

Projects / initiative

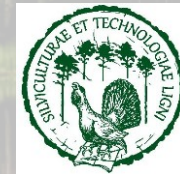
Selected Remote Sensing Methods Used in Polish Forestry

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Department of Forest Engineering
POLAND



Network to Innovate: New Innovative
Technologies in Forestry
8 September 2026

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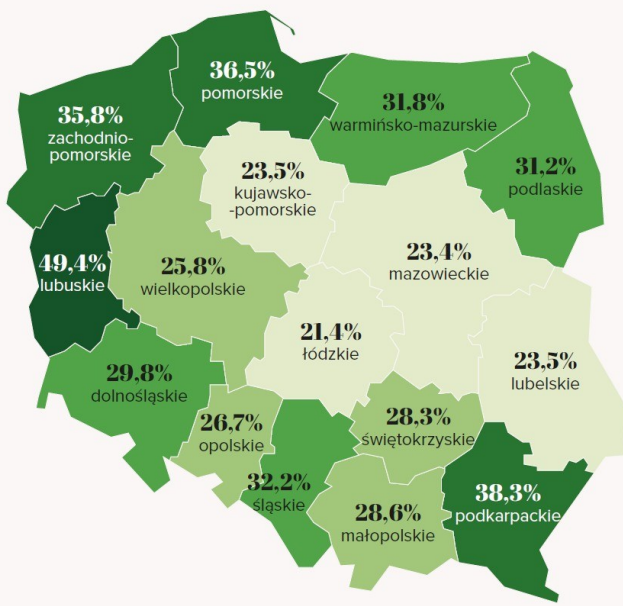
Selected Remote Sensing Methods Used in Polish Forestry

- Measurement of roundwood stacks
- Use of airborne laser scanning (ALS, ULS) data in Polish forests

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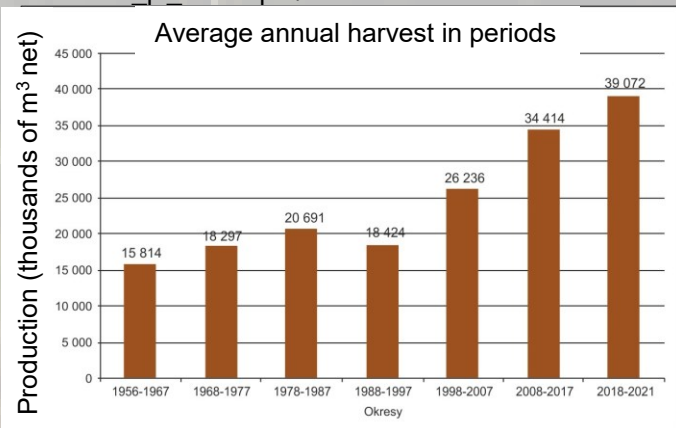
Measurement of roundwood stacks

FOREST COVER OF VOIVODESHIPS IN POLAND

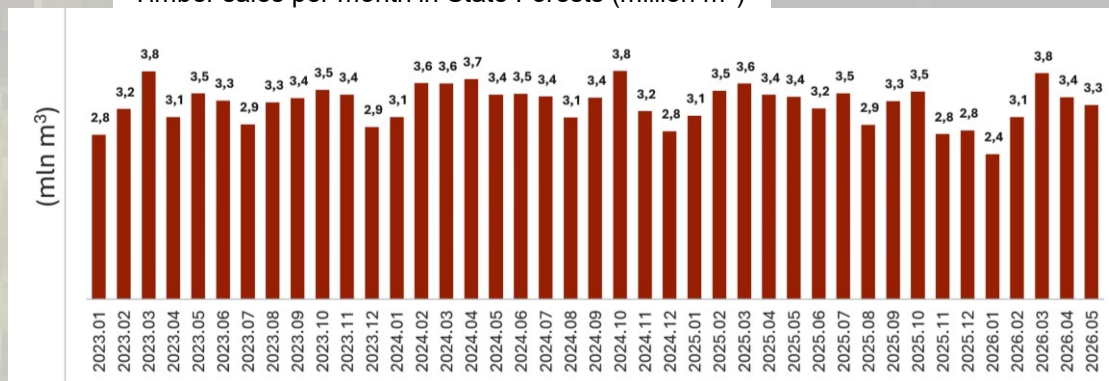


- Forests serve many functions; the economic function primarily involves **supplying timber** to society and the economy,
- Supplying timber process includes several steps: harvesting, extraction, formation into stacks at the forest roadside, and **roundwood measurement**,
- The stacked roundwood is measured to **calculate the volume and value**,
- Accurate estimation of the volume of roundwood is essential for **billing purposes and economic success**.

https://www.lasy.gov.pl/pl/informacje/publikacje/dopocztytania/lasy-panstwowe-w-liczbach-1/lasy-w-liczbach_pl_online.pdf/view



Timber sales per month in State Forests (million m³)



<https://www.gov.pl/web/klimat/bezpieczna-przyroda-i-stabilny-przemysl-polskie-drewno-zasila-rodzimy-rynek-zamiast-plynac-do-chin>

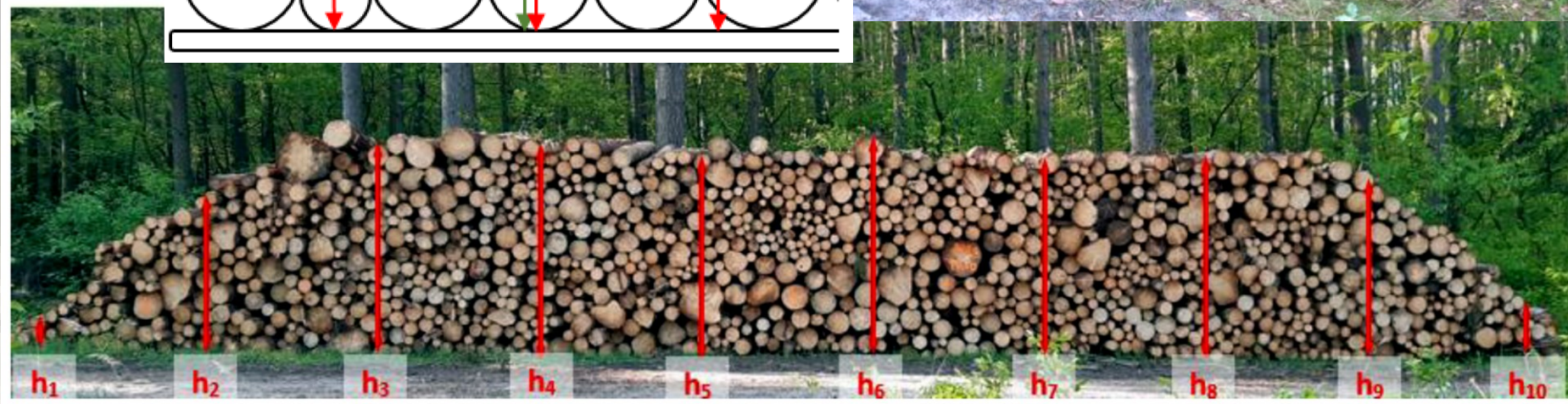
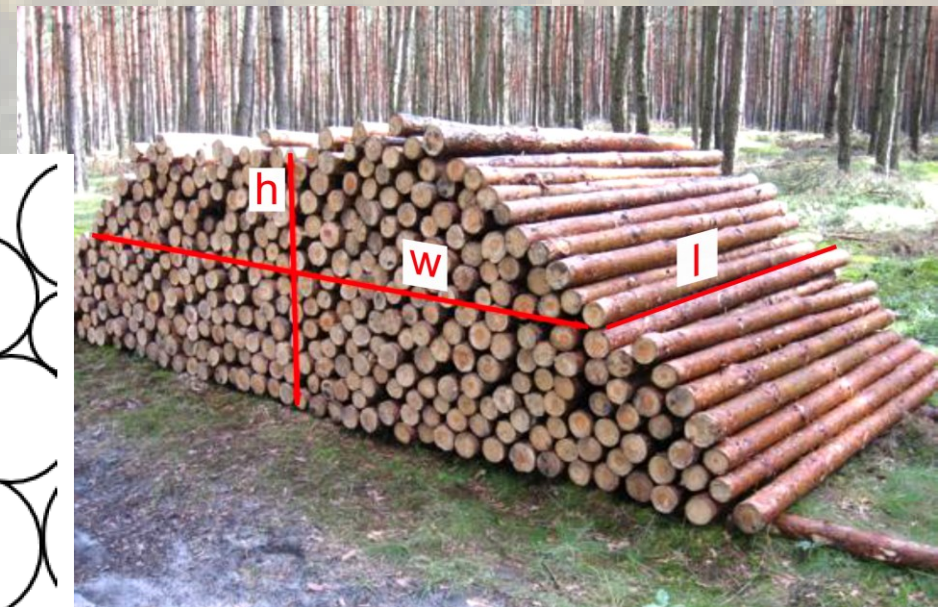
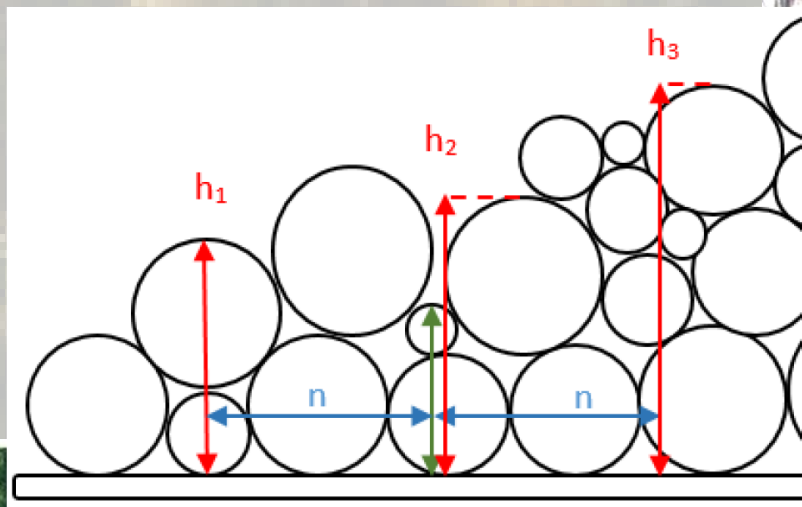
<https://gpd24.pl/wiadomosci/jak-zmieni-sie-wielkosc-pozyskania-surowca-w-najblizszych-latach/>

Measurement of roundwood stacks

- Procedure recommended by the Polish State Forests regulations,
- Length (l) – height (h) – width (w) – distance (n),
- Traditional measurement features:
 - number of measurements data,
 - manual data collection and entry into a database,
 - time.

Order No. 51/2019 of the Director General of the State Forests dated 30 September 2019 on the introduction of technical conditions in the turnover of wood raw material in the State Forests in Poland (mark: ZM.800.8.2019).

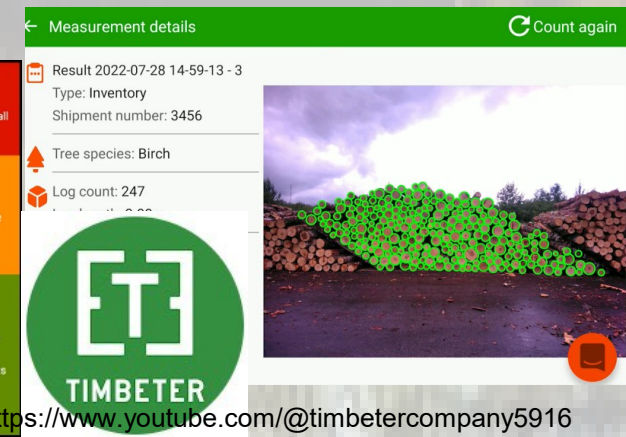
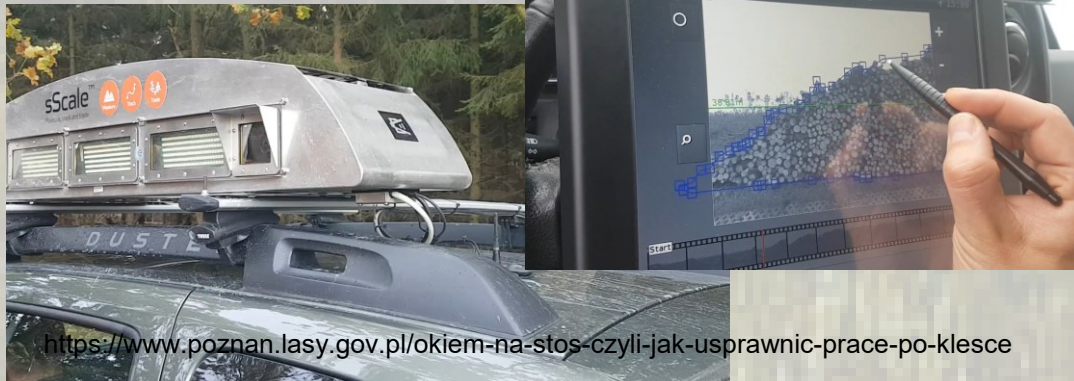
ORDER No. 69 of the Director General of the State Forests of July 30, 2025, amending Order No. 51 of the Director General of the State Forests of September 30, 2019, on the introduction of technical requirements applicable to the trade in wood raw material in the State Forests National Forest Holding by amending the content of the annexes (case reference: ZL.7603.13.2024)



Digital measurement of roundwood stacks

- tests and trainings

- Tests since 2013 in Poland: Świeradów Forest District, Development and Implementation Center of the State Forests in Bedoń,
- 2020-2023 – tests conducted by Poznań University of Life Sciences, Forest Experimental Station in Murowana Goślina,
- November 2021, Poznań – conference "Innovative Timber Measurement Methods in Forestry and the Wood Industry," Poznań University of Life Sciences,
- 2024 - wide testing in Pniewy Forest District at Poznań RDLP,
- tests of various systems: sScale and mScale (Dralle), iFovea Pro (Trestima), Timbeter (Estonia), LogStackPro, LogStackLidar (HD LogSystems), Trestima (Trestima OY).



Digital measurement of roundwood stacks

- tests and trainings

- 2020 – developing the standard for data integration with the professional application Leśnik+ (Forester+) used by Polish foresters in their everyday work, and the IT system of State Forests (SILP),
- Formal inclusion of digital, photo-optical measurement of wood in stacks using mobile devices in the technical specifications and regulations of the Director General on the measurement and classification of wood raw material,
- **Timbeter** has been chosen as the most convenient and easy-to-use application for Polish foresters,
- September 2025 - Order of the Director General regarding further pilot testing of the LogStackLidar application.



Digital measurement of roundwood stacks - tests and trainings

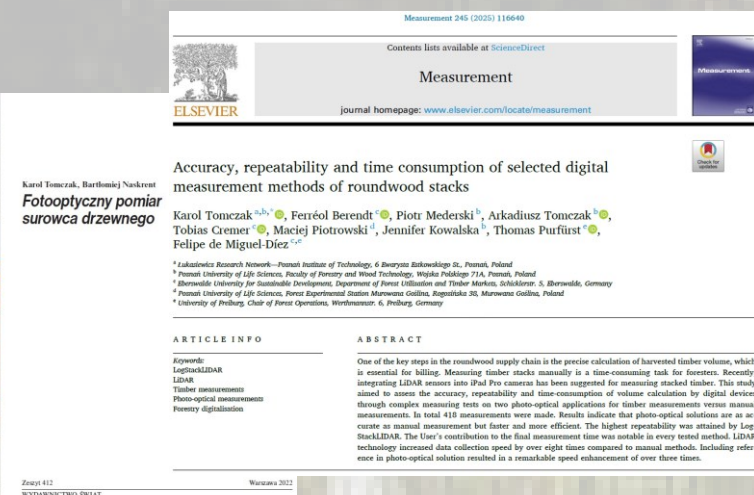
- The results of testing were analyzed, compared, described, and summarized in the professional manuals and scientific papers,
- Discussions during the professional conferences,
- Number of training sessions for users.

https://krzystkowice.zielonagora.lasy.gov.pl/aktualnosci/-/asset_publisher/1M8a/content/szkolenie-dotyczace-odbioru-klod-metoda-stosowa-



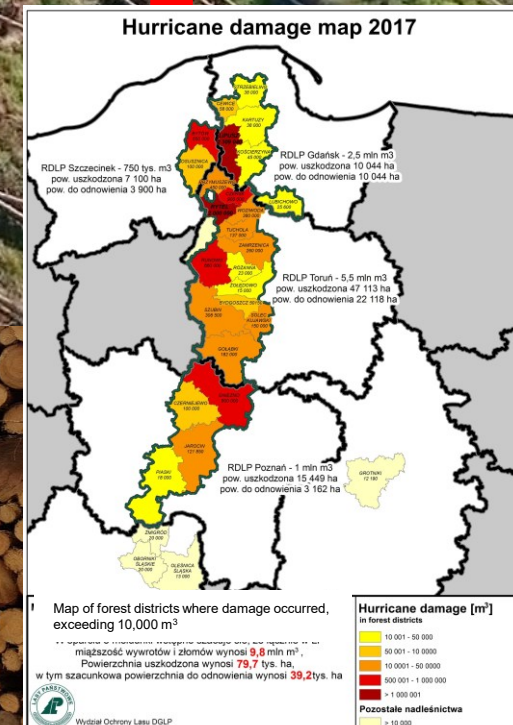
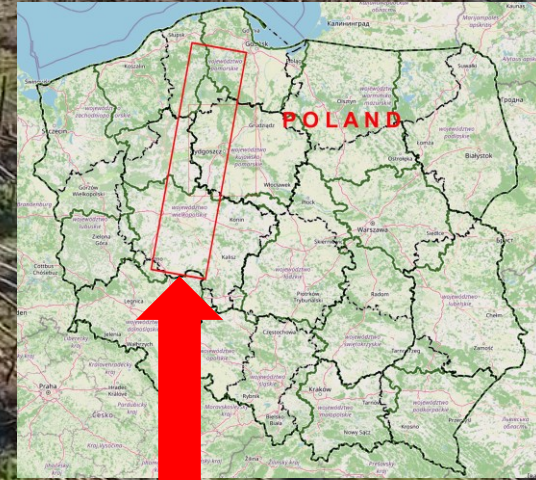
<https://firmylesne.pl/fotooptyczny-pomiar-drewna/>

https://jarocin.poznan.lasy.gov.pl/widget/aktualnosci/-/asset_publisher/jPX2/content/fotooptyka-w-lasach-panstwowych-coraz-blizej/maximized



Digital measurement of roundwood stacks in practice

- The state of emergency after the significant disaster in 2017,
- enormous losses in the Polish forests: 60 forest districts affected by the disastrous hurricane,
- damages of 79700 ha of forested areas,
- 9.8 million m³ of wood to measure and record,
- the first large-scale test for the systems of **digital measurement of roundwood stacks**



Digital measurement of roundwood stacks

The major features and principles of operation:

non-reference and reference measurements



(LSL)

- active LiDAR (laser) sensor – light pulses – measuring return time – an output: a 3D point cloud converted into a model to analyze,
- an operator walks/rides along the stack and records a video/scan,
- polygon representing the roundwood stack contour (stack face area) on a screen – editing by the user during processing,
- device equipped with a LiDAR sensor,
- no need for an external scale.



(Timbeter, iFovea Pro)

- a photo-optical system – measurements based on image analysis,
- one photo or a series stitched in one of the stack face area,
- the software analyzes the 2D image – calculates the face area using computer algorithms, AI, and recognizes the shapes of the roundwood,
- a reference element is needed – the section measured and marked at the stack face,
- a standard smartphone or tablet camera, Android or iOS processors.

Digital measurement of roundwood stacks

Factors influencing the efficient operation of digital stack measurement applications:

- ability to use various types of mobile devices: special tablets or phones with cameras; the better the camera matrix, the better the accuracy of the measurement image,
- a stable internet connection when transferring data to the server,
- sufficient RAM on the mobile device,
- a functioning processor.

Advantages



- at least the same level of accuracy as manual measurement,
- reduction of human error,
- increased speed – good, repeatability – efficiency in comparison to manual work;
- time saved for other foresters' activities,
- better working conditions,
- higher precision during trade transactions.

and

Disadvantages, concerns (are there any?)



- the need for precision in stacking the wood,
- staff reduction in the forestry sector?
-
-
-?

Use of airborne laser scanning (ALS, ULS) data in Polish forests

PAŃSTWOWE GOSPODARSTWO LEŚNE LASY PAŃSTWOWE

Instrukcja urządzania lasu

Część I

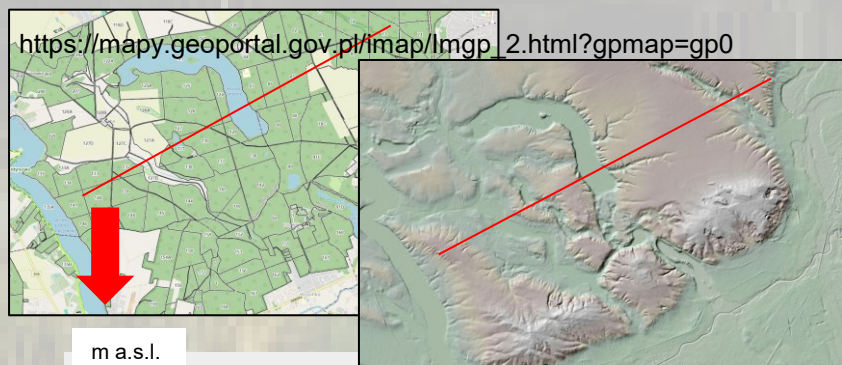


Forest Management Instructions 2024: Chapter II. Inventory works, subchapter 4. Inventory of wood resources in the forest district,
4.2. Description of the volume inventory by airborne laser scanning using fixed reference ground test surfaces (ALS method)

Standardization of the method used for:

- 1) inventory of timber resources;
- 2) field forest assessment and forest stand description;
- 3) forest map updates.

ALSgator application – estimation of the abundance of forest stands from ALS



Project REMBIOFOR 'Remote sensing-based assessment of woody biomass and carbon storage in forests' funded by: National Centre for Research and Development in Poland under the BIOSTRATEG programme (grant agreement number BIOSTRATEG1/267755/4/NCBR/2015) and The State Forests National Forest Holding.



m a.s.l.

distance

Distance m

Use of airborne laser scanning (ALS, ULS) data in Polish forests

- Scientific and utility projects developing the use of laser scanning data for practical forestry,
- State Forests cooperation with scientific institutes and universities,
- Cooperation with professional companies in the field of RS,
- The role of the State Forests IT Department in the integration of ALS data and products of their processing with the IT system of the State Forests (SILP).



Zakład Informatyki Lasów Państwowych
im. Stanisława Kostki Wiśnińskiego

Project No.: 500463: Extension of the forest management inventory method using the results of the REMBIOFOR project. By Consortium: Forest Research Institute (Leader), Institute of Dendrology of the Polish Academy of Sciences in Kórnik, University of Agriculture in Kraków, Warsaw University of Life Sciences. Project manager: dr. hab. Krzysztof Stereńczak.

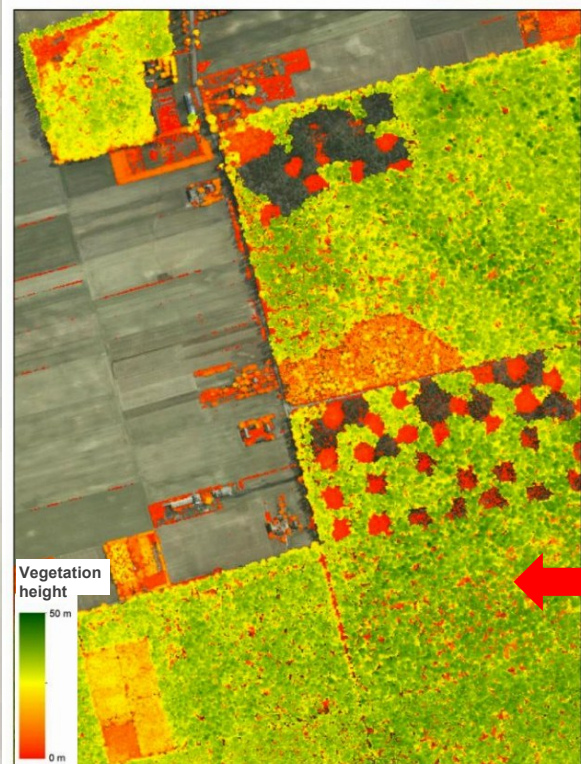


<https://tpi.com.pl/rozwiwania-pomiarowe-dla-lesnictwa/#>

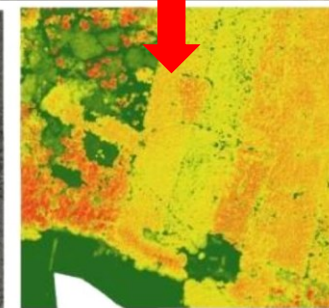
Project No. 12/22: Timber resources of the inventory unit in the light of various inventory methods and the volume of the stand obtained using these methods and the actual volume of the harvested timber. Author: Poznań University of Life Sciences Author: prof. dr hab. Roman Jaszczak.

Project No. 3/15: An inventory of the country's actual forest cover using existing photogrammetric data. By the Institute of Geodesy and Cartography. Project manager: Dr. eng. Agata Hościło.

State Forests project search engine:
<https://tbr.lasy.gov.pl/apex/f?p=102:1:::>



Research area



Tree crown height model

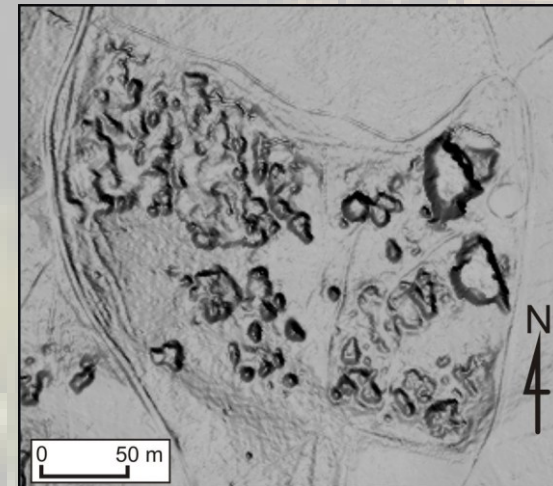
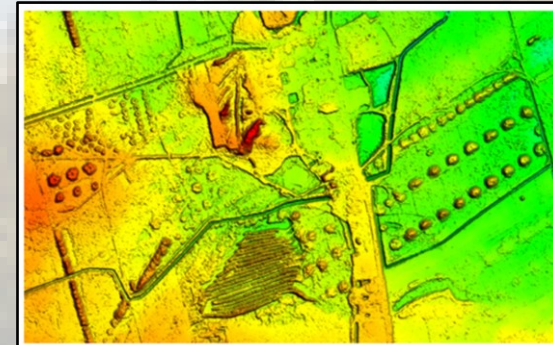


Boundaries of divisions

Use of airborne laser scanning (ALS, ULS) data in Polish forests

Other fields of application:

- Past and present mining activities in forests; impact on forest condition,
- Forest engineering, support for the design and optimization of forest road networks,
- Forest archaeology, detection, investigation, and protection of heritage objects; locating and investigating wartime objects and execution sites, locating graves
 - in combination with other remote techniques, e.g. GPR
 - the current fields of activity in the Department of Forest Engineering, Poznań University of Life Sciences (Poland).



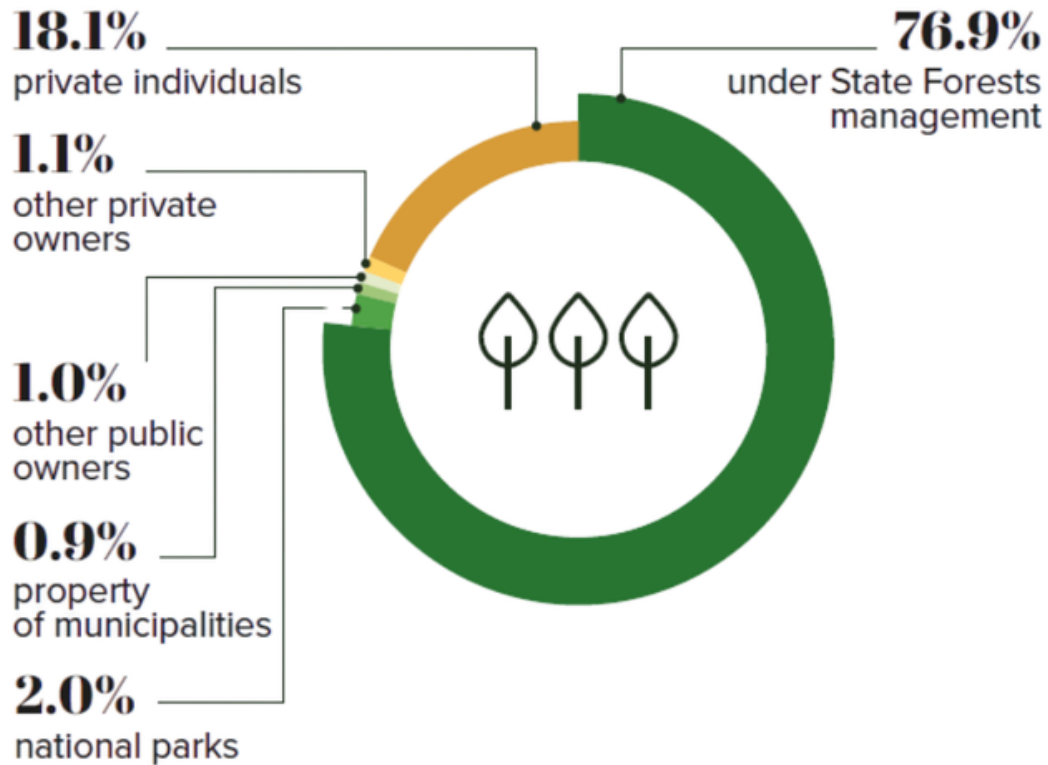
Kurowska, Grzyb, Czerniak, 2026: <https://doi.org/10.3390/f17010037>

Kurowska, Czerniak, Bańkowski, 2023: <https://doi.org/10.3390/f14071386>

Collaboration with other stakeholders

The State Forests National Forest Holding

OWNERSHIP OF FORESTS IN POLAND



In Poland

<https://www.lasy.gov.pl/en/about-state-forests/organization>

- forests cover nearly 9.3 million hectares - 29.6% of the country's total area,
- the vast majority are publicly owned - more than 7.1 million hectares managed by the State Forests National Forest Holding.

Collaboration: Ministry of Climate and Environment,
Scientific and research institutions: Forest Research Institute (IBL),
Forestry departments of universities, Polish Academy of Sciences (PAN);
Chief Inspectorate of Environmental Protection (GIOŚ) and Regional
Directorates for Environmental Protection (RDOŚ),
Uniformed and rescue services: State Fire Service (PSP),
and Volunteer Fire Departments (OSP),
Local government units,
Educational institutions,
Ministry of Science and Higher Education

Thank you!

Ewa Kurowska

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