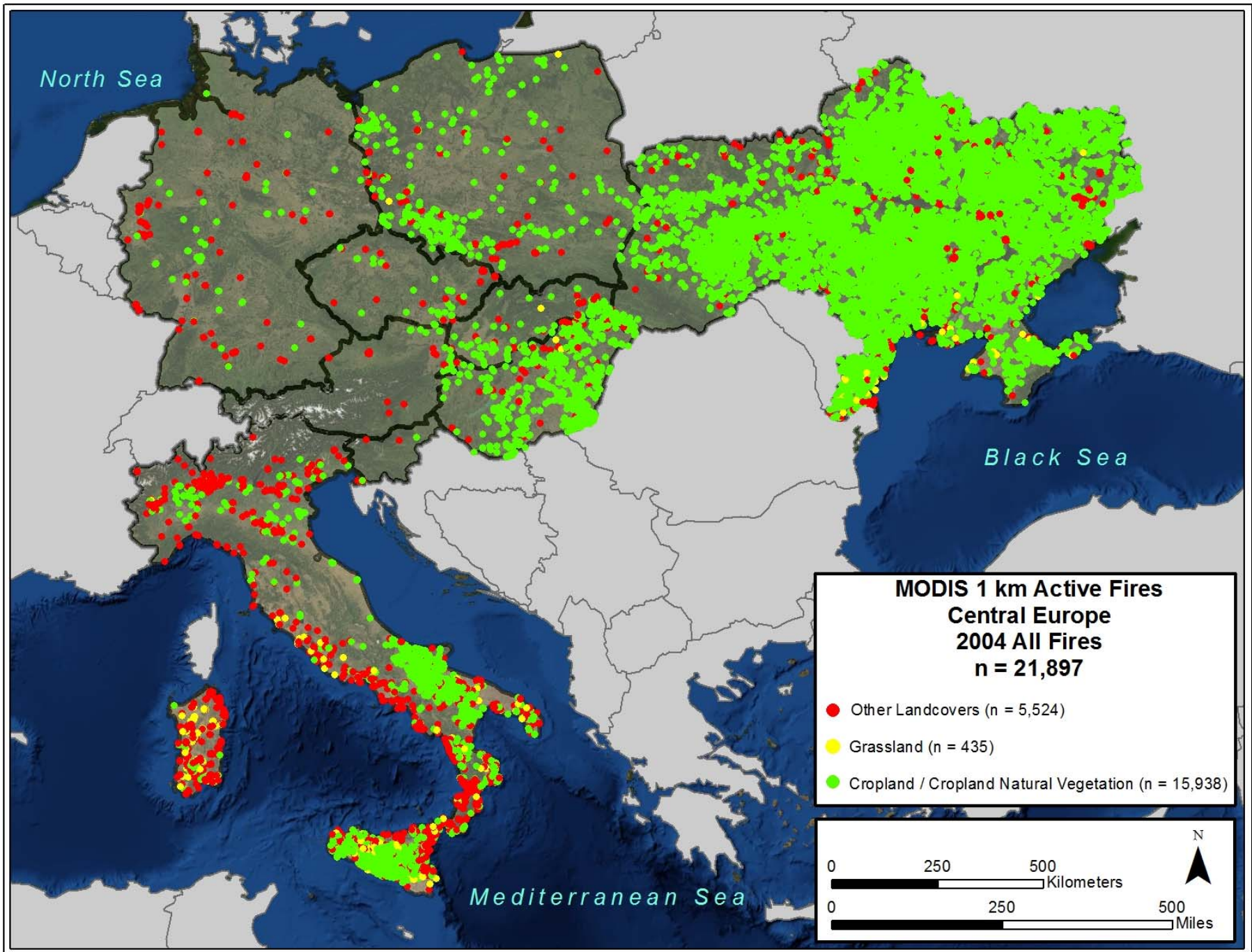
A satellite image of Earth showing a large landmass, likely South America, with a prominent mountain range and a large body of water. The text is overlaid on the image.

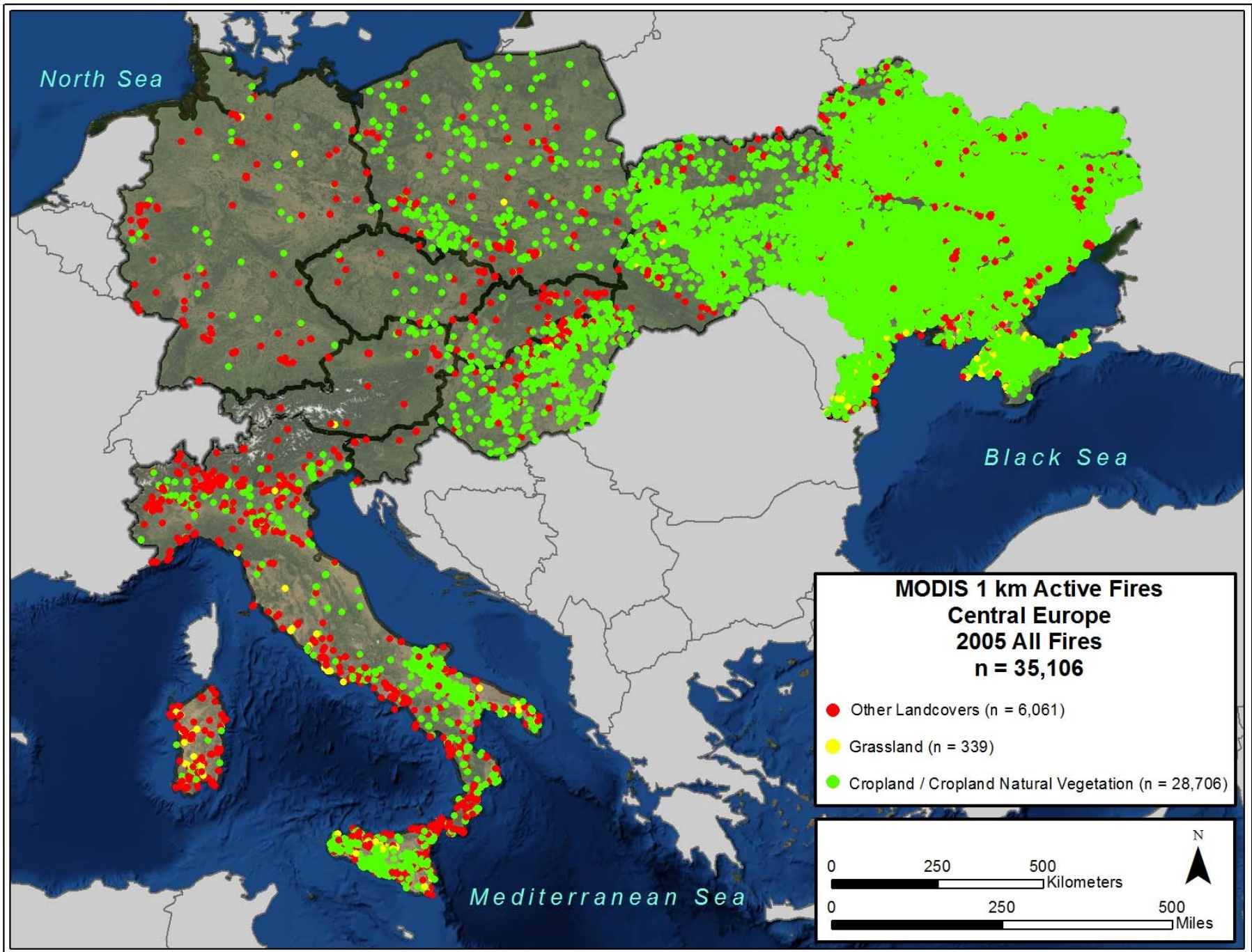
**COUNTRY-LEVEL ESTIMATES FROM
MODIS TIME SERIES**

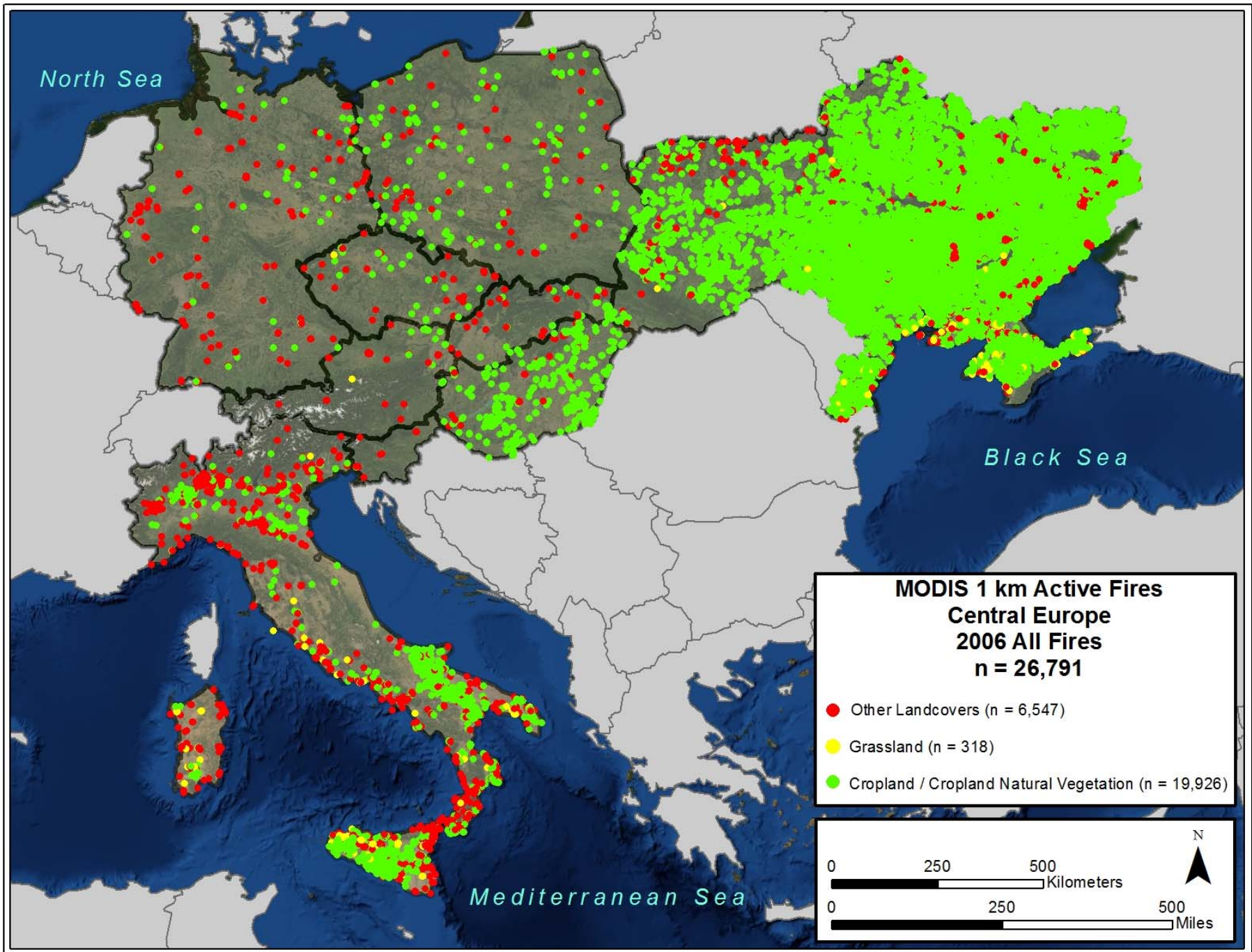


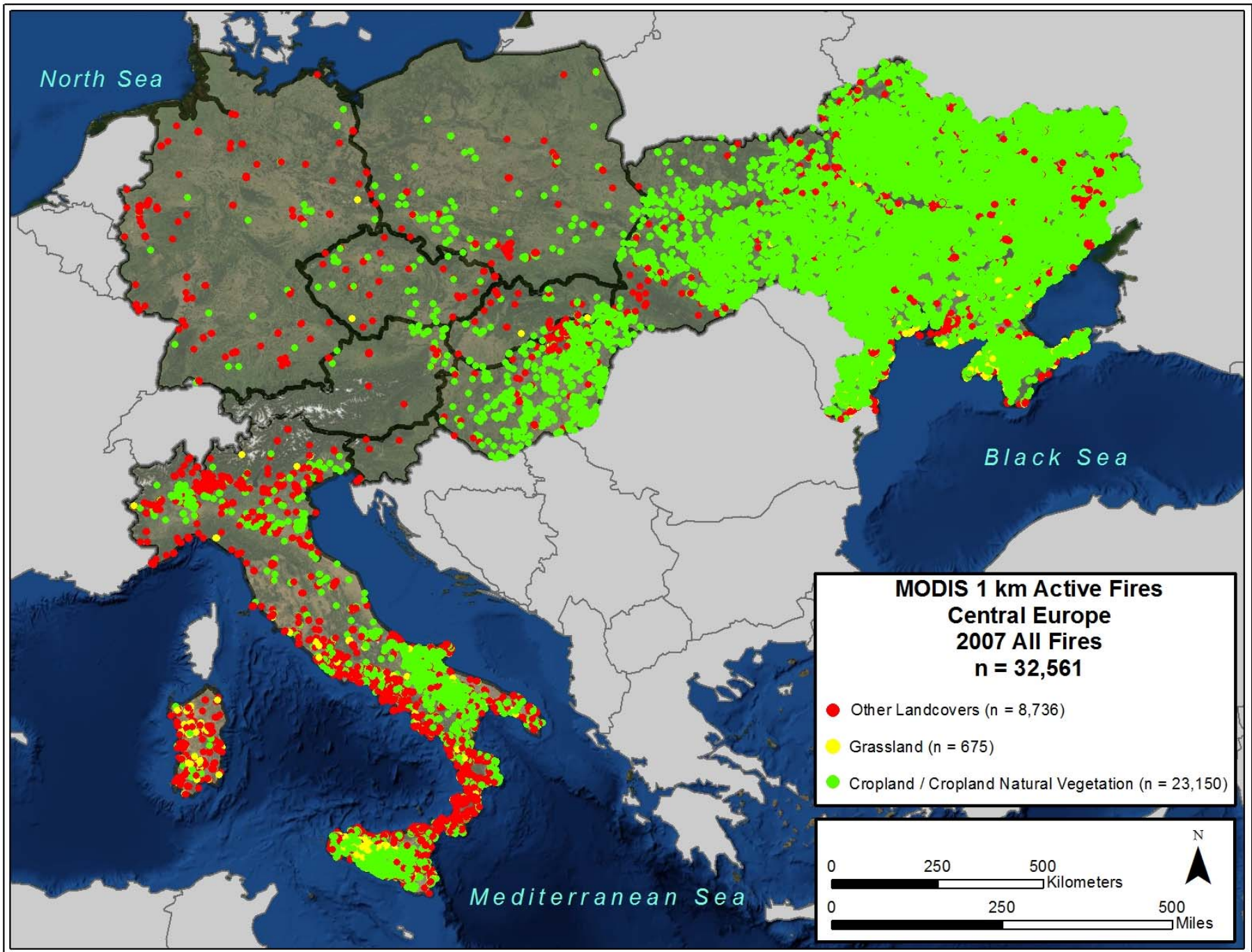


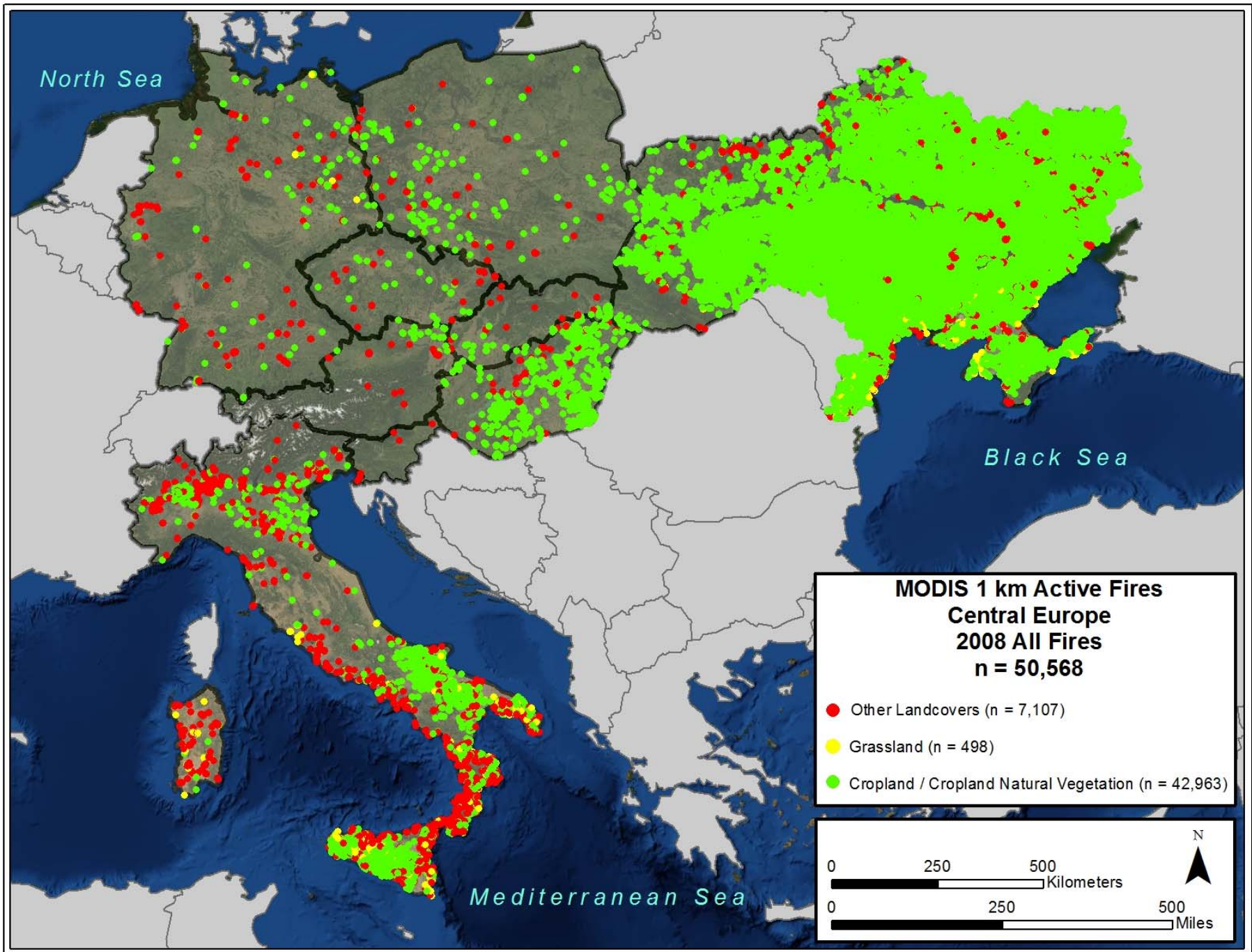


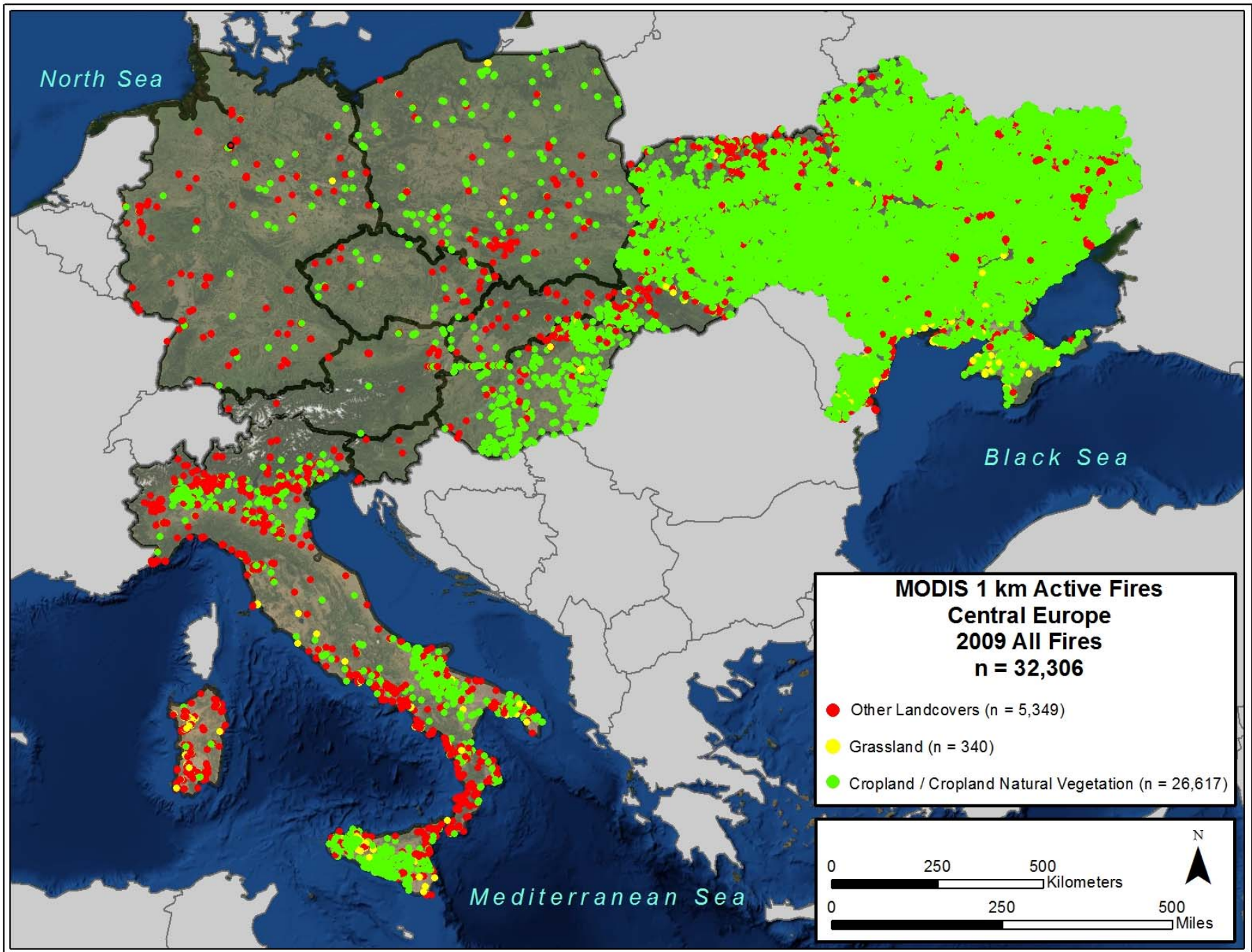


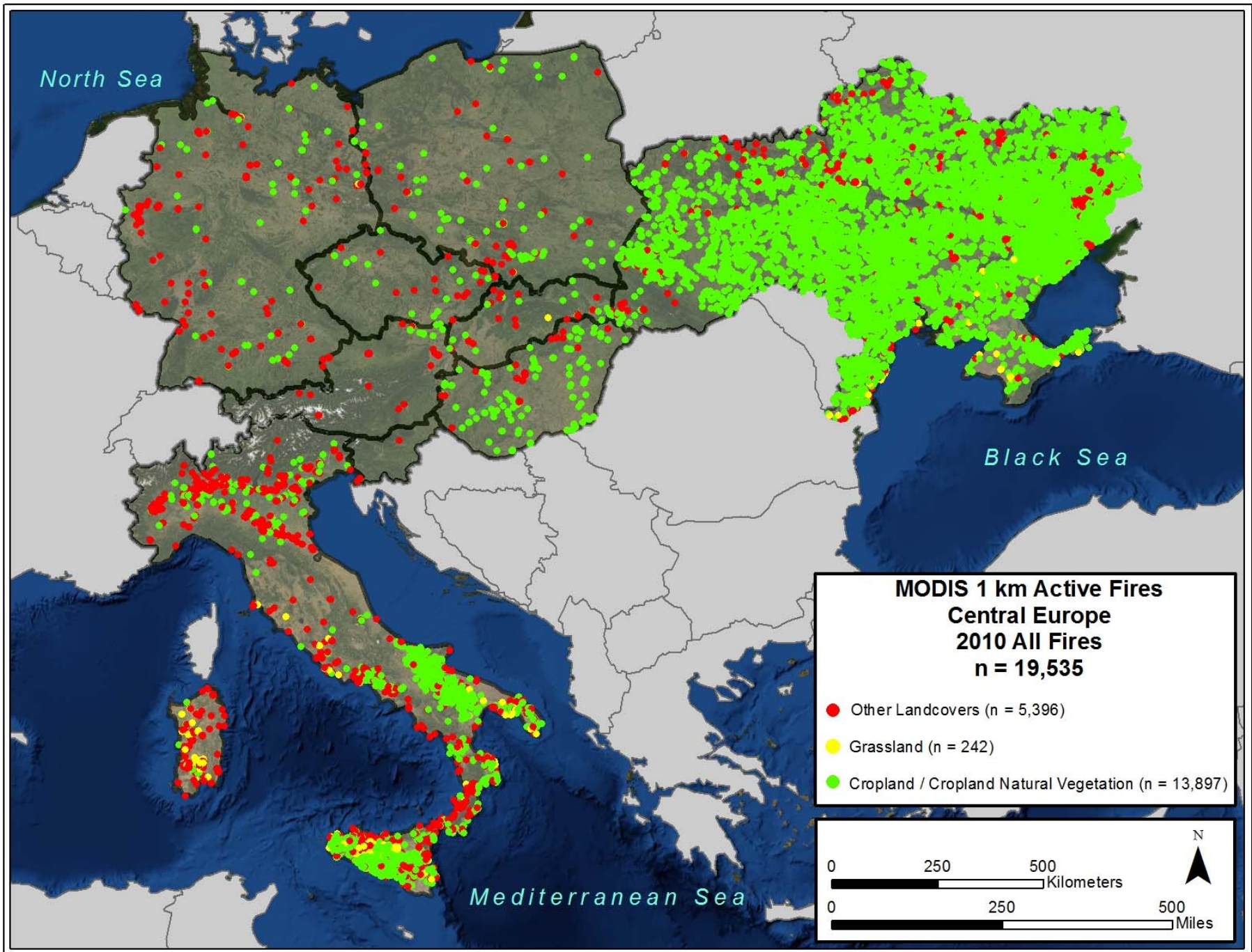


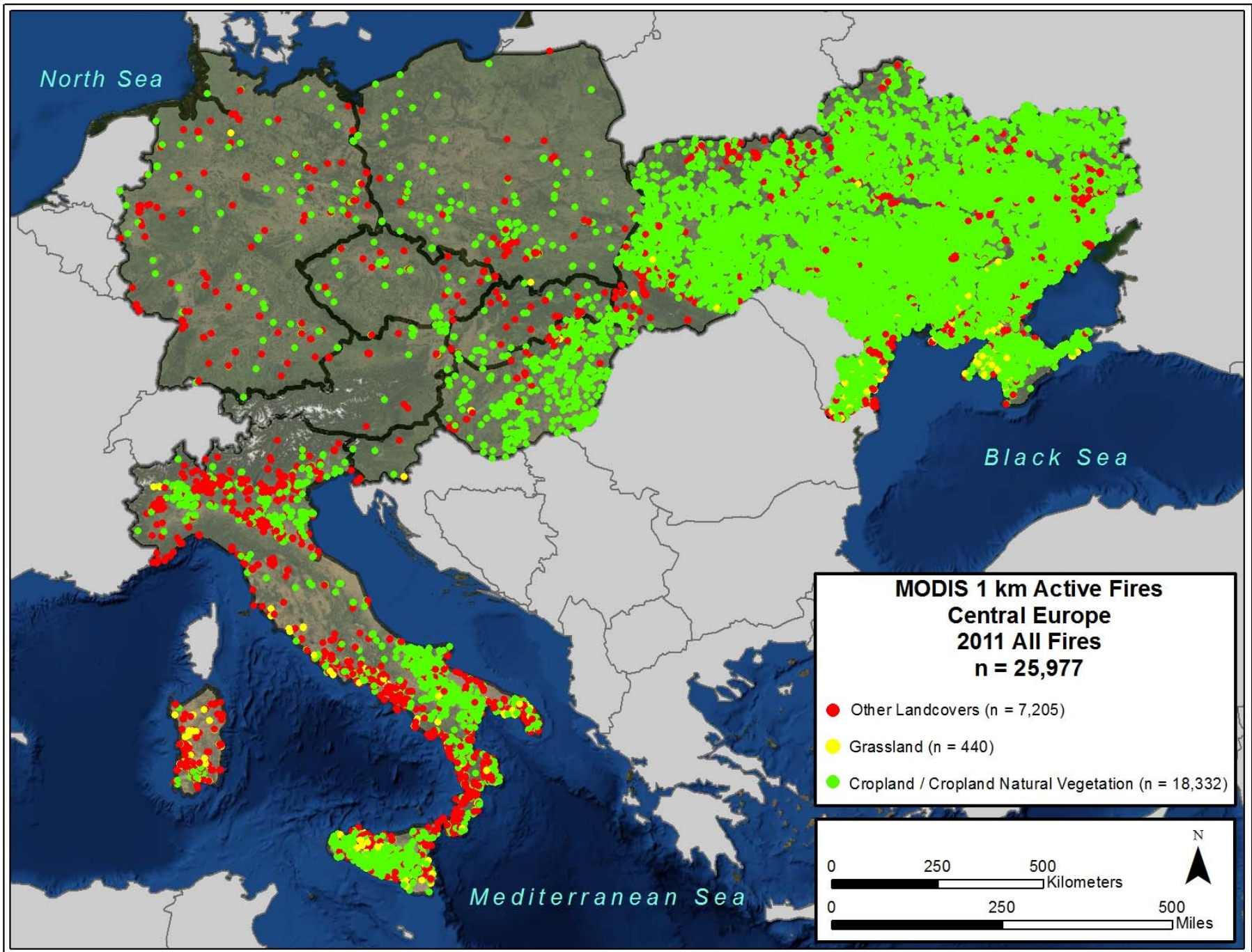


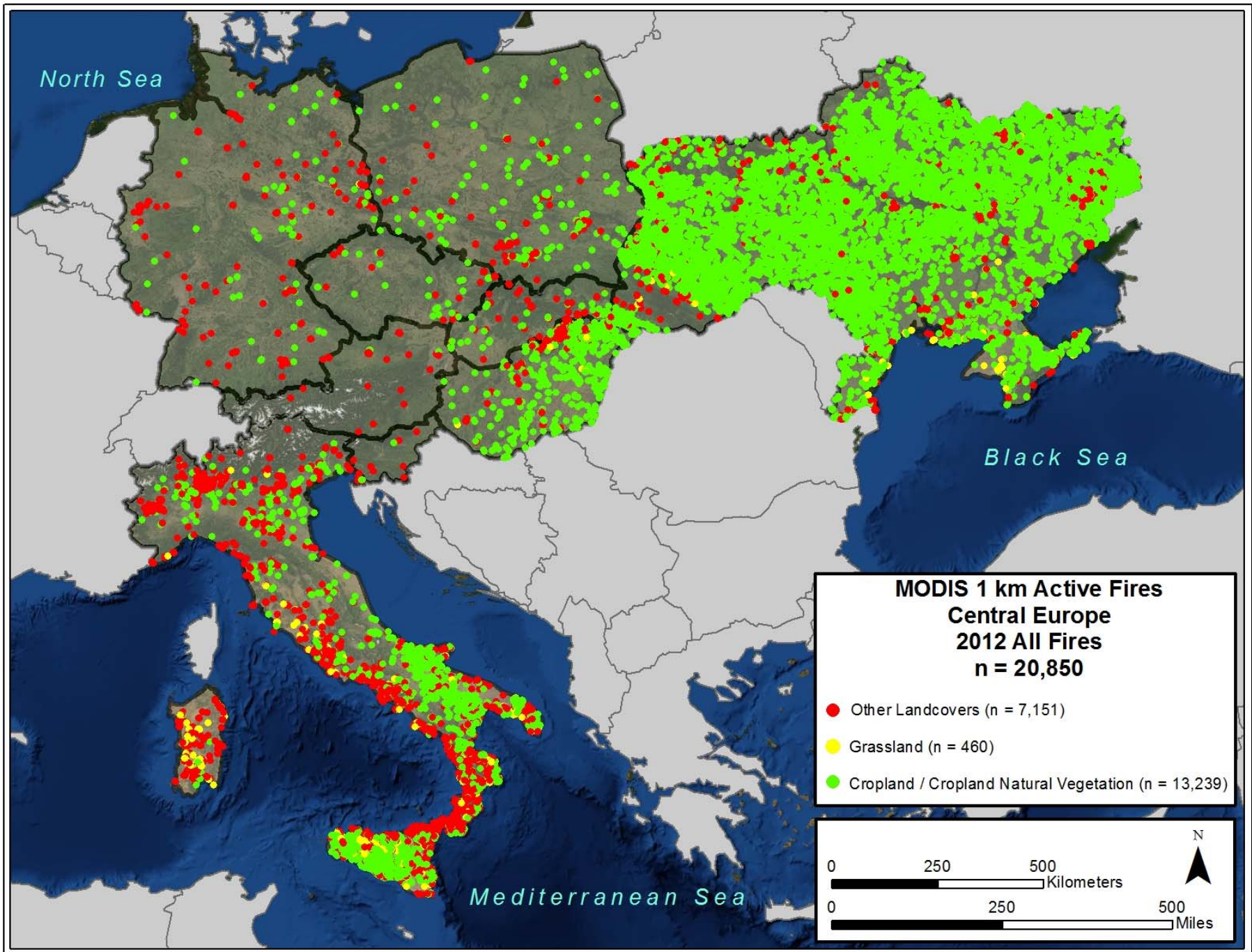


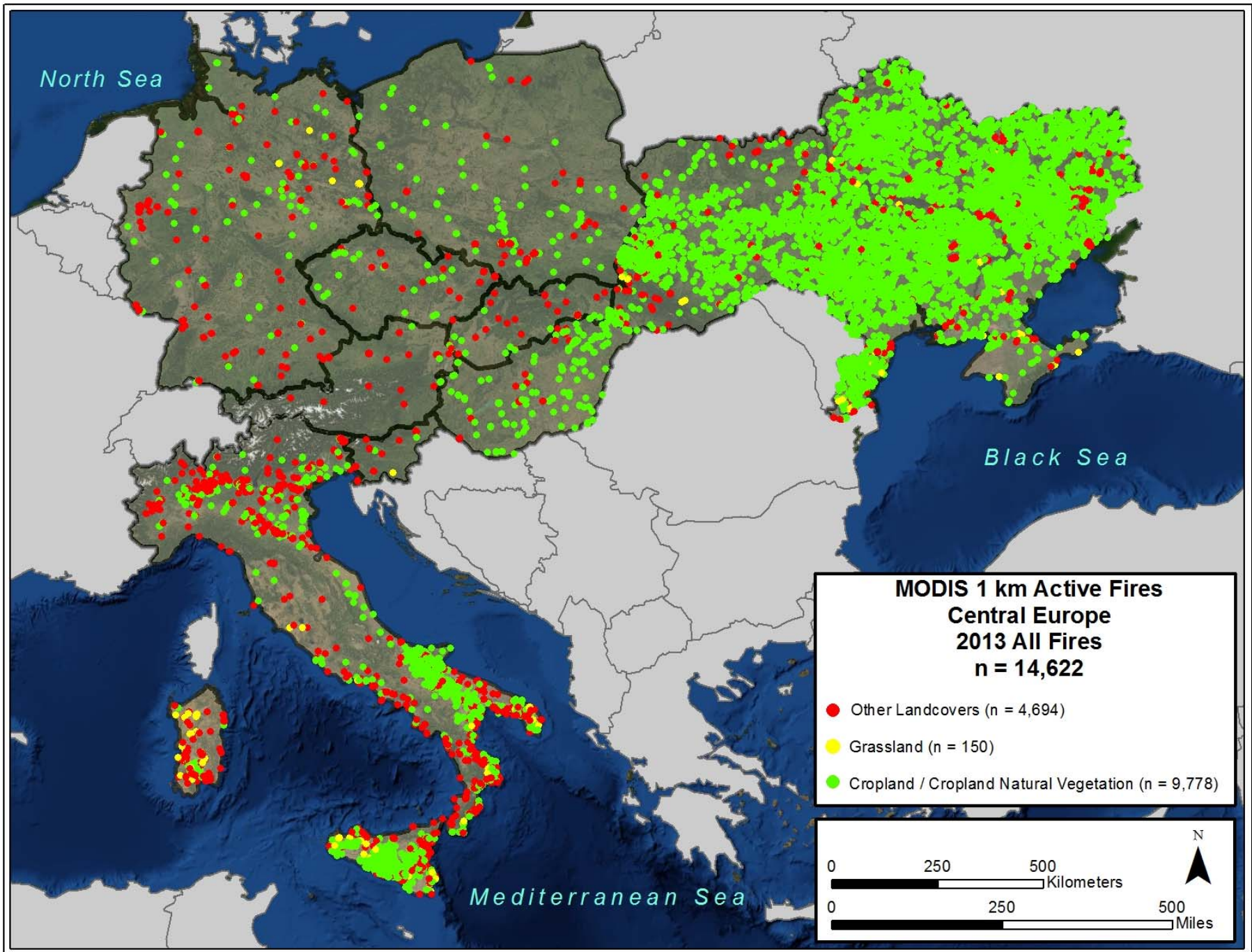


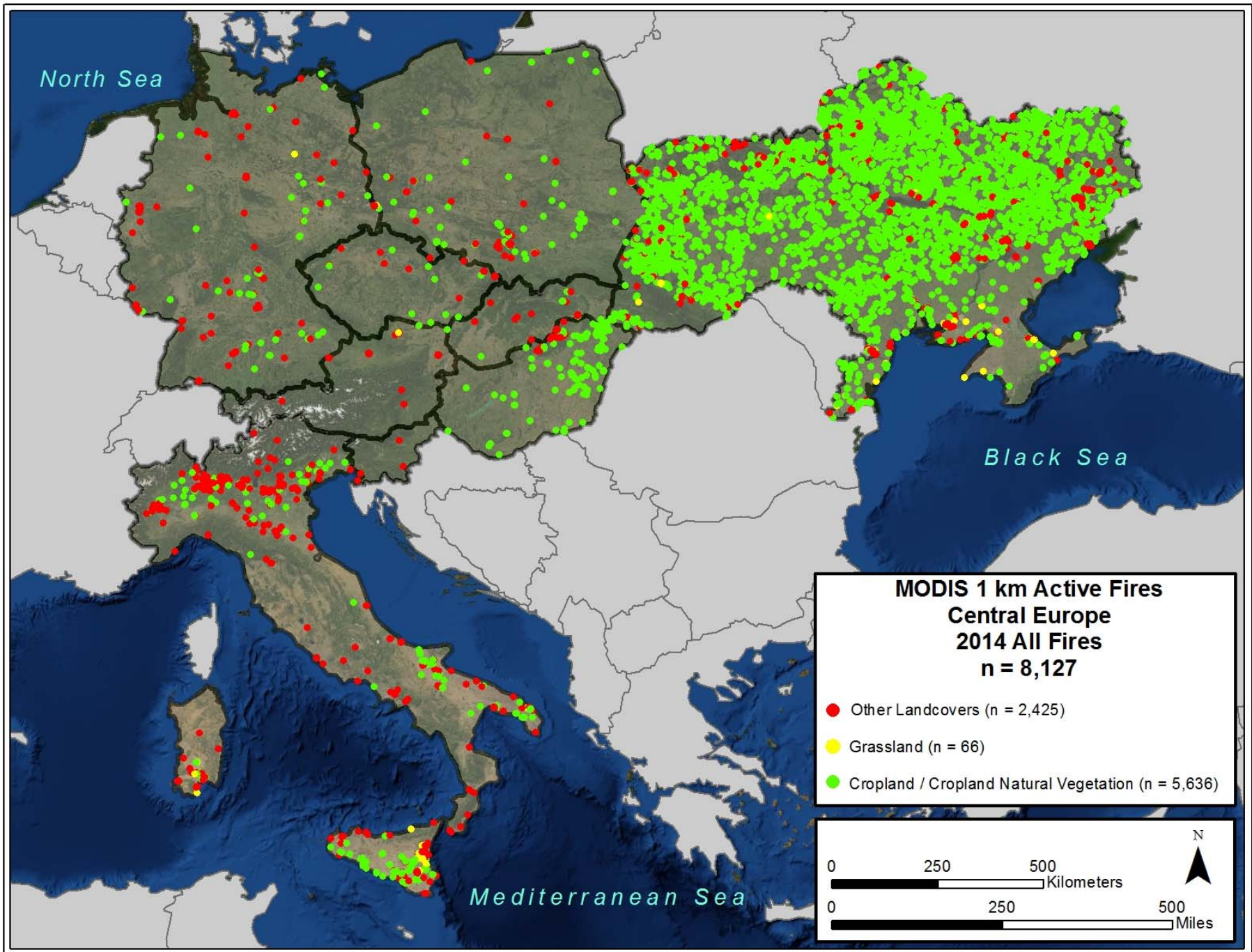






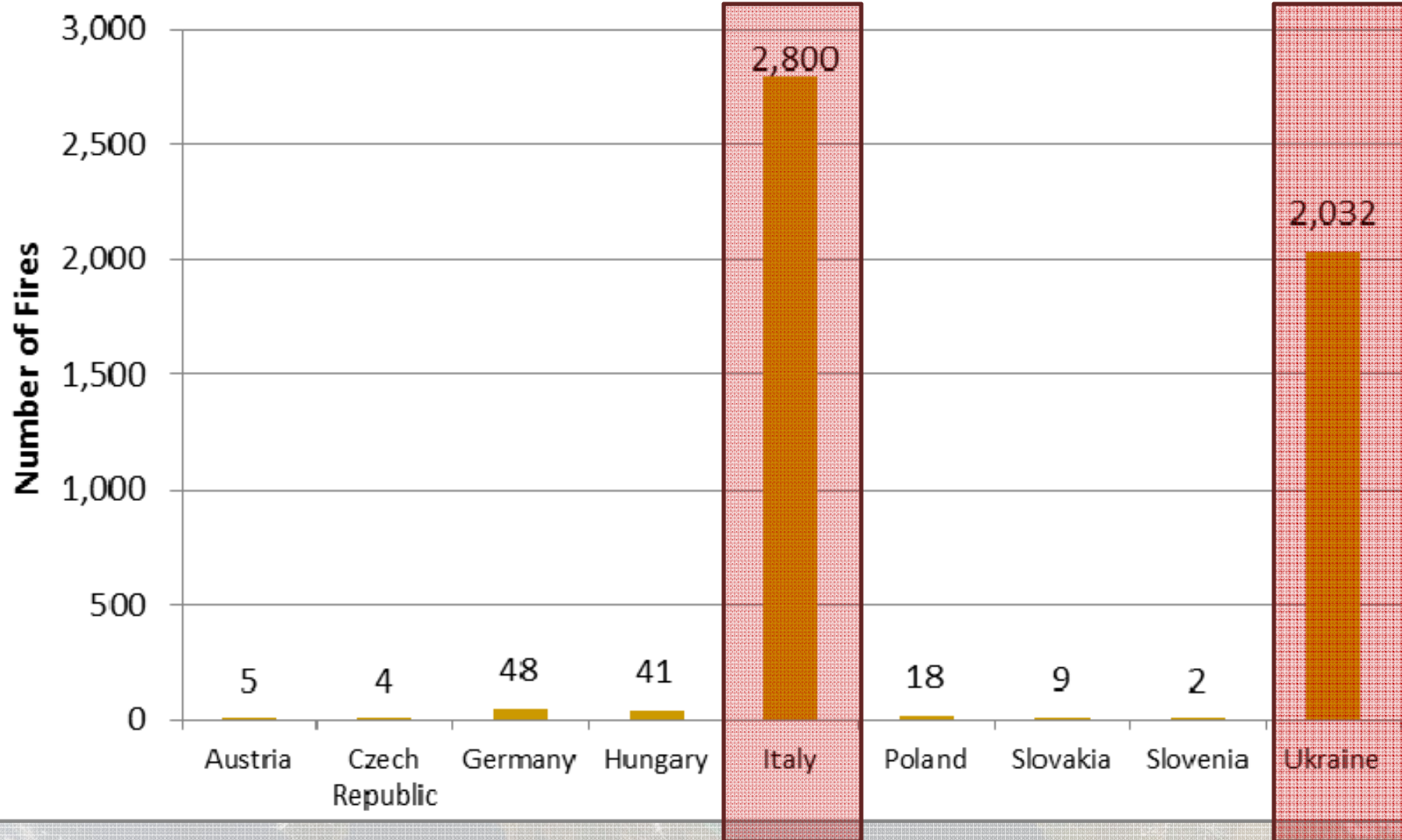




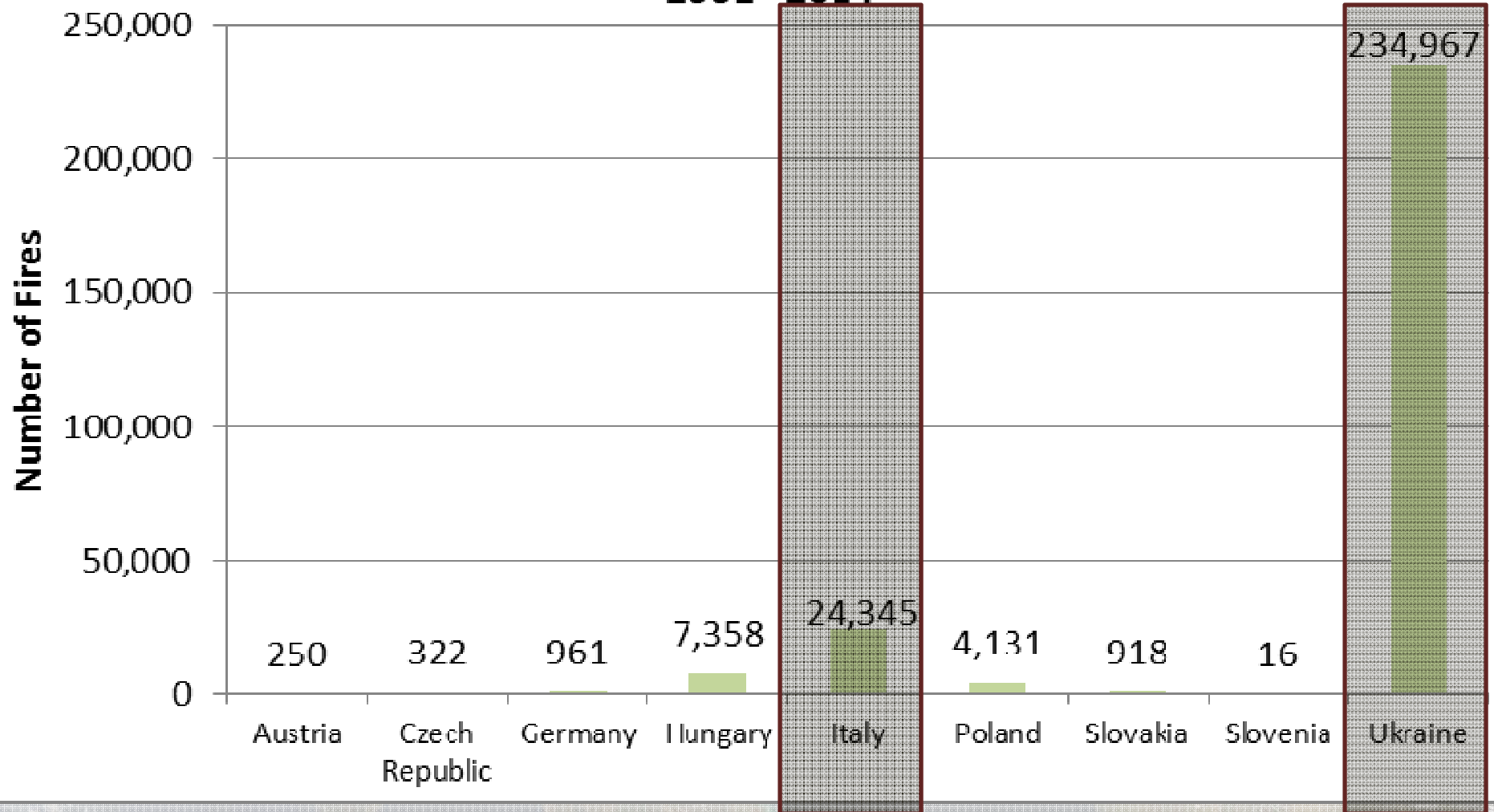


Grassland Fires in Central Europe

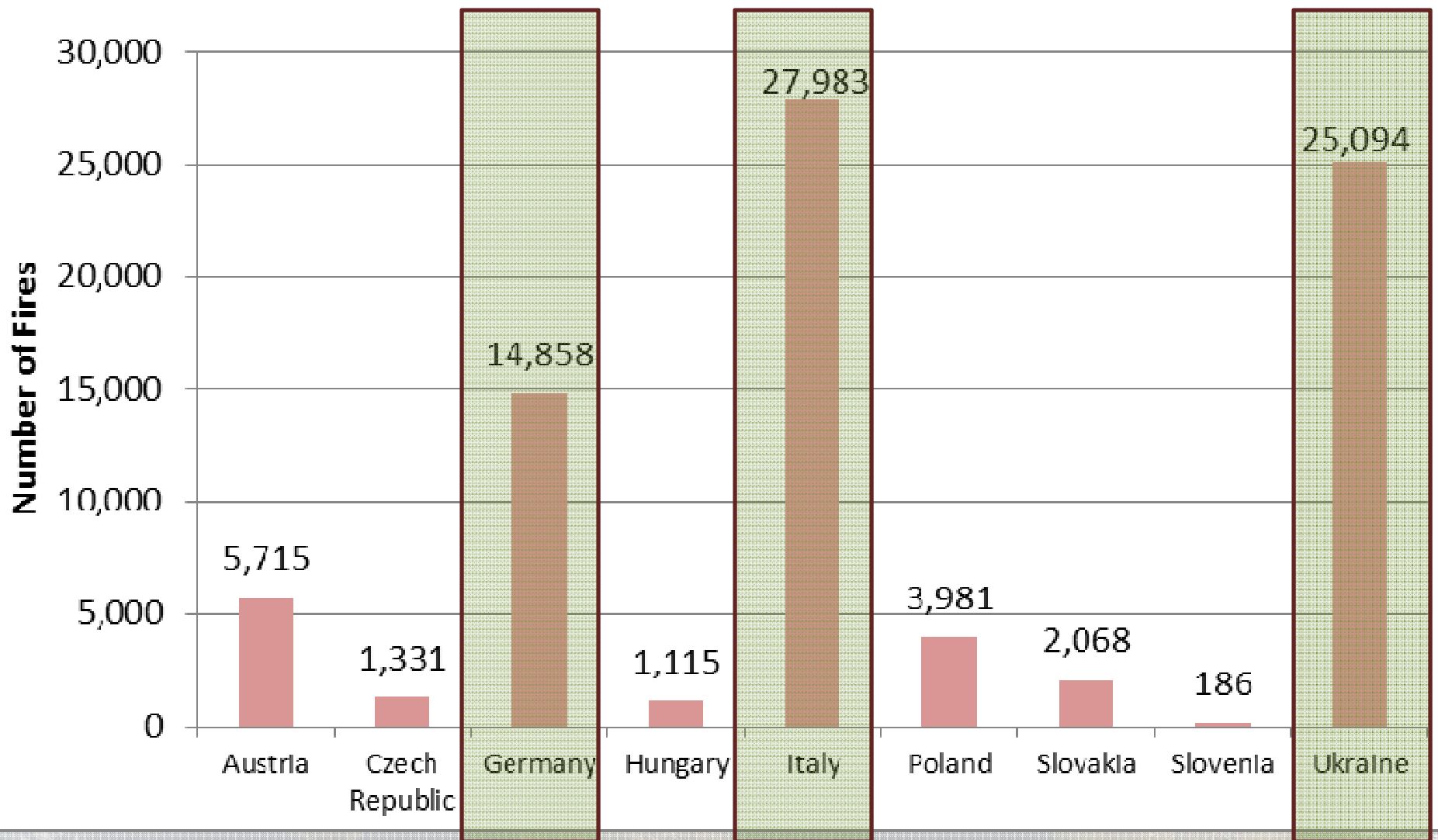
2001 - 2014



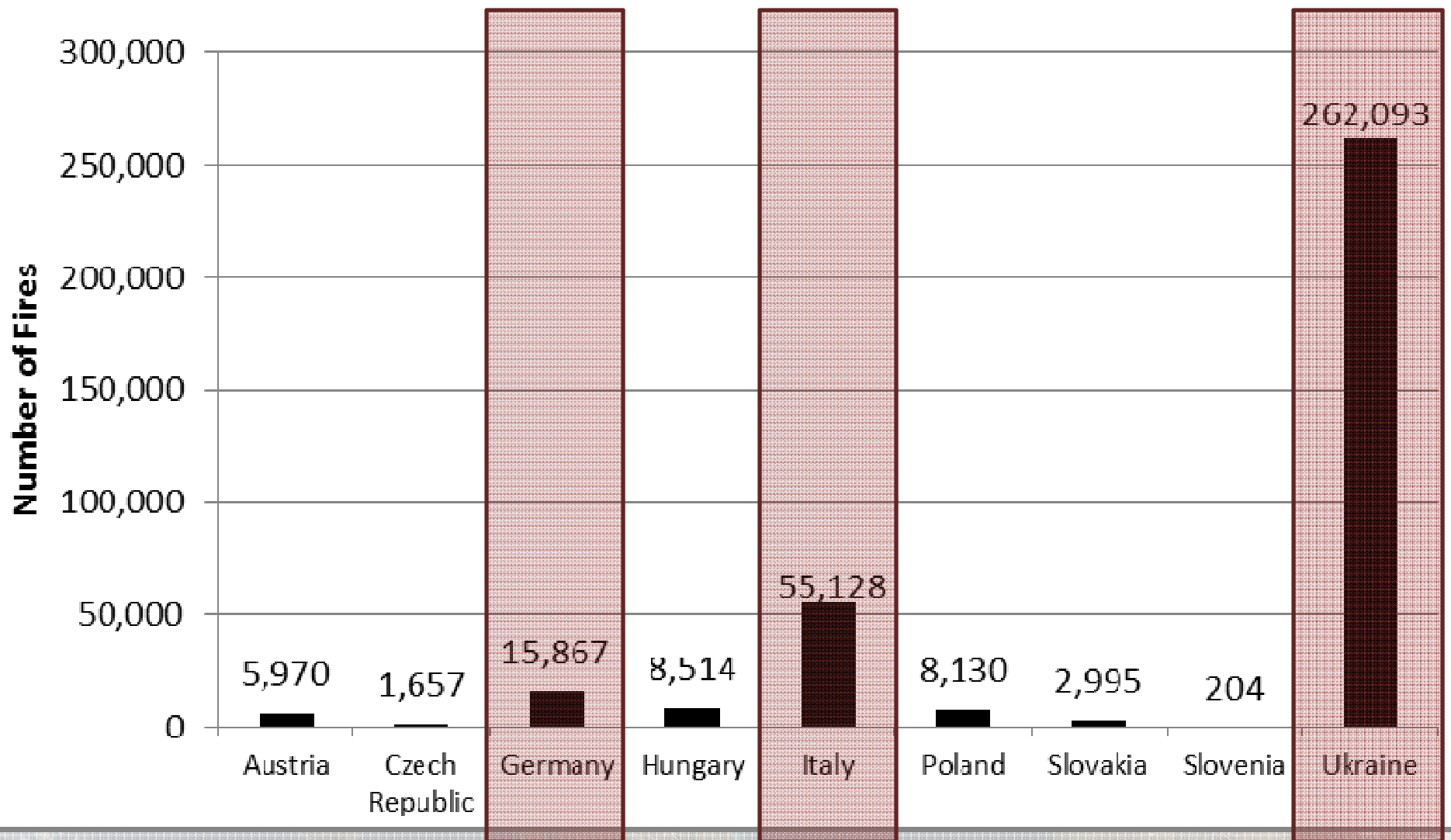
Cropland/Cropland Natural Vegetation Fires in Central Europe 2001 - 2014



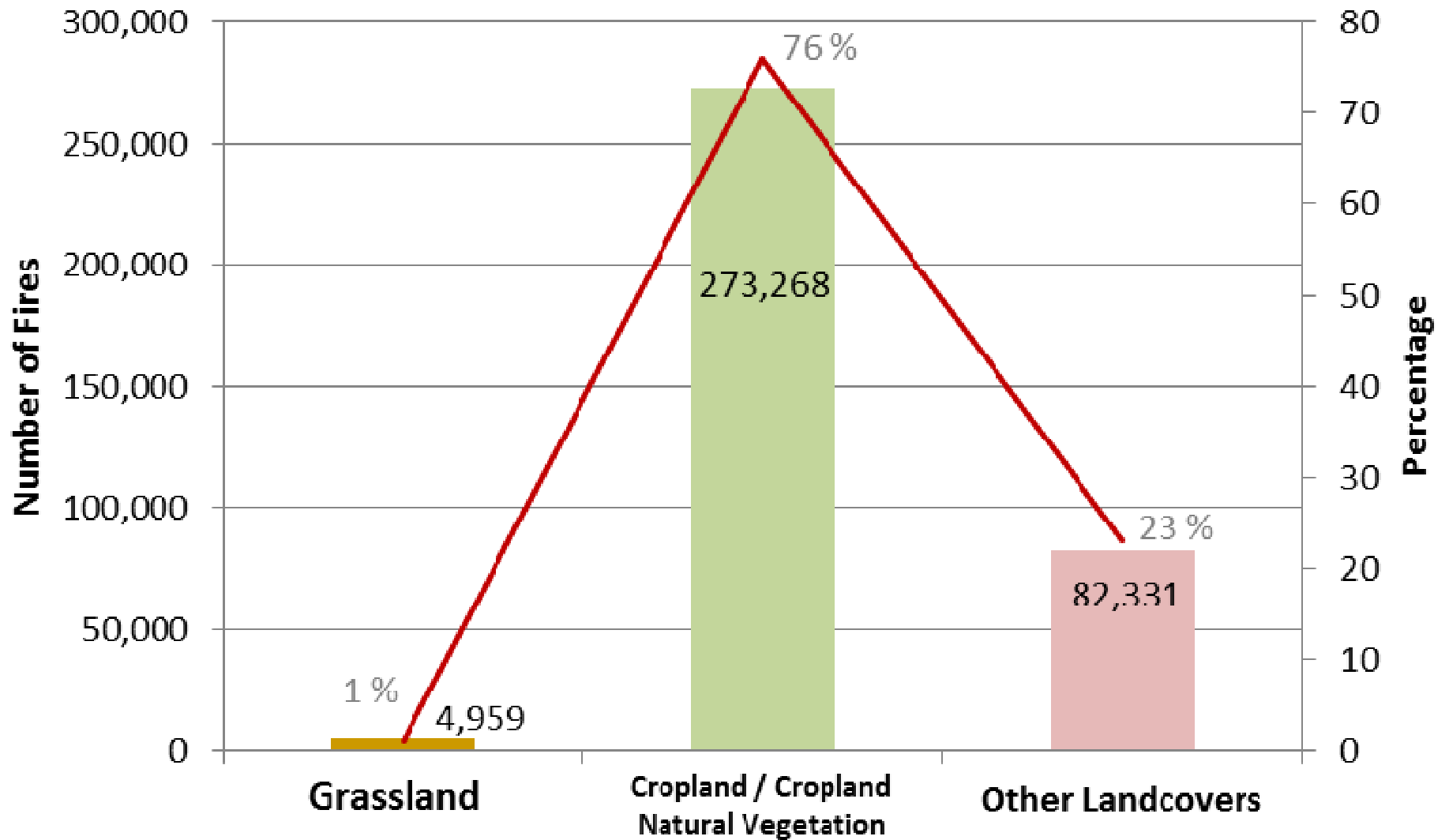
Other Land Cover Fires in Central Europe 2001 - 2014



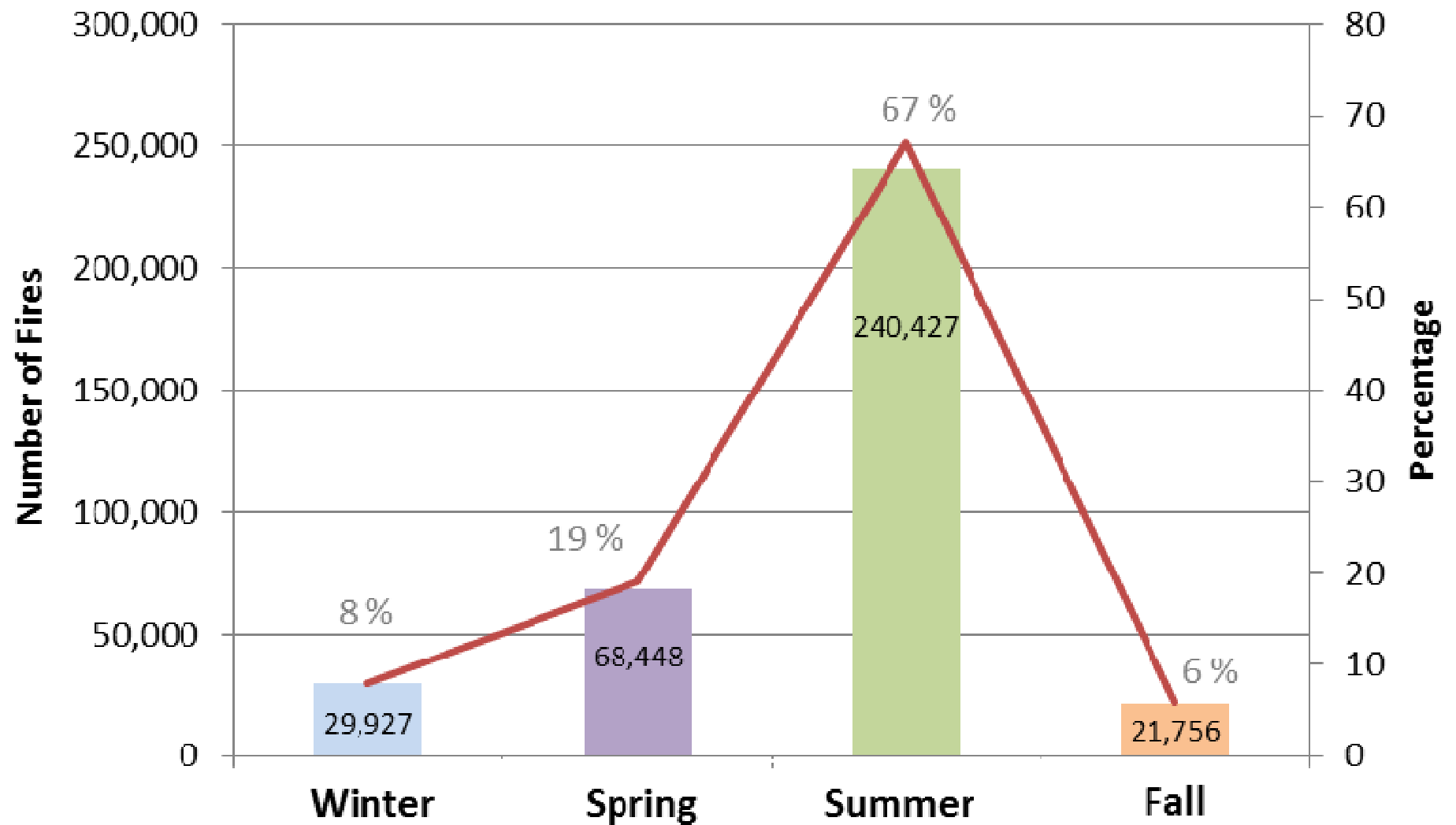
Total Fires in Central Europe 2001 - 2014



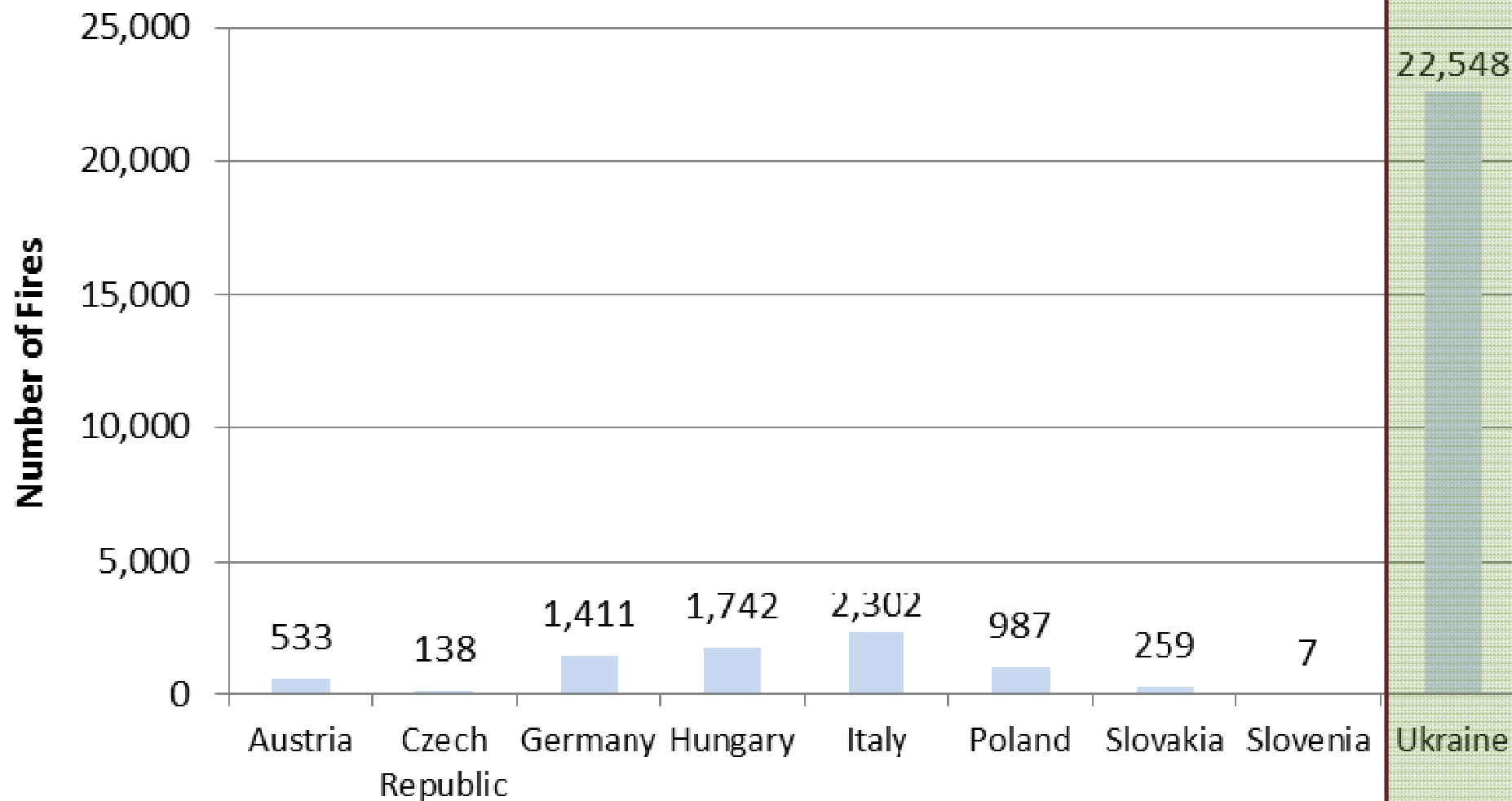
All Fires: Land Cover



All Fires: Seasonality

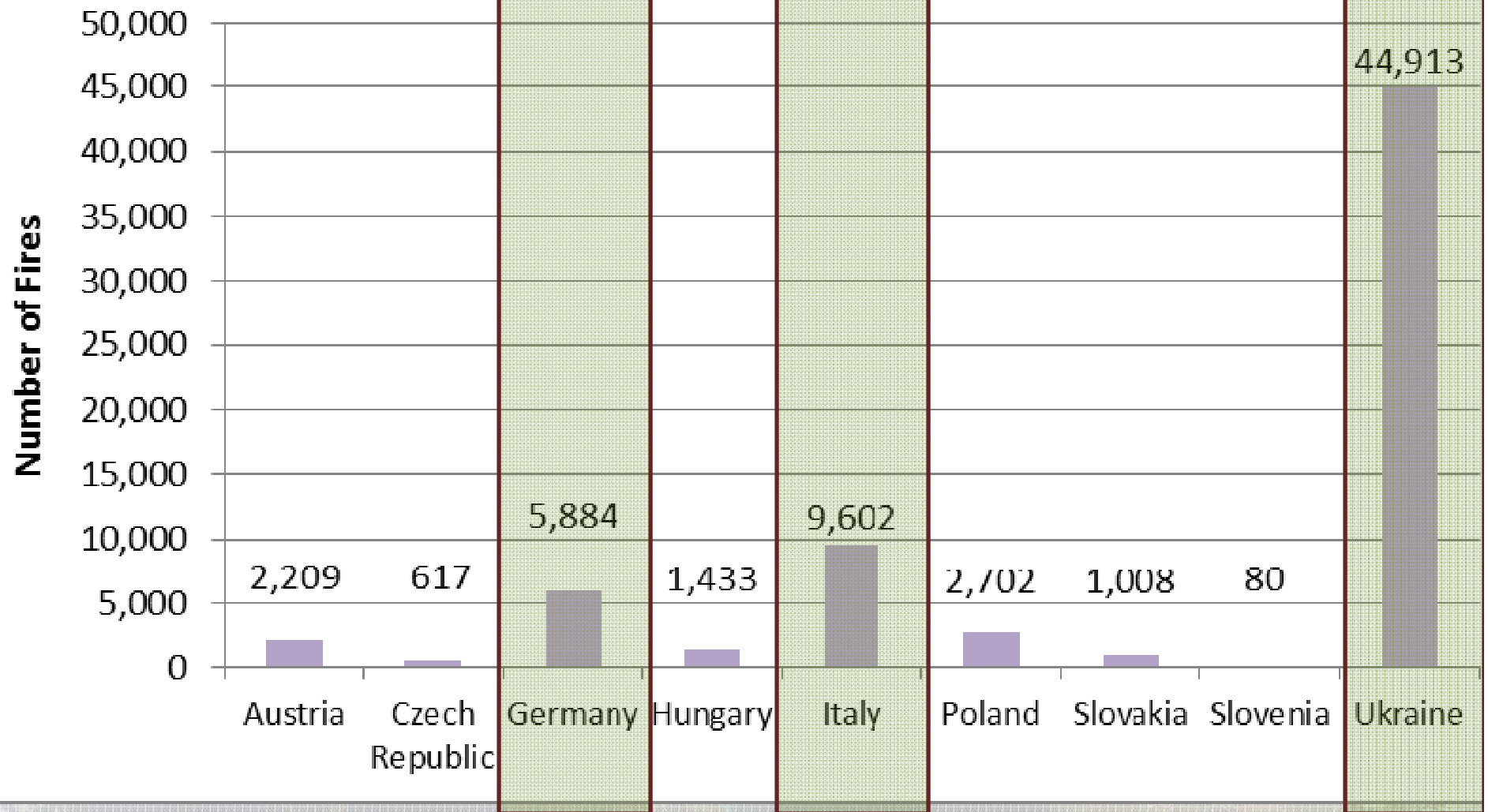


All Fires: Winter January - March



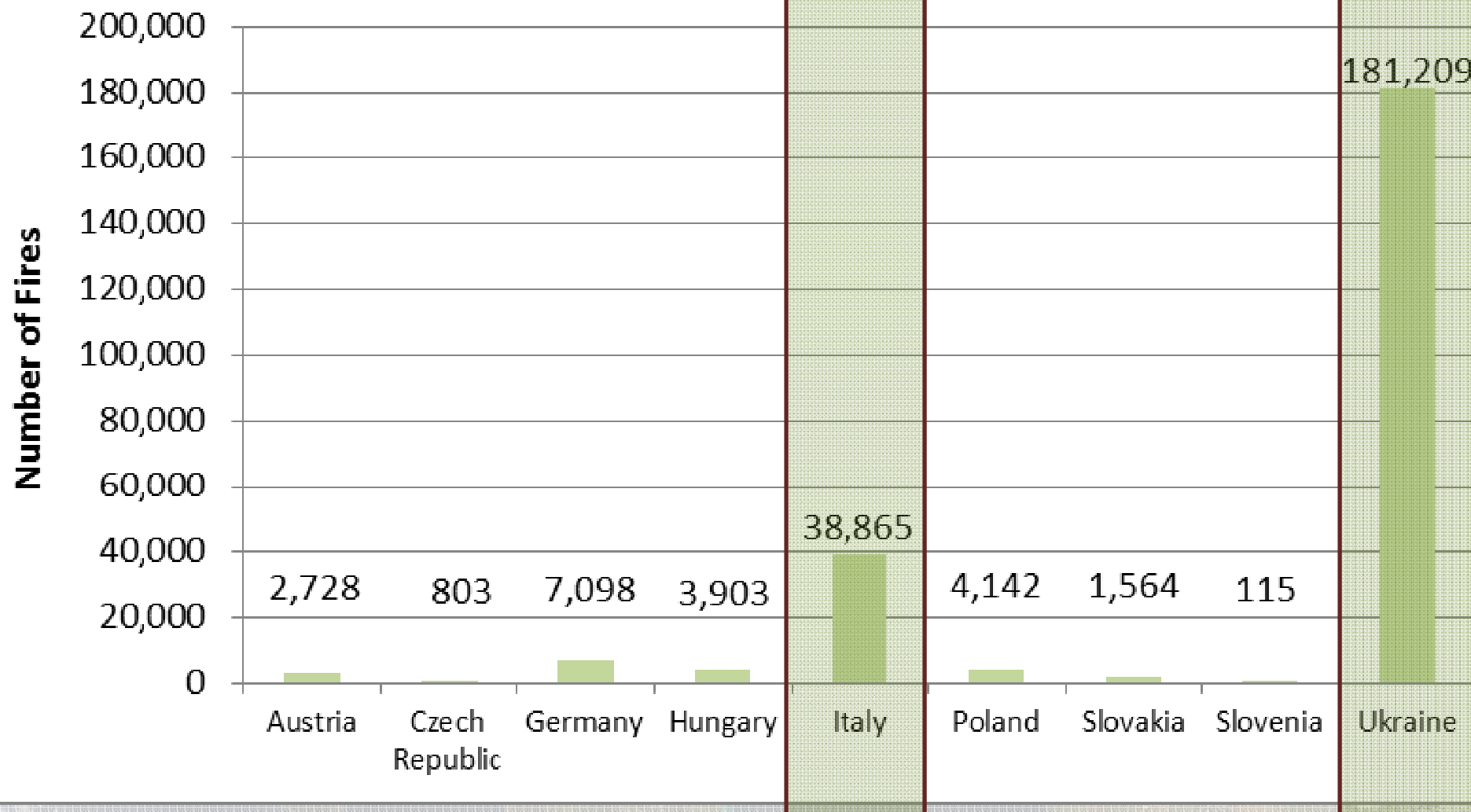
All Fires: Spring

April - June



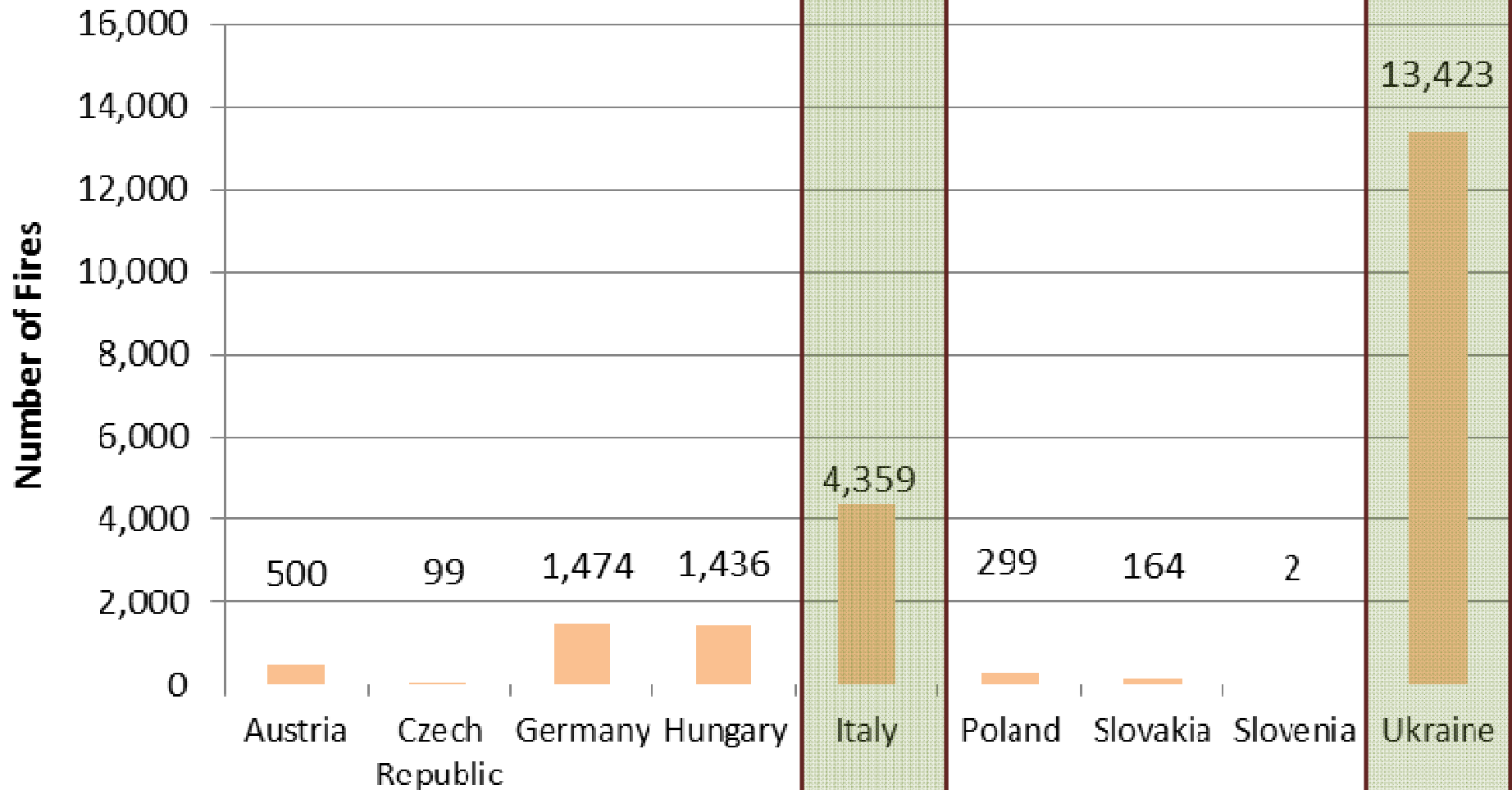
All Fires: Summer

July - September

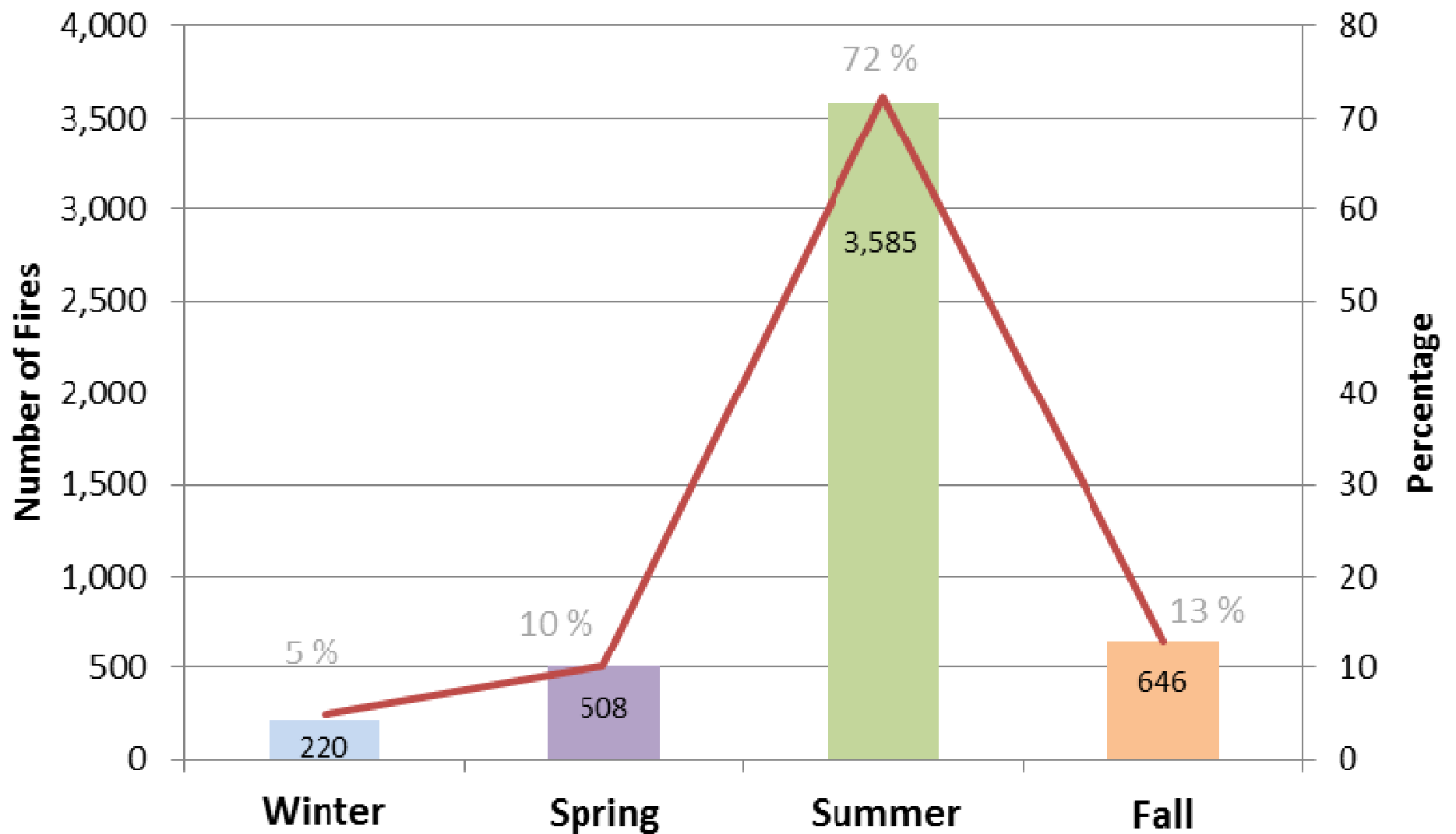


All Fires: Fall

October - December

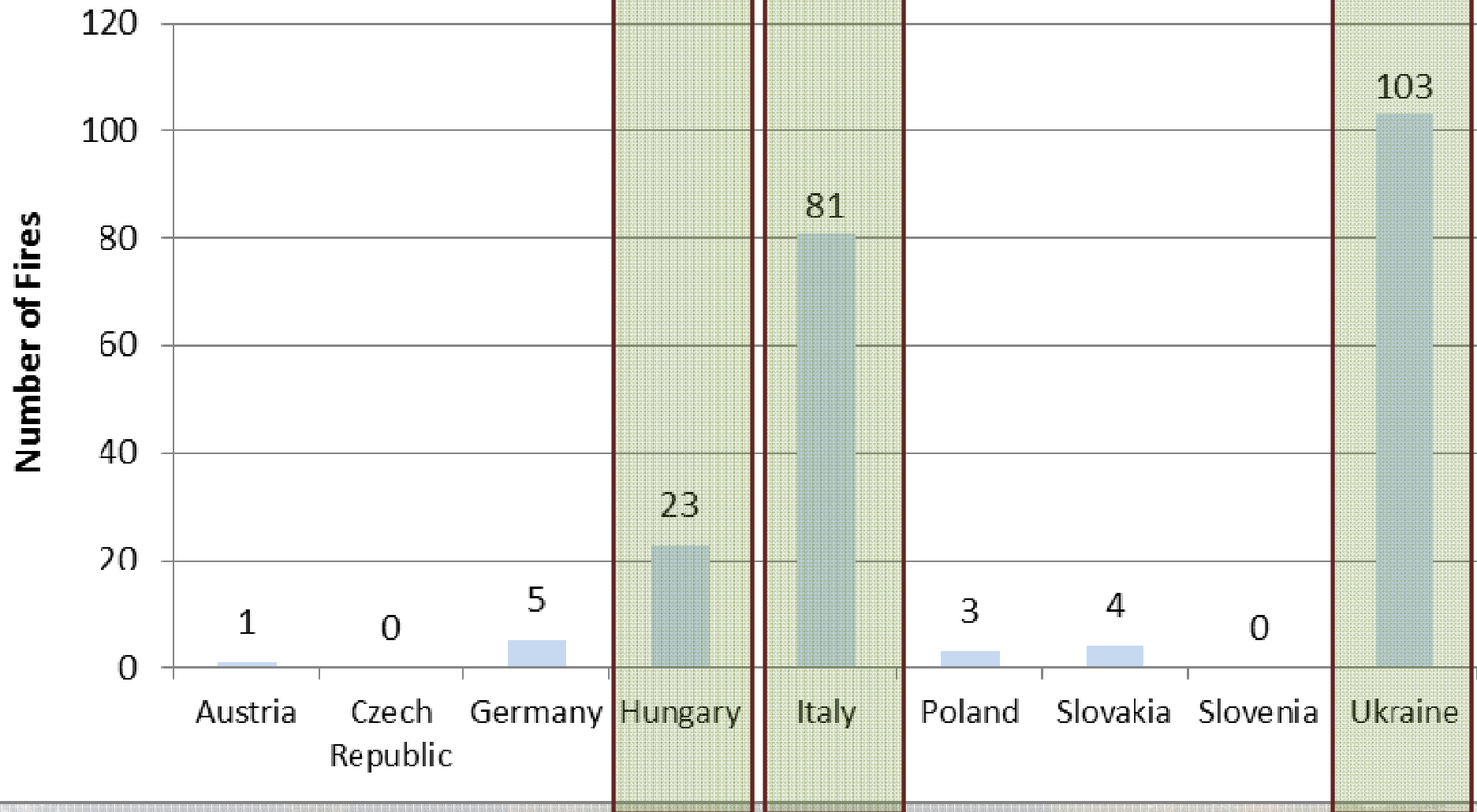


Grassland Fires: Seasonality



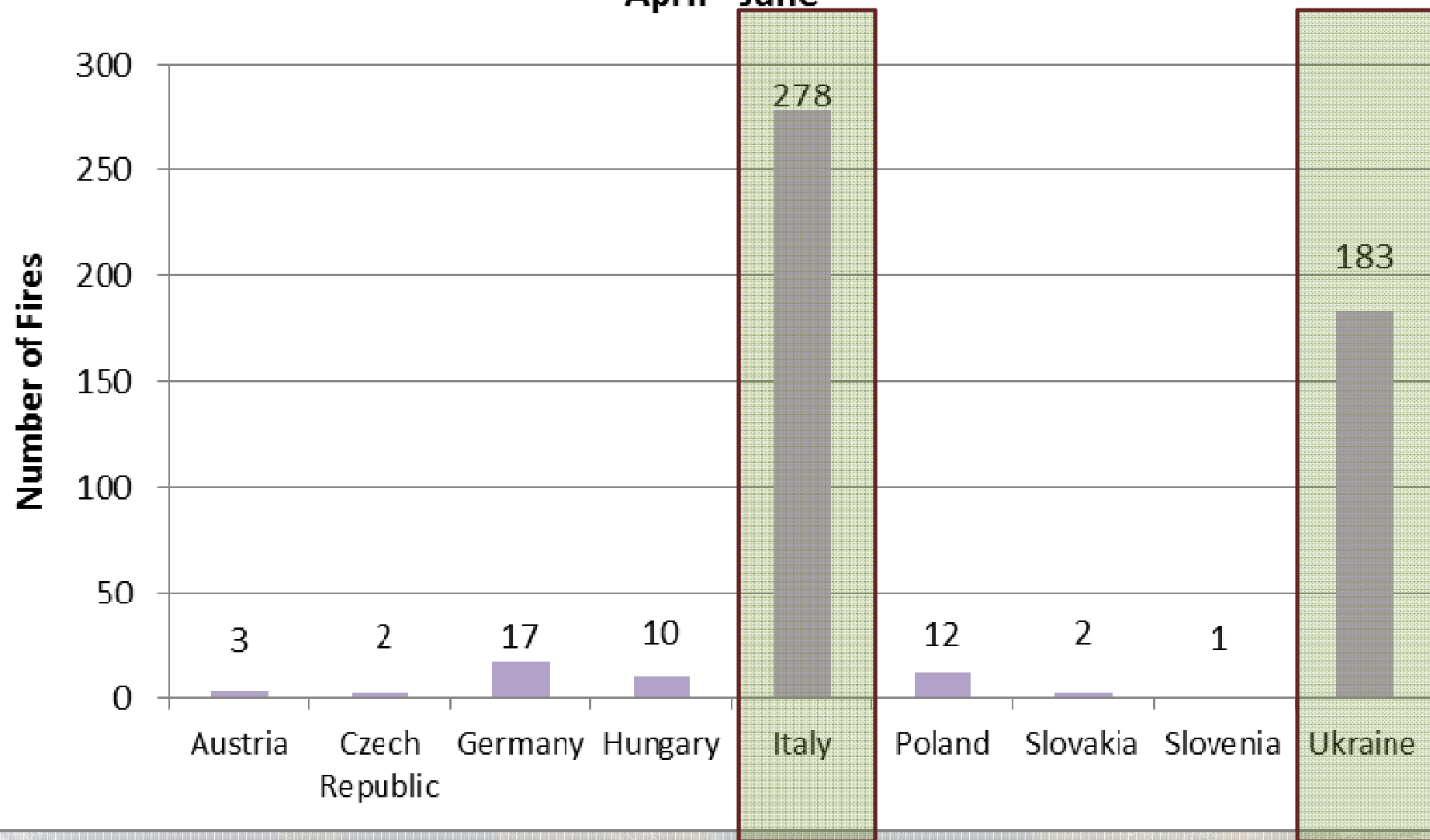
Grassland Fires: Winter

January - March



Grassland Fires: Spring

April - June



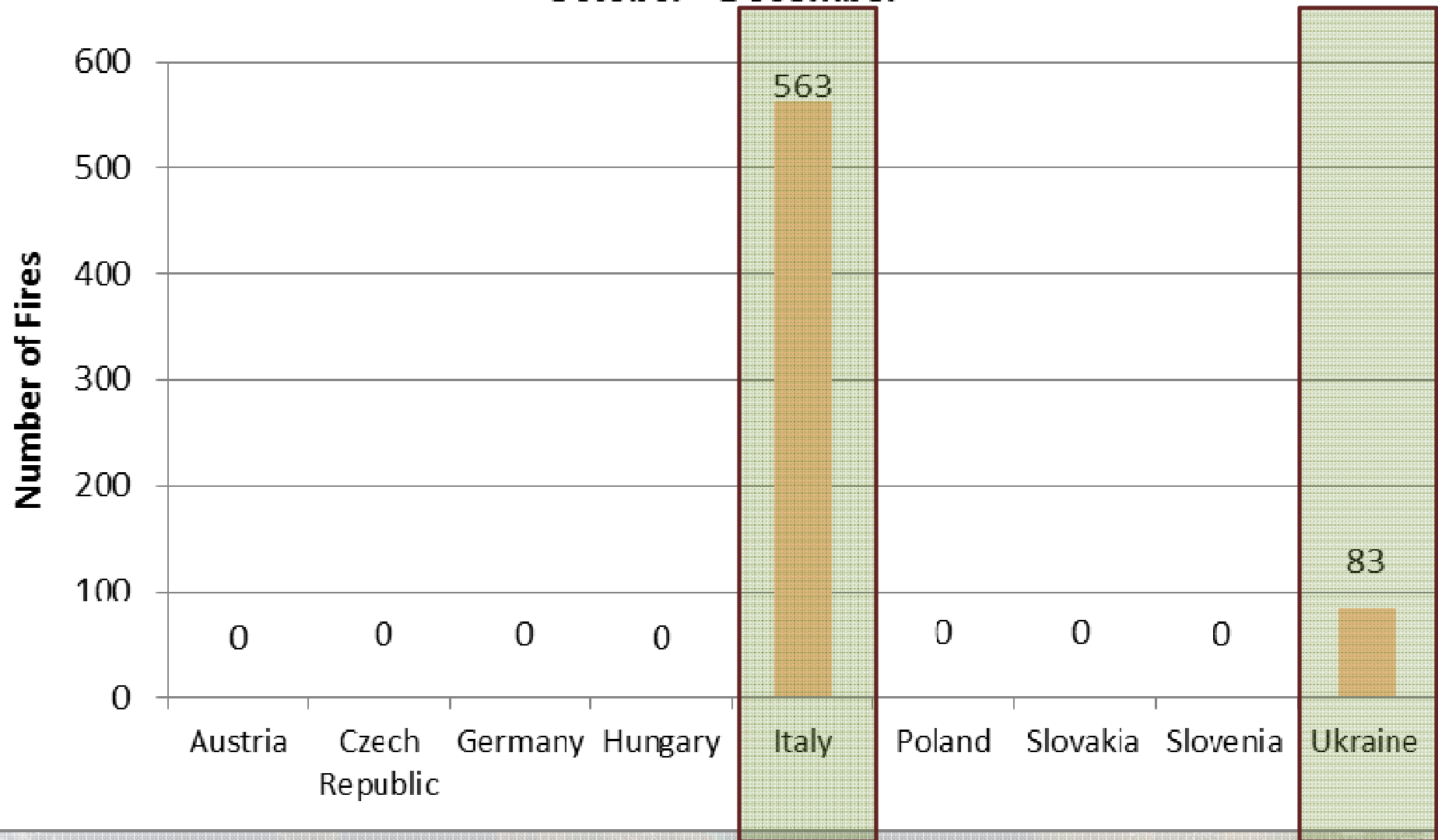
Grassland Fires: Summer

July - September

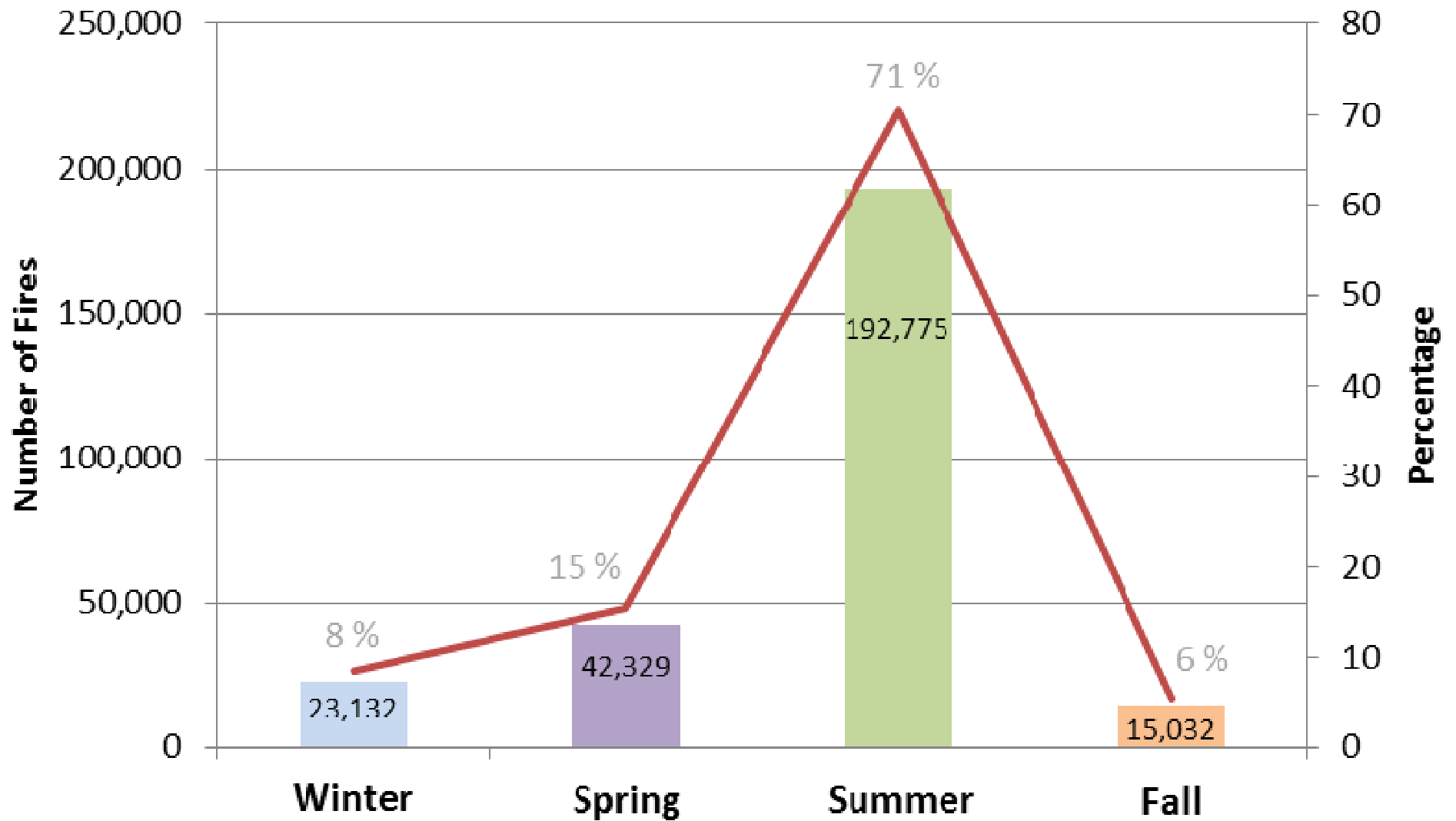


Grassland Fires: Fall

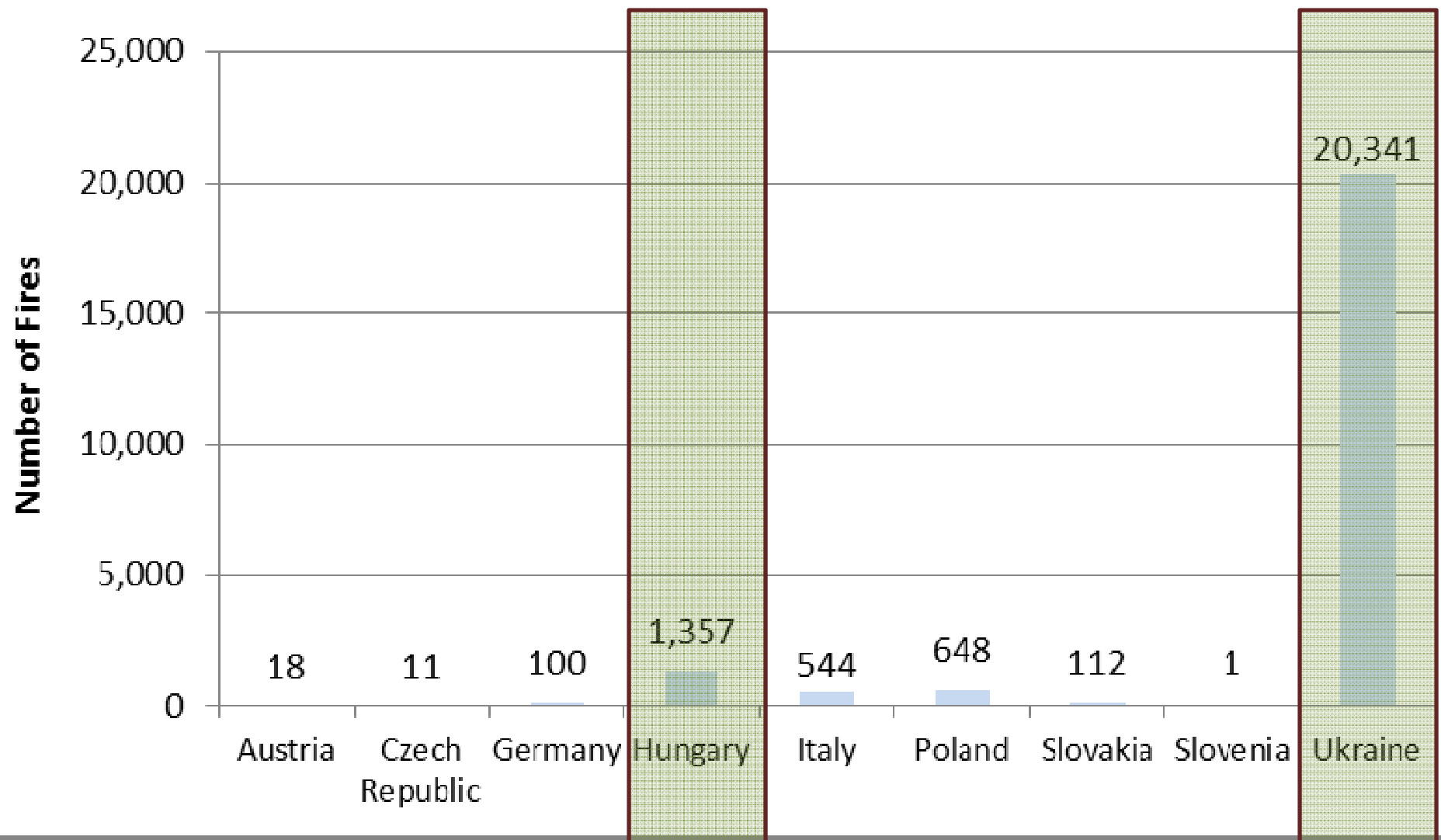
October - December



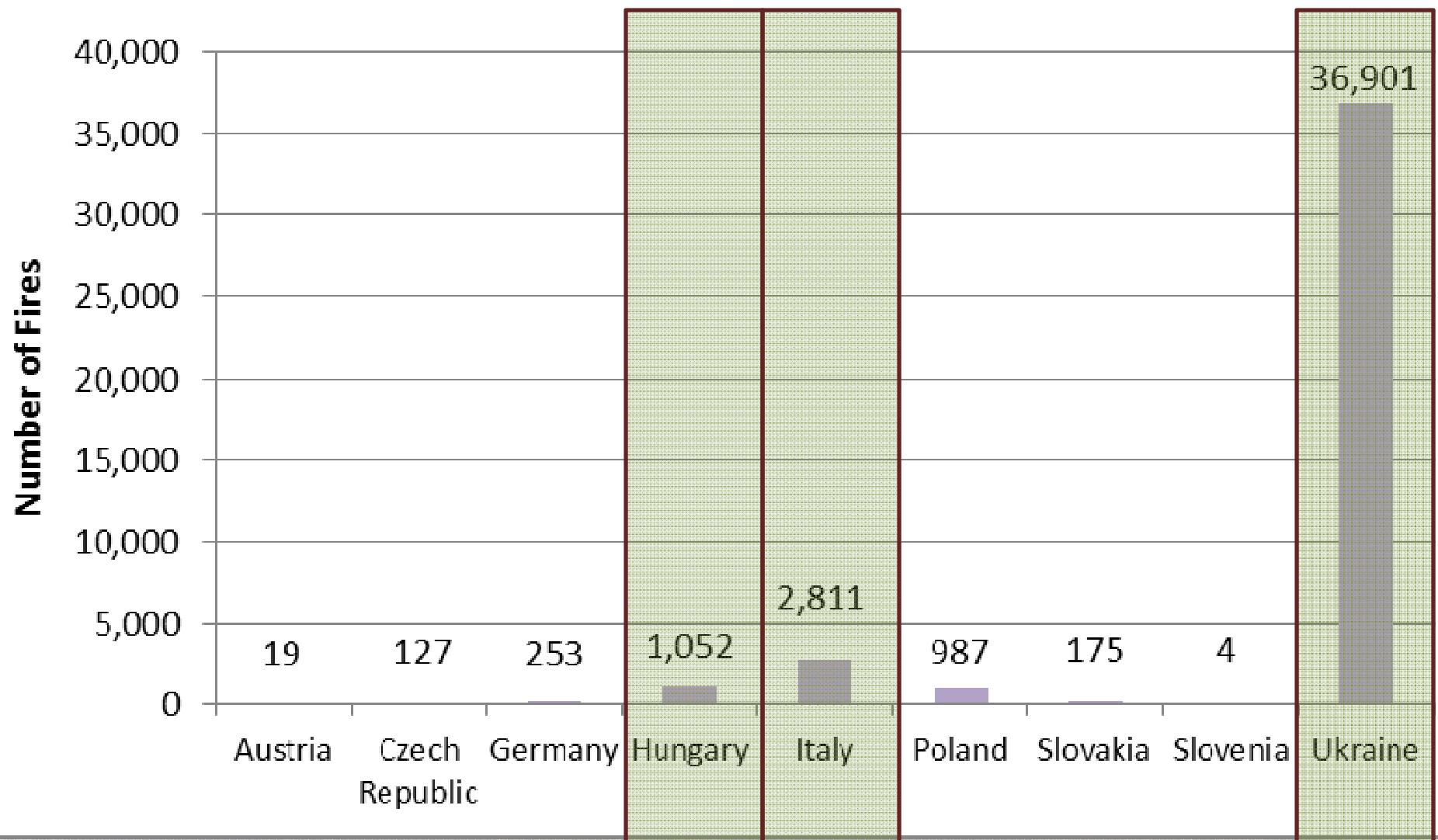
Cropland / Cropland Natural Vegetation Fires: Seasonality



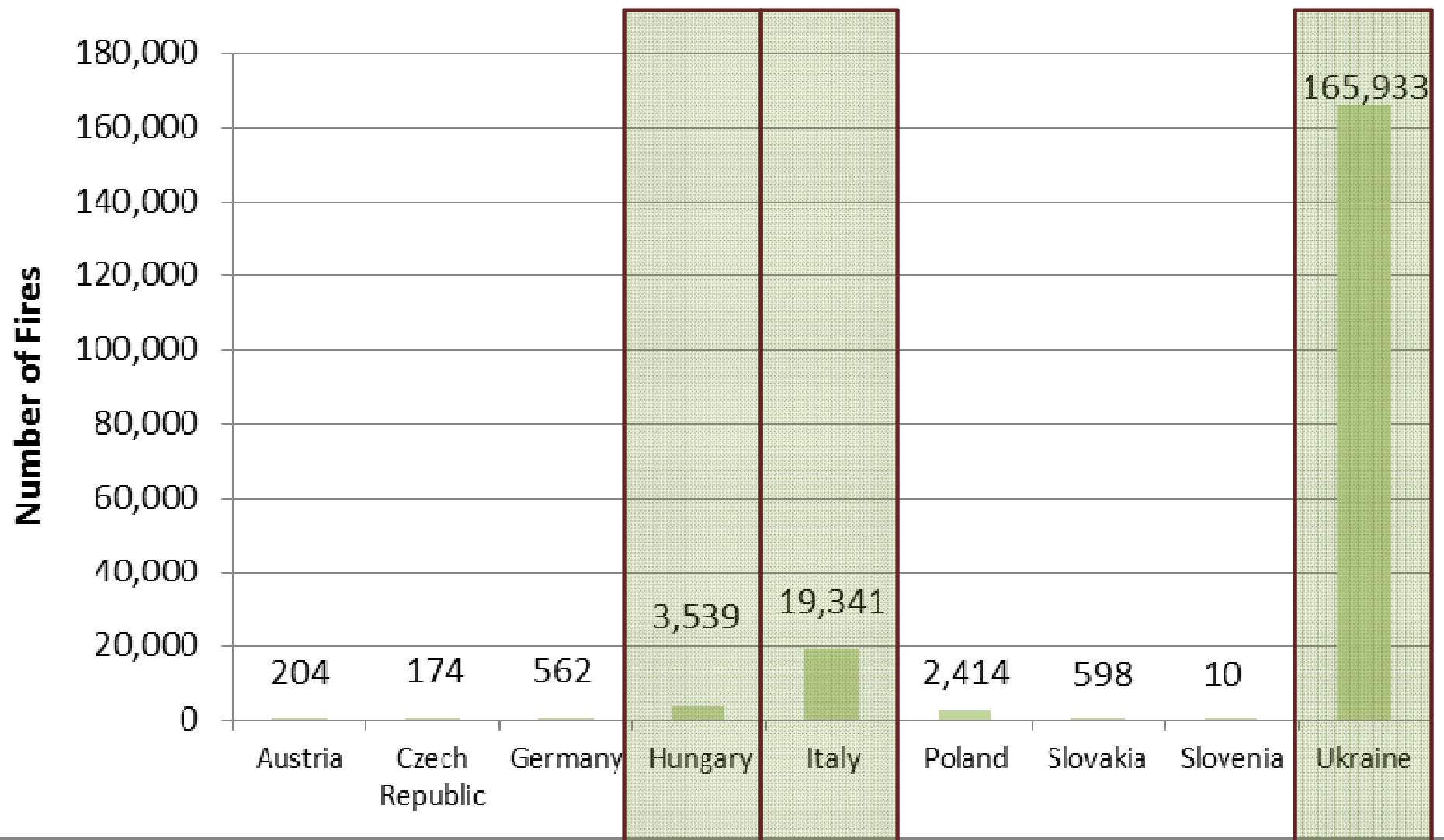
Cropland / Cropland Natural Vegetation Fires: Winter January - March



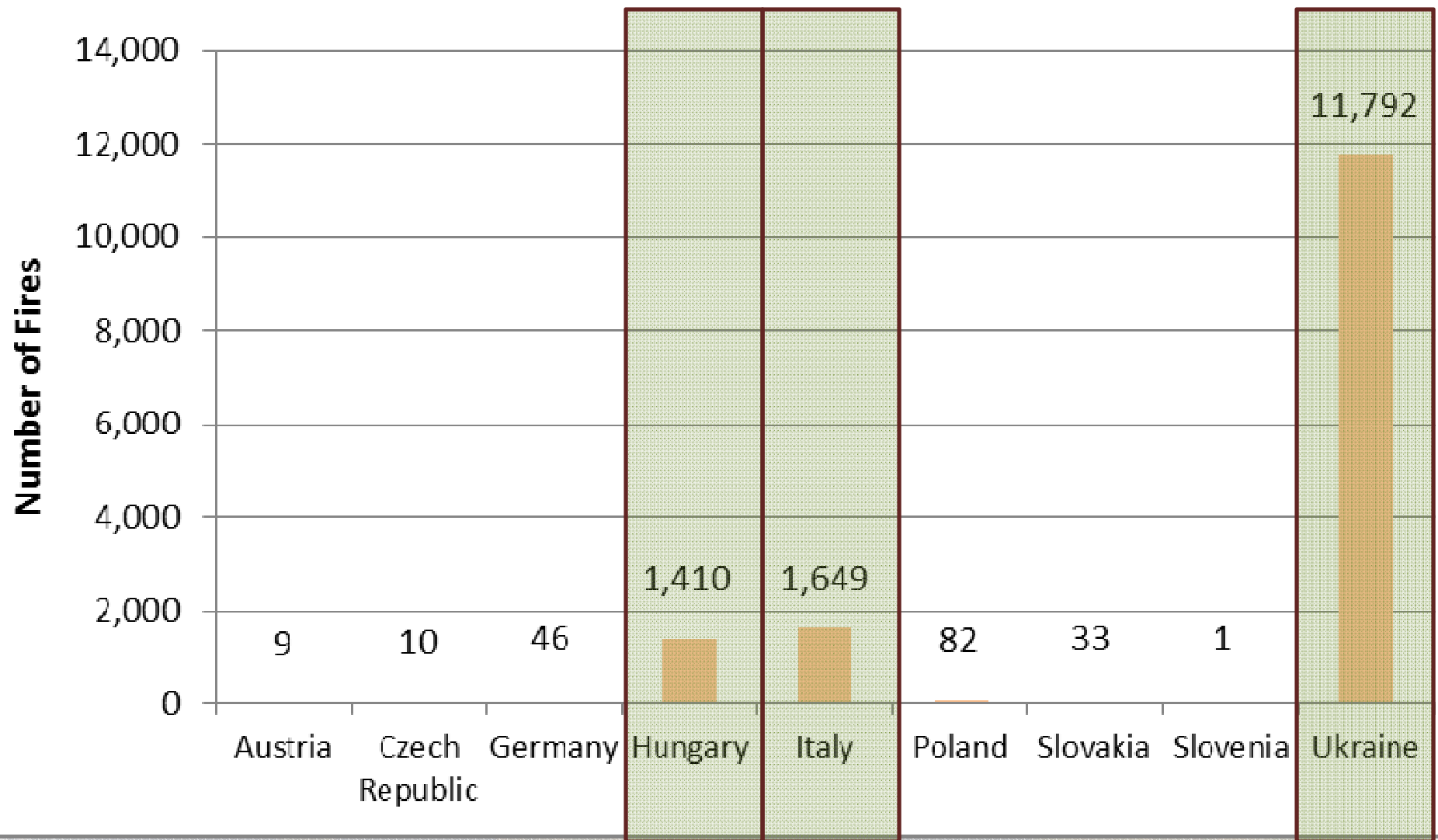
Cropland / Cropland Natural Vegetation Fires: Spring April - June



Cropland / Cropland Natural Vegetation Fires: Summer July - September



Cropland / Cropland Natural Vegetation Fires: Fall October - December



A satellite-style map of the Mediterranean region, showing the Mediterranean Sea, the Black Sea, and surrounding landmasses. The word "Questions?" is overlaid in the center of the image in a white, sans-serif font with a black outline.

Questions?