The SPEED & the VOLUME of TREE BIOMASS ROTATION in natural temperate forest

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Czech Long-term Ecosystem Research Outputs

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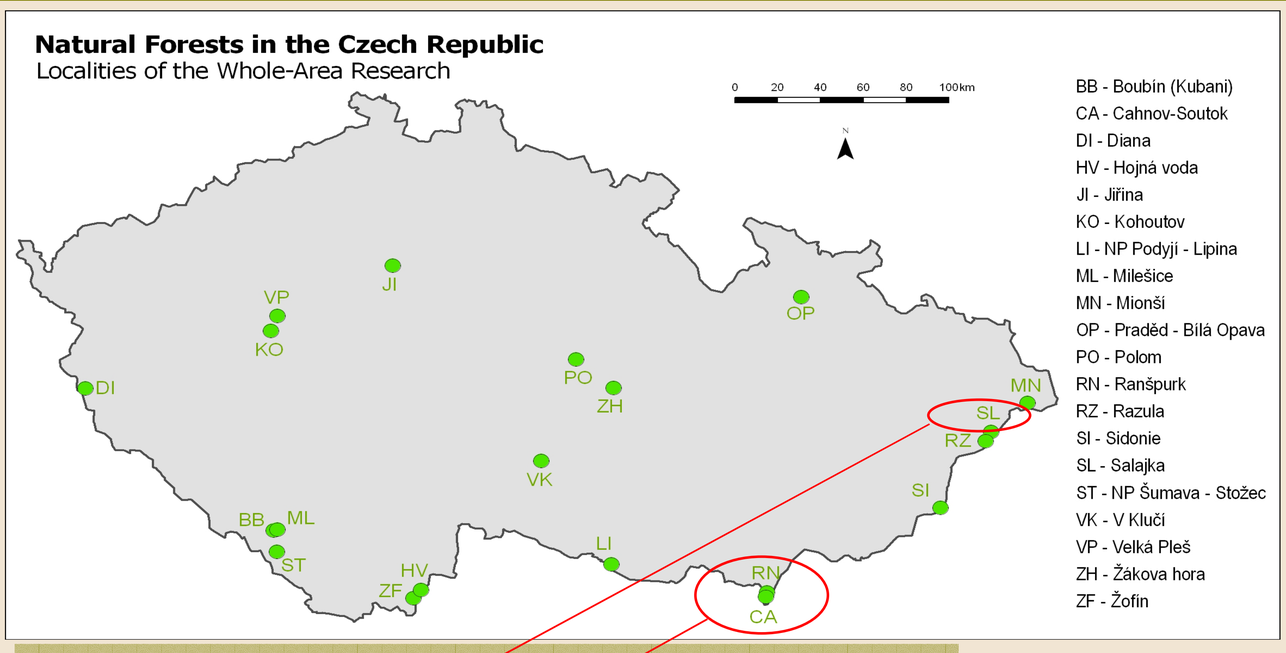
Goals...

- to describe long-term tree biomass volume oscillation (live+dead wood, live/dead wood ratio etc.)
- to describe the speed and the volume of tree biomass rotation
- to analyze the capability of (near) natural forest to balance the old influence of man or the actual disturbances

Methods...



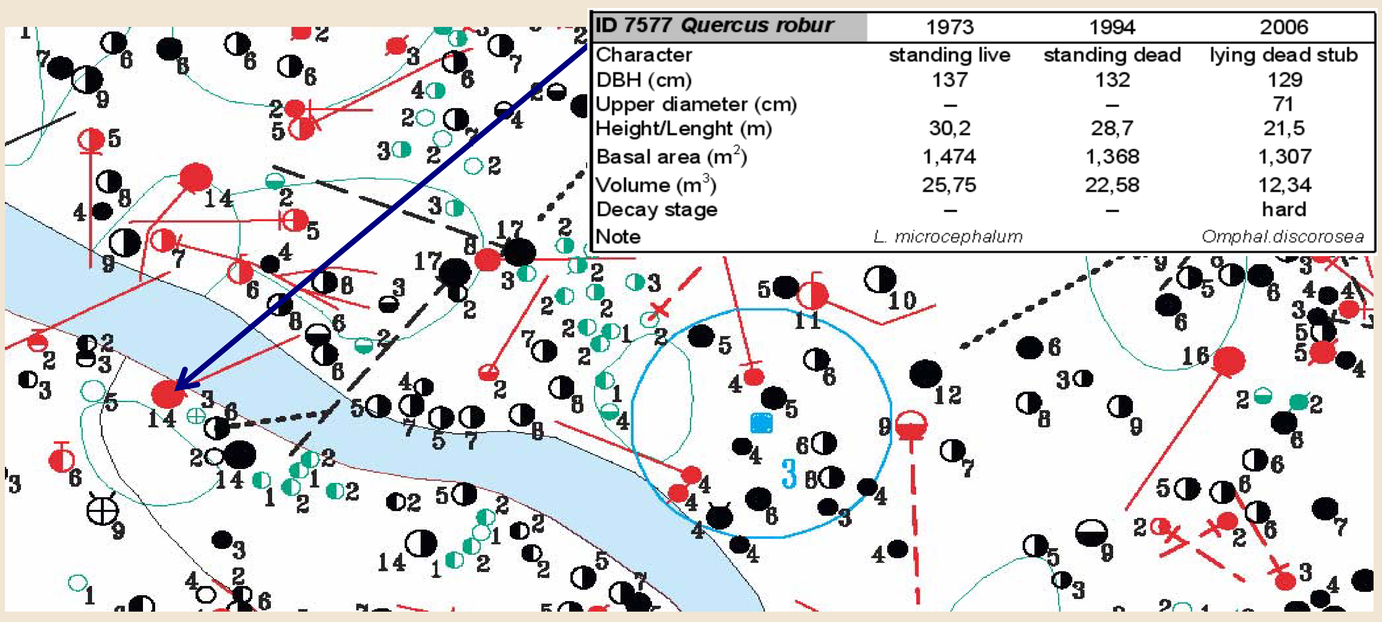
The large and long-term collected data sets are available:

LOCALITY	STAND TYPE	AREA [ha]	SURVEY YEARS	STANDING TREES COUNT	LYING TREES COUNT
Bílá Opava	mountain spruce	1.23	1974, 1999	222	28
Boubín	spruce-fir-beech	46.62	1972, 1996, 2010	13123	3357
Cahnov-Soutok	alluvial hardwood	17.32	1973, 1994, 2006	4091	505
Diana	fir-beech	19.78	1994, 2007	2177	201
Hojná voda	spruce-fir-beech	8.94	2001, 2011	3720	173
Jiřina	alluvial hardwood	1.82	1978, 1999	1164	77
Kohoutov	beech dominated	25.29	1978, 1998	2017	427
Milešice	spruce-fir-beech	8.86	1972, 1996, 2010	2790	393
Mionší 1	fir-beech	5.92	1995, 2009	2368	233
Mionší 2	fir-beech	1.00	1953, 1999	433	81
Mionší 3	fir-beech	2.54	1957, 2004	1325	370
Podyjí - Lipina	oak-hornbeam	4.60	2004, 2019	3495	1795
Polom	spruce-fir-beech + alder	19.34	1973, 1995	7650	602
Ranšpurk	alluvial hardwood	22.25	1973, 1994, 2006	6001	767
Razula	fir-beech	22.84	1972, 1995, 2009	4073	761
Salajka	fir-beech	19.03	1974, 1994, 2007	9255	1071
Sidonie	beech dominated	13.50	2005, 2020	3555	220
Stožec	ravine and slope	16.21	1974, 1998	2884	566
Velká Pleš	oak-hornbeam	10.45	1976, 1999	4543	974
V Klučí	fir-beech	1.50	1973, 2000	190	97
Žákova hora	spruce-fir-beech	17.46	1974, 1995	5962	679
Žofín	spruce-fir-beech	74.50	1975, 1997, 2008	18899	2862

DATA SOURCES:
- Salajka (21 ha); 10 000 trees measured three times
- Cahnov+Ranšpurk (38 ha); 11 000 trees measured three times
- whole area inventories
- all living and dead (standing + lying) trees DBH ≥ 10 cm were measured incl. position, stem parameters, decay stages, heights etc.

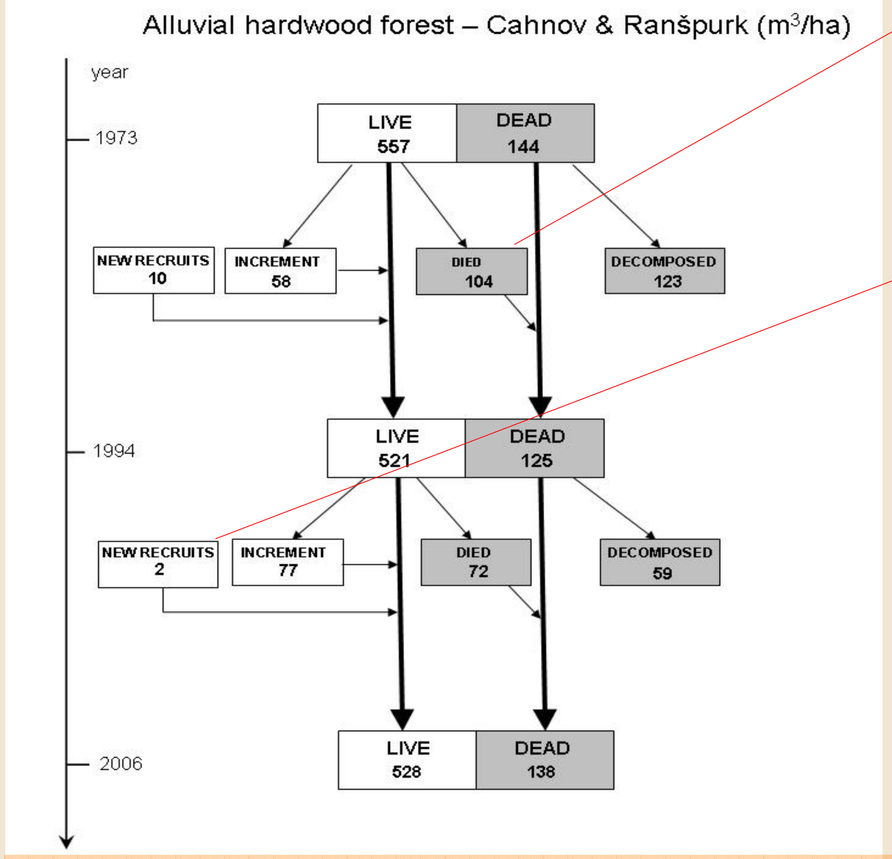
DATA PROCESSING:
- software PraleStat - http://www.pralesy.cz

ASSESSMENT DURATION:
- 1973-2008



ID 7577 *Quercus robur*	1973	1994	2006
Character	standing live	standing dead	lying dead stub
DBH (cm)	137	132	129
Upper diameter (cm)	–	–	71
Height/Lenght (m)	30,2	28,7	21,5
Basal area (m^2)	1,474	1,368	1,307
Volume (m^3)	25,75	22,58	12,34
Decay stage	–	–	hard
Note	*L. microcephalum*		*Omphal.discorosea*

First results...

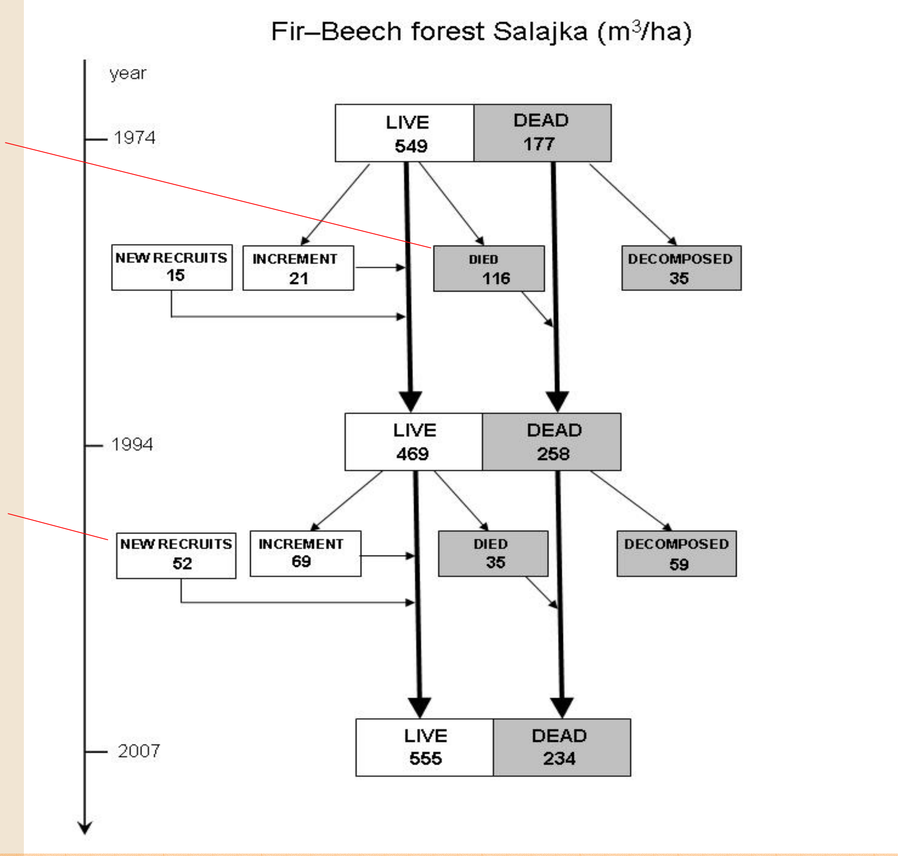


The end of pasture oak generation *decline*

The end of pasture fir generation *decline*

New ash, hornbeam, maple generation was limited by browsing of ungulates, but now is comming (under the registration limit yet)

New beech generation replaced the space of fir completely



Alluvial hardwood forest - m^3/ha/year

Period	Grown up	Decomposed	Balance
1973-1994	3,24	5,86	-2,62
1994-2006	6,58	4,91	1,67
1973-2006	4,45	5,15	-0,70

Period	Tree biomass rate (years)
1974-1994	112
1994-2007	87
1974-2007	104

Fir-Beech forest - m^3/ha/year

Period	Grown up	Decomposed	Balance
1974-1994	1,8	1,75	0,05
1994-2007	9,30	4,54	4,76
1974-2007	4,76	2,85	1,91

Period	Tree biomass rate (years)
1974-1994	95
1994-2007	186
1974-2007	120

- Alluvial hardwood forests Cahnov and Ranšpurk were old pasture oak dominated forests, but they are left to the spontaneous development since 1932.
- Lower mountain Carpathian fir-beech forest Salajka is one of the most well preserved fir-beech strict reserve in the Western Carpathians left to the spontaneous development since 1935.
- Both reserves have not been clearcut in the past.
- Alluvial hardwood forests Cahnov and Ranšpurk were influenced by decline of old oak pasture generation in the second half of 20th century, but the volume of oak tree biomass was replaced by hornbeam, ash, field maple etc.
- Lower mountain Carpathian fir-beech forest was influenced by decline of old fir pasture generation in 20th century , but the volume of fir tree biomass was replaced by beech rapidly (20 years).

⟶ **Both ecosystems demonstrate a high level stability in the total volume of tree biomass with an essential change in the tree species composition, spatial structure and age structure.**

-They are equal long term volumes of tree biomass in the lowland alluvial hardwood forest and in the lower mountain fir-beech natural forest

⟶ **The speed of alluvial hardwood forest biomass rotation is faster in comparison with biomass rotation of lower mountains fir-beech forest.**

Related papers

JANÍK D., ADAM D., VRŠKA T., HORT L., UNAR P., HORAL D., KRÁL K., ŠAMONIL P., 2008. Tree layer dynamics of the Cahnov-Soutok near natural floodplain forest after 33 years (1973-2006). European Journal of Forest Research 127 (4): 337-345.

VRŠKA T., ADAM D., HORT L., KOLÁŘ T., JANÍK D., 2009. European beech (Fagus sylvatica L.) and silver fir (Abies alba Mill.) rotation in the Carpathians - a developmental cycle or a linear trend induced by man? Forest Ecology and Management. 258 (2009): 347-356.

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