

Long-term monitoring of permafrost degradation in North-West Finland

ARCTIC SCIENCE SUMMIT WEEK 2022

Results

Introduction

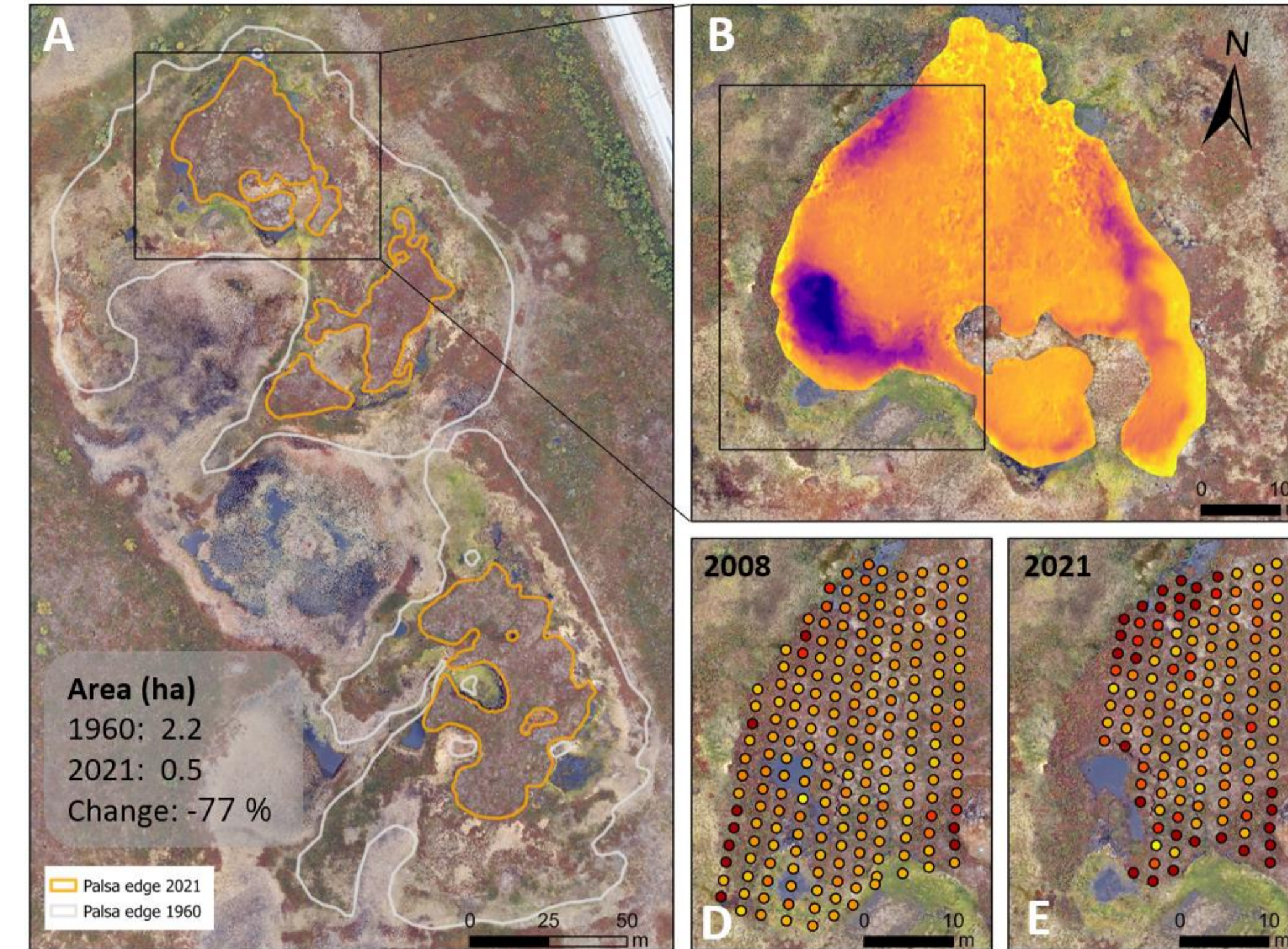
Palsas (peat-covered mounds with frozen cores) occur in the narrow zone of sporadic permafrost and are sensitive to climatic changes. Palsa mires are very heterogenous environments and important hot spots of biodiversity in northern regions (Luoto, et al. 2004). They are expected to disappear from many subarctic regions, including Finnish Lapland (Fewster, et al. 2022). However, detailed long-term monitoring data of the degradation process of palsas are scarce in Finland.

Methods

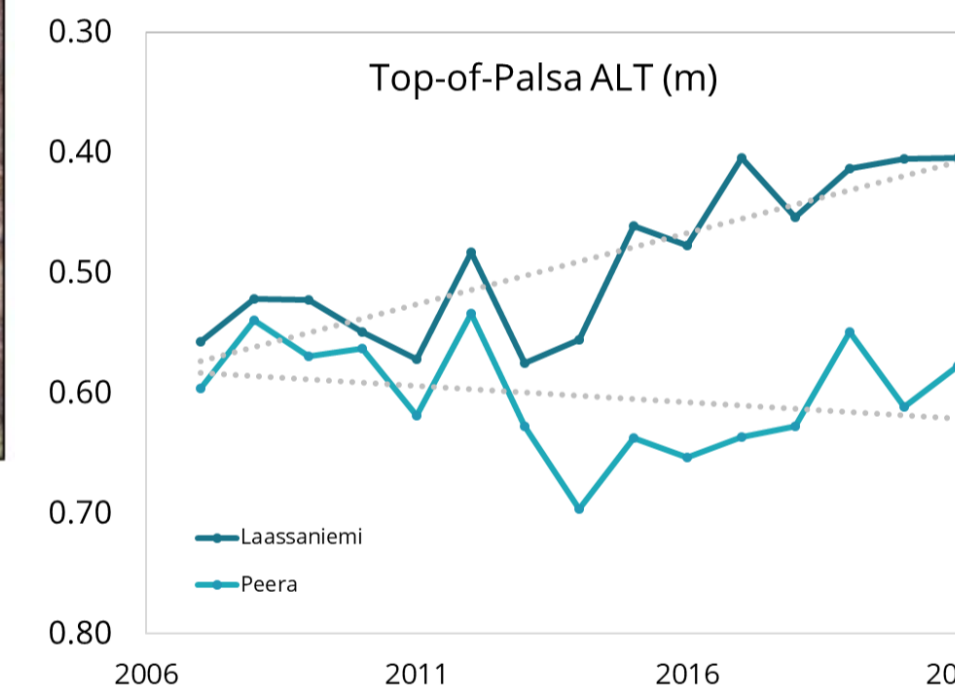
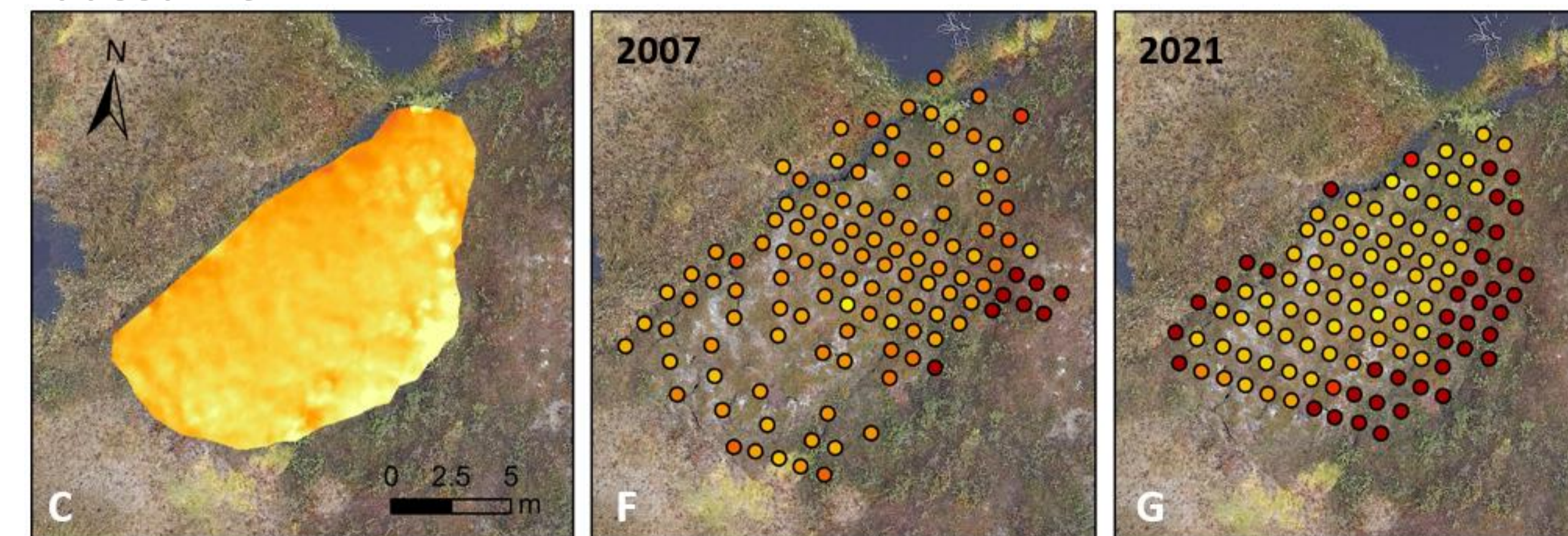
We used aerial orthophoto time-series analysis (1960–2012), Unmanned Aerial Systems (UAS) surveys (2016–2021) and detailed field measurements (2007–2021) to investigate changes at two palsa sites (Peera and Laassaniemi) located in North-West Finland.

- ❖ Palsa edges were manually digitised from all aerial orthophotos to quantify loss of permafrost area (Fig. A).
- ❖ Volume and height changes (Fig. B and C) were derived from UAS digital elevation models.
- ❖ Active-layer thickness (ALT) was measured annually at ca. 400 points (Fig. D-G).

Peera



Laassaniemi



Conclusions

Less than 25 % of permafrost area was left in 2021 compared to 1960's extent at both of our study sites. Different signs of degradation (loss of area, increasing thermokarst and thickening active layer) are more pronounced in Peera palsa, however. Extent of detectable palsas in Laassaniemi has not changed much after 2012. Here, the degradation is observed mainly as gradual lowering of palsas' profile. Although the lateral extent of the frozen core of Laassaniemi palsa is decreasing, the active layer above the remainign core is becoming shallower.

The archival orthophotos and UAS data reveal palsa degradation in great details, while the long-term field observations allowed us to detect contrasting trends in the active layer thickness between the two sites.

Acknowledgements

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References

Fewster, R.E, et al. Imminent loss of climate space for permafrost peatlands in Europe and Western Siberia. *Nat. Clim. Chang.* (2022) <https://doi.org/10.1038/s41558-022-01296-7>
Luoto, M., et al. Loss of palsa mires in Europe and biological consequences. *Environ. Conserv.*, (2004), DOI: 0.1017/S0376892904001018