Silvicultural approach required to increase forest resilience to climate change and wildfires in the Ukrainian Carpathians

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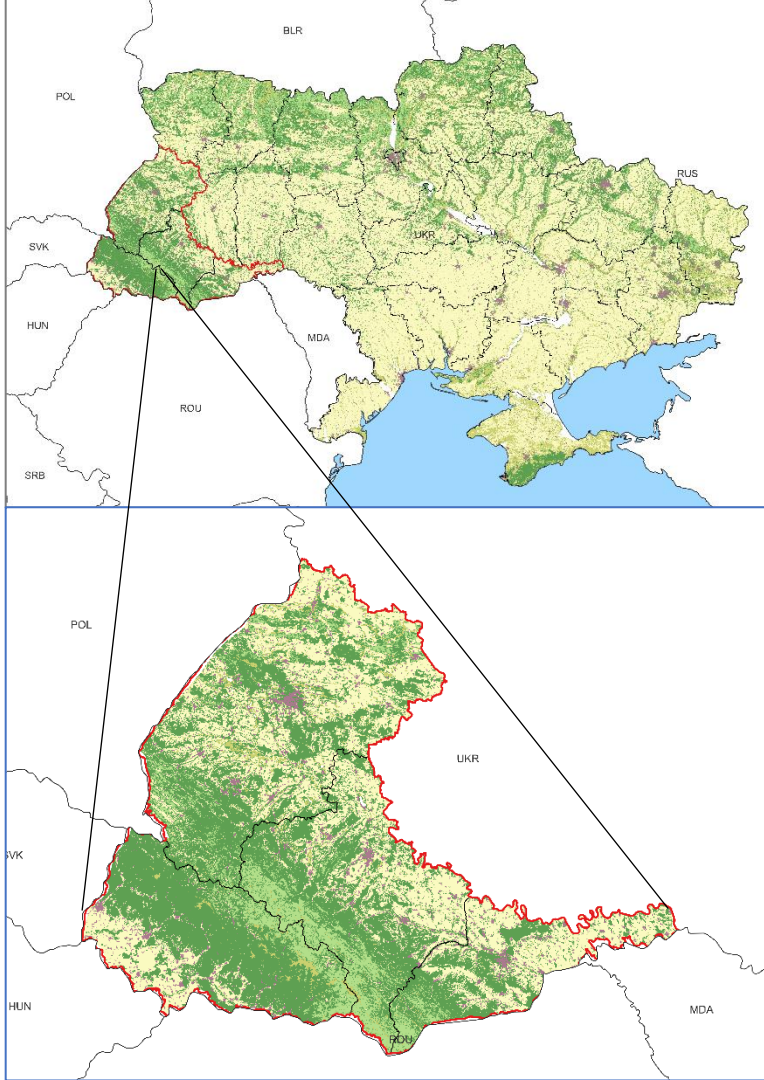
About the region

- The **four oblasts** (regions) affiliated with the Ukrainian Carpathians (Lviv, Ivano-Frankivsk, Zakarpattia and Chernivtsi)
- **9.3 % of Ukraine's territory** and **22 %** of the **forest** lands (SFRAU, 2023).
- **Forest cover** in the region has changed relatively little over the last decades and a **slight increase** in forest area is observed



Statistical data

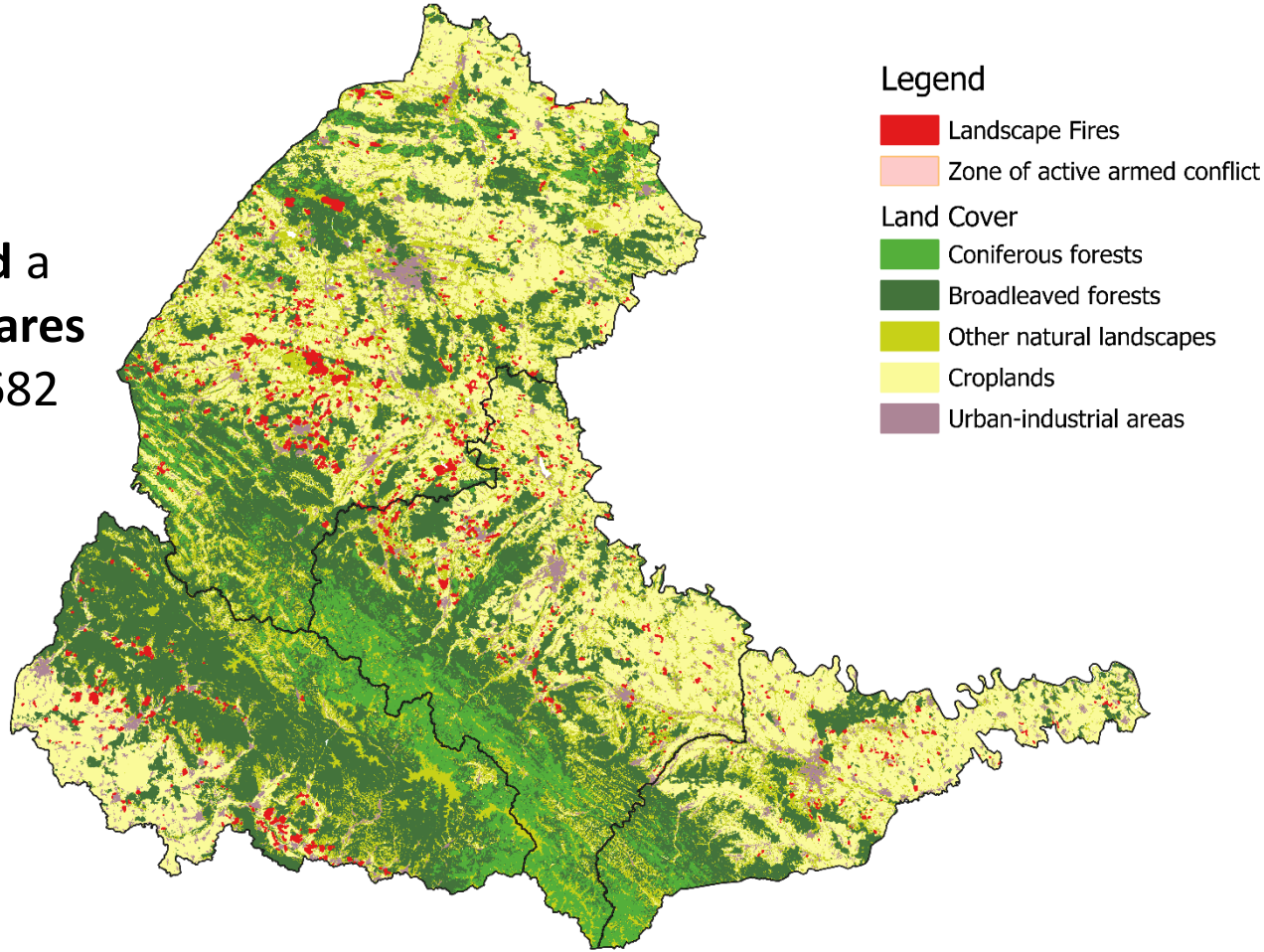
Over the last 4 years:

- **6.2 million m³ (40 %)** out of **15.9 million m³ of logged timber** has been harvested in **mature stands**.
- **Clear-cuttings** carried out on **46.9 %** of the area.
- Only **41.2 % of the wood** is suitable for **commercial** purposes, others are determined as firewood.
- Moreover, **2.1 million m³** have been logged as part of **sanitary cuttings.**

Source: Forestry Innovative Research Centre, 2023

Wildfires

In **2022 wildfires covered** a total area of **62 313 hectares** (1229 cases) of which 4 682 ha of forests

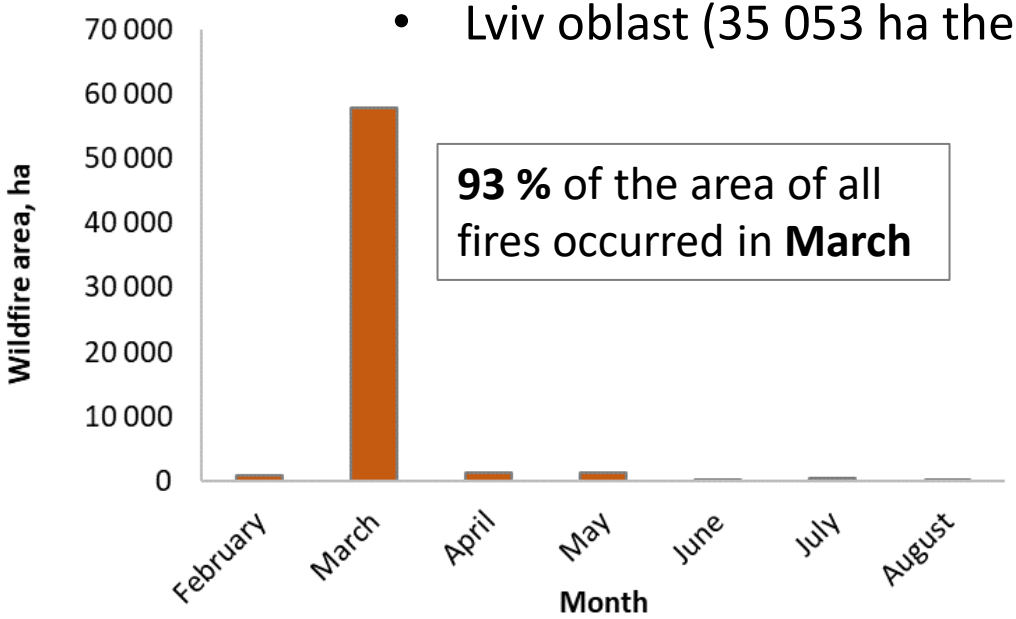


Sourse: REEFMC, 2023

Wildfires

Wildfire distribution by regions (oblast):

- Ivano-Frankivsk oblast (11 223 ha thereof **790 ha of forests**);
- Zakarpattia oblast (13 079 ha thereof **1 811 ha of forests**);
- Chernivtsi oblast (2 958 ha thereof **41 ha of forests**);
- Lviv oblast (35 053 ha thereof **2 040 ha of forests**).



Over the last 30 years, the Carpathian region was not affected by large forest wildfires, however, **in 2022** forest fires affected **4.7 thousand ha of forest** (**7 %** of the **total area** affected by fire were forest fires).

Sourse: REEFMC, 2023

Forest Firefighting training for foresters of the Carpathian region in 2023

Clear-cutting

Disturbance

Forest disturbed by extreme wind 2023

Dry spruce forest due to insects

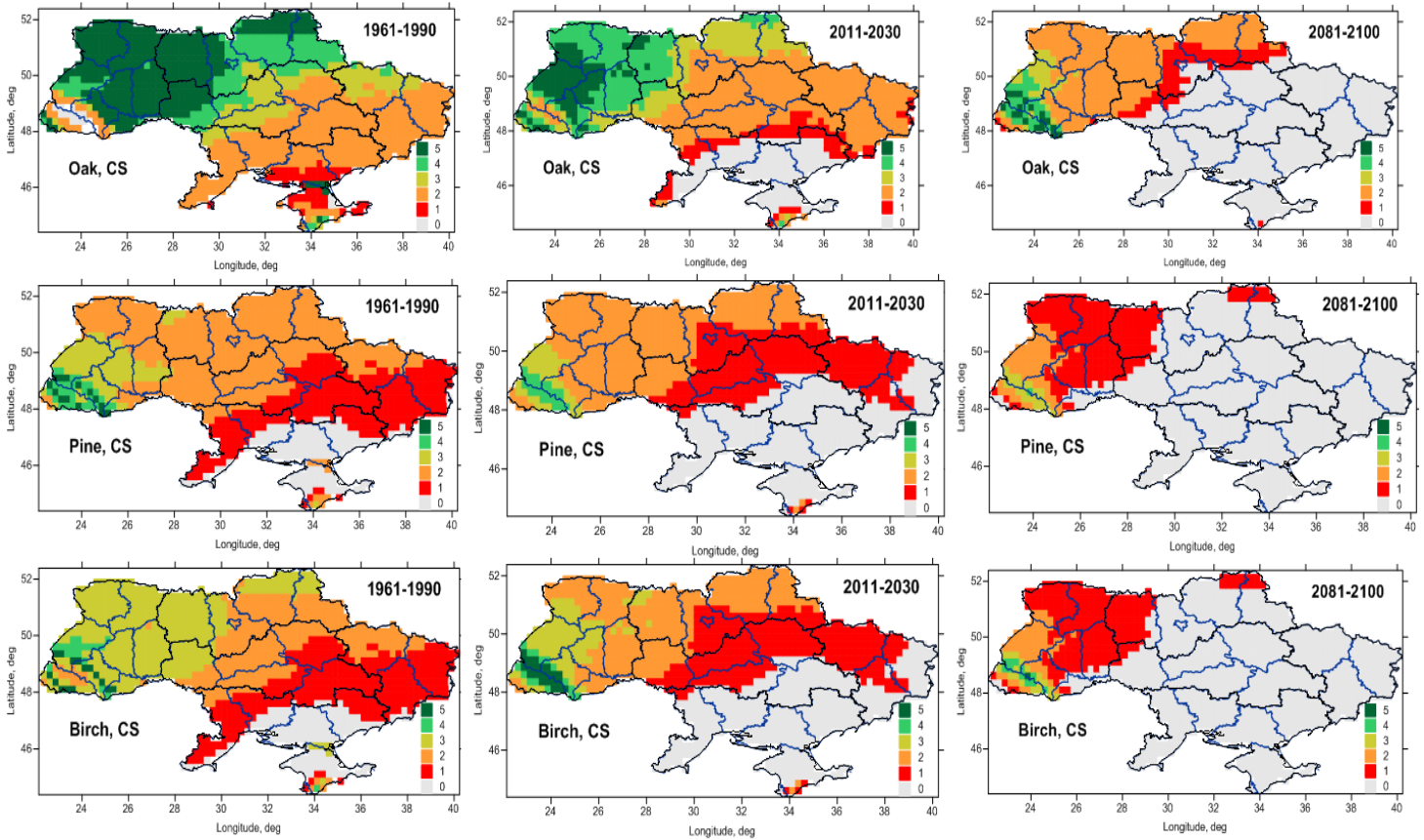
Species-poor beech forest

Climate change

IPCC scenario A1B (~RCP6.0)

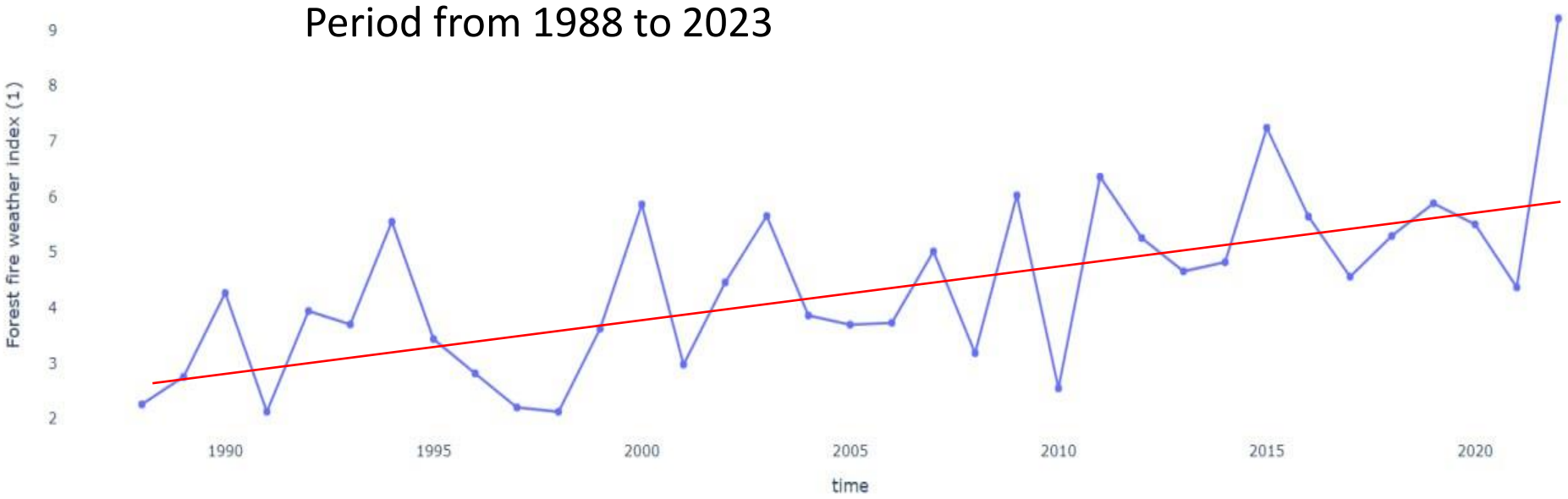
Forecast of climatic conditions for the growth of **oak**, **pine** and **birch** in Ukraine

5-optimal cond.
1- extreme cond.



Source: Shvidenko, Buksha, Krakovska, Lakyda 2017

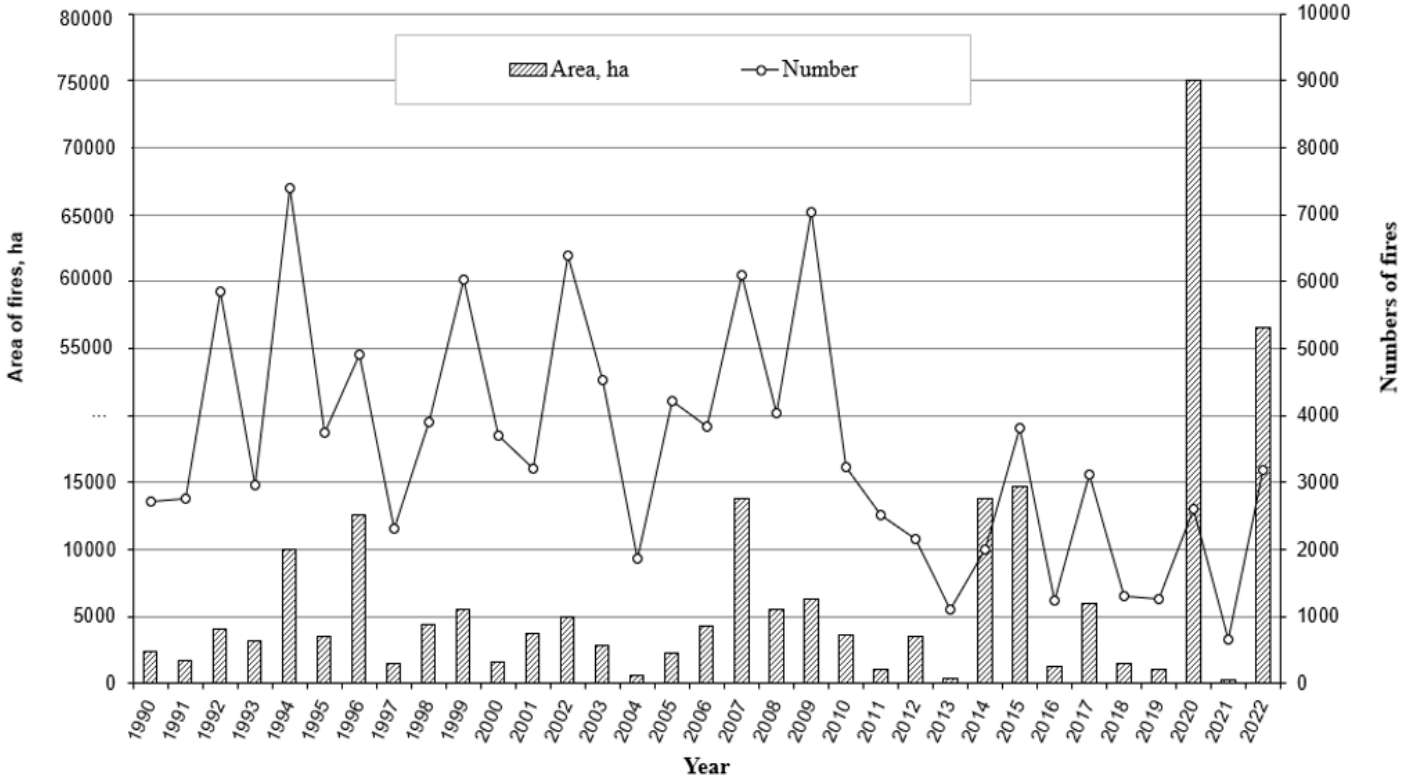
Fire Weather Index (FWI)



Source: EFFIS - European Forest Fire Information System (https://effis.jrc.ec.europa.eu/)

Dynamics of forest fires in Ukraine

Number and area of forest fires in Ukraine, 1990-2022



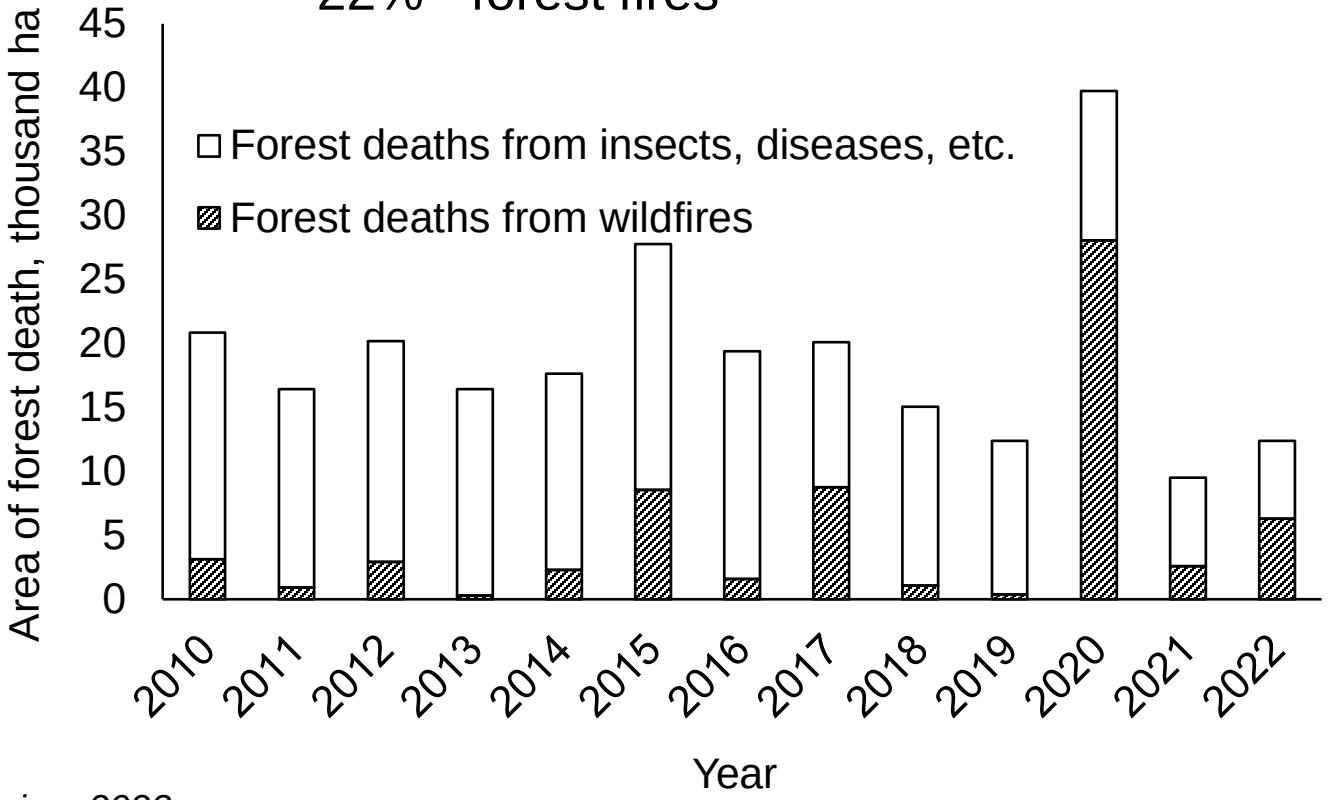
Sources:
State Statistics Service of Ukraine, 2000-2021; Zibtsev et al., 2023

Forests death

78% - insects, diseases and extreme weather impacts

22% - forest fires

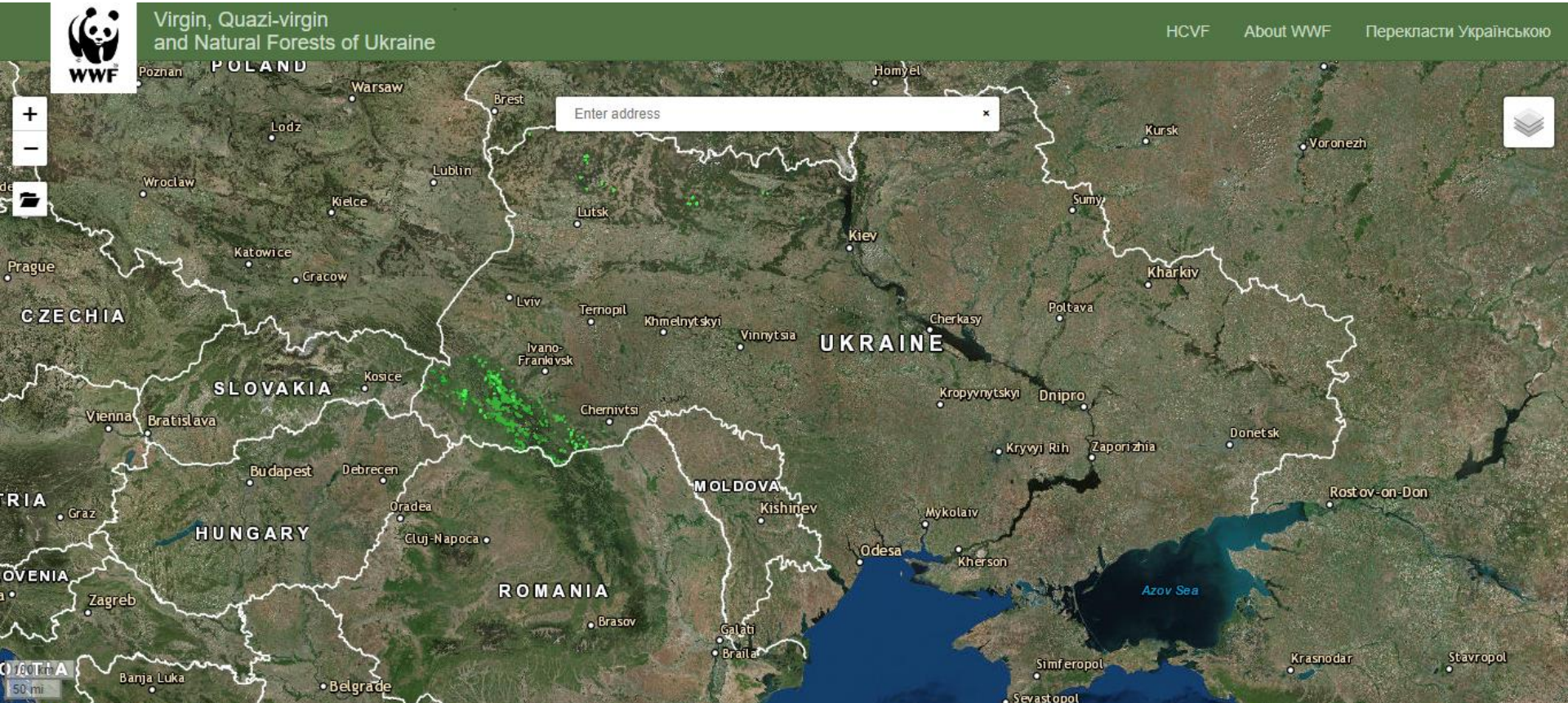
For the last 13 years annual forest loss in Ukraine:
- **5 thousand ha** from forest fires;
- **14 thousand** ha as a result of insects, diseases and extreme weather impacts



Sources:
State Statistics Service of Ukraine, 2023

Virgin forests as a guide for forest formation

Virgin, Quasi-virgin and Natural Forests of Ukraine http://gis-wwf.com.ua/#

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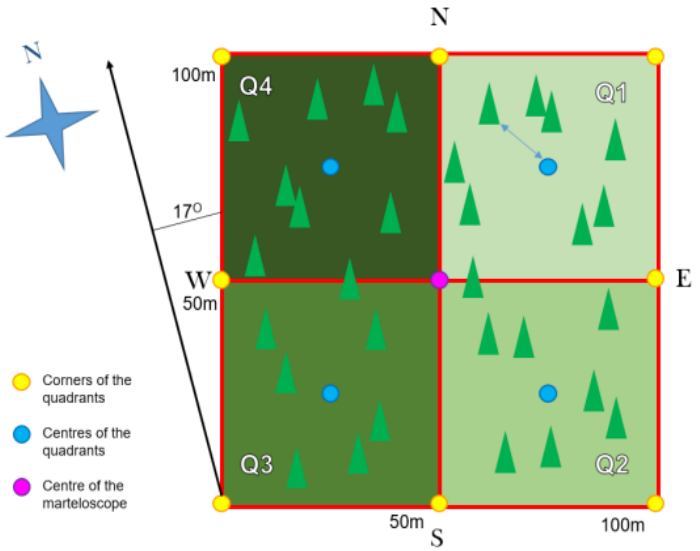
Digitalization for Sustainable Forest Management / Climate Smart Forestry

Marteloscope system for studying, teaching and distributing best practices of close-to-nature silviculture

The Sylvotheque system is a software developed at the Bern University of Applied Sciences (HAFL) - https://martelage.sylvotheque.ch/.

More about the Marteloscope system: http://iplus.efi.int/uploads/Marteloscope_Guidelines_Setup.pdf



Source: Derks et al., 2020

Sylvotheque System (martelage.sylvotheque.ch)

Conclusions

Considering the increase of fire risks due to **the population flow** into this region caused by the full-scale russian invasion along with climate change scenarios (IPCC, 2022), **existing approaches should be shifted** to climate smart silviculture aiming to increase forest resilience.

The key pillars of this approach should be ensuring that **native hardwoods share in species composition**, for appropriate sites or/and **uneven-aged structure** stands.

Primarily, forest transformation and implementation of such approaches should be pursued on **forest edges and in wildland-urban interface** zone base on silvicultural and close-to-nature forestry practices.

Proposals in forest sector

- Step-by-step change in current forestry approaches aiming to **shift into Climate-Smart Forestry**, incl. restoration activities.

- Collect and archive **information about virgin forests** (OGF) as an example of naturally-adapted forests using the practice of Marteloscopes with new tools of visualization of the photospheres.

- Collecting and analyzing data on existing practices and experimental plots of thinning, selective, and transformation cutting as a **basis for developing guidelines for forest management** to increase forest resilience to climate change, insects, diseases, wildfires, and extreme weather impacts.

- Sharing the results of existing practices among foresters, scientists, and in the forestry education system with **open access to data**.

Proposals on capacity building &network

- **Constant opportunities** to learn and adopt best **European** Forest Management **practices** considering biodiversity conservation, ecosystem resilience, social and economic aspects, for:
    - - students
    - - for practitioners
    - - researchers / lecturers

**Programs of training / sharing experience should be accessible to people with different levels of foreign language proficiency.*

*** Considering limits for male-dominated forest sector visiting international programs abroad, internal programs are welcome*

Thanks for your attention!