



Czech University of Life Sciences Prague

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Forest monitoring systems in the Czech Republic.

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Presentation outline:




- Czech forest brief overview
- History of forest monitoring (Forest management plans)
- National forest inventory
- Technology in different periods and its evolution
- Future perspectives

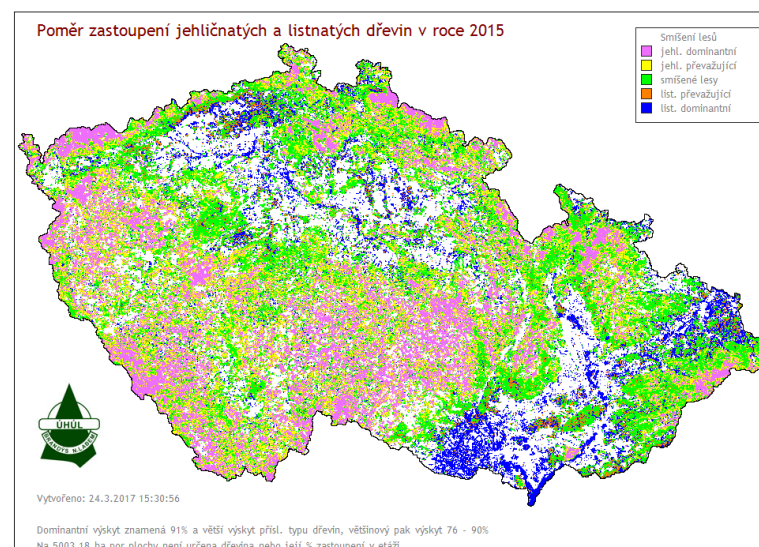


Czech republic has 36% of its territory covered by forests

2 904,2 thousands hectares (NFI 2)

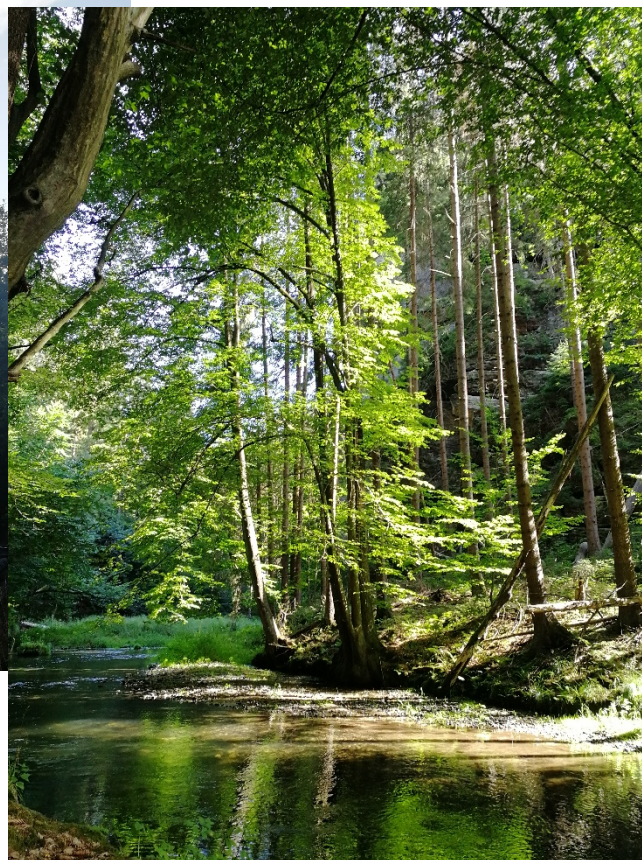


-  dominant coniferous
-  mixed
-  dominant broadleaves





Mountain coniferous .. through mixed midhigh



.. till low lands forests with abundant water



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History of forest inventory

How did it all started.. And WHY?

1355 Maiestas Carolina – king's Charles IV interest in order for Czech land, includes also forest protection (protect the beauty of the Czech forests)

1565 Constitutio Maximiliana – probably first forest legislation with aim to provide hints for management and information about forests (protect the continuity of wood resources and the first clear order to: Measure forests)

The inventory is later carried on by forest orders:

Locally for individual stakeholders and counties

Globally 1754 Maria Theresa Forest order – the summaries from cadaster are used to estimate the area of forest land and amount of forest, mostly for tax purposes



Around the year 1855 it is considered as approximate start of statistical sampling

Usually done by forest services (institutes) separately for Czech, Moravia and Czech Silesia

- Statistical report about forest status in republic of Czechoslovakia as of the year 1920 (State statistical office)
 - Done by questionnaires
- The law č. 37/1928 forest protection (first time obligation to have forest management plan)
- In 1.1.1935 forest taxation office (the predecessor of current forest management services)
 - Later (1944) department for forest typology

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Lesy.
(Viz tab. 7 a diagr. 10.)

Lesní plocha zaujímá 4,663 tisíce ha, t. j. 33% z výměry celé republiky. V jednotlivých zemích podobně zaujímá lesní půda třetinu nebo něco méně než třetinu celé plochy, ale na Podkarpatské Rusi celou polovinu.

Tab. 7. Lesy podle stavu z roku 1920.

	Cechy	Morava a Slezsko	Podkarp. Rus	Slovensko	Podkarp. Rus	Republika	
I. Celková plocha lesní.							
Celková plocha lesní koncem roku 1920 v tisíc. ha	1,572	797	643	154	1,659	635	4,663
V % úhrnné plochy lesní v celé republice	33%	17%	13%	3%	35%	13%	100%
V % velkové plošné výměry té které země	30%	29%	28%	34%	33%	50%	33%
Plocha lesní, o níž data pro r. 1920 zjištěna, v tisíc. ha	1,572	797	643	154	1,548	612	4,529
II. Plocha zalesněná dle druhů porostů a tvaru lesů.							
Ze zjištěné plochy lesní bylo skutečně zalesněno							
tisíc ha	1,512	761	614	147	1,442	557	4,272
z ní připadalo tisíc ha:							
1. na porosty: a) jehličnaté	1,300	467	375	92	440	124	2,331
V tom čistě porosty smrkové							
b) listnaté	709	231	173	58	149	107	1,196
c) smíšené jehličnaté a listnaté	142	166	122	44	302	56	666
2. na lesy: a) vysoký	1,468	677	532	145	1,311	547	3,903
b) střední	9	19	19	6	12	1	41
c) nízký	32	65	63	2	208	6	310
III. Výroba dříví.							
Výroba dříví r. 1920 úhrnem [v tisících m ³ na 1 ha v m ³]	5,362	3,928	2,867	731	3,715	704	13,379
V tom: užitečného	199	198	170	28	276	122	755
palivového	2,748	1,655	1,168	487	1,530	49	5,973
a palců	208	625	572	33	1,336	481	2,710
kletu a odpadků	1,777	883	741	142	374	6	3,040
Průměrný roční přírůstek [v tisících m ³ na 1 ha v m ³]	4,10	2,37	2,16	21	199	55	901
r. 1920 u všech tvarů lesů	4,861	2,965	2,273	692	4,586	1,632	14,044

*) Mimo to u Slovenska resp. v úhrnu 697 ha ochranného lesa, o němž podrobná data nebyla udána. — *) Mimo to jest kosodřeviny v Cechách 2,951 ha, na Moravě 20 ha, ve Slezsku 56 ha, na Slovensku 2,471 ha, v úhrnu 5,564 ha; vedle toho na Slovensku není dat o tvaru lesů na ploše 8,314 ha, v Podkarp. Rusi na ploše 4,457 ha, resp. v úhrnu na ploše 12,771 ha. — *) Na Slovensku a v Podkarp. Rusi nebylo možno zjistiti výrobu na celé zalesněné ploše; plocha, kde výroba neexistuje, činí na Slovensku 172,818 ha, v Podkarp. Rusi 357,910 ha, celkem 530,728 ha.



- 1. cycle of Forest Management Plans update in 1947/48 – first so called Forest inventory (based on FMP only) in 1950
- 2. cycle Forest management plans update includes also mapping, forest typology, protection and more information– Forest inventory 1960.
- 3. cycle Forest management plans update (1971) – Forest inventory 1970
- Since 1979 – starting to build permanent updates of FMP annually).
- 4. cycle Forest management plans update – Forest inventory 1980.
- 5. cycle Forest management plans update– Forest inventory 1990.



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- Statistical sampling in defined points
- In comparison to FMP more parameters are measured
- 2001-2004 – 1. cycle (FieldMap technology for rapid digital data acquisition)
- 2011-2015 – 2. cycle, higher use of remote sensing
- 2016-2020 – 3. cycle, permanent inventory
- 2021-2025 – 4. cycle



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Everything started with the questionnaires

Later simple tools like calipers, dendrometric tapes started to be deployed

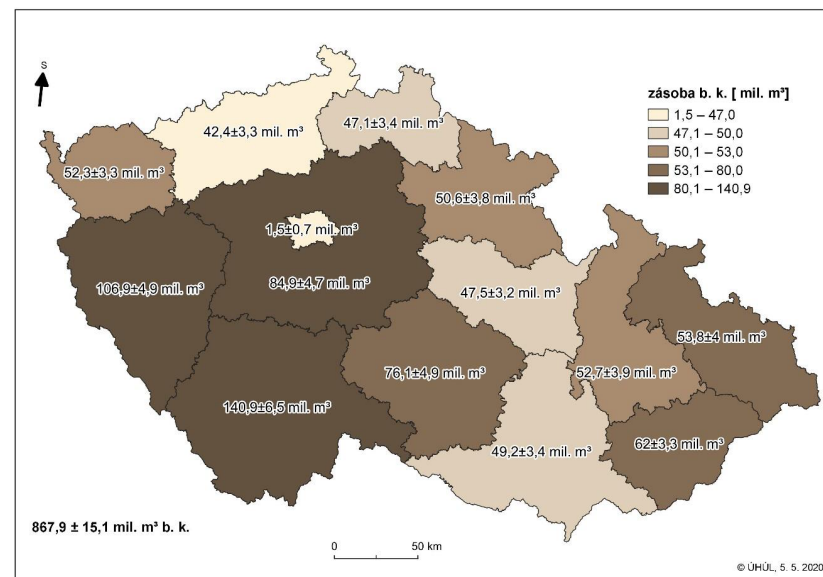
Leading to main technology : statistical mathematics

Sampling, inter- and extrapolating until the remote sensing appeared as breakthrough method

NFI 1 only information (forest/non forest) was used from aerial imagery

NFI 2 additional information is collected from remote sensed imagery from additional plots like canopy cover, etc..

Finally in NFI 3 RS was used to directly estimate wood volume using terrestrial plots and





Apart of these services following state-wide information is available:

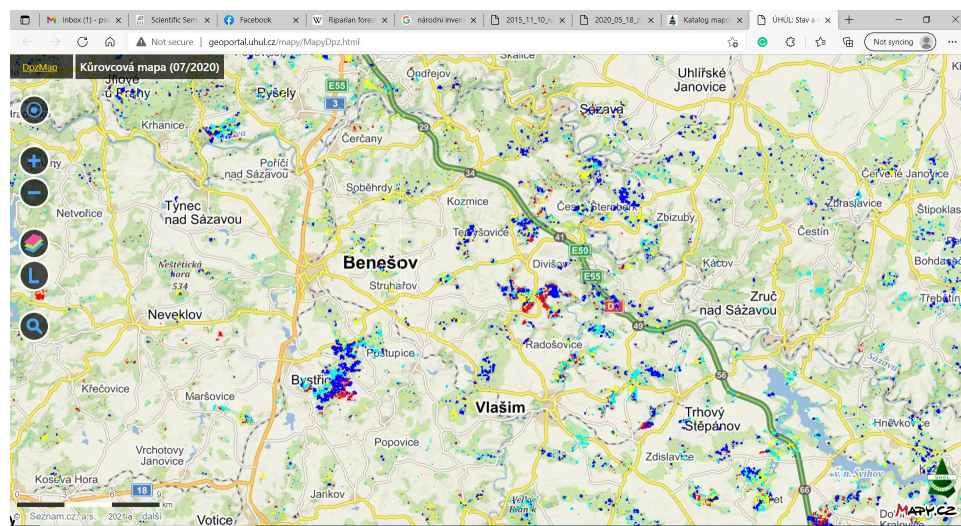
PlanetScope based map of forest harvest and mortality
(kurovcovamapa.cz) updated several times per year

Aerial imagery based map of harvest detection and nDSM

Forest health status

Forest growth status

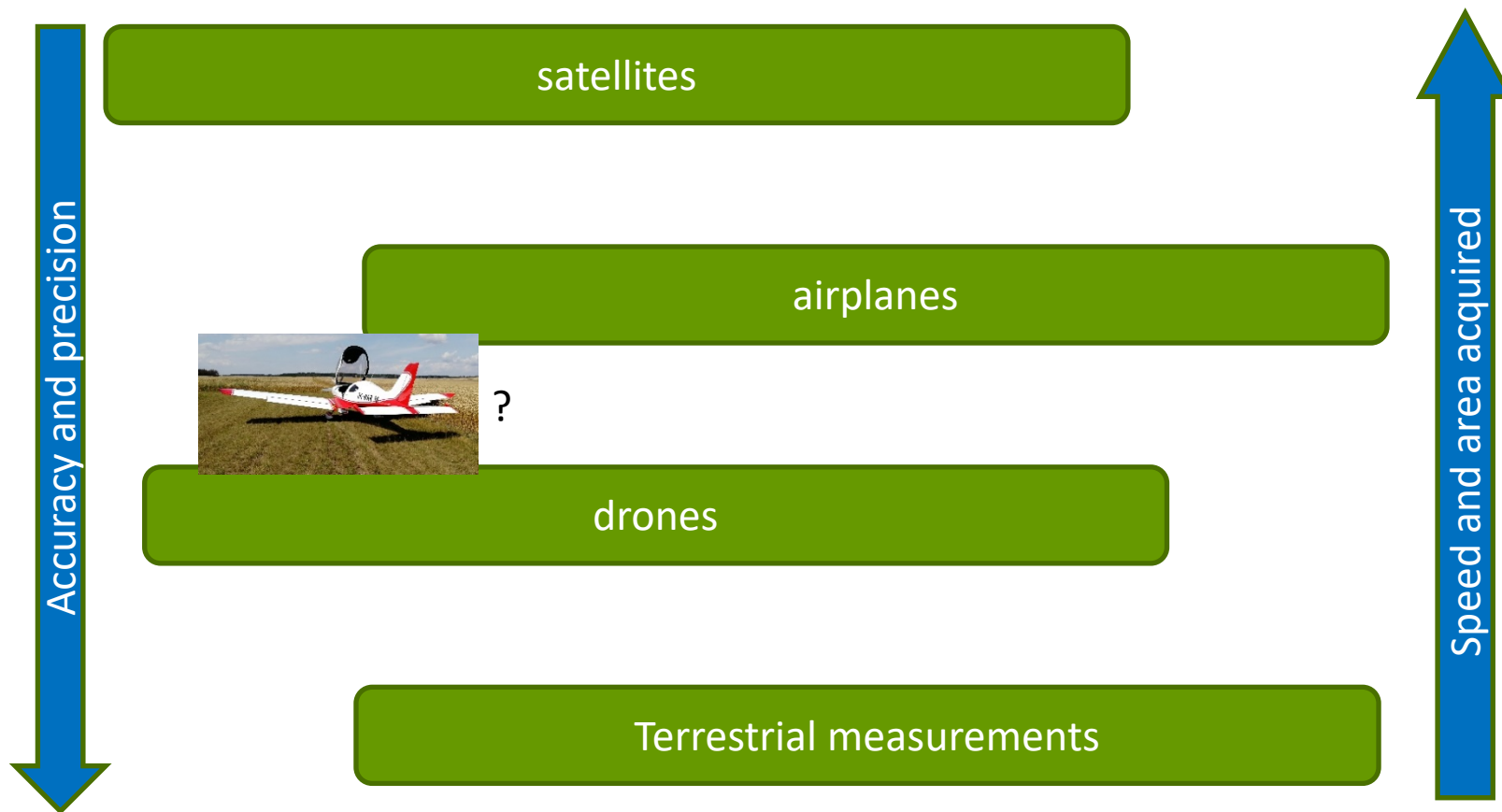
Forest species map
(satellite based)





All technology is available

4 levels of data acquisition





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- Over hundred years we monitor forests, the last decades are in the direction of remote sensing technology
- Different products are used by forest services in the Czech Republic for different resolutions
- The private owners are familiar with a certain amount of technology
- The most important information for growth and prediction (which is the age of the forest) can be achieved by more monitoring
- Better and more precise information means better and more stable forests

Thank you for your attention