



## Lessons from the disturbance dynamics of lowland forests

---

Tomáš Vrška & Kamil Král

Silva Tarouca Research Institute, dpt. Forest Ecology

Brno, CZ – [www.naturalforests.cz](http://www.naturalforests.cz)



We have been surprised when the invitation to the workshop was delivered to our team

„.....simply setting aside forests for free development risks missing out on the conservation of associated biodiversity. Due to past land use and fragmented landscapes, **natural disturbances and process cannot fully operate within single small set-asides.**“

It is a very bold statement.

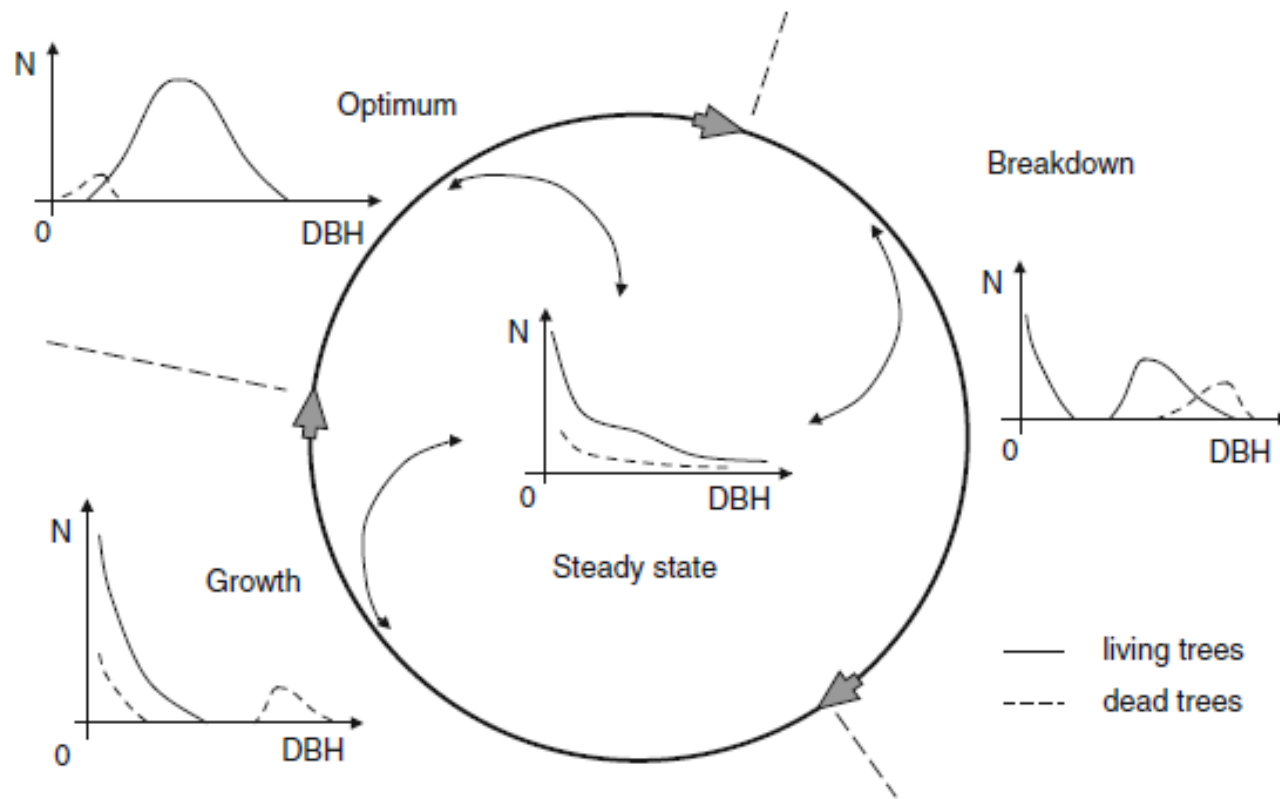
Who and where studied natural disturbances in lowland forests?

Which scientific publications?

## Problem definition:

- no virgin forests in lowlands
- old-growth forests are left to spontaneous development secondarily (formerly the pasture forests etc.)
- low number of localities left to spontaneous development (most protected areas are intended to active management)
- an even smaller number of localities with good scientific data
- short time of spontaneous development yet (more decades, but no hundreds of years)
- according to knowledges from highlands and mountains – disturbance dynamics is not fully developed (is not in full flow) yet – it needs time

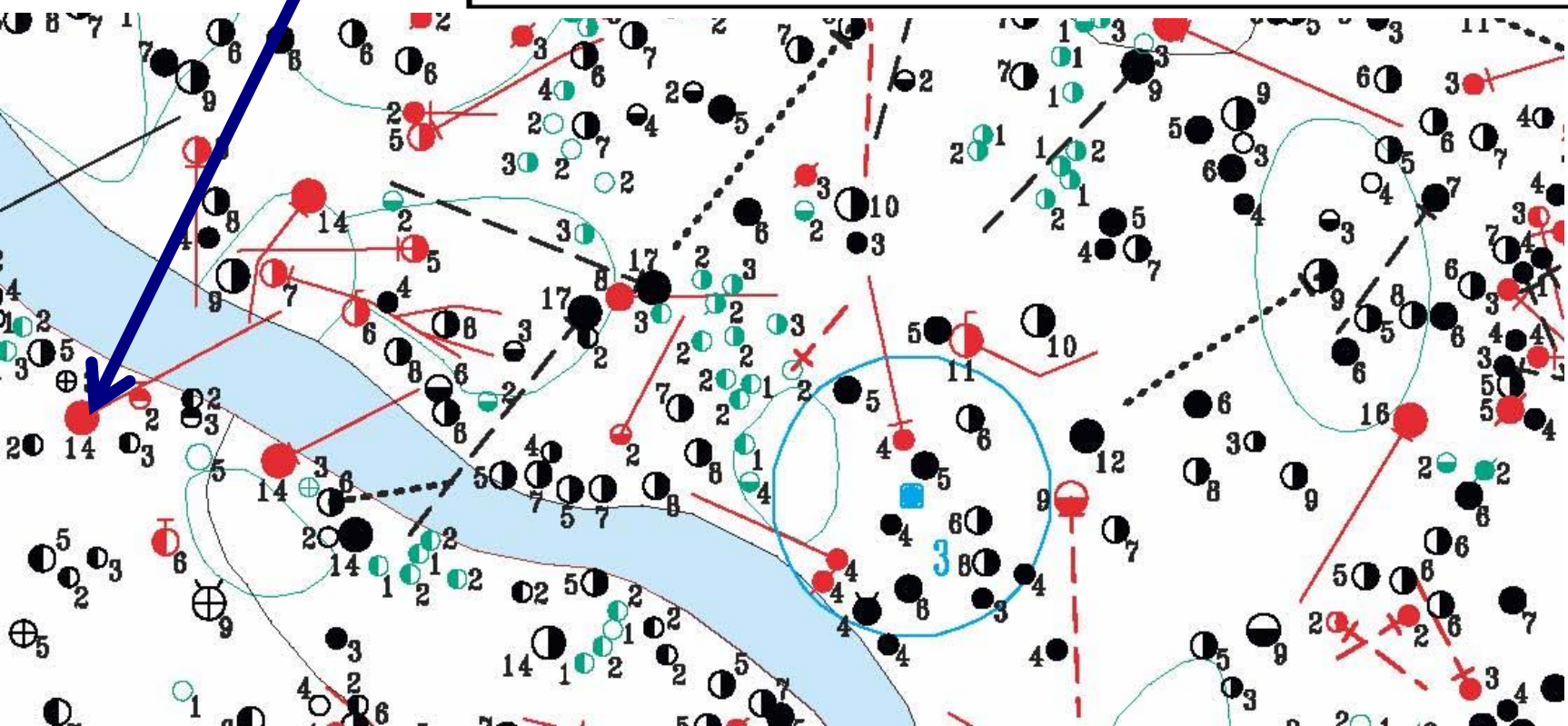
Simple theory, but more variable reality



Is the developmental trajectory really cyclical?  
What is the proportion of developmental stages?  
How does it change during the time?

# Stem position maps

ID 7577 <i>Quercus robur</i>	1973	1994	2006
Character	standing live	standing dead	lying dead stub
DBH	137	132	129
Upper diameter	—	—	85
Height/Lenght	30,2	28,7	21,5
Basal area	1,4741	1,3684	1,3069
Volume	25,75	22,10	17,35
Note	<i>L. microcephalum</i>		<i>Omphal. discorosea</i>



# Classification using ANN

Live trees:  
d<sub>1,3</sub> [cm]

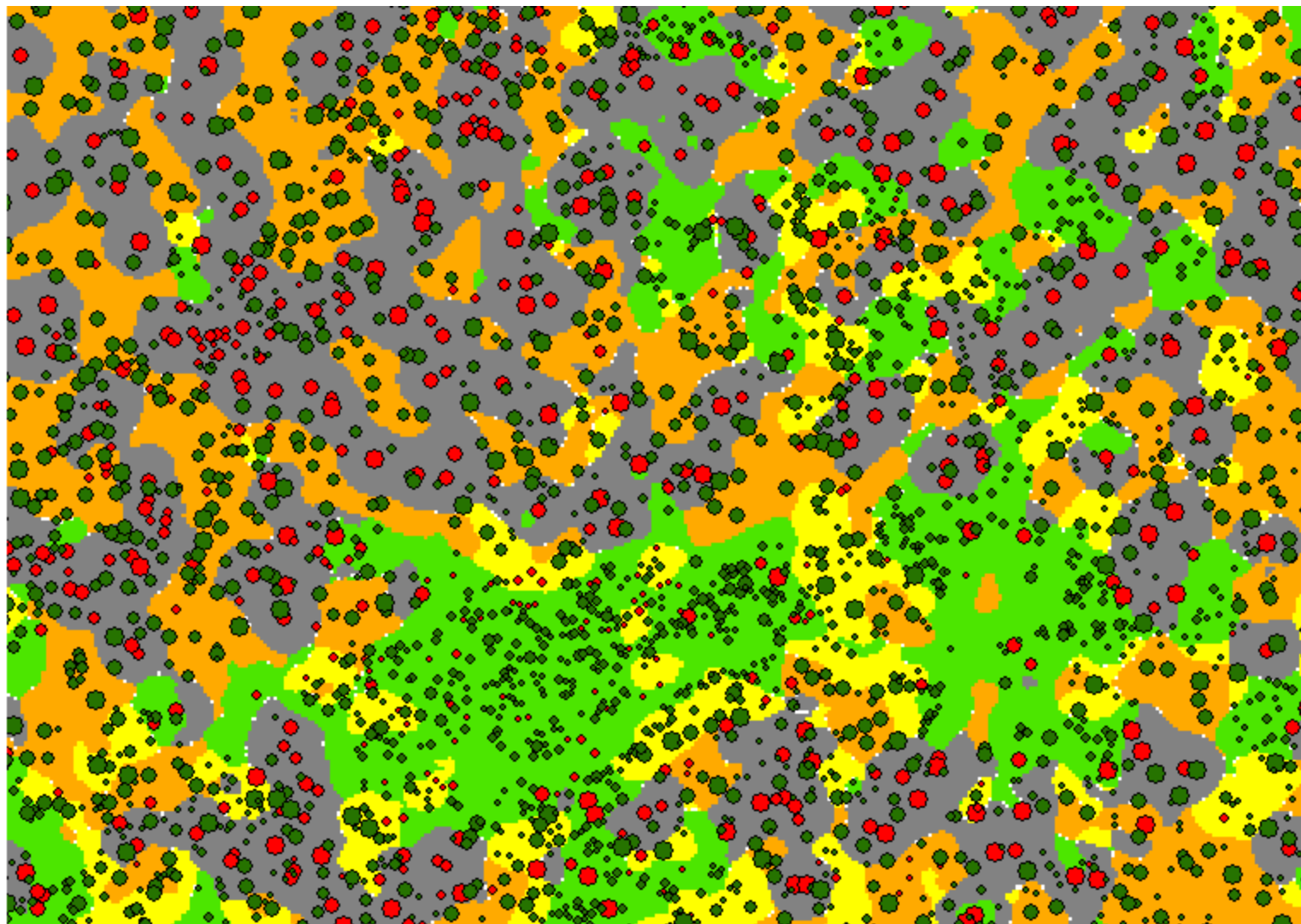
- 10 - 25
- 25 - 45
- 45 - 65
- 65 - 85
- 85 - 148

Dead trees:  
d<sub>1,3</sub> [cm]

- 10 - 25
- 25 - 45
- 45 - 65
- 65 - 85
- 85 - 165

Stage:

- Growth
- Optimum
- Breakdown
- Steady State

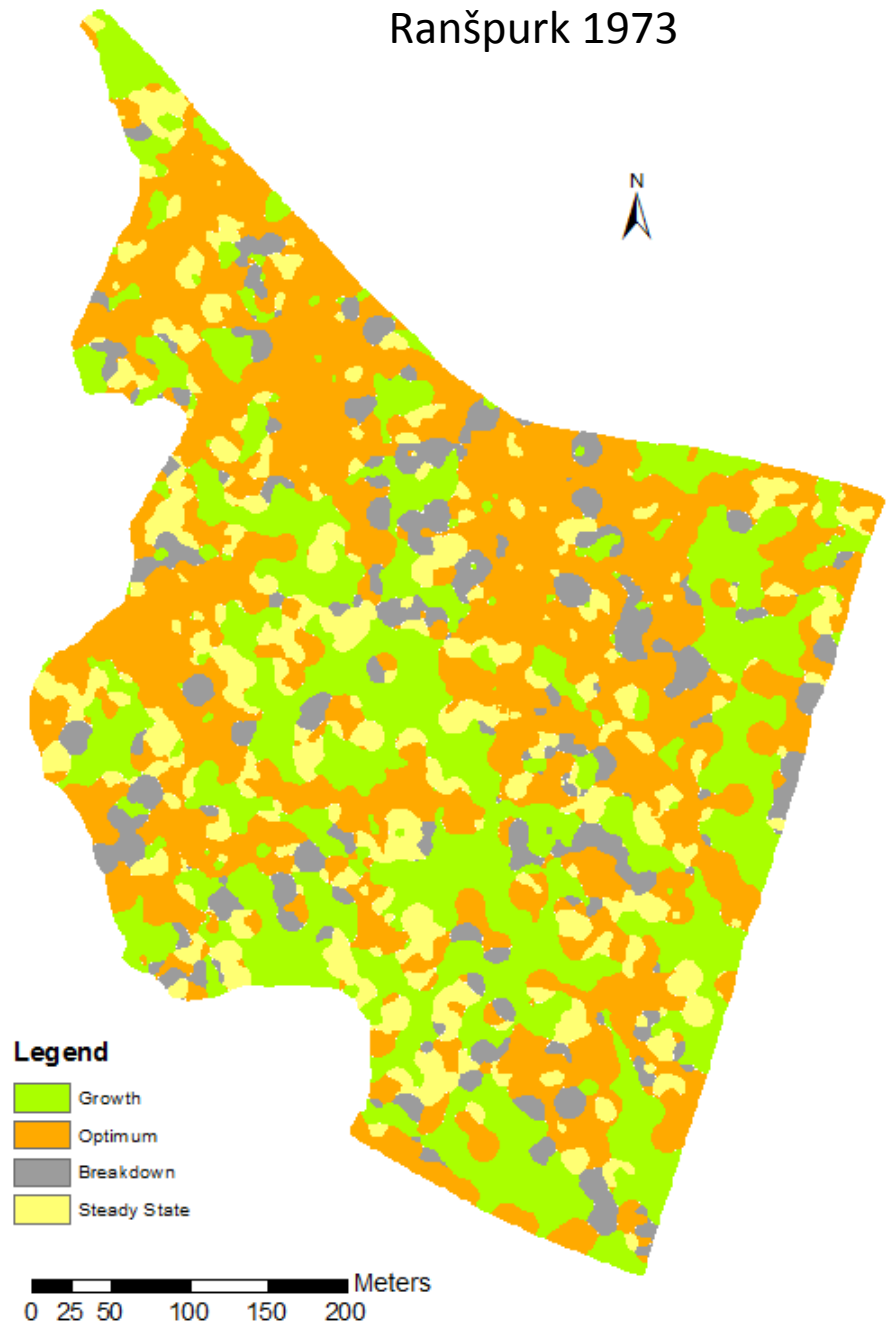


0 10 20 40 60 80 Meters

## Alluvial hardwood forest Ranšpurk (153-155 ma.s.l.):

- old pasture forest (till the half of 19th century)
- Formerly oak dominated forest, now mixture of hornbeam, field maple, ash, linden and other species
- totally left to the spontaneous development since 1932

Král K., Janík D., Adam D., McMahon S., Vrška T., 2014. Patch mosaic of developmental stages in Central European natural forests along an elevation and vegetation gradient. *Forest Ecology and Management* 330: 17-28.

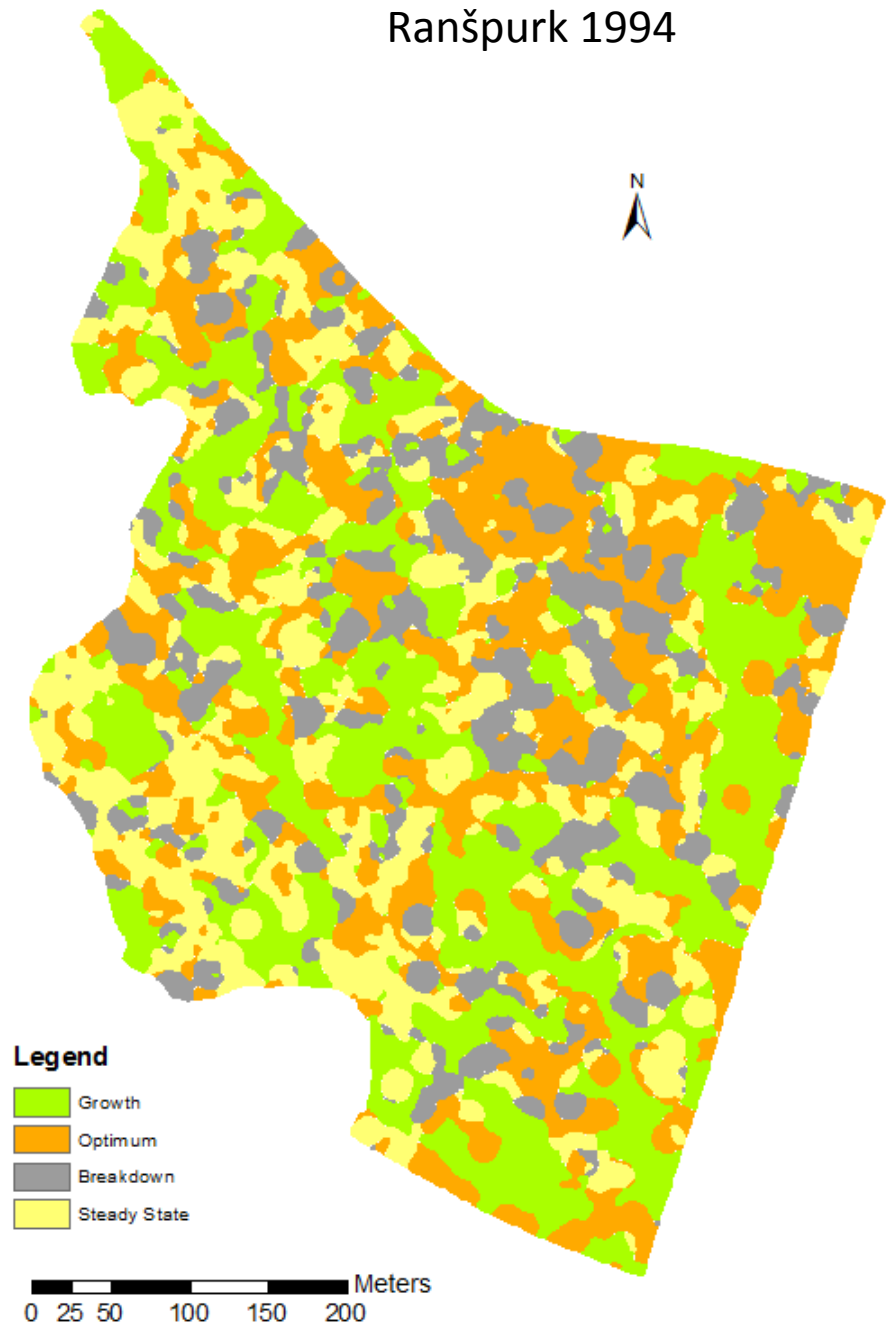




## Alluvial hardwood forest Ranšpurk (153-155 ma.s.l.):

- old pasture forest (till the half of 19th century)
- Formerly oak dominated forest, now mixture of hornbeam, field maple, ash, linden and other species
- totally left to the spontaneous development since 1932

Král K., Janík D., Adam D., McMahon S., Vrška T., 2014. Patch mosaic of developmental stages in Central European natural forests along an elevation and vegetation gradient. *Forest Ecology and Management* 330: 17-28.



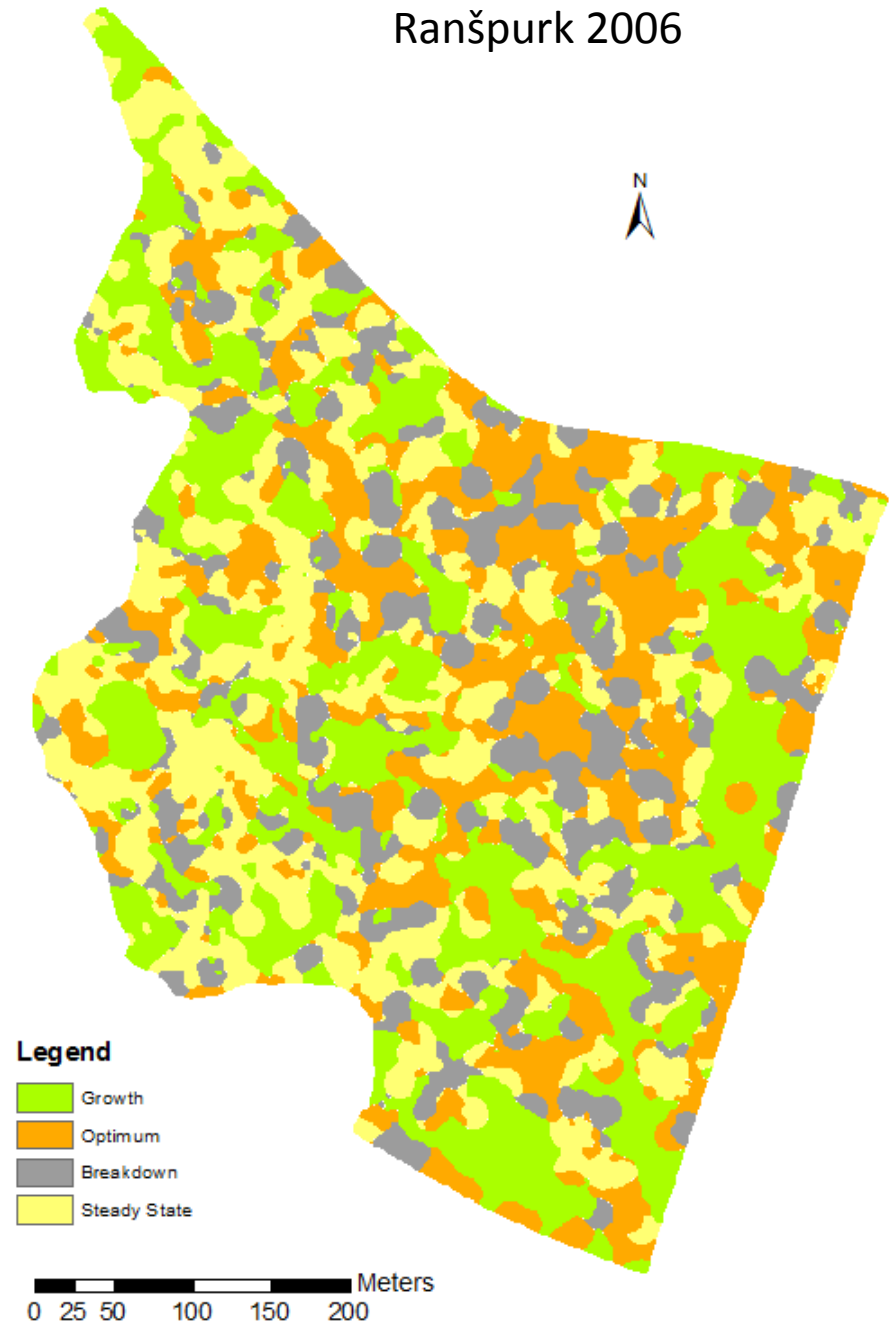


## Alluvial hardwood forest Ranšpurk (153-155 ma.s.l.):

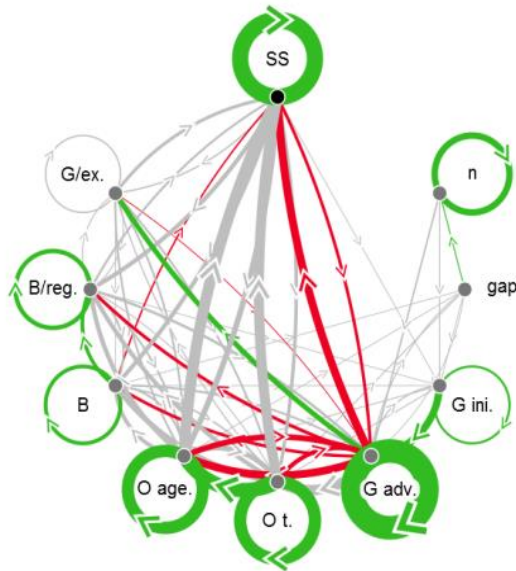
- old pasture forest (till the half of 19th century)
- Formerly oak dominated forest, now mixture of hornbeam, field maple, ash, linden and other species
- totally left to the spontaneous development since 1932

Král K., Janík D., Adam D., McMahon S., Vrška T., 2014. Patch mosaic of developmental stages in Central European natural forests along an elevation and vegetation gradient. *Forest Ecology and Management* 330: 17-28.

Ranšpurk 2006

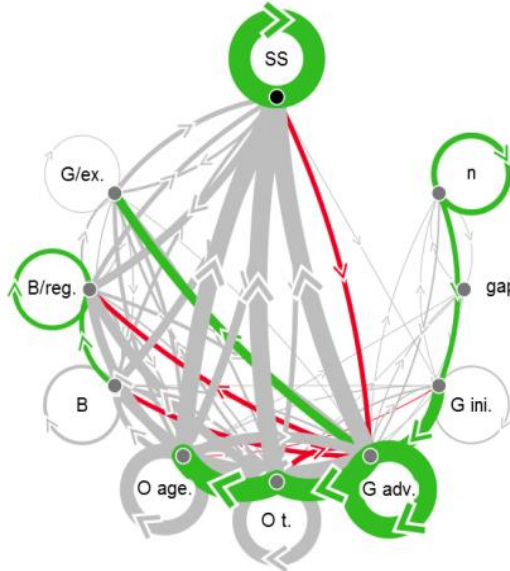


21 years (1973–1994)



Cahnov-Soutok + Ranšpurk, FDR

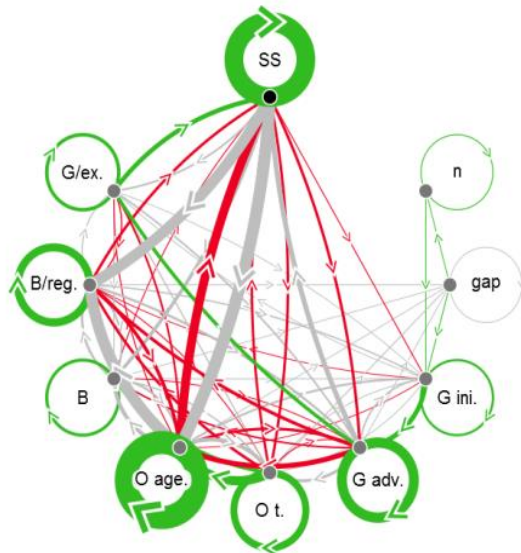
33 years (1973–2006)



**The thickness** of an arrow is directly proportional to observed occurrence of the transition.

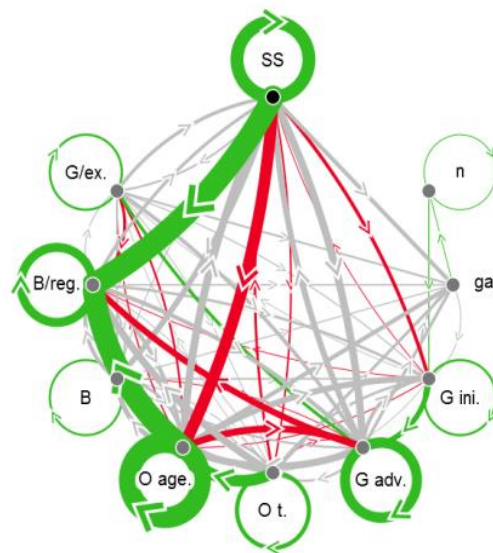
**The colors** indicate its abundance compared to random transitions: **green** is significantly more and **red** is significantly less frequent than random, **grey** is not different from random frequency.

22 years (1975–1997)



Žofín, FDR

33 years (1975–2008)



Král K., McMahon S., Vrška T., 2016. Spatiotemporal patch dynamics of natural temperate forests. – under prep.

During the 21 years (70s to 90s)

29% of the area - cyclical development

37% of the area - noncyclic development

34% of the area - stable

During the 33 years (70s to 00s)

The stage of growth's area decreased from from 40% to 29%

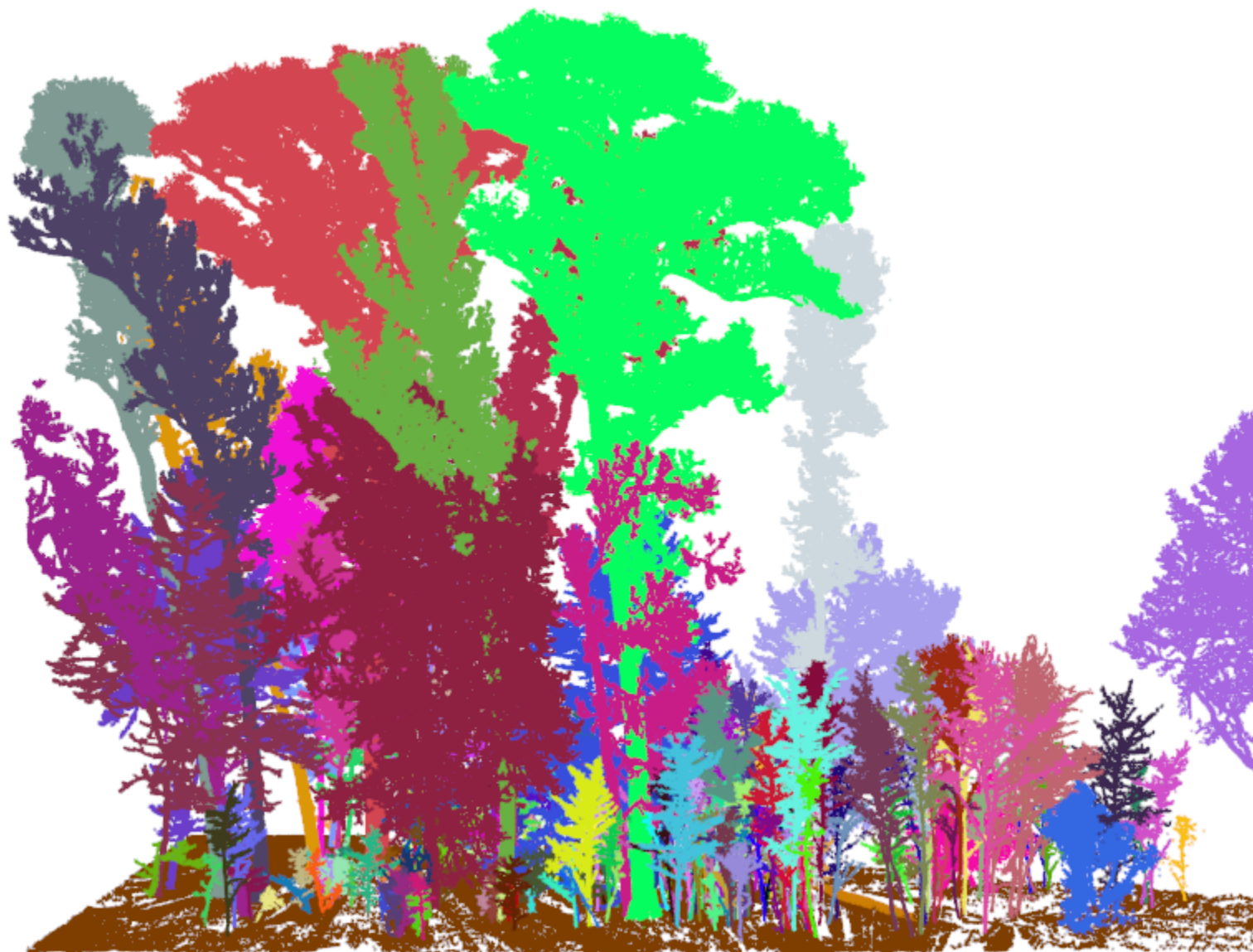
The breakdown's area increased from 10% to 17%.

But the mean patch size of breakdown stage varies about 500m<sup>2</sup> only.

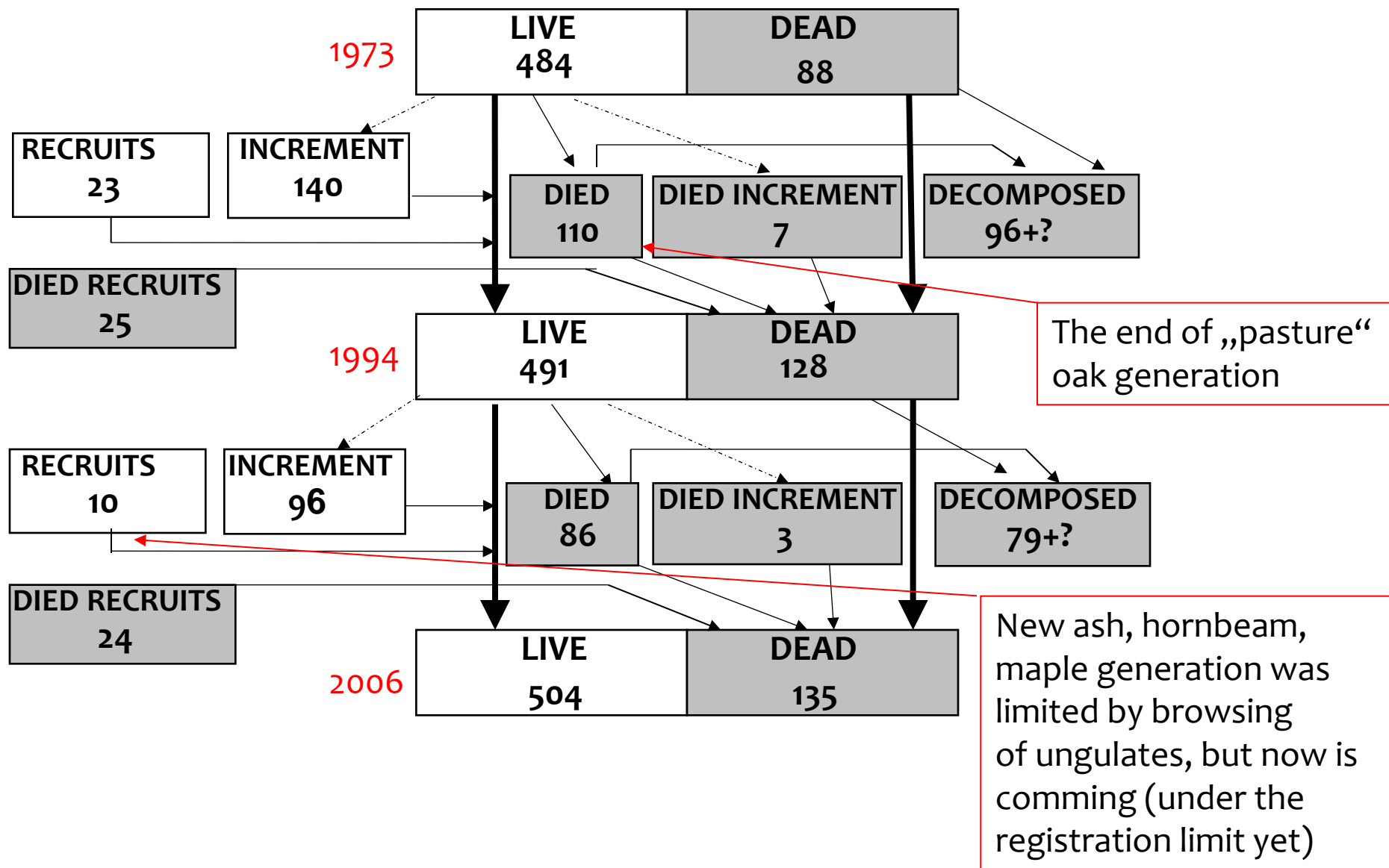
The increase of the Breakdown stage:

- wind storm in January 1994
- dieback of the European white elm
- dieback of old abundant cohort of pedunculate oak (decrease of water level)

Ranšpurk 2015



# Alluvial hardwood forests – Ranšpurk (m3/ha)



Long-term proportion of deadwood – 20% of stem biomass in total

Actual biomass turnover speed – 8-9 m<sup>3</sup> / ha / year

Actual biomass turnover time – 60 years



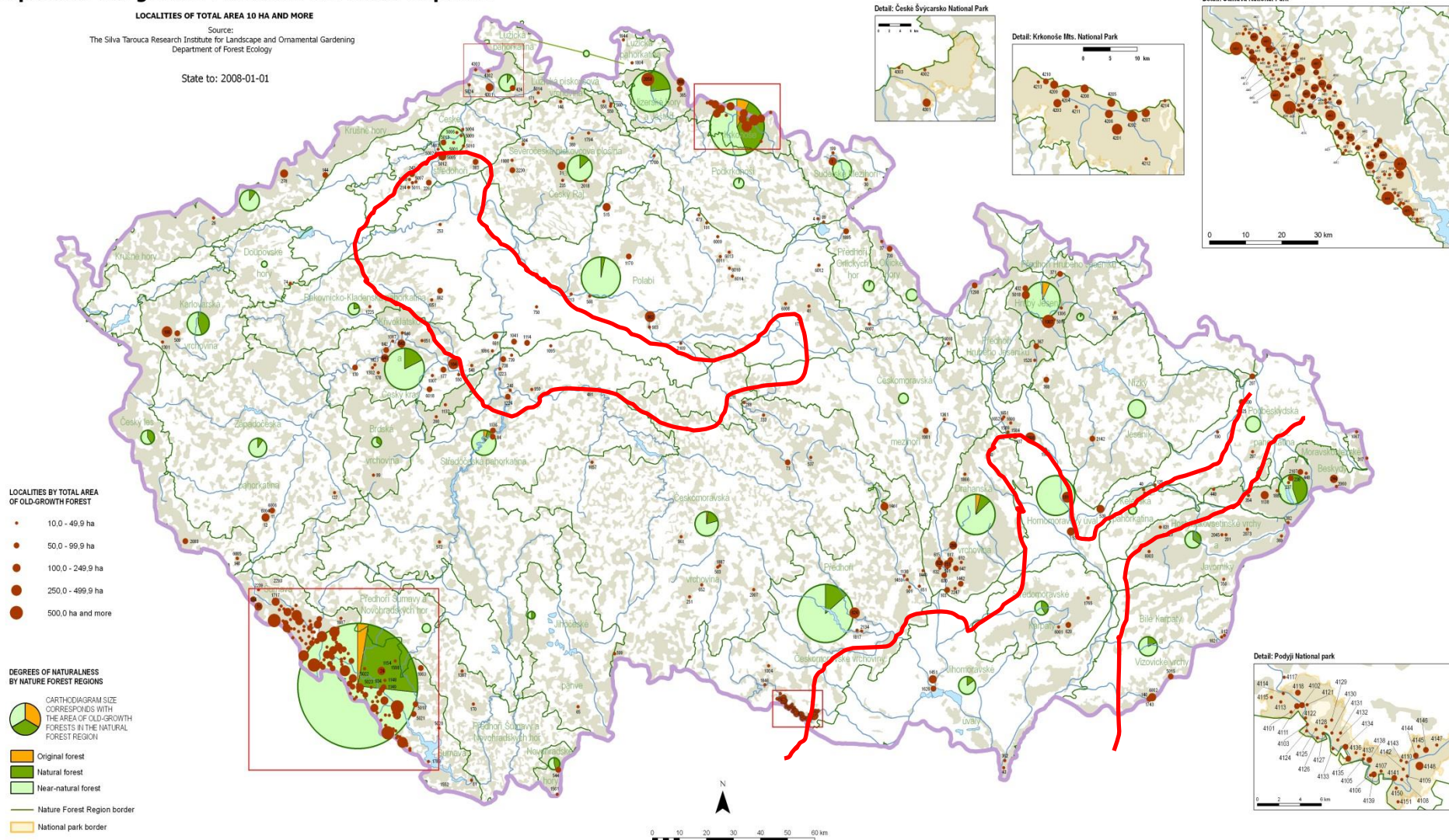
# 1% of the Czech forests is left to spontaneous development – 25.000 ha

## Important Old-growth Forests in the Czech Republic

### LOCALITIES OF TOTAL AREA 10 HA AND MORE

Source:  
The Silva Tarouca Research Institute for Landscape and Ornamental Gardening  
Department of Forest Ecology

State to: 2008-01-01

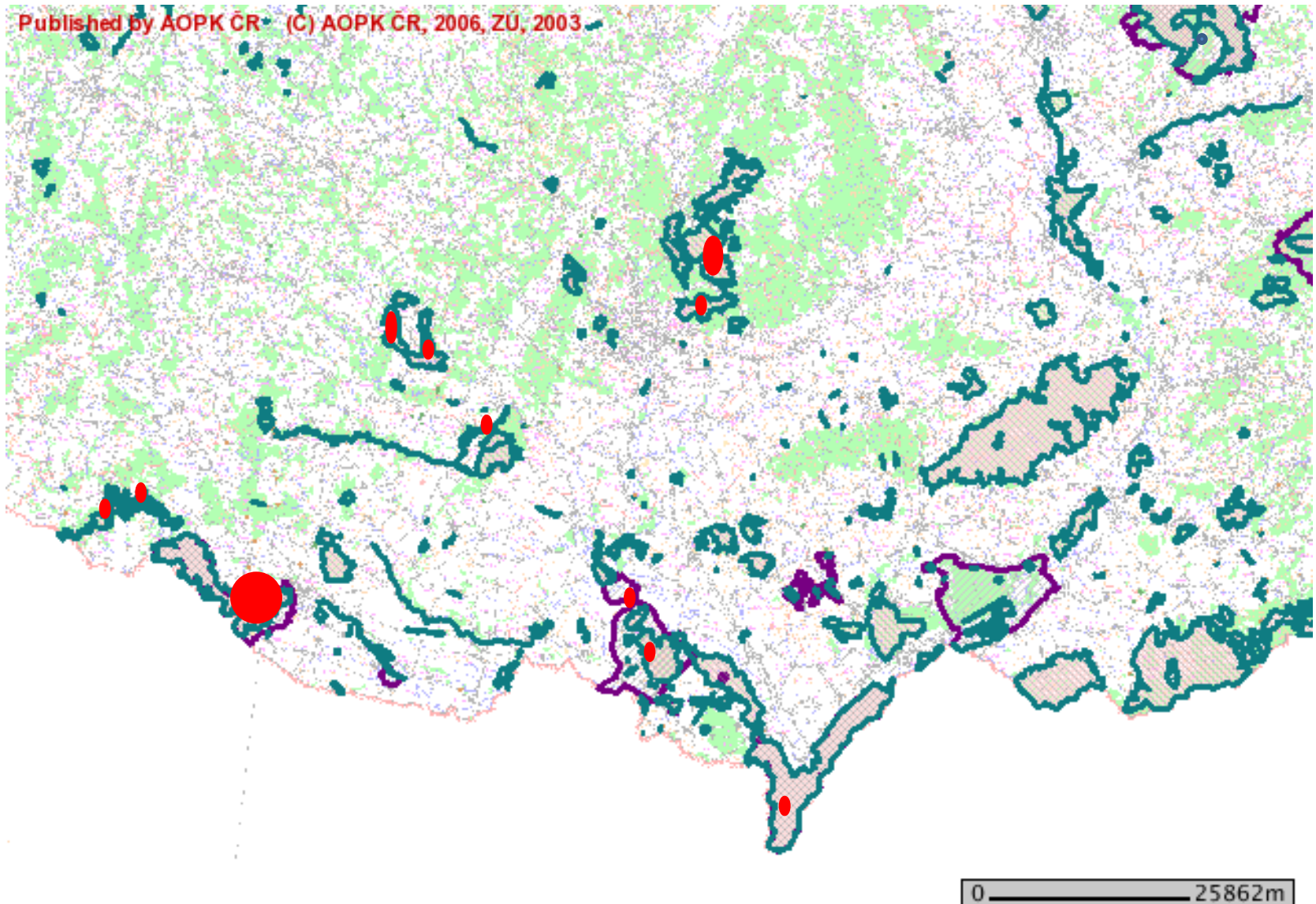


Representation of old-growth forests in lowlands is below-average



## South-Moravian lowland region –

forests left to spont. man. represent the minority of forest protected areas



Active conservation management is the main tool for bio-cons,

but we advocate the need of lowland unmanaged forests as the INTEGRATED part of nature conservation concept.

It will be space-minor everytime.

Protection of very rare species (no light-demanding species – fungi, molluscs, lichens, bryophytes etc.)

The main problem of biodiversity conservation is the actual silvicultural system which is not in harmony (do not agree) with the conservation goals yet. It covers the majority of forest protected areas (including reserves) in lowlands.



## Return of natural disturbances into the former pasture and coppice forests



photo - Vertical Images

Inimitable „management“ – variability of conditions – shapes, intensity, soils, microtopography...



1994



1999



2006



photos - T. Vrška

Thanks to  
EEA grants  
Norway grants