

Forest management and biodiversity in protected areas



Prof. Ing. Miroslav Svoboda, Ph.D. and KEL group members
Faculty of Forestry and Wood Sciences, CULS Prague, Czech R.



Disturbance history of an old-growth sub-alpine *Picea abies* stand in the Bohemian Forest, Czech Republic

Miroslav Svoboda, Pavel Janda, Thomas A. Nagel, Shawn Fraver, Jan Rejzek & Radek Bače

Keywords

Dendroecology; Dendrochronology;
Disturbance interactions; Forest dynamics;
Norway spruce; Spruce bark beetle; Sumava

Abstract

Questions: What historical natural disturbances have shaped the structure and development of an old-growth, sub-alpine *Picea abies* forest? Are large-scale,



Contents lists available at [ScienceDirect](#)

Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco



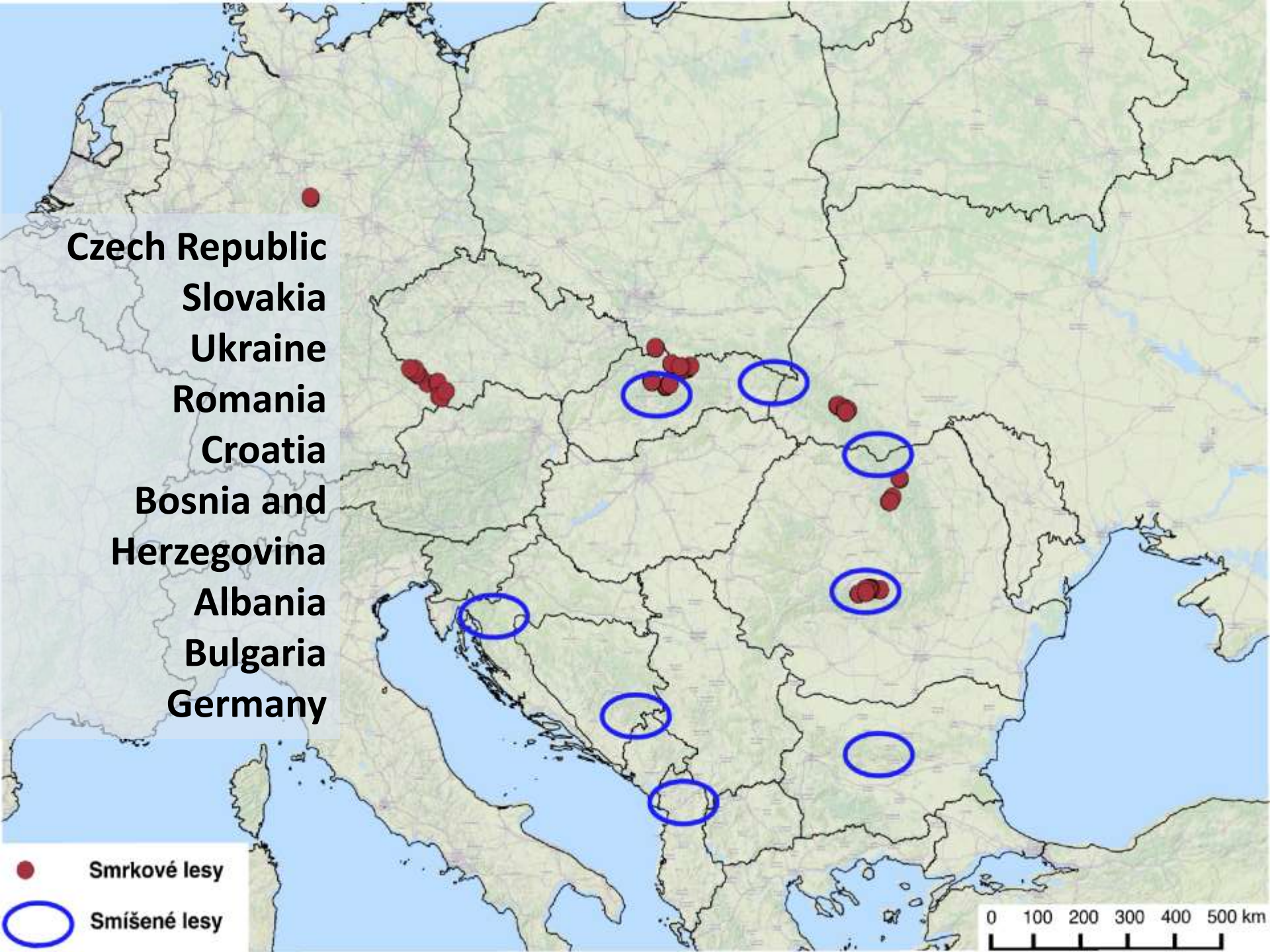
Frequent severe natural disturbances and non-equilibrium landscape dynamics shaped the mountain spruce forest in central Europe



Vojtěch Čada ^{*}, Robert C. Morrissey, Zuzana Michalová, Radek Bače, Pavel Janda, Miroslav Svoboda

Czech University of Life Sciences Prague, Faculty of Forestry and Wood Sciences, Department of Forest Ecology, Kamýčká 129, 165 21 Praha 6 – Suchbát, Prague, Czech Republic





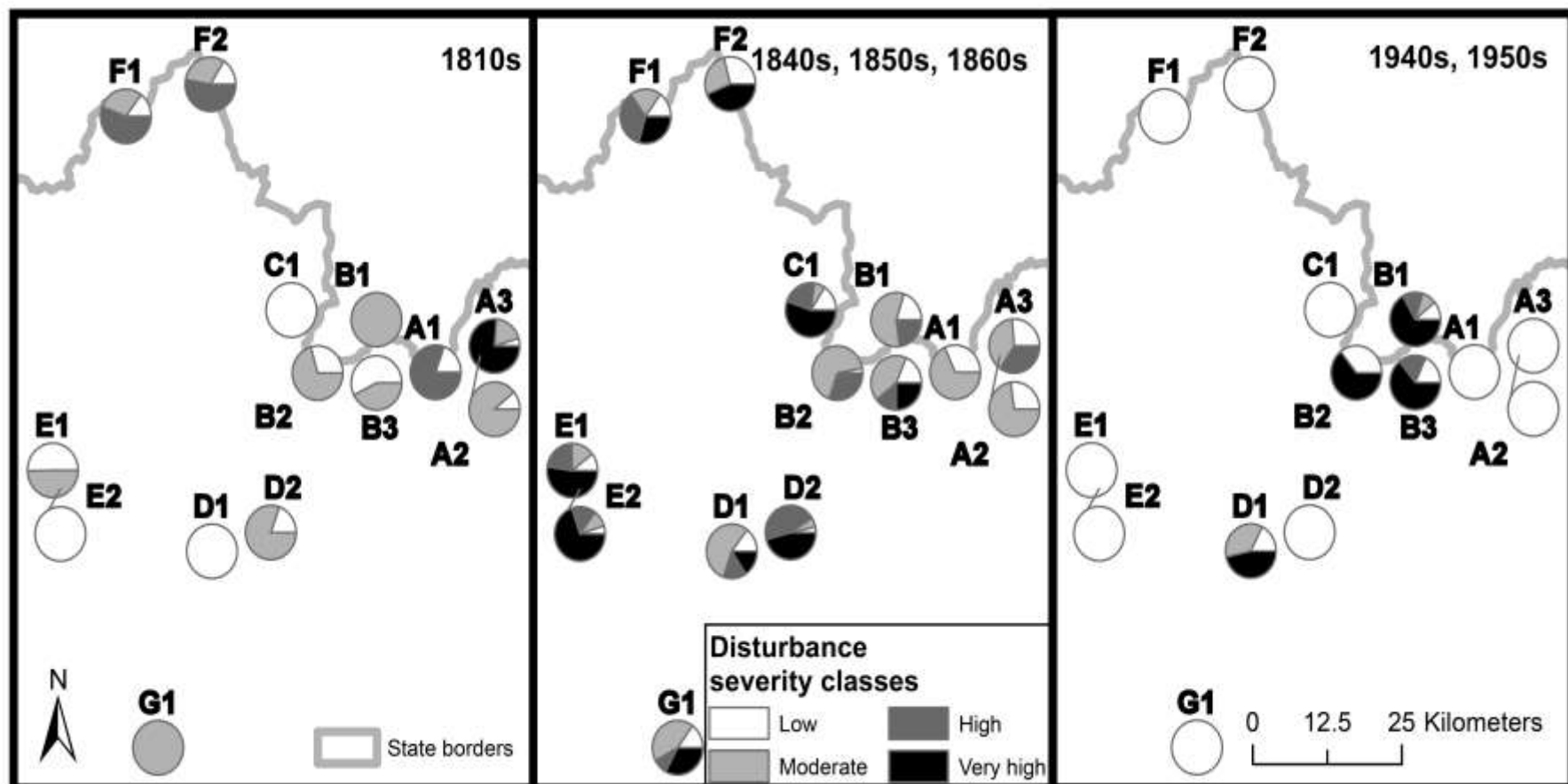


The historical disturbance regime of mountain Norway spruce forests in the Western Carpathians and its influence on current forest structure and composition ^{*}

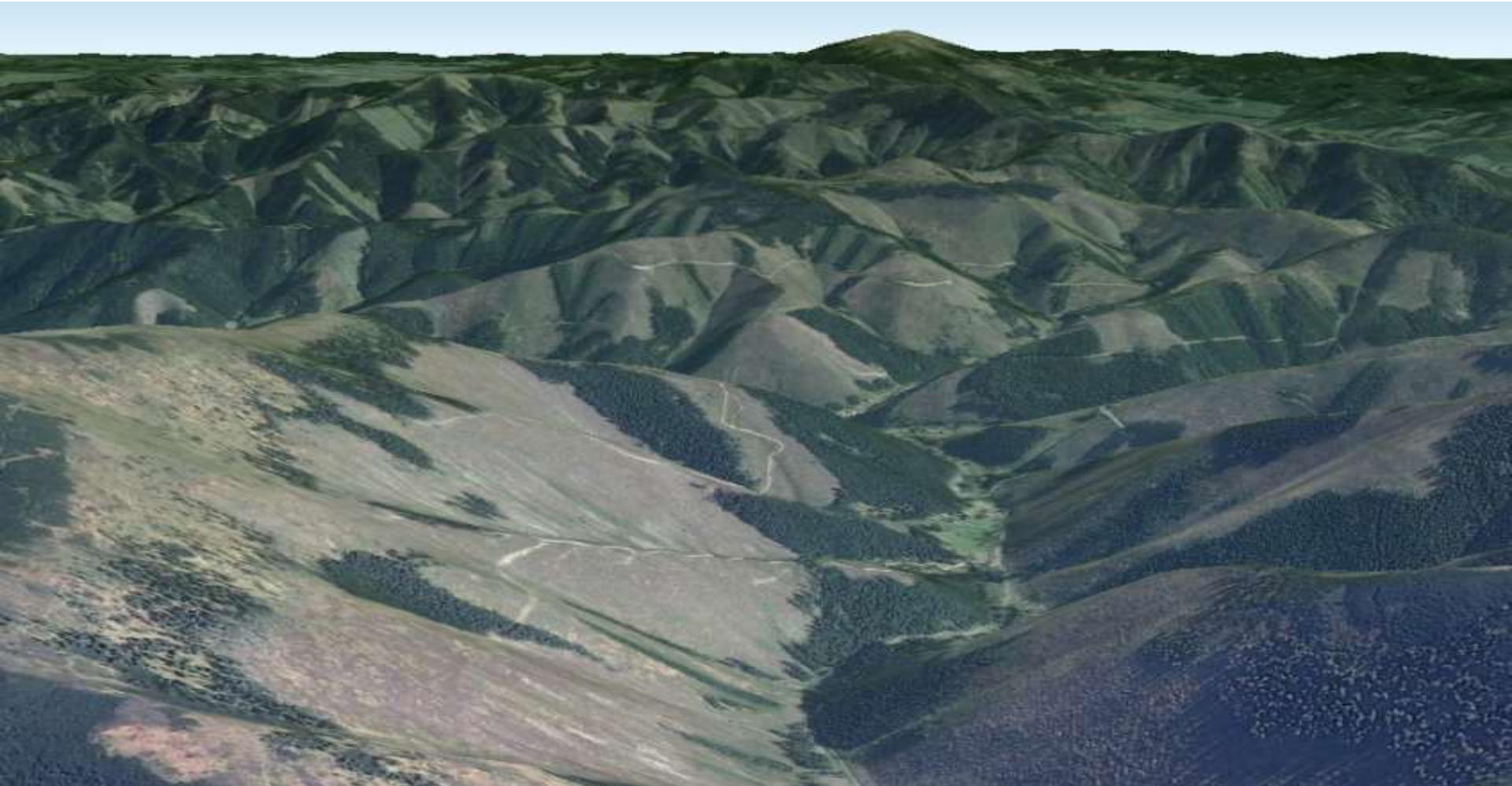


Pavel Janda ^{a,*}, Volodymyr Trotsiuk ^a, Martin Mikoláš ^{a,b}, Radek Bače ^a, Thomas A. Nagel ^{a,c}, Rupert Seidl ^d, Meelis Seedre ^a, Robert C. Morrissey ^a, Stanislav Kucbel ^c, Peter Jaloviar ^c, Marián Jasík ^{a,b}, Juraj Vysoký ^{a,b}, Pavel Šamonil ^f, Vojtěch Čada ^a, Hana Mrhalová ^a, Jana Lábusová ^a, Markéta H. Nováková ^a, Miloš Rydval ^a, Le

^a Fa
^b PR
^c De
^d In
^e Fa
^f De

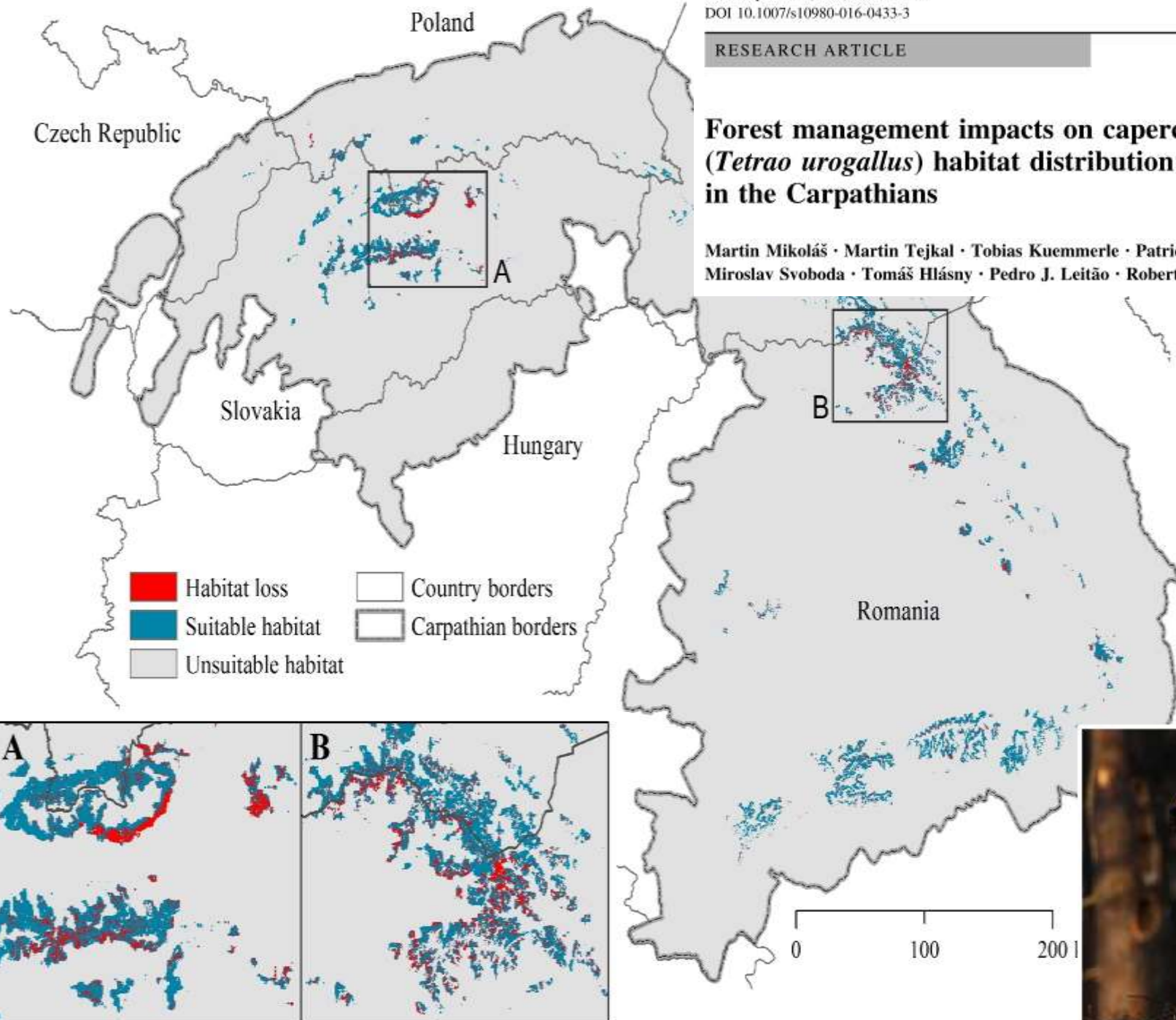


NP Low Tatra Mts. - Slovakia



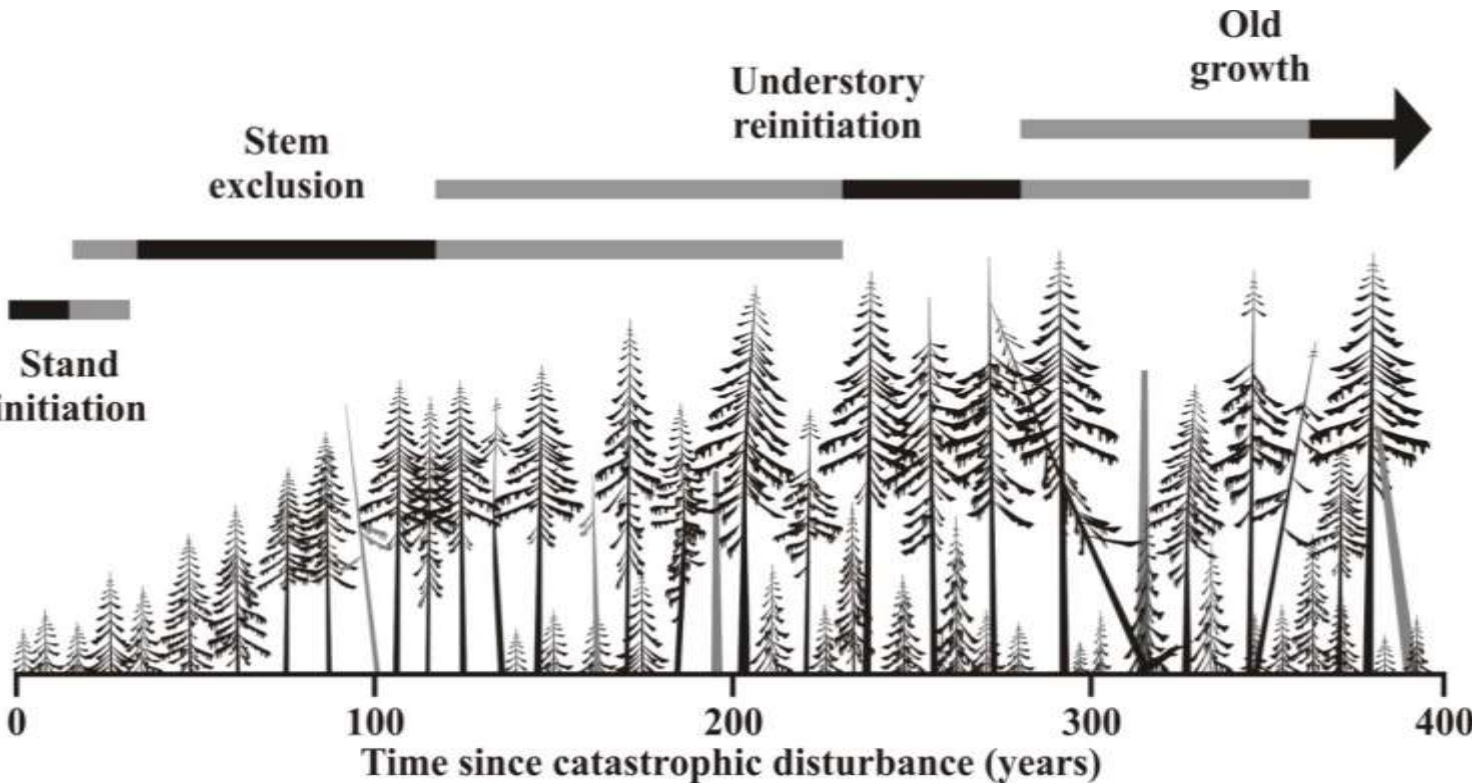
Forest management impacts on capercaillie (*Tetrao urogallus*) habitat distribution and connectivity in the Carpathians

Martin Mikoláš · Martin Tejkal · Tobias Kueimmerle · Patrick Griffiths · Miroslav Svoboda · Tomáš Hlásny · Pedro J. Leitão · Robert C. Morrissey



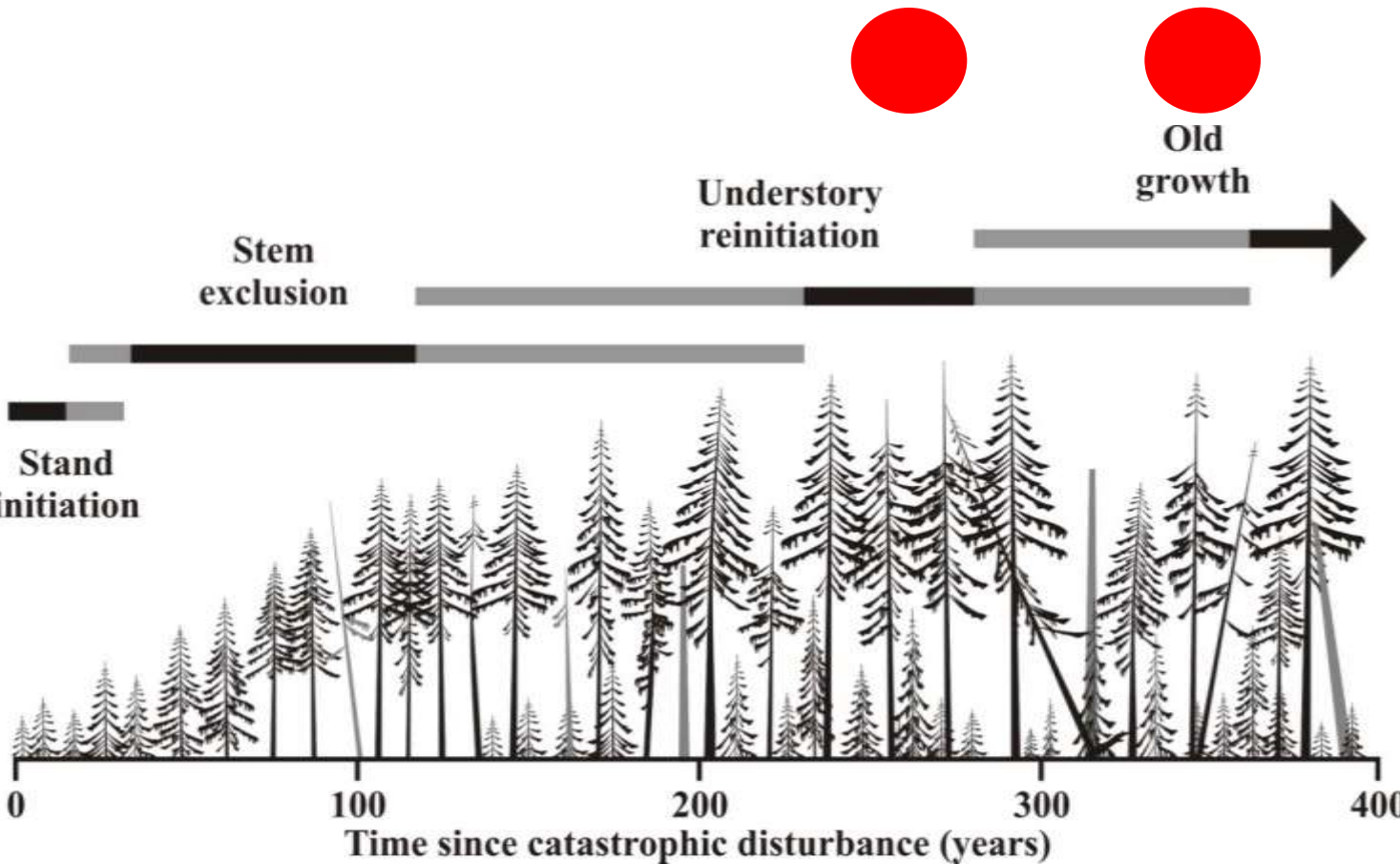
Concept of forest dynamics

- disturbances regulate proportion of the stand successional stages over the landscape



Species diversity and stand development

red spots show the highest species diversity



Early seral stage – high diversity

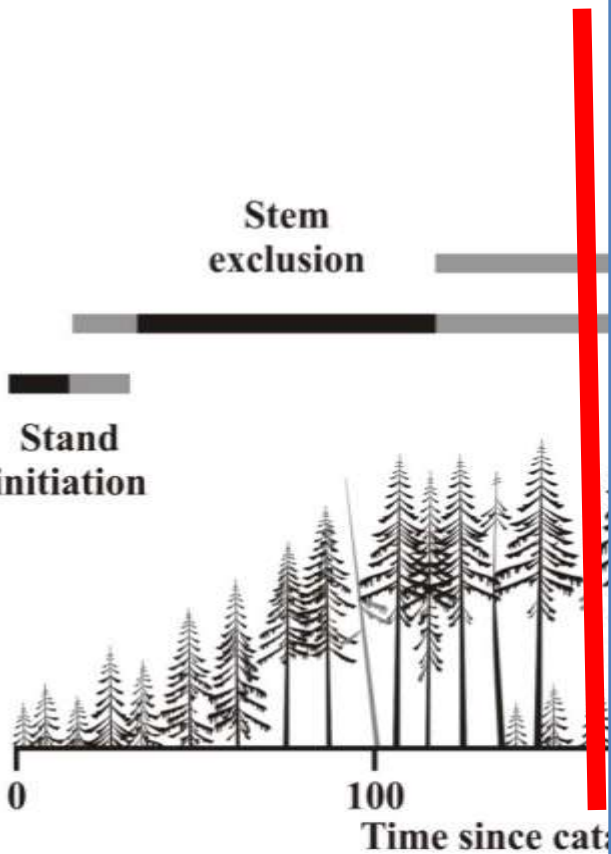


50 m





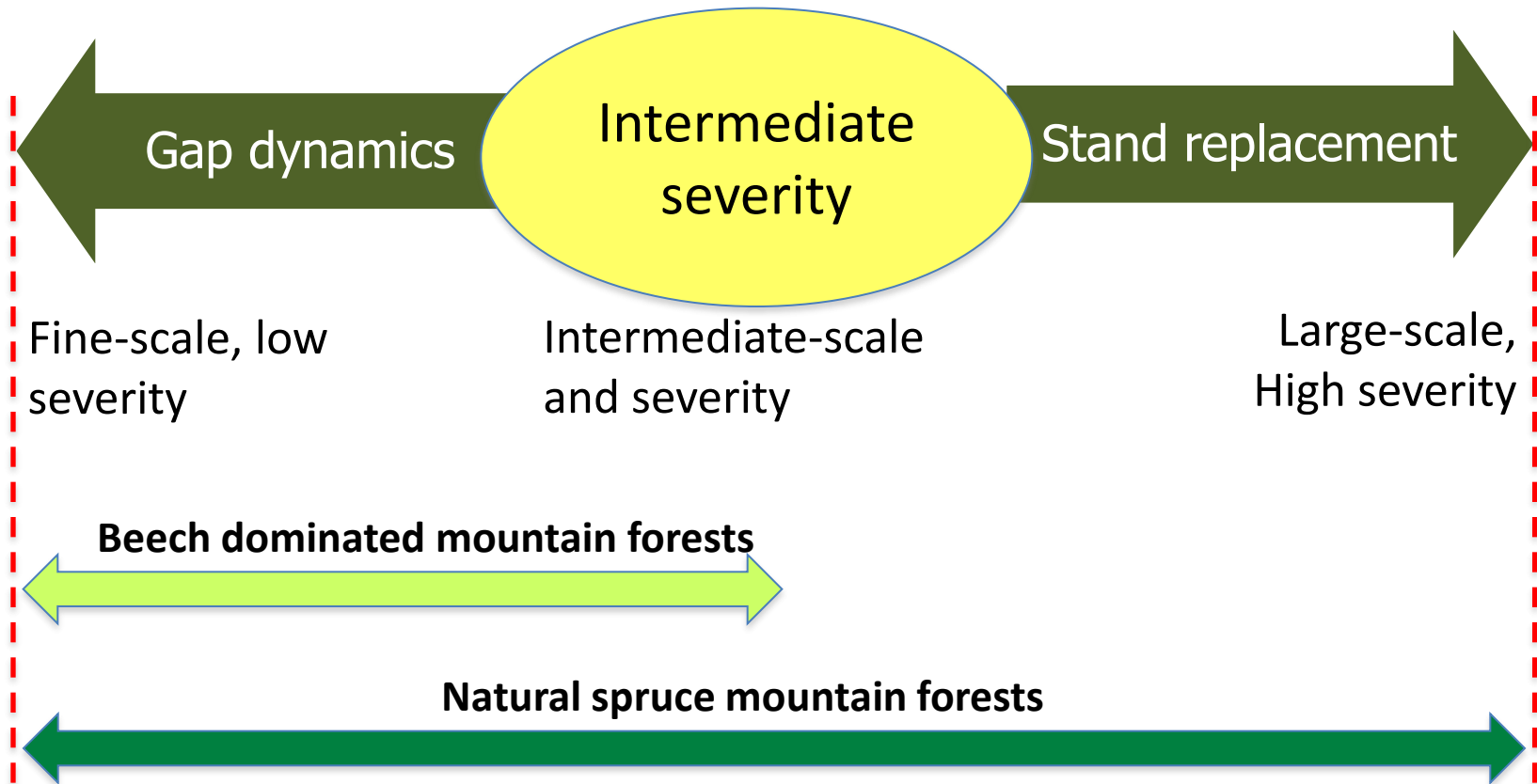
Species diversity x stand development x forestry



Forest management reduced the landscape to „young“ forest due to „short“ rotation periods

The old-growth and the early-seral (disturbed) stages are „more less “ eliminated from our landscape

Disturbance regime in temperate forests



- heterogeneity and complexity in space and time
- non-equilibrium view of disturbance regimes



Photo Sumava NP



Photo Sumava NP









Natural disturbances are part of the natural dynamics of the primary forests in the Carpathians – Kotlov žľab- Western carpathians





++ LANDSCAPE HETEROGENEITY ++++++

Global Change Biology

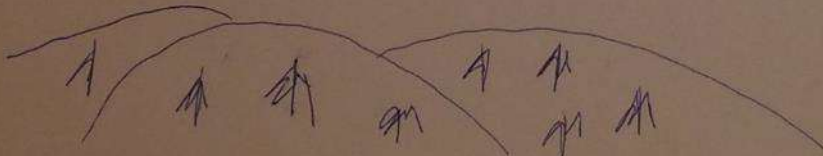
Explore this journal >

PRIMARY RESEARCH ARTICLE

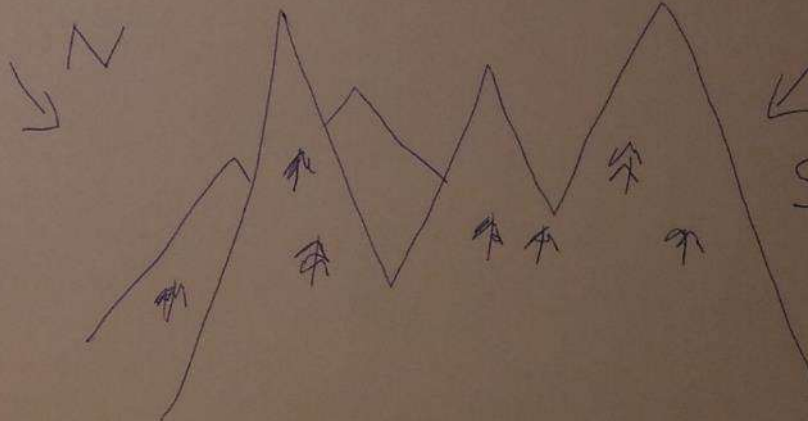
Natural disturbances are spatially diverse but temporally synchronized across temperate forest landscapes in Europe

Cornelius Senf , Rupert Seidl

First published online 2015



BOHEMIAN FOREST



ALPS

Resource connectivity and availability ++ +





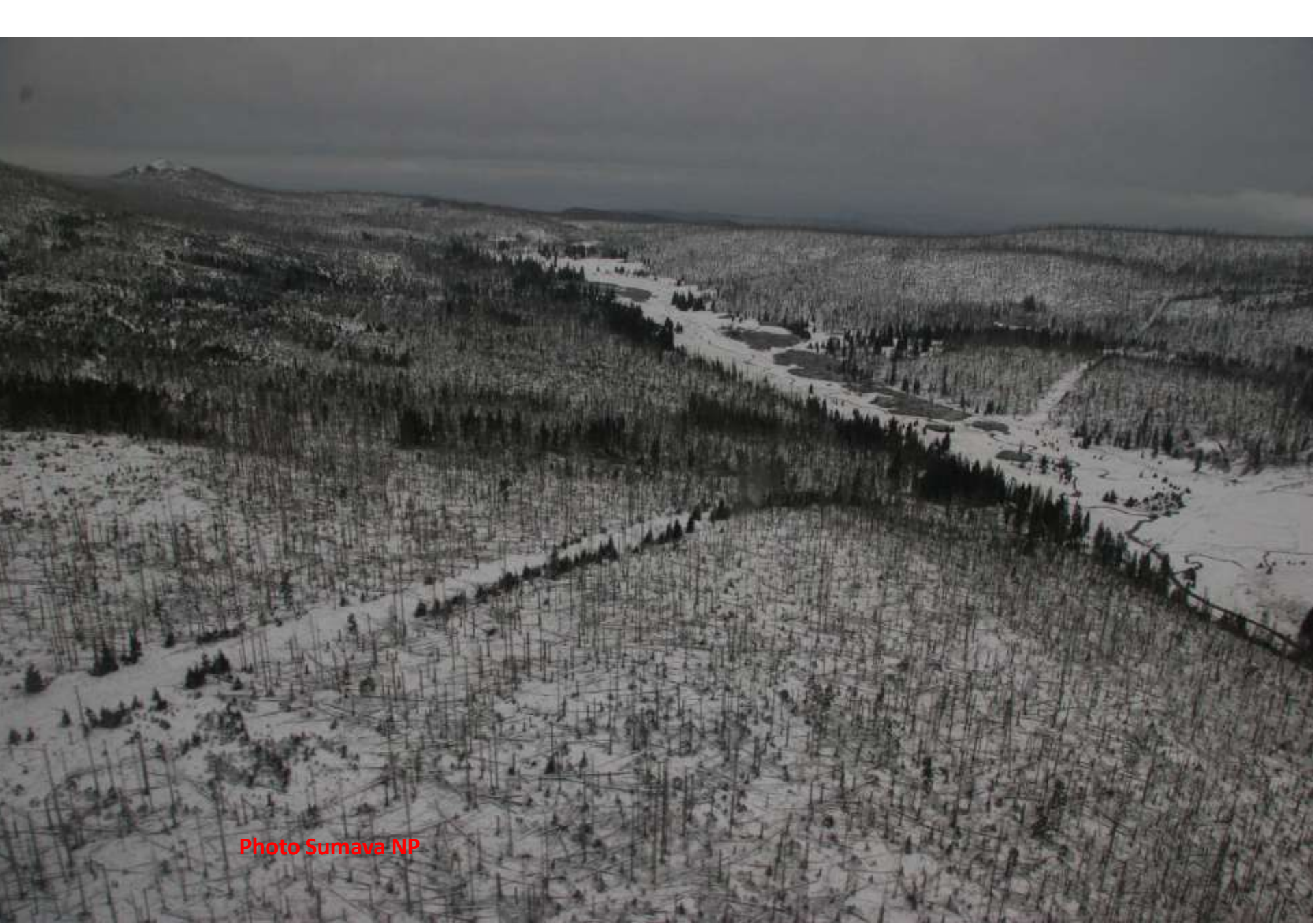


Photo Sumava NP

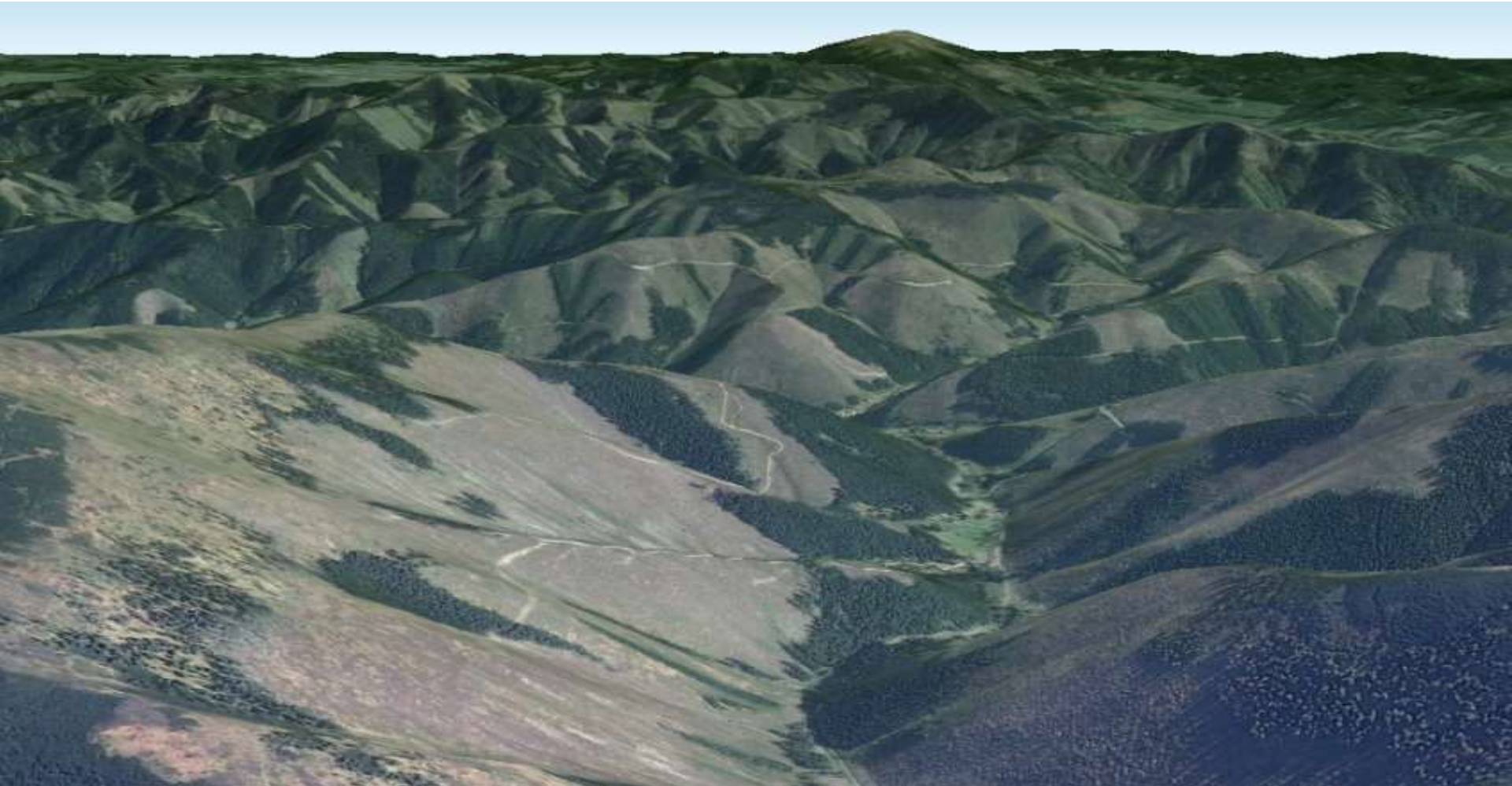




**Salvage logging of old-growth
forest in National park Low
Tatra Mts. – Velky Bok
(www.pralesy.sk)**



NP Low Tatra Mts. - Slovakia





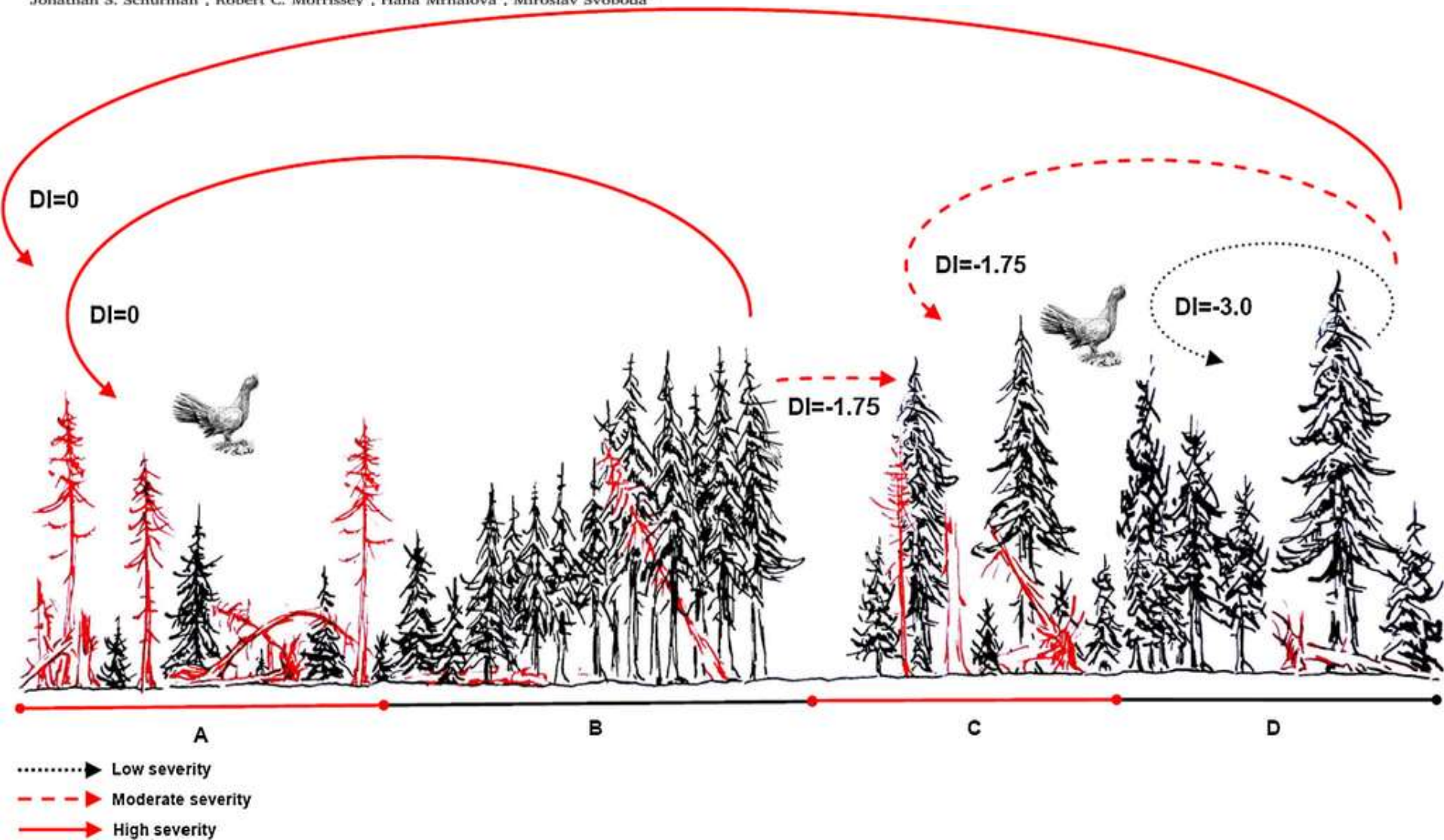
- ❑ **More than 100 km² of old-growth forests have been logged in protected areas in Slovakia in short period**
- ❑ **Habitats of many another protected and endangered species have been destroyed**
- ❑ **Capercaillie is an umbrella species with strong preference to old-growth forests**
- ❑ **Flagship species to promote conservation of ecosystems and biodiversity,**
- ❑ **population trend of this species are well documented**



Mixed-severity natural disturbances promote the occurrence of an endangered umbrella species in primary forests

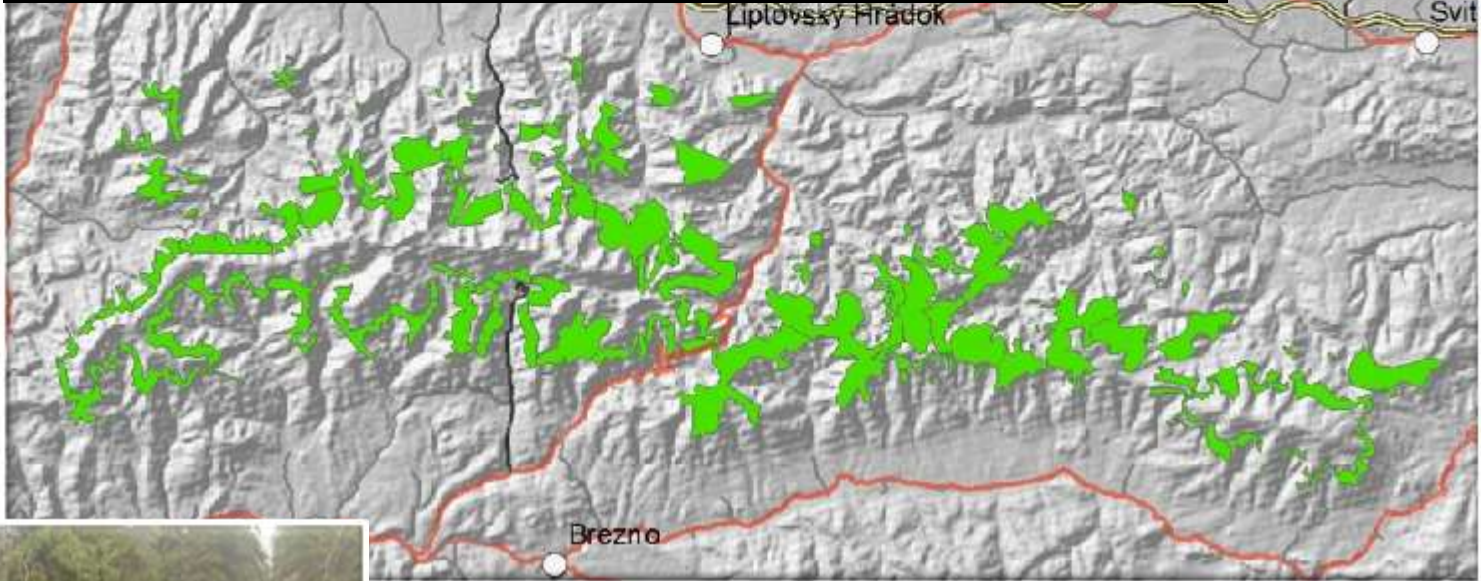
Martin Mikoláš^{a,b,c}, Marek Svitok^c, Kurt Bollmann^d, Jiří Reif^{e,f}, Radek Bače^g, Pavel Janda^h, Volodymyr Trotsiukⁱ, Vojtěch Čada^g, Lucie Vítková^g, Marius Teodosiu^{h,k}, Joy Coppes^l, Jonathan S. Schurman^g, Robert C. Morrissey^g, Hana Mrhalová^g, Miroslav Svoboda^g

- Natural disturbances generate habitat for the capercaillie



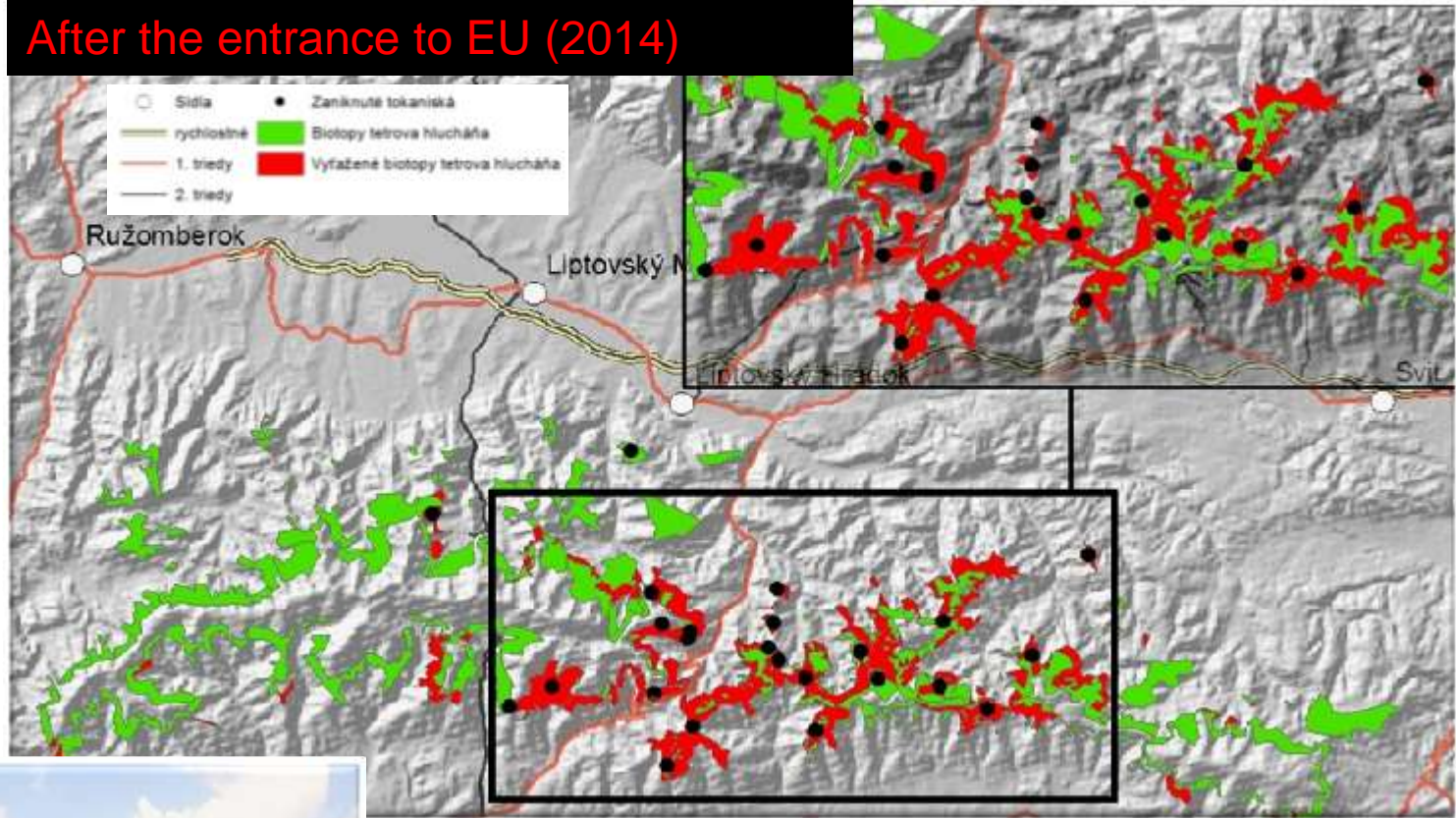
MAIN REASON OF RAPID POPULATION DECLINES IS LOSS OF HABITATS

Before the entrance to EU (2004)



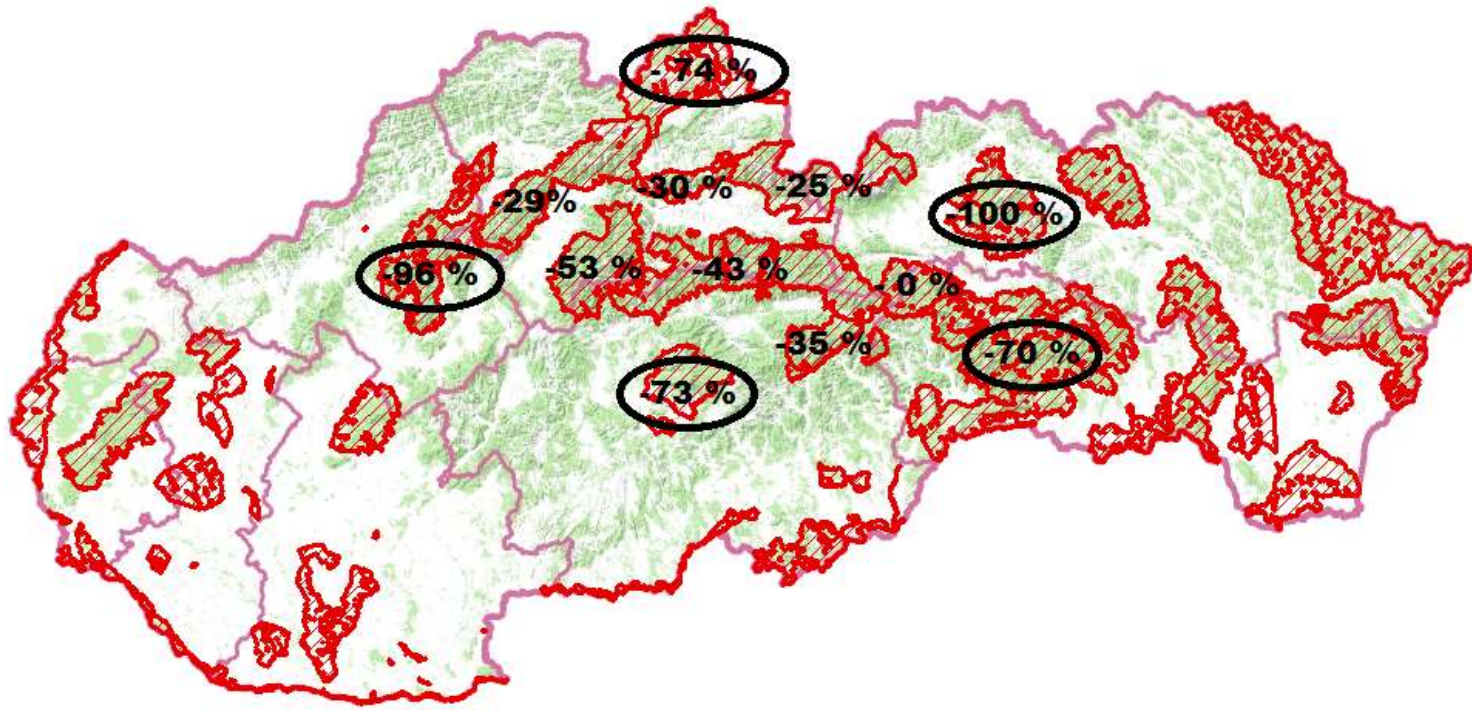
- ❑ National park Low Tatra Mts.
- ❑ Year 2004: habitat area: 193 km²
- ❑ Number of Capercaillie males in 2004: 200 (Gúgh et al. 2015)

After the entrance to EU (2014)

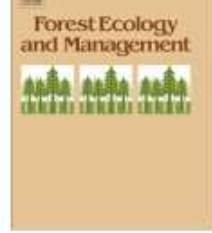


- ❑ NP Low Tatra Mts.
- ❑ Year 2015: habitat area 126 km², decrease by 67 km², Number of Capercaillie males: 100 – 130, decrease by 70 - 100 males (43 %)
- ❑ 24 extinct (logged) lek centres since 2004

Extinction of Capercaillie in SPAs in Slovakia is clear indication of risk of complete extinction of species in Western Carpathians (SK, PL, CZ)



- ❑ Protection of Capercaillie in Slovakia is crucial for protection of this species in Poland and Czech Republic (they have edge population in relation to Slovak population)
- ❑ **Rapid decrease of species, for which protection is Slovakia responsible** (due to high portion of its population in Carpathians)
- ❑ **extinction of species in some areas can not be understood as fulfillment of Birds Directive.**
- ❑ Present state is in stark contradiction with Article 2 and Article 3 (especially point 2.b „upkeep and management in accordance with the ecological needs of habitats inside and outside the protected zones „)



CrossMark

Review

Habitat management alternatives for conservation forests in the temperate zone: Review, synthesis, and implications

Frank Götmark*

Department of Biological and Environmental Sciences, University of Gothenburg, Box 463, SE-40530 Göteborg, Sweden

A 1

Arti
Rec
Rec
Acc
Ava
Key
Wo
Fort
Prot
Res
Suc
Dist

Management alternatives for conservation forest:

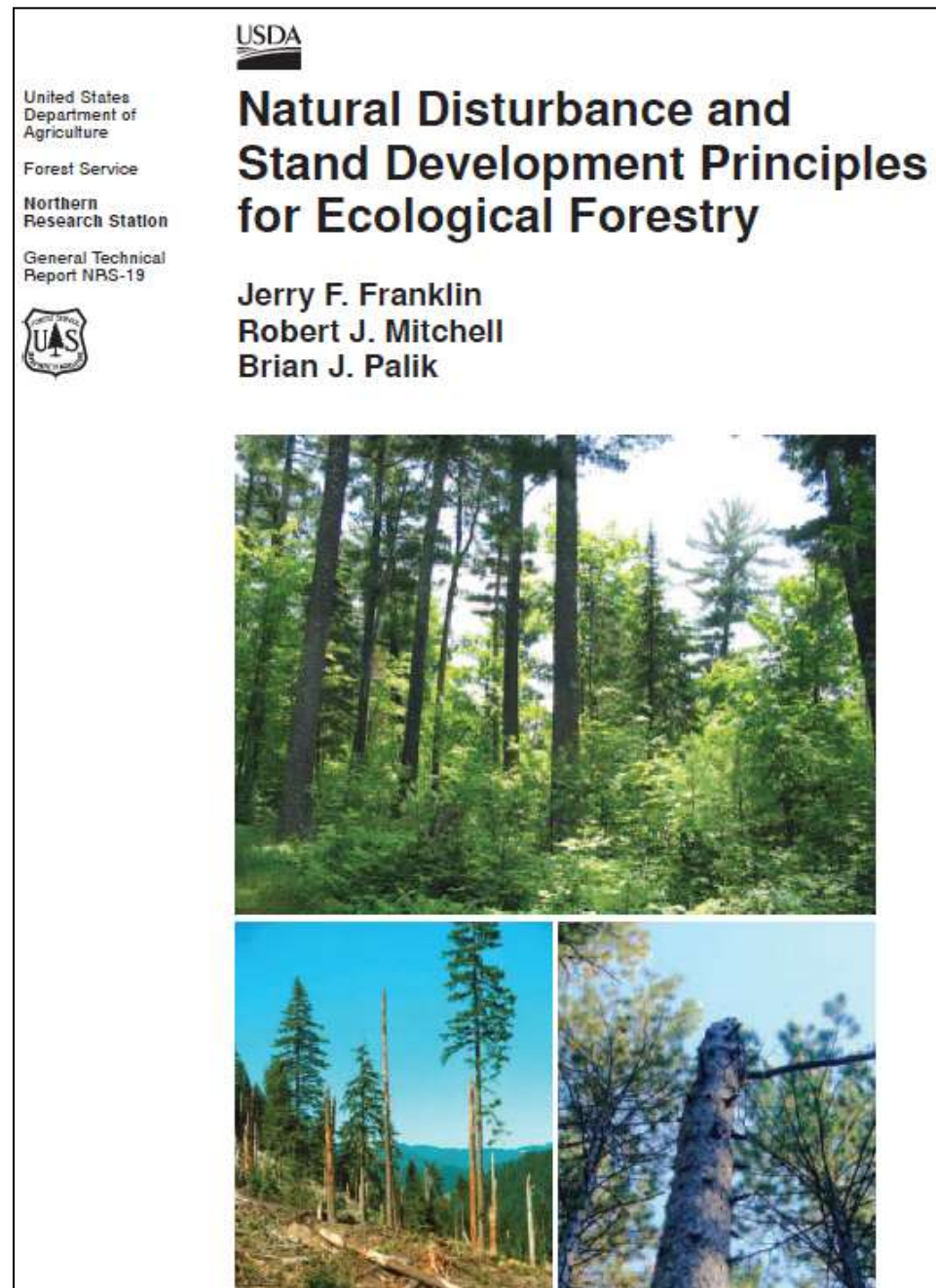
1. Minimal intervention
2. Traditional management (coppicing and grazing)
3. Non-traditional management (mimicking natural dynamics and disturbances – specific structural characteristics)
4. Species management

...not only one correct habitat option for conservation forests. Many more studies of the management alternatives are needed, particularly long term experiments. In addition, management plans, decisions, and

Ecological forestry

Incorporate natural
processes and patterns
into forest management

....



Ecological forestry

- Forest management practices necessary for:
 - Maintaining
 - or
 - Restoring

Structural and species diversity
- Adaptive uses of management practices creating structural and compositional heterogeneity







Maintaining natural processes ...





Effects of natural disturbances and salvage logging on biodiversity – Lessons from the Bohemian Forest [☆]



Simon Thorn ^{a,*}, Claus Bässler ^{a,b}, Miroslav Svoboda ^c, Jörg Müller ^{a,b}

^a Field Station Fabrikschleichach, Department of Animal Ecology and Tropical Biology, Biocenter University of Würzburg, Glashüttenstraße 5, 96181 Rauhenebrach, Germany

^b Bavarian Forest National Park, Freyunger Str. 2, 94481 Grafenau, Germany

^c Czech University of Life Sciences, Faculty of Forestry and Wood Sciences, Prague, Czech Republic



Management alternatives for preserving biological legacies of the disturbances:

- 1. Leave the bark on the trunk ...**
- 2. Bottom of the trunk with bark (standing or lying)**
- 3. Leave part of the tree crown with the branches ...**
- 4. Do not close the mounds ...**

Islands of the non salvaged (partly) patches or single tree with the preserved biological legacies





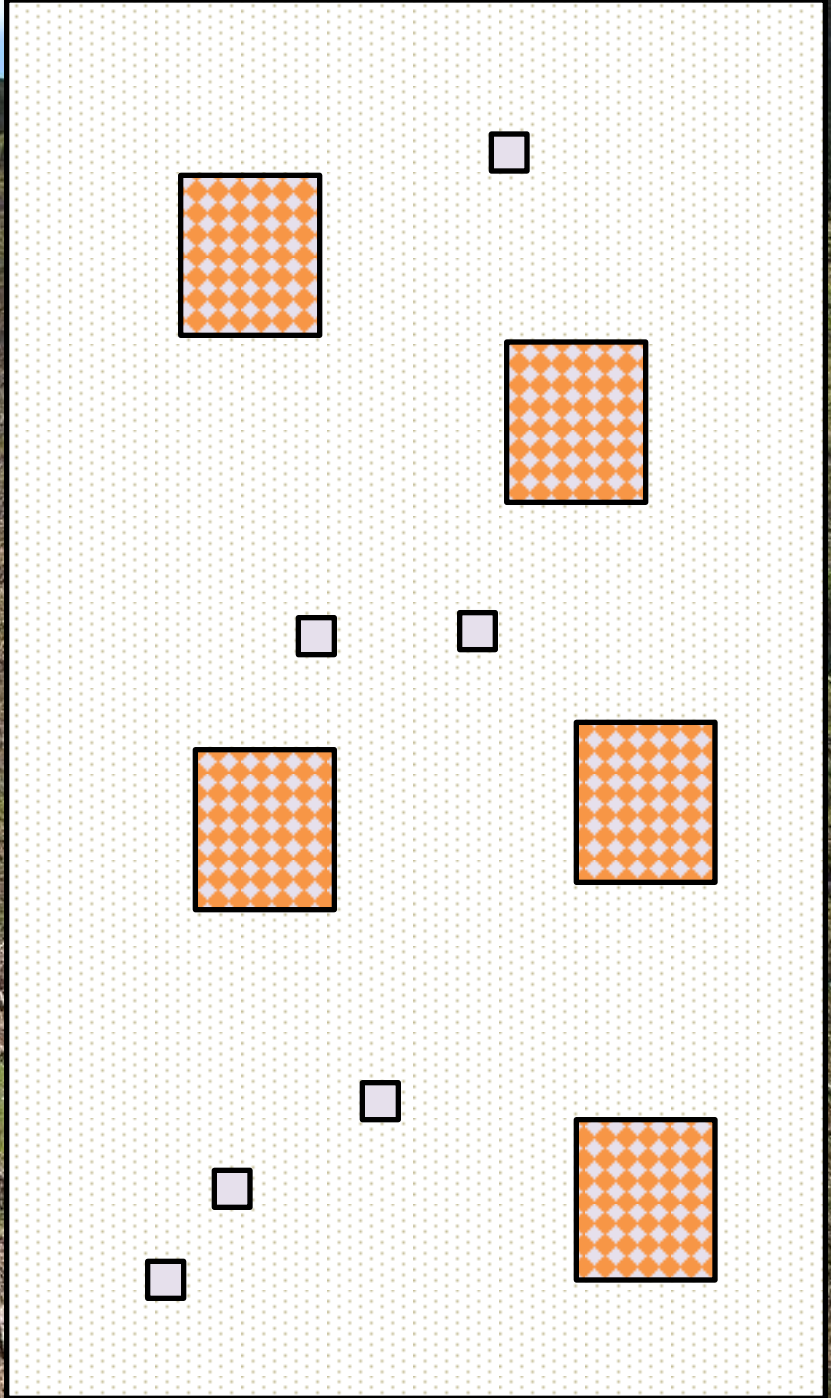


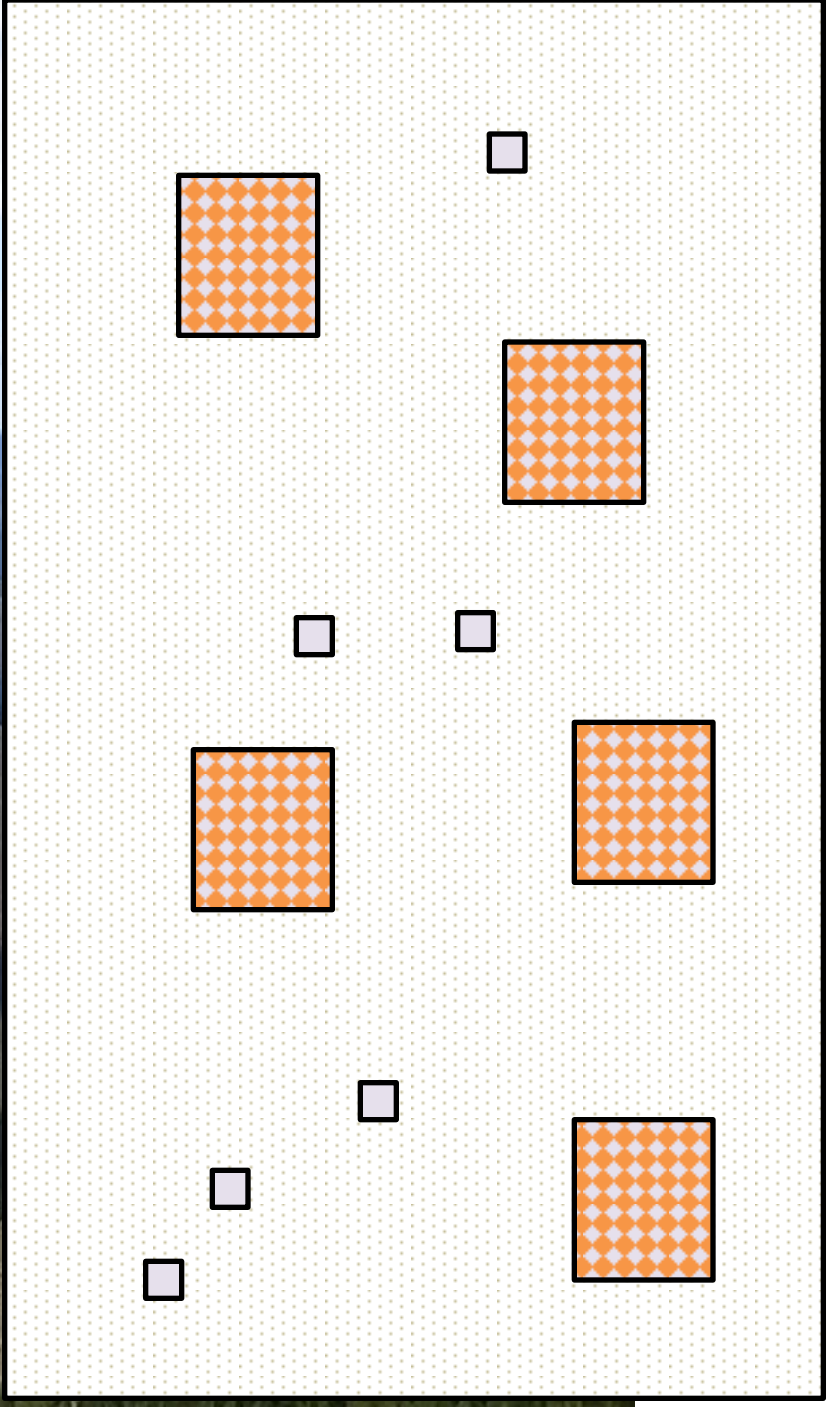








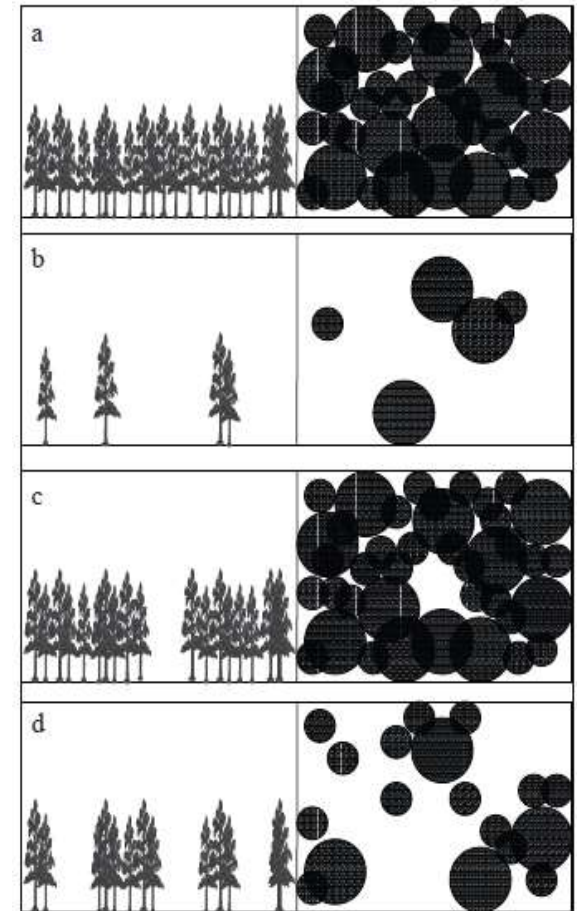




Restoring natural processes ...

Variable retention thinning

- Increase vertical and horizontal heterogeneity
- Diversity enhancement on a variety of levels:
 - Structural
 - Species
 - Tree, stand, landscape







1996



2001



2003



2004



2005



2006



2009



2010



2011



2012

More analogies to old-growth ?



Wide spacing

Clumps & gaps

Canopy 'rumple'

Tree size differentiation

**Co-existence of shade
tolerant/intolerant**

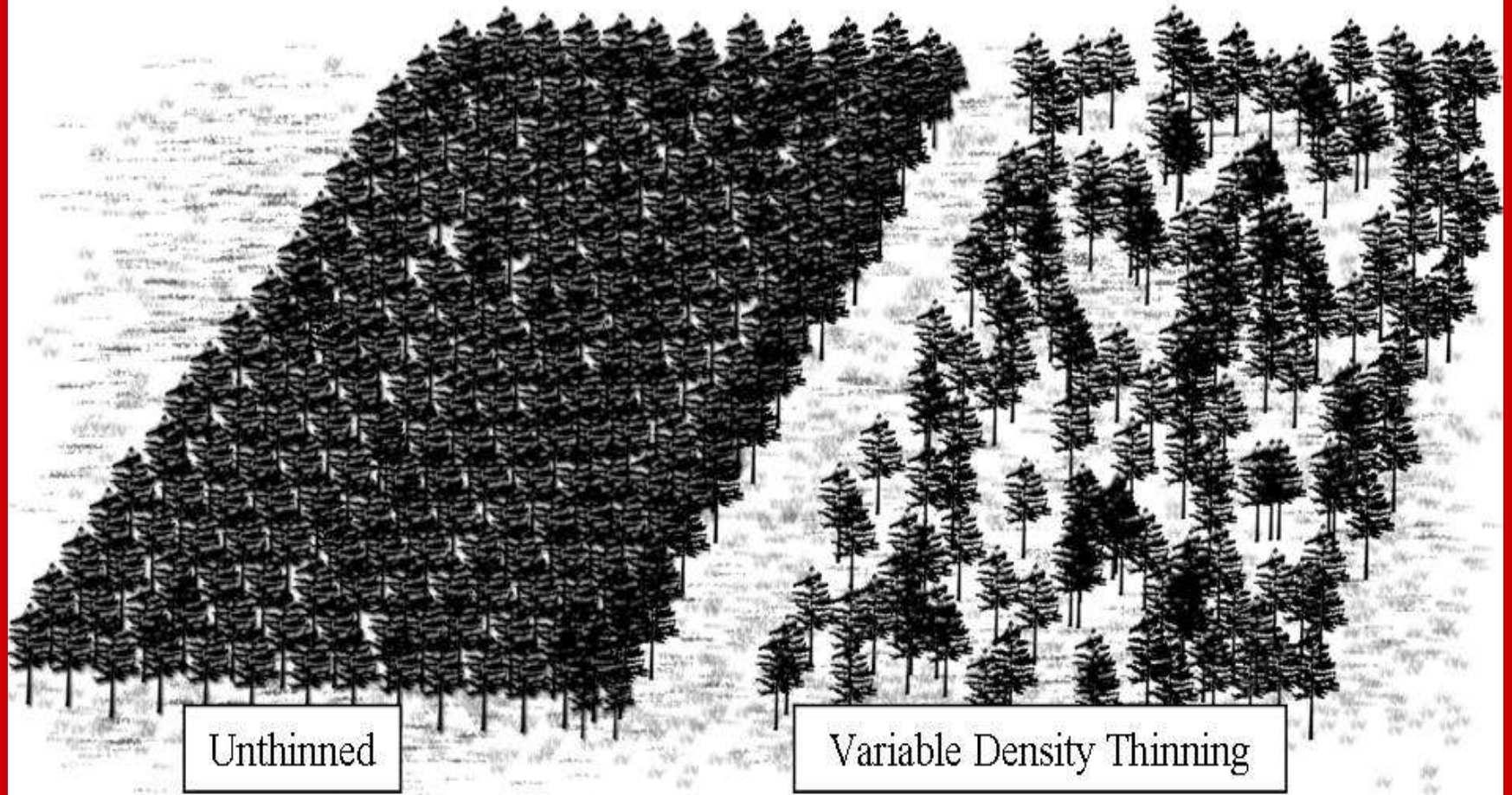
**Open grown trees – less self
pruning**

... mostly on a smaller scale...





Restore and restart natural processes ...



Unthinned

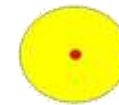
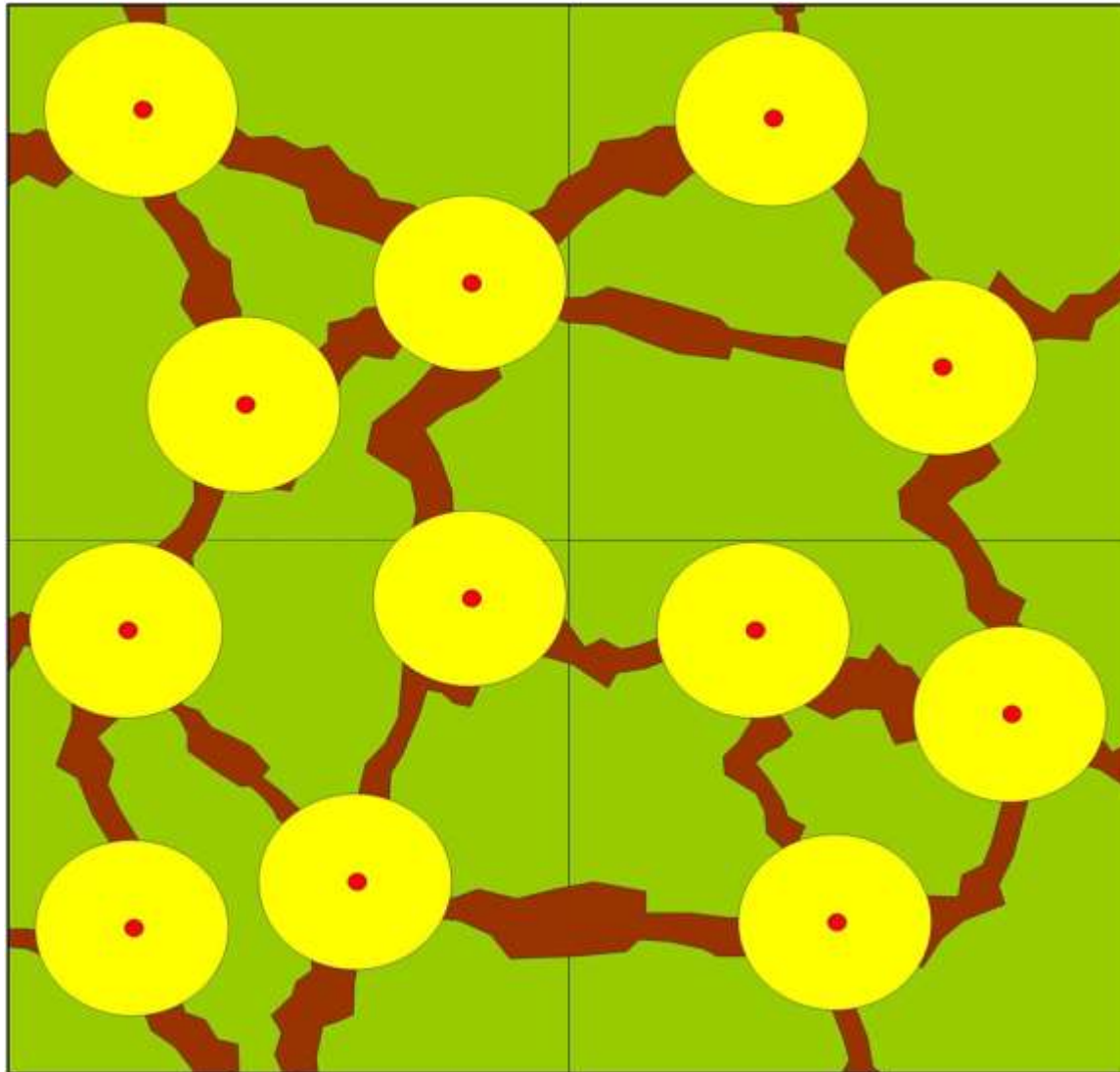
Variable Density Thinning

Homogeneity

x

Heterogeneity

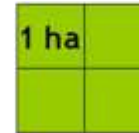
Young stand



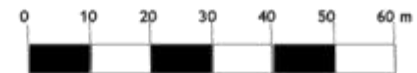
Open areas (20-30m, removing spruce, fir and beech)

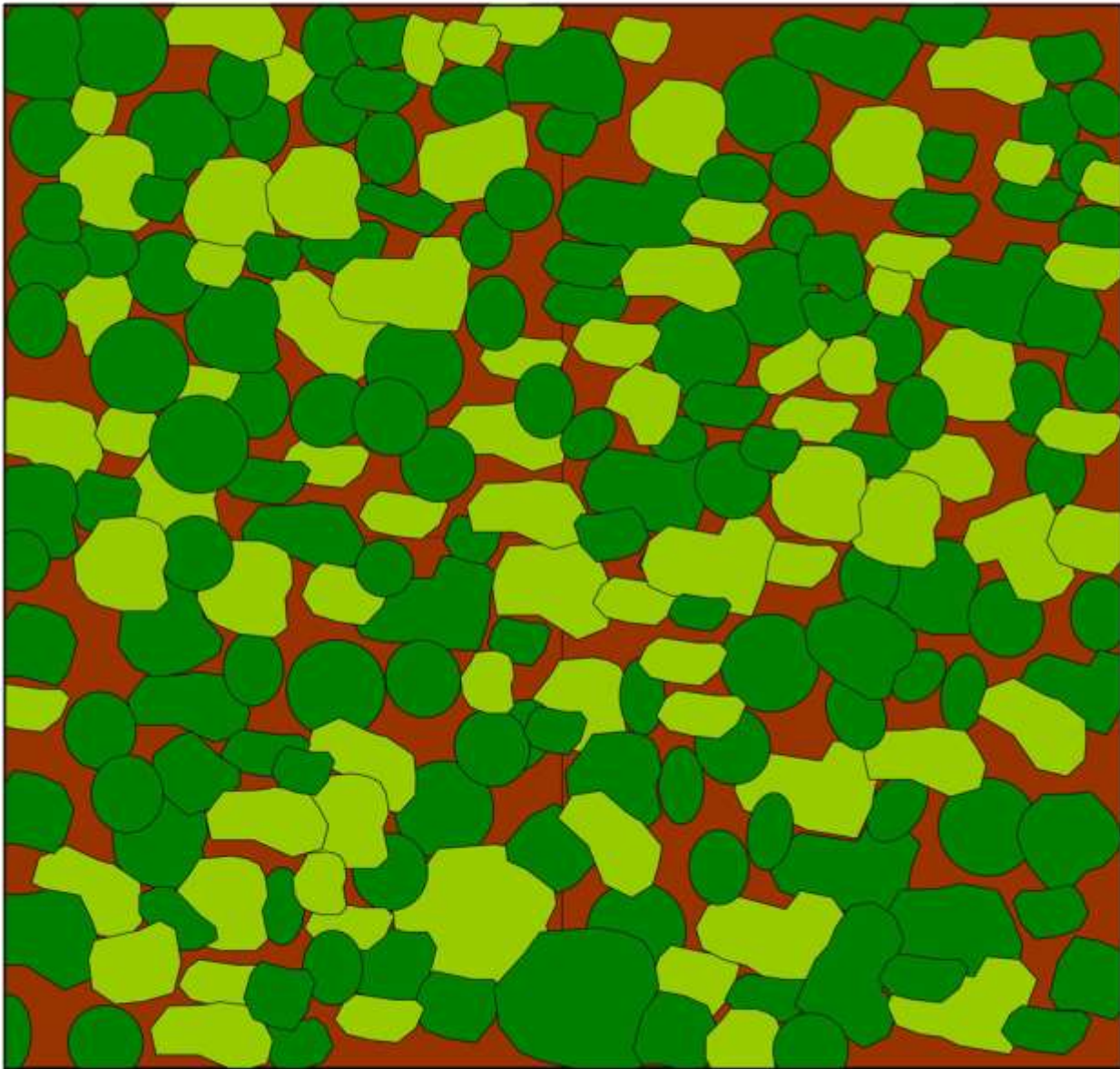


Lighter corridors (3-8m wide, wide forestry trails, aisles)



Remaining area (normal management)





Thinning stand

Before



Deciduous trees



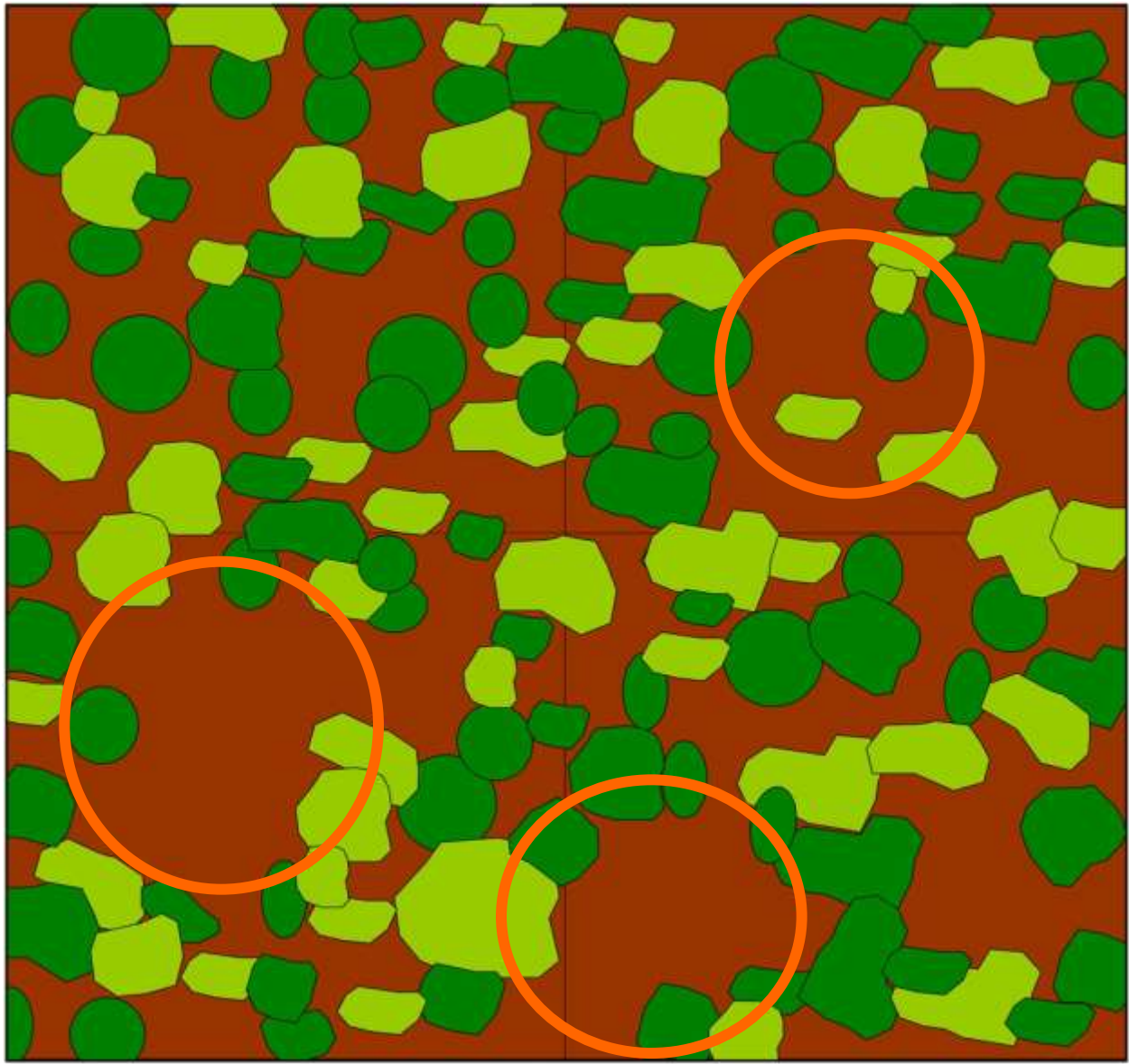
Coniferous trees



1 ha

Thinning area








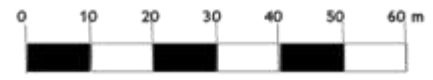
Thinning stand

After

Legende

-  Deciduous trees
-  Coniferous trees

 1 ha Thinning area







© Seznam.cz, © TopGis

© Seznam.cz, © TopGis

© Seznam.cz, © TopGis

© Seznam.cz, © TopGis

© Seznam.cz, © TopGis

© Seznam.cz, © TopGis

© Seznam.cz, © TopGis

© Seznam.cz, © TopGis

© Seznam.cz, © TopGis

© Seznam.cz, © TopGis

© Seznam.cz, © TopGis



1996



2001



2003



2004



2005



2006



2009



2010

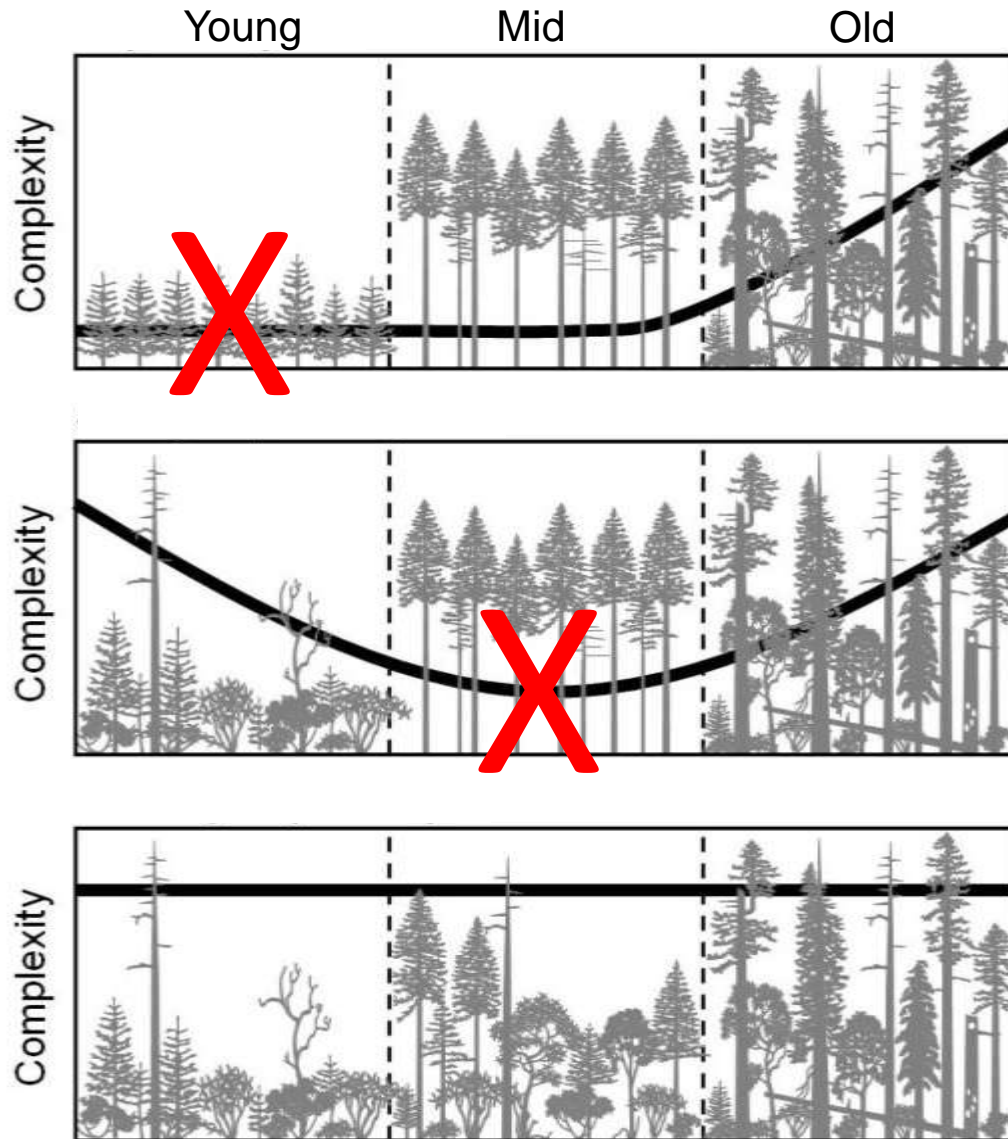


2011



2012

Continuity of Complexity ?



**Sparse regeneration
→ Skip the closed-canopy
middle stage ?**

Forest management promoting species diversity through habitat maintenance or restoration

- maintaining biological legacies (salvage and sanitary logging)
- restoring and restarting natural processes (variable density thinning)
- living tree and stand retention
- dead wood and veteran tree management
- tree microsite management

Mařák, Bohemian Forest, 1850

Thank you for your attention

