Utilizing diverse geospatial datasets for identifying different types of high conservation value forests

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5th INTERNATIONAL CONFERENCE

Old-growth forests: policy and practice

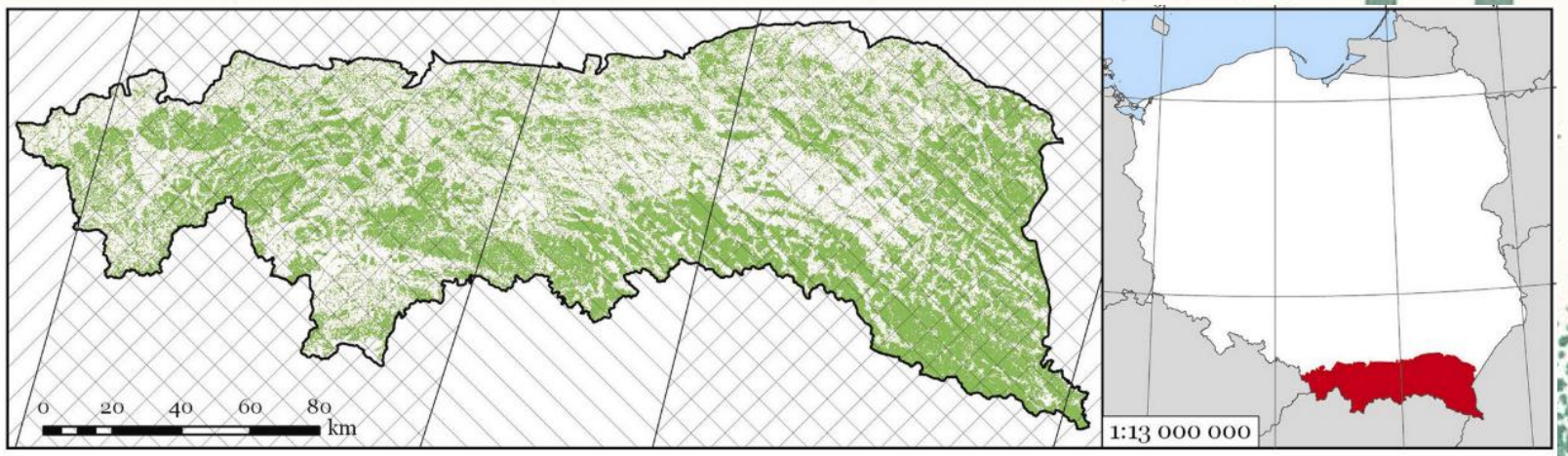
High Conservation Value Forests (HCVFs)

- Biodiversity – maintain diverse species and habitats
- Rare ecosystems – support threatened or unique ecological communities
- Ecosystem services – watershed protection, erosion control
- Cultural value for local communities

- Beyond primary and old-growth, HCVFs include early successional, multi-aged, riparian, and previously managed forests

HCVFs in the Polish Carpathians

- Growing emphasis on ecosystem protection in Europe (Biodiversity Strategy, Nature Restoration Law) - identifying HCVFs is essential
- Polish Carpathians: diverse, ecologically valuable forests, biodiversity hotspot with many HCVFs unprotected
- Objective to identify & classify HCVFs using remote sensing + historical maps

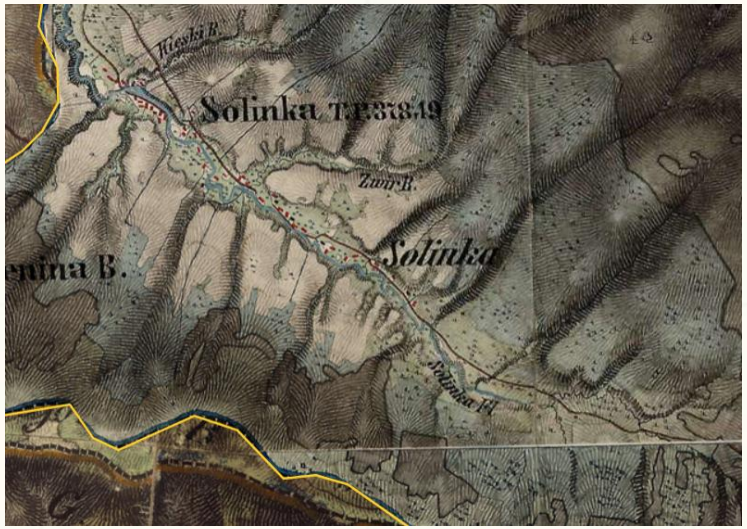


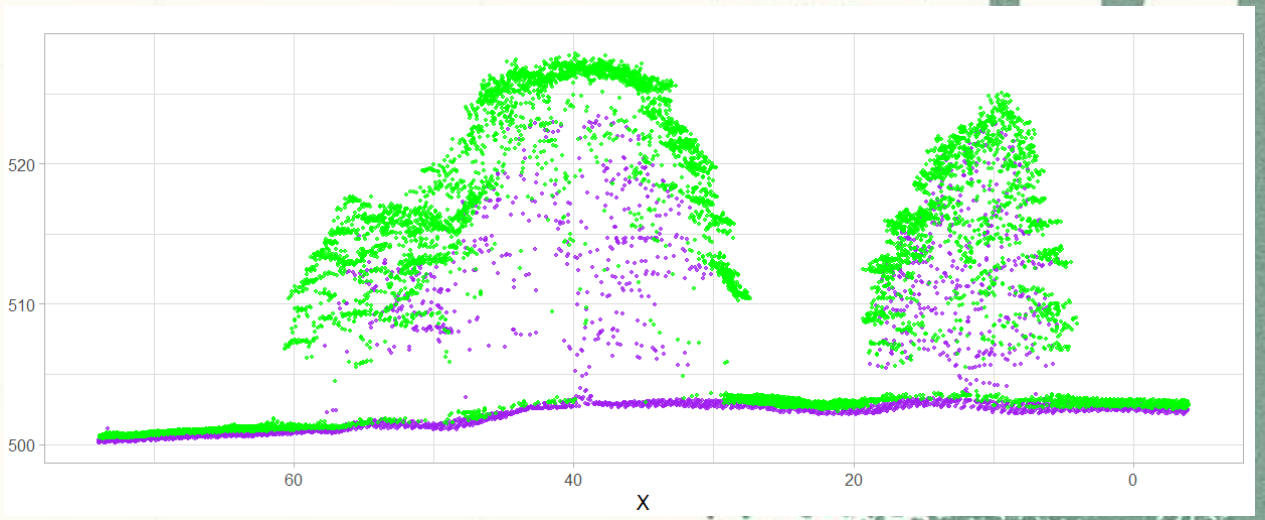
Datasets

Historical maps (19th century, 1930s, 1970s)

Remote sensing:

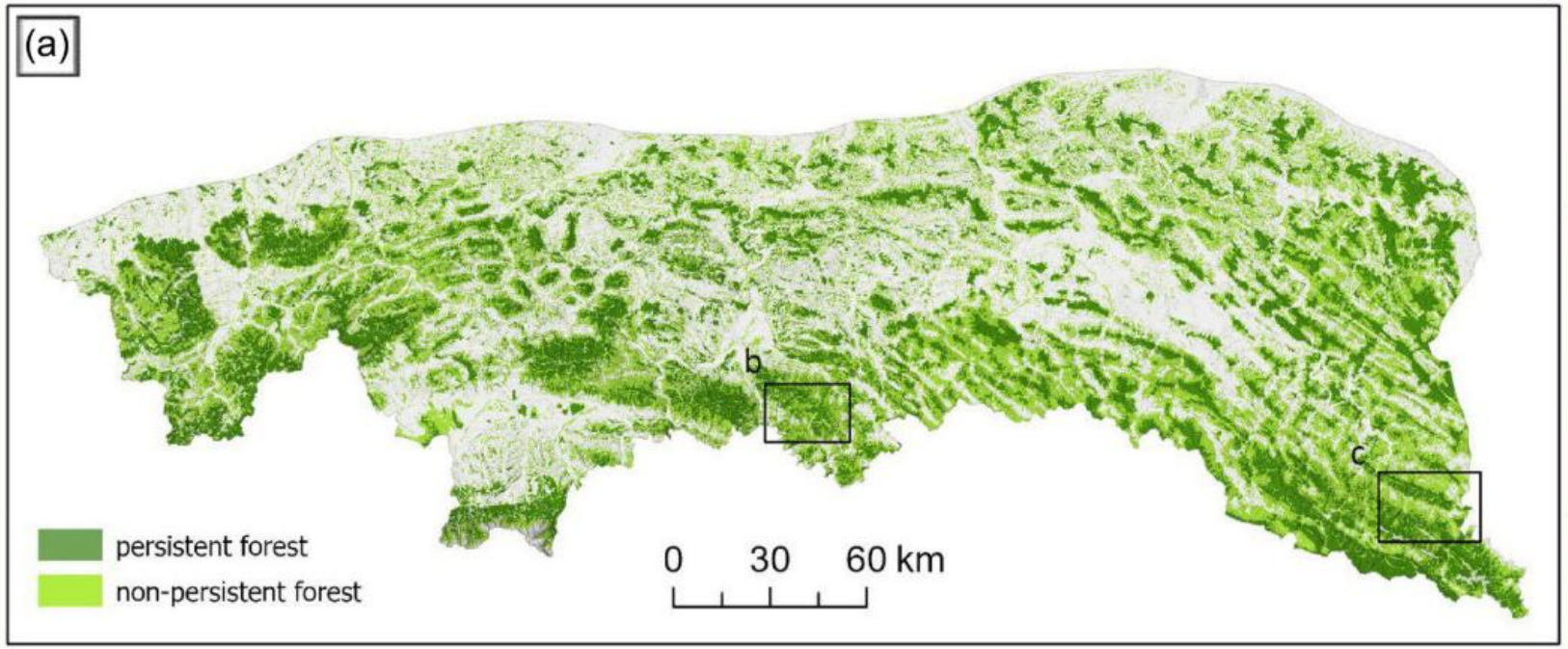
- Sentinel-2, Landsat
- LiDAR





Forest continuity

- Forest continuity: long-term forest presence without land-use conversion (e.g., agriculture).
- Mid-19th c.: minimum forest extent; stands present then likely have long continuity.
- Data: 5 time periods (1860s, 1930s, 1970s, 2013, 2023) → "**persistent forests**"
- Result: 4,200 km^2 identified; ~50% outside protected areas.



LETTER

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Historical maps improve the identification of forests with potentially high conservation value

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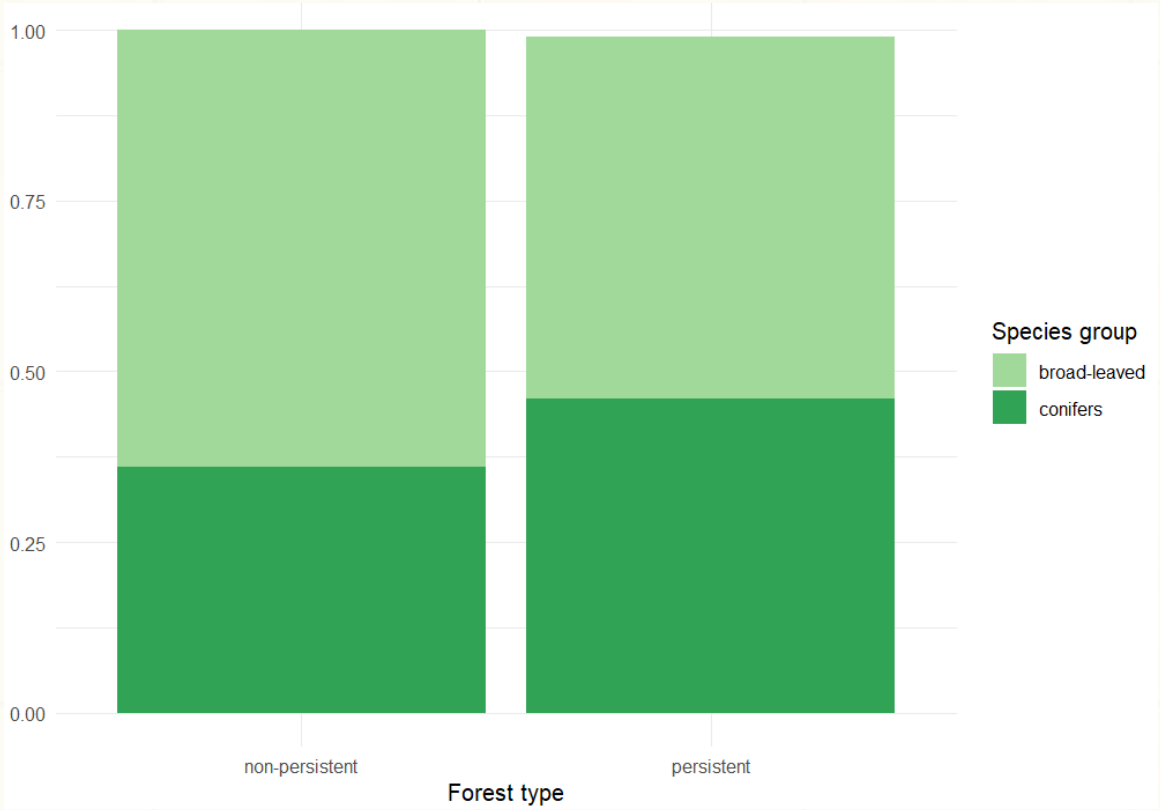
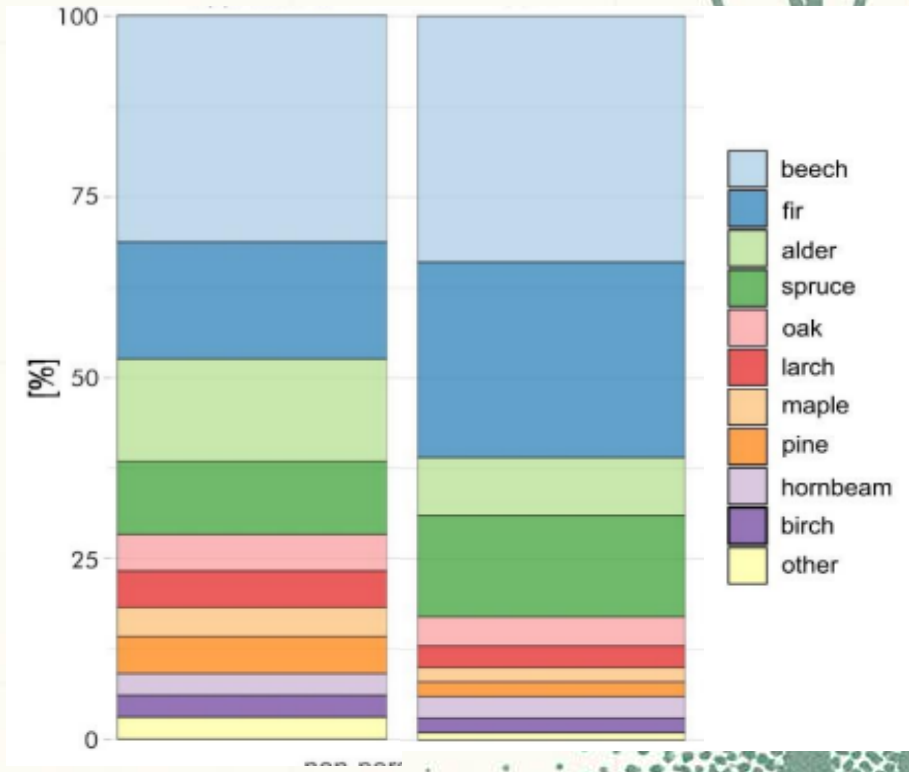
Persistent forests

Map of forest tree species for Poland based on Sentinel-2 data

Ewa Grabska-Szwagrzyk[1], Dirk Tiede[2], Martin Sudmanns[2], and Jacek Kozak[1]

- Based on Sentinel-2 forest tree species classification

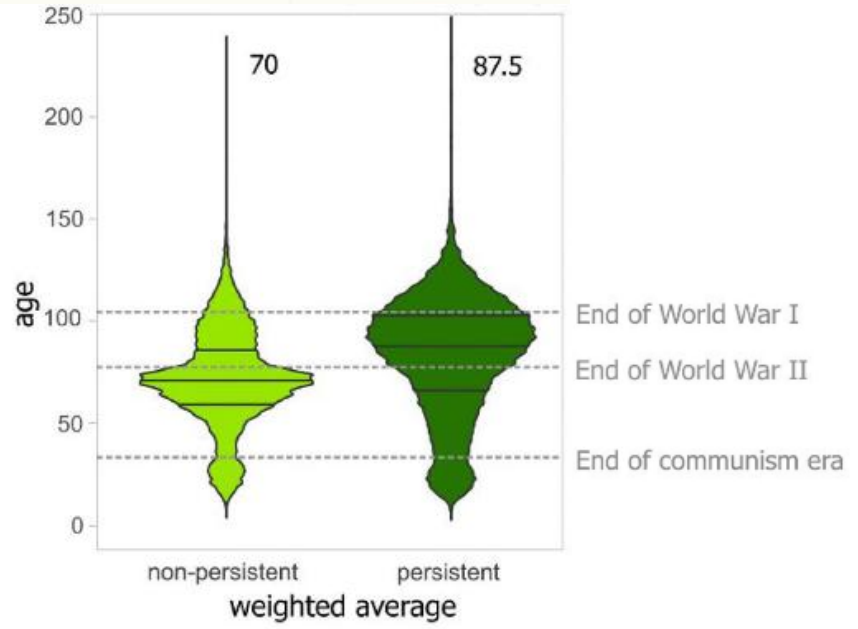


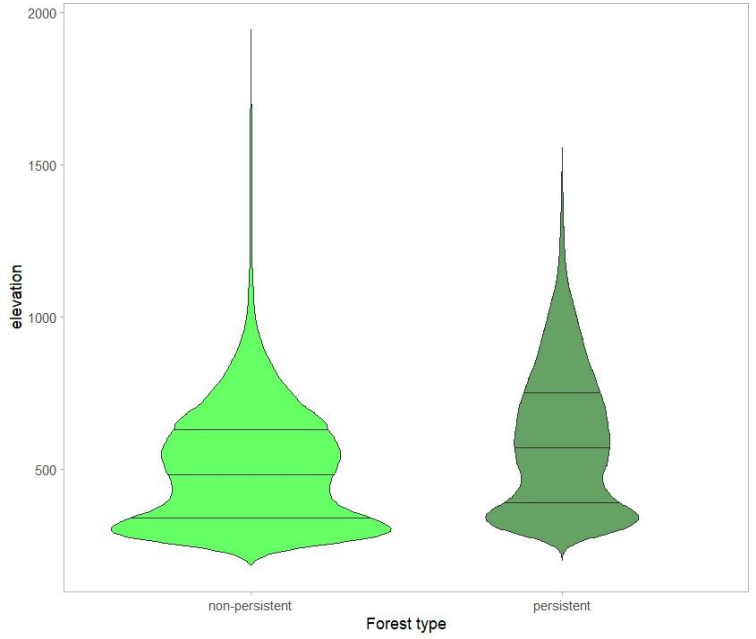


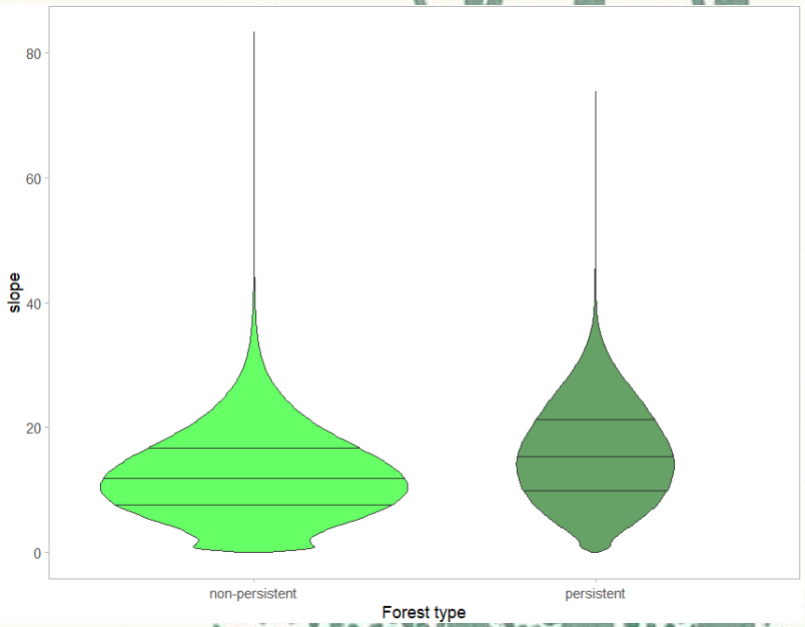
Persistent vs non-persistent forests

Age and topography:

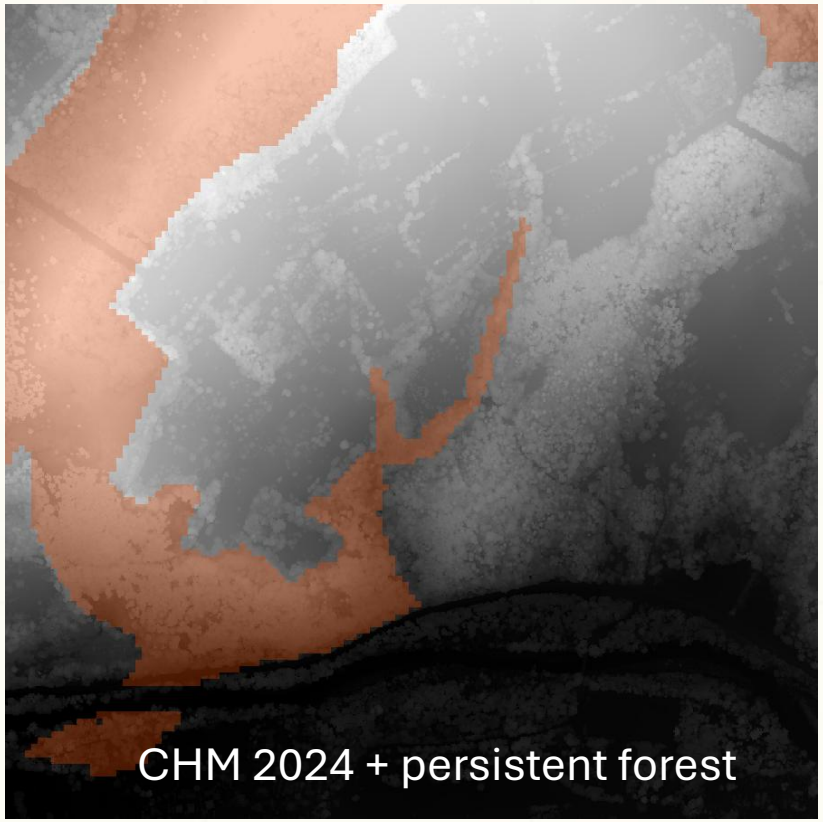
- Stand age from Polish Forest Data Bank
- DEM

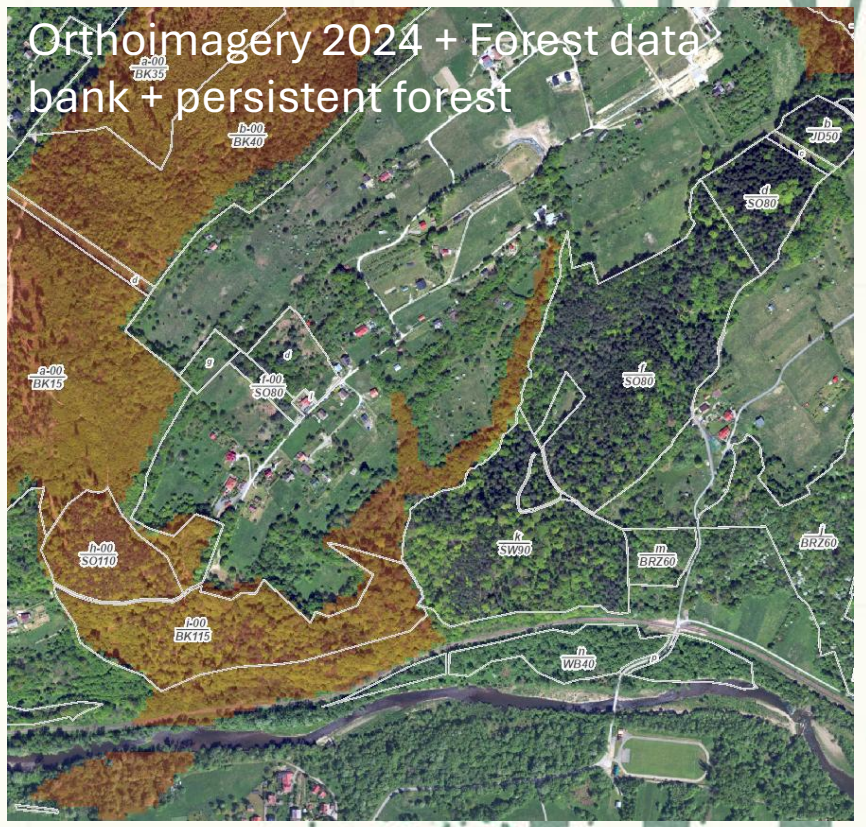






Land use legacy vs peristent forests



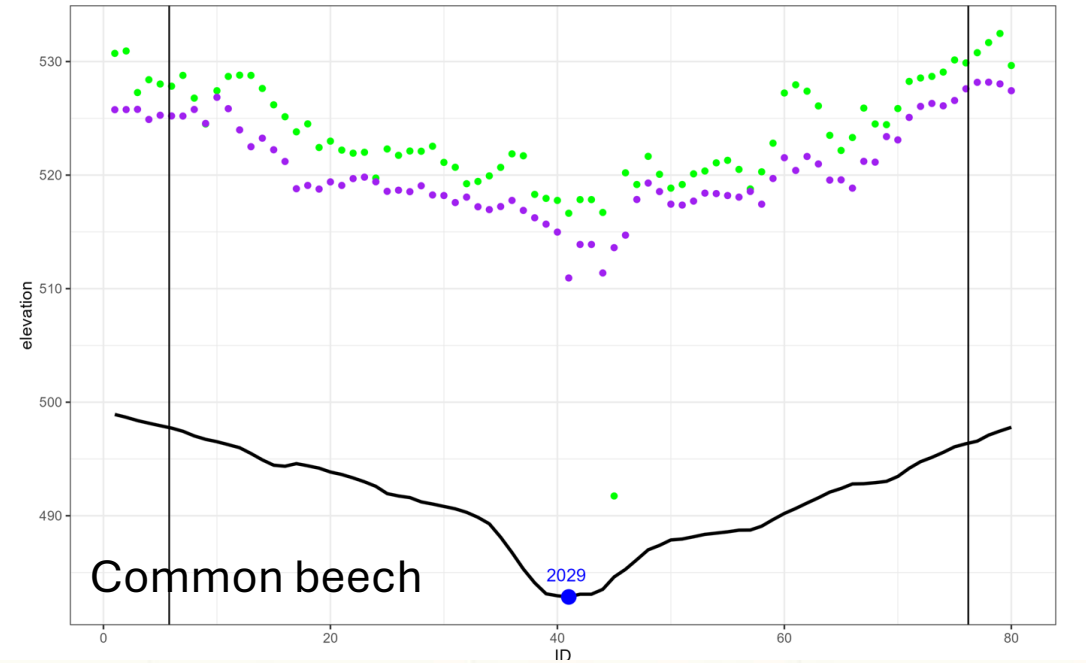


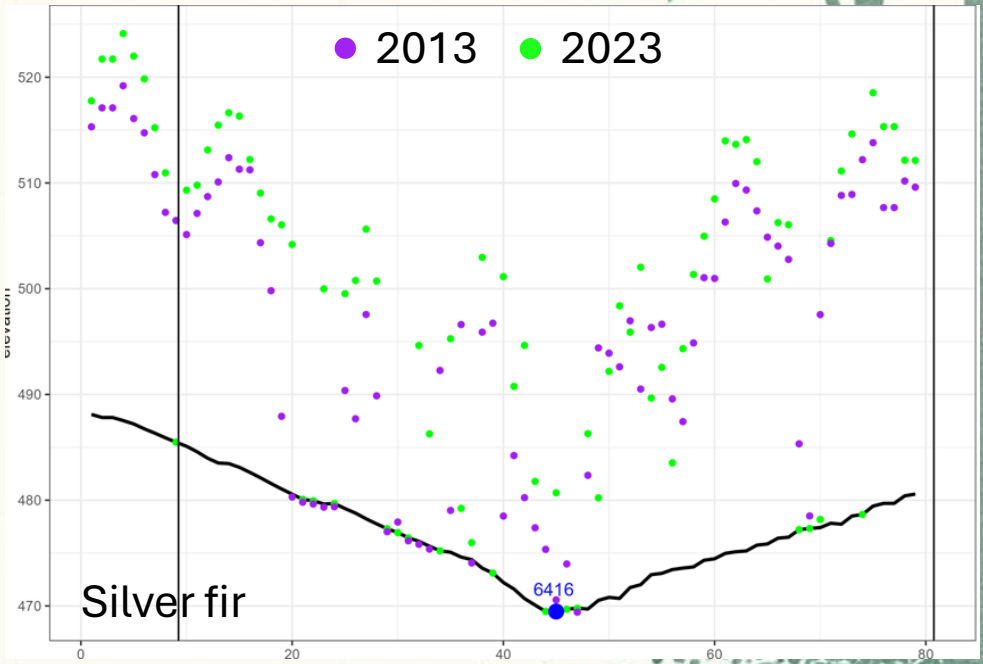
forest

wooded pastures

Identification of riparian & persistant forests

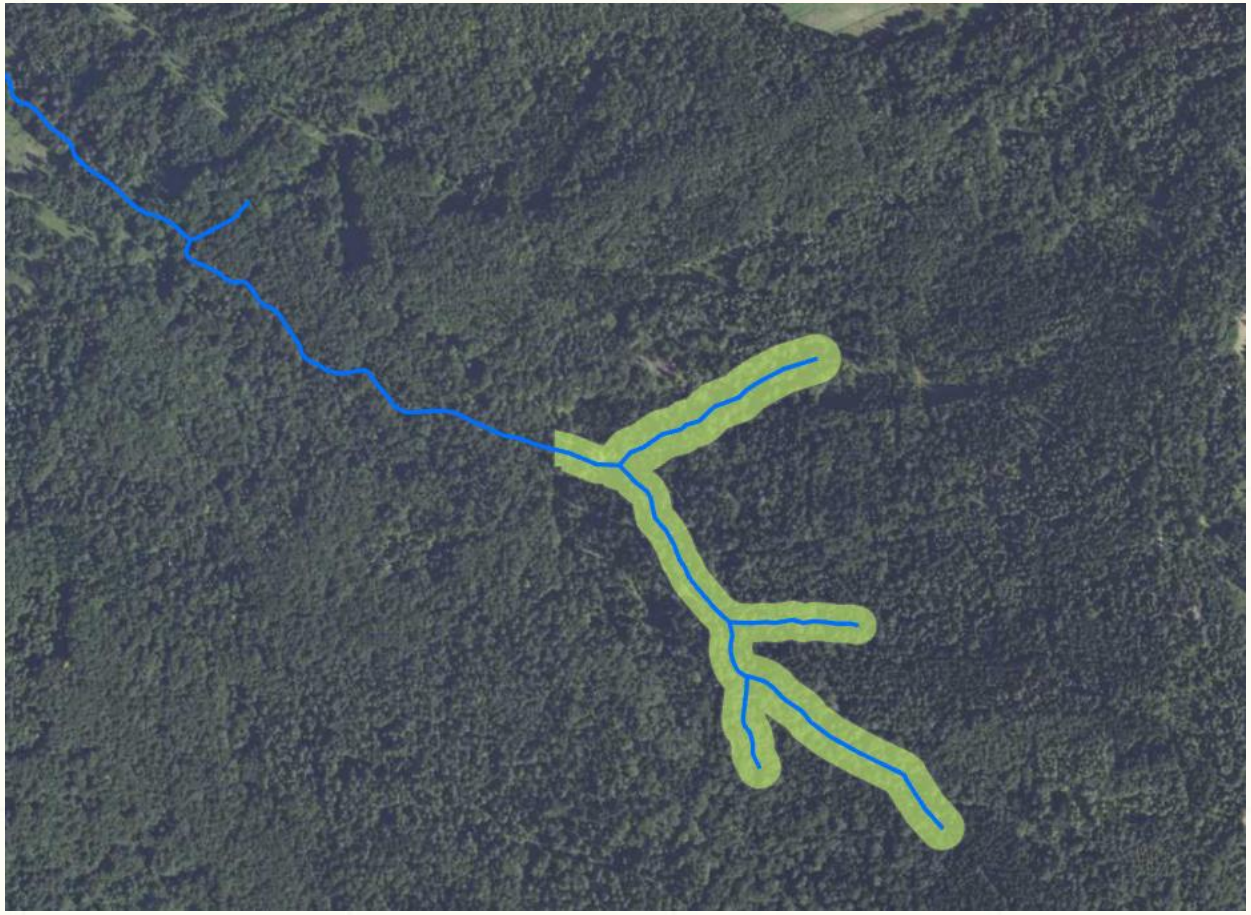
- Riparian forests- along riverbanks and other freshwater bodies
- Study in Maków Beskid (434 km^2); use of Canopy Height Model
- Definition based on tree heights (mean 20% highest) transformed into horizontal distance from the stream

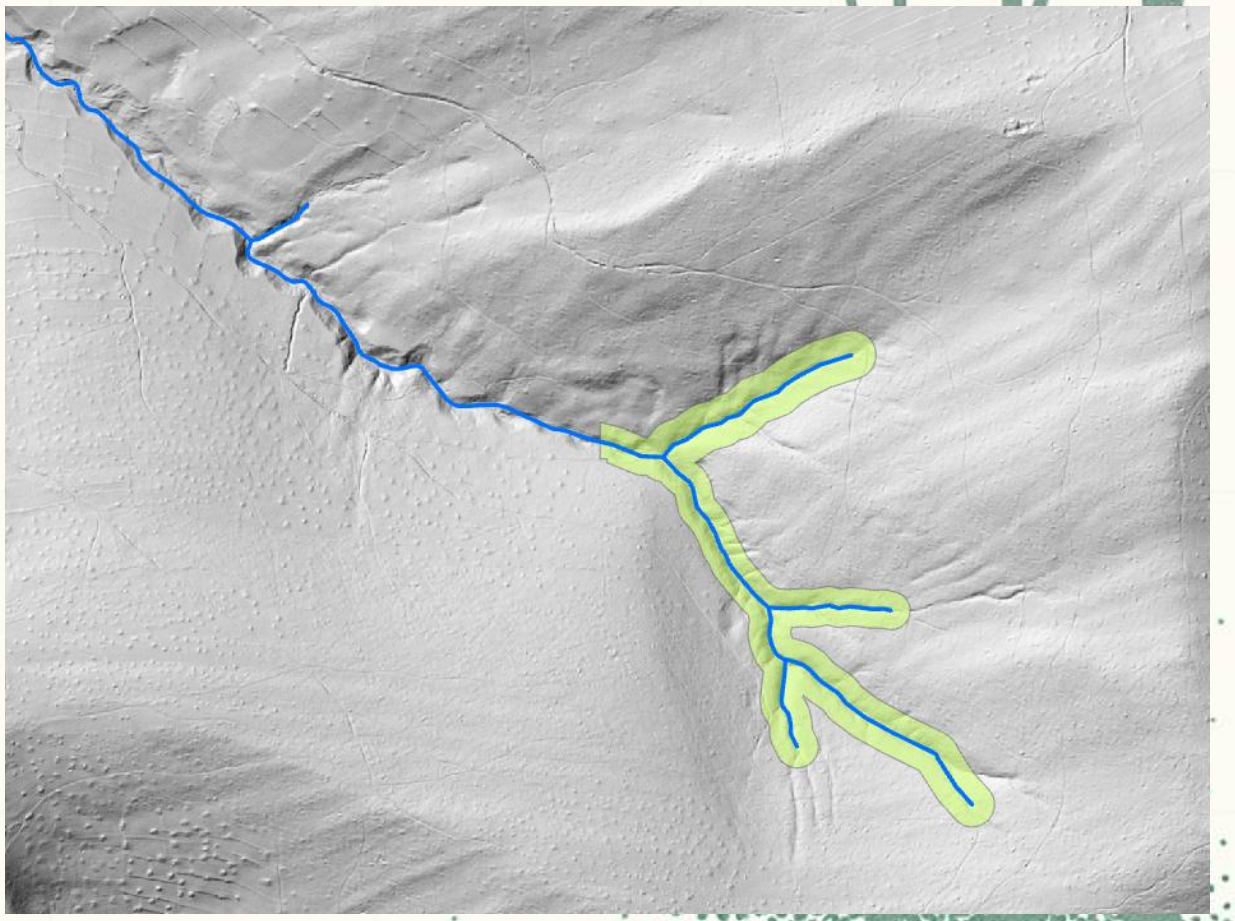


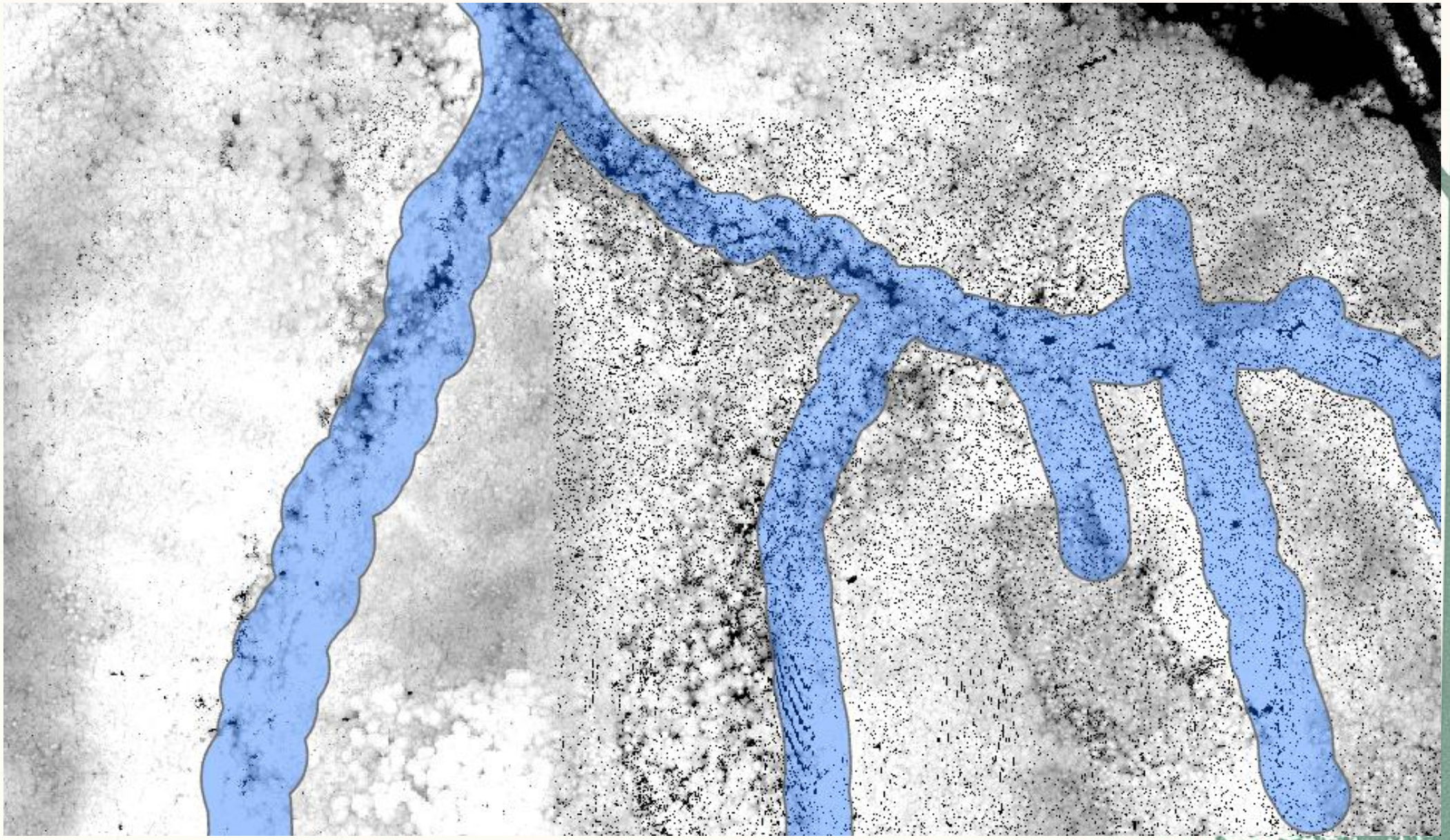


16 km^2 of peristent and riparian forests in Maków Beskids

64% - fir; 21% - beech; alder; pine; spruce; larch

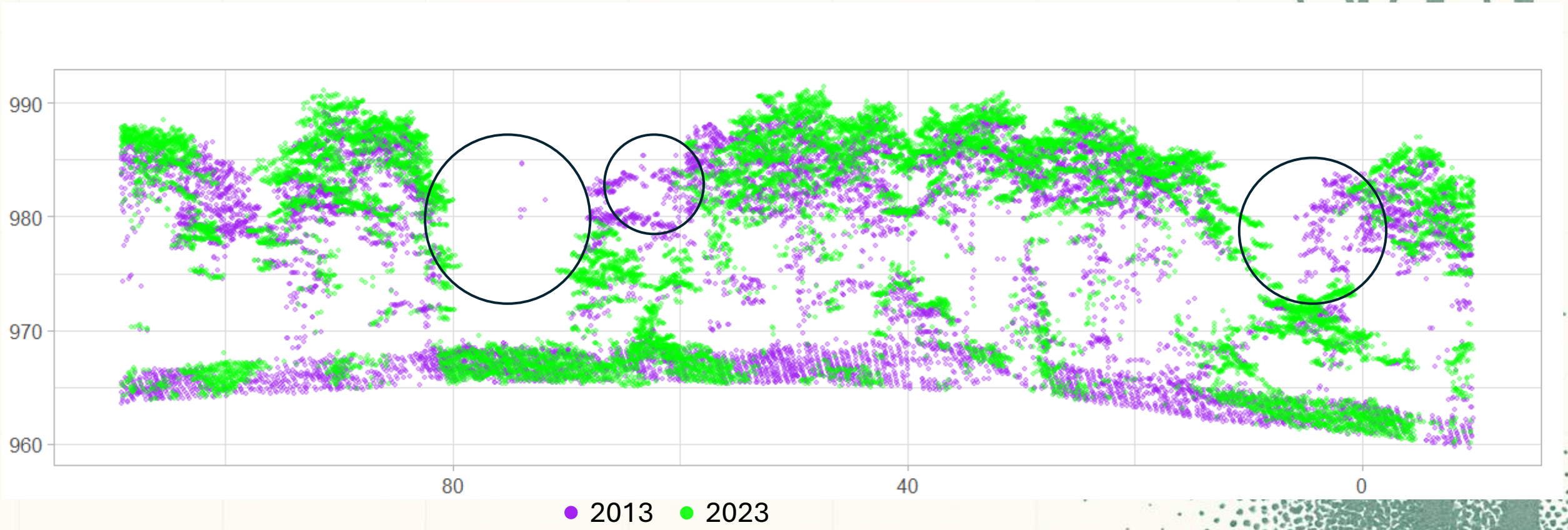




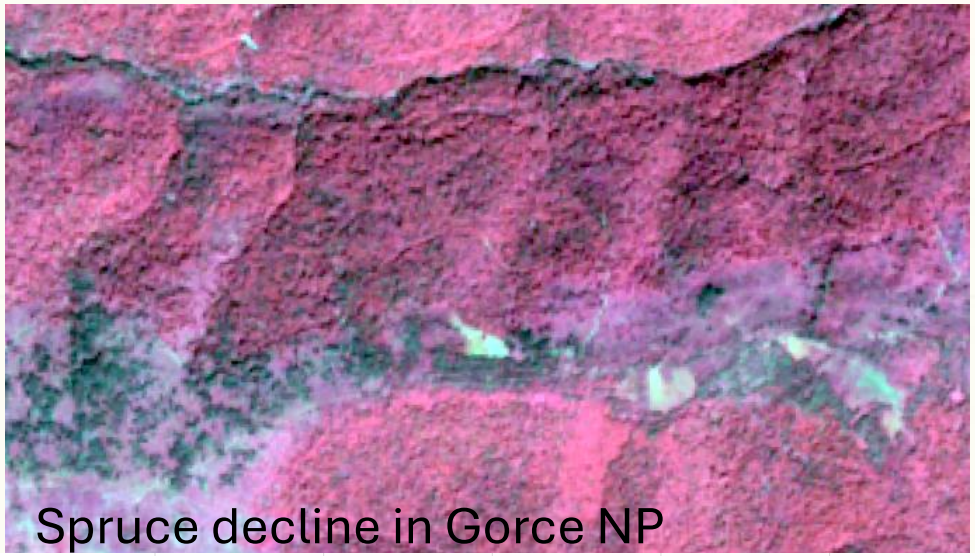


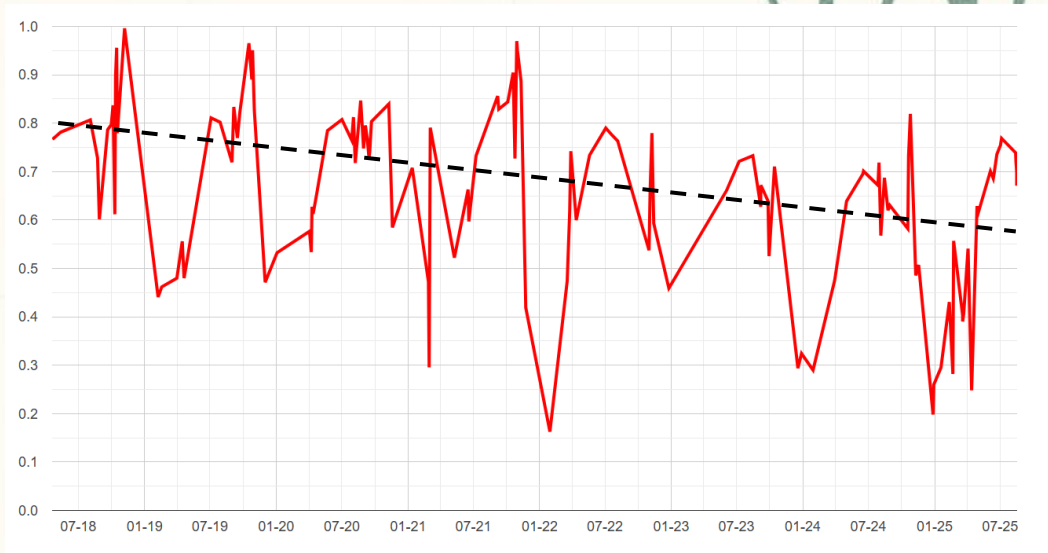
Lidar profiles and dynamics

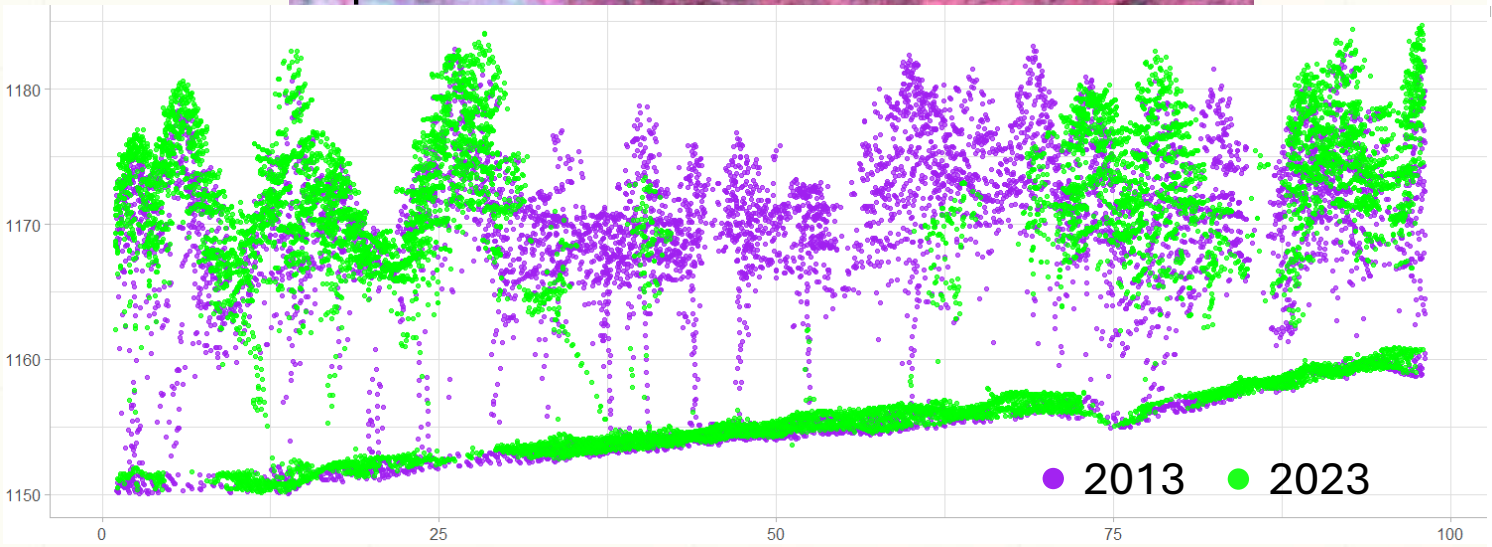
Old-growth – Śnieżnica Nature preserve with nearly 200 years old common beach

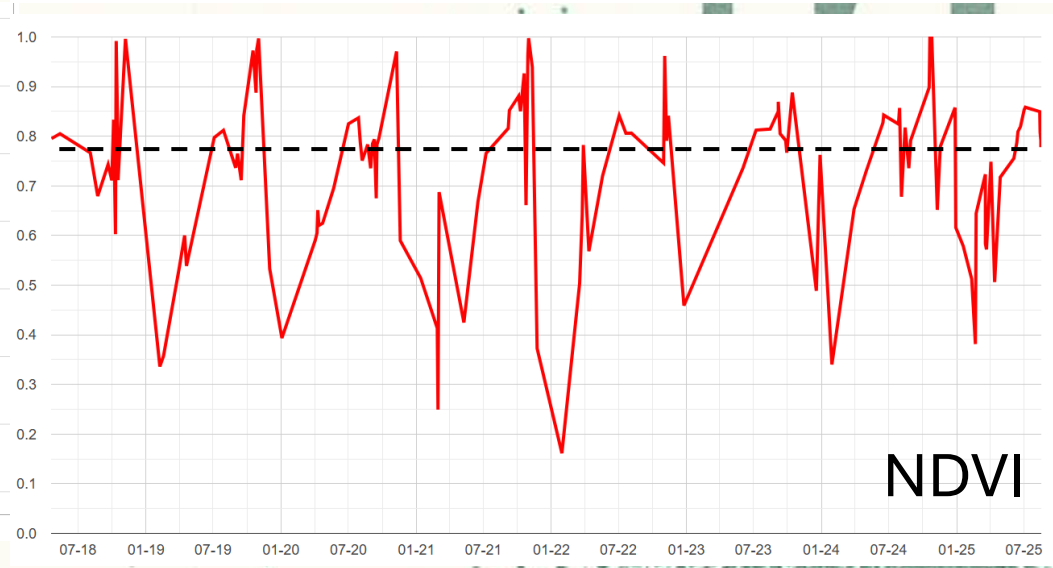


Dynamics in HCVFs - Sentinel-2 time series

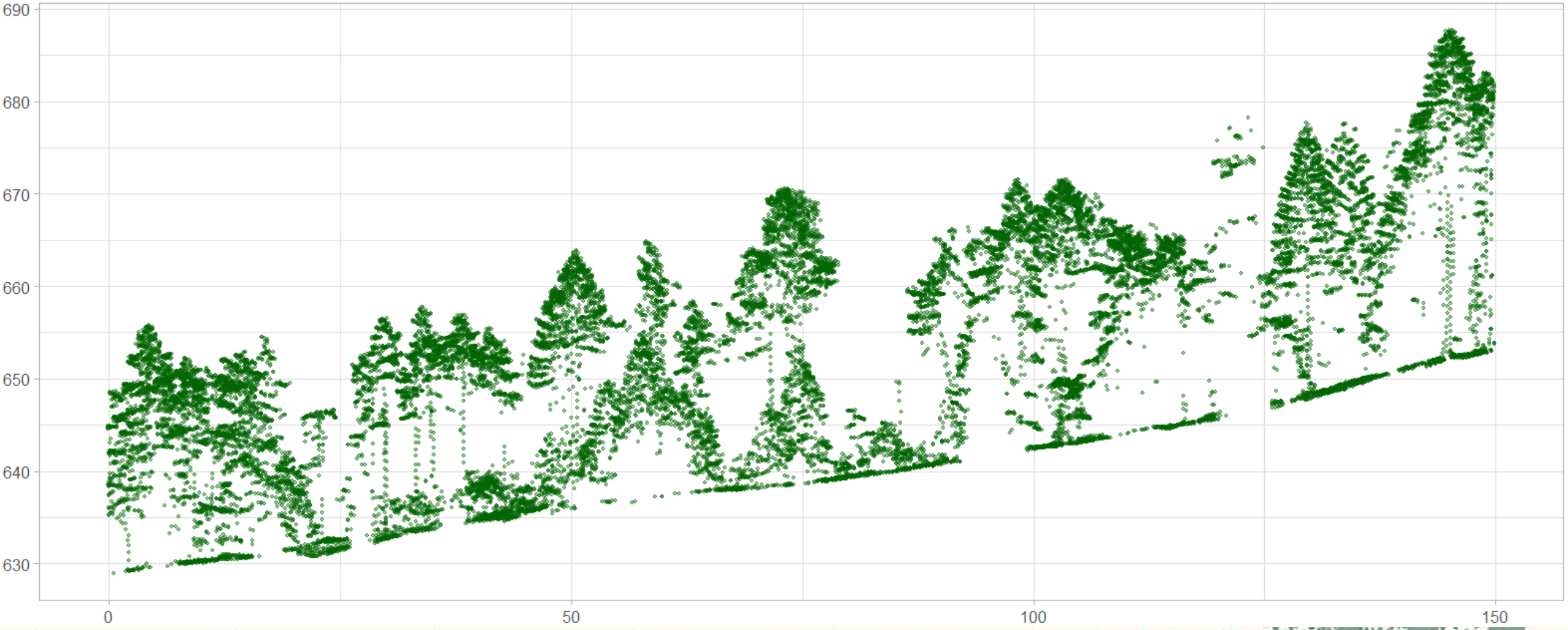






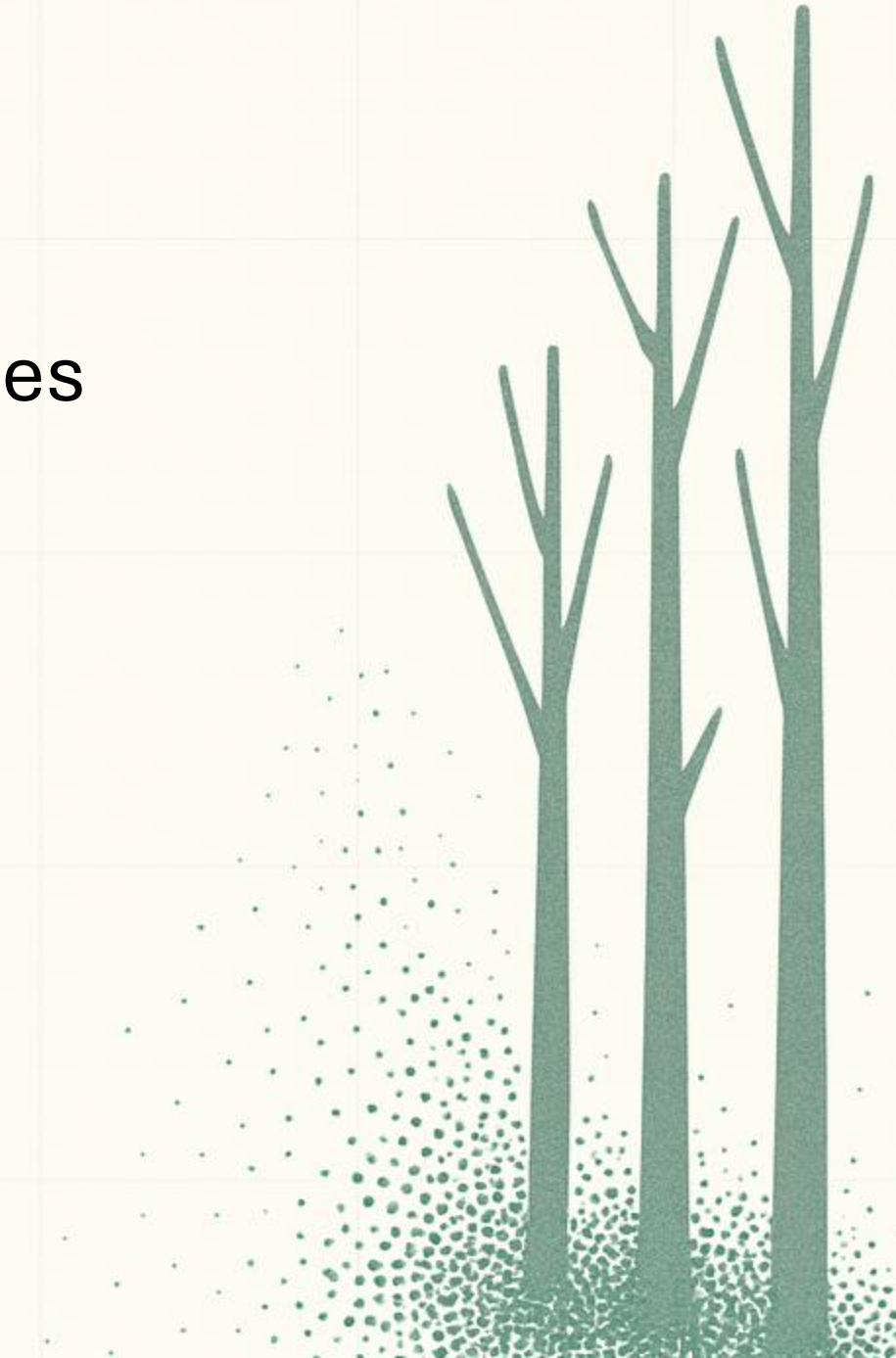


Uneven aged stands



Conclusions & perspectives

- Different data → different HCVF attributes
  - Historical maps: persistent forests
  - Satellites: recent dynamics
  - LiDAR: structure & canopy
- Recommendations
  - Integrate multi-source data
  - Focus on persistence & legacy areas
  - Test in other regions



Thank you for your attention!

Project: "Identification and classification of High Conservation Value Forests (HCVFs) with remote sensing and geospatial data"

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POLAND