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| **Modernization and transformation of Lithuanian National Forest Inventory: the role of remote sensing** |
| **Introduction/Aim:** The Lithuanian National Forest Inventory (NFI) has evolved into a primary data provider for numerous national and international forestry stakeholders over the last quarter-century. Incorporating data collection for greenhouse gas reporting in the Land Use, Land Use Change, and Forestry sector (LULUCF) a decade ago transformed the Lithuanian NFI into a multidisciplinary activity. Methodologically, the Lithuanian NFI adheres to principles developed several decades ago, employing systematic sampling that includes measurements on more than sixteen thousand plots and relies heavily on human field measurements. However, ongoing efforts are being made to update the inventory to align with current international and national legal frameworks, particularly in upgrading the sampling scheme to facilitate wall-to-wall mapping of both land uses and forest land attributes. The presentation aims to introduce the latest developments of the Lithuanian NFI and its adaptation to the current international and national legal framework, focusing primarily on the enhancement of the sampling scheme to enable comprehensive mapping of land uses and forest land attributes.**Methods:**The sampling design is founded on the potential of remote sensing to identify historical land use conversions and the evolution of forest land attributes. Although airborne laser scanning data serves as the primary information source, other forms of remotely sensed data, particularly those available for historical periods, are integrated and verified alongside GIS datasets associated with land use or land cover. Initially, land use types are identified across a network of virtual sample plots distributed throughout the entire country at 25x25-meter intervals. This process combines information sourced from spatial databases with data derived from airborne laser scanning, airborne orthophotos, and satellite images to justify specific land use classifications. Subsequently, the grid of virtual sample plots is refined to a resolution ranging from 5x5 to 12.5x12.5 meters for forested areas to accurately characterize their dendrometric properties, leveraging remote sensing techniques and data from the NFI permanent field plots. Furthermore, a modeling approach to reconstructing past land use development is applied. This involves utilizing historical land use data from NFI permanent plots and earlier versions of spatial data, supported by historical remote sensing imagery, as inputs for machine learning algorithms. **Results:** Operational guidelines for new Lithuanian NFI starting from 2025 are elaborated and validated. Additionally, examples demonstrating the improved Lithuanian NFI for updating the State forest cadastre, facilitating private forest management planning, and supporting carbon farming initiatives are provided. **Conclusion:** The suggested approach could be applied for wall-to-wall mapping of current land use and the reconstruction of past land use and forest dynamics. This contribution aids in developing a comprehensive understanding of landscape evolution over time, particularly as part of continuous forest monitoring and sustainable management efforts aimed at delivering multiple ecosystem services. |