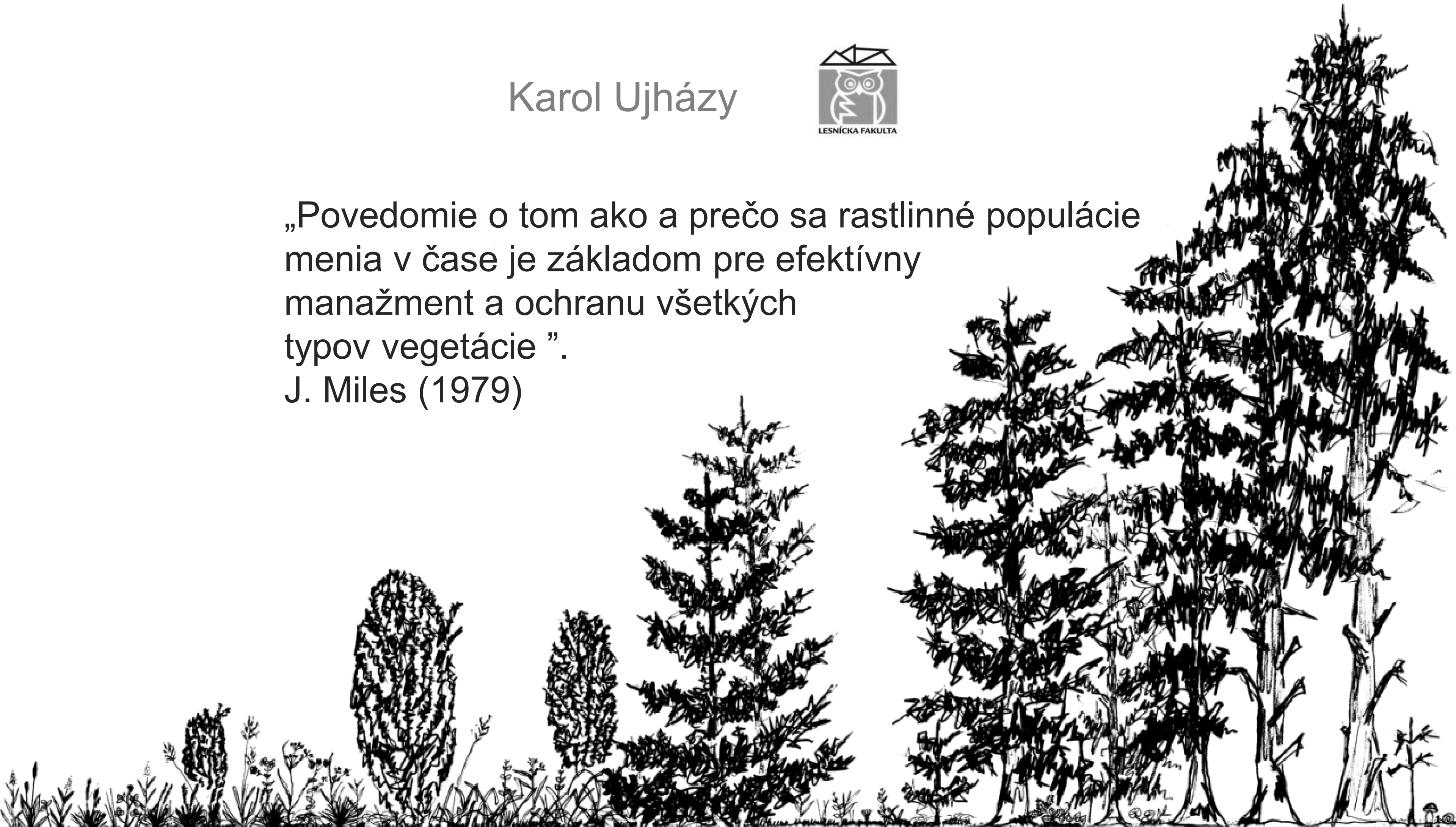
Dynamika vegetácie 8

Karol Ujházy

LESNÍCKA FAKULTA

„Povedomie o tom ako a prečo sa rastlinné populácie menia v čase je základom pre efektívny manažment a ochranu všetkých typov vegetácie ”.
J. Miles (1979)

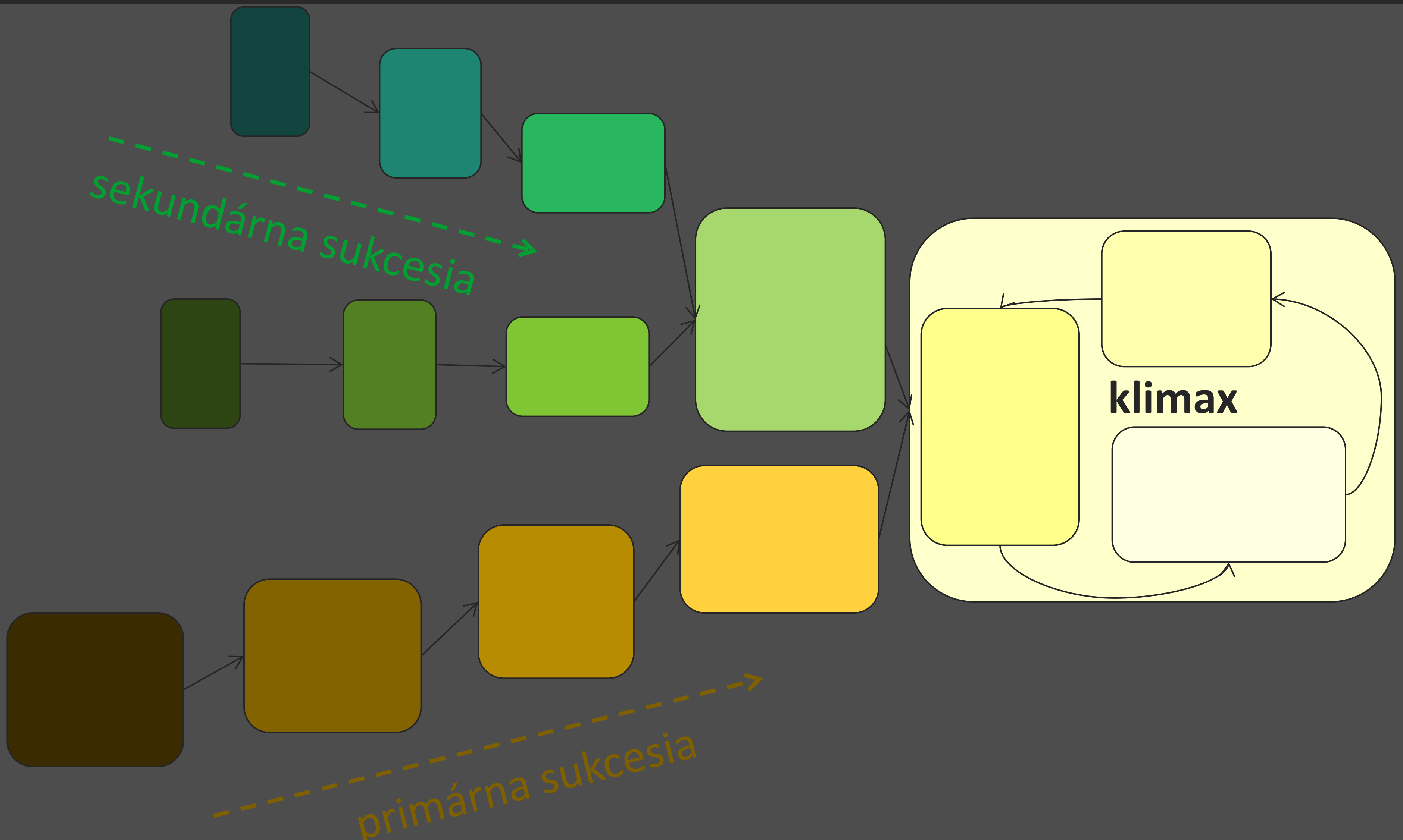


Adaptívne zmeny

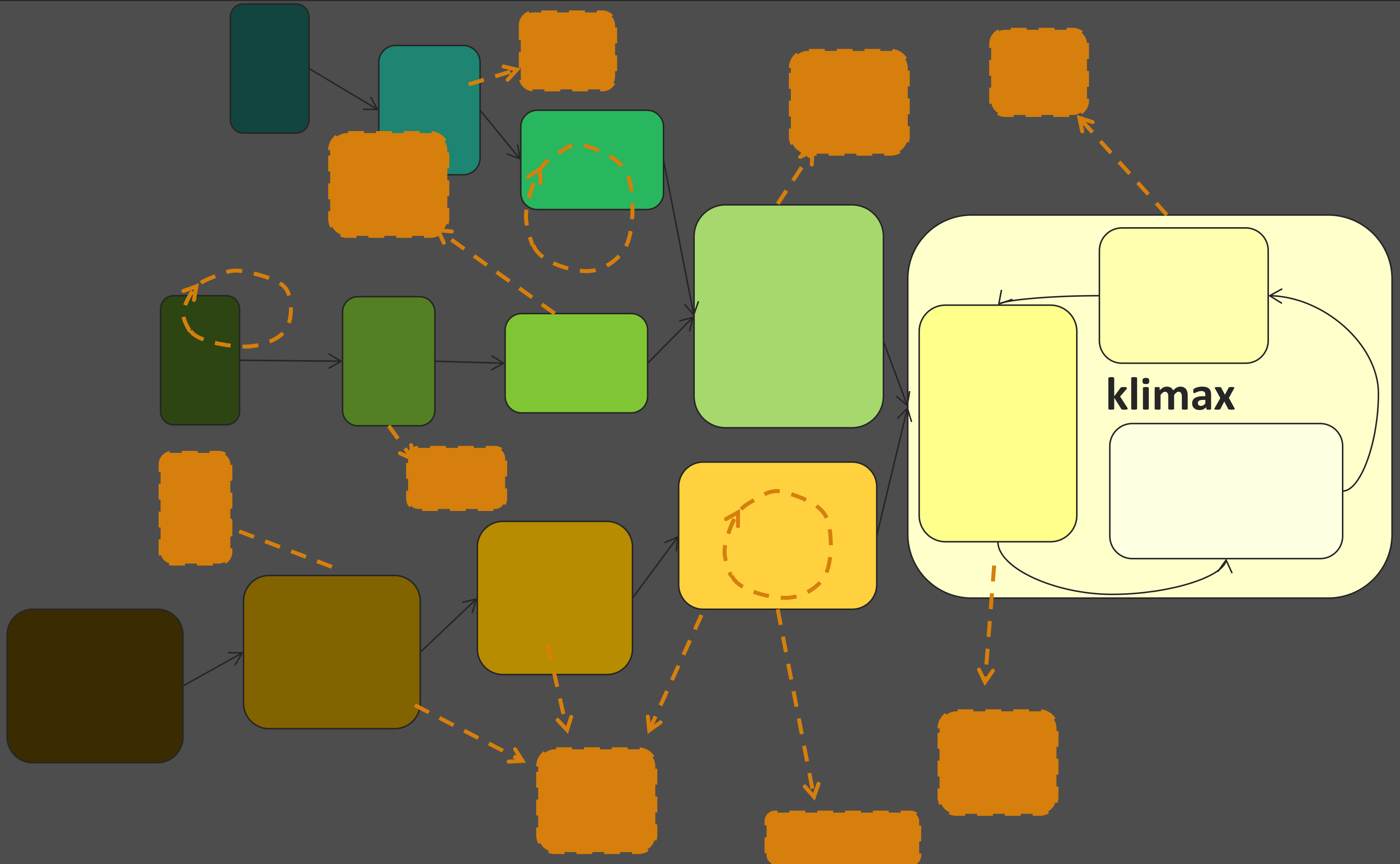
- **vnútorná dynamika a sukcesia**
  - **endogénne zmeny** = spontánny vývoj ekosystému, často po disturbancii resp. po skončení ľudského pôsobenia
  - vývoj ku klimaxu (alebo v rámci klimaxu) predpokladá stabilné prírodné podmienky

- **adaptívne zmeny**
  - **exogénne zmeny** (Moravec 1969, 1994) = prispôsobovanie sa vonkajším prírodným alebo antropickým faktorom
  - vonkajšie faktory nedovoľujú vývoj a stabilizáciu v klimaxe

Adaptívne zmeny



Adaptívne zmeny
– vznik nových spoločenstiev



Adaptívne zmeny

- reakcia a neustále prispôsobovanie vonkajším vplyvom
  - silnejšie ako „príťažlivosť“ ku klimaxu
  - odlišná štruktúra až odlišné spoločenstvá
  - čím silnejšie zásahy tým odlišnejšie spol. od klimaxu
- ak vonkajšie vplyvy trvajú s rovnakou intenzitou
  - vznikajú dlhodobo ustálené spoločenstvá
  - zablokované sukcesné štádiá
  - napr. lúky, pasienky, pasienkové lesy, kroviny
- druhové zloženie závisí od prírodných podmienok a vonkajších (antropických) faktorov


Martincová, J. 2019

Adaptívne zmeny v lesných spoločenstvách

- priame vplyvy na lesné ekosystémy
  - rôzne formy lesného manažmentu
    - zakladanie – pestovanie – ťažba
      - zmeny drevinového zloženia a štruktúry
    - množstvo exportovanej biomasy
    - boj proti škodcom
  - manažment zveri
- nepriame vplyvy človeka
  - zmeny klímy
  - znečistenie ovzdušia
  - socioekonomické zmeny s dopadom na lesné hospodárstvo a život na vidieku

Reacfia fytocenóz na zmeny hospodárenia v lesoch

- **adaptácia na historické formy manažmentu**
  - pastva v lese
  - hrabanie opadu
  - osekávanie letniny na krmivo
  - žír ošípaných na žaľuďoch
  - zbieranie tenčiny na palivo
  - kosenie trávy v hájoch
  - výmladkové hospodárenie
  - uhliarstvo

Fanta 2007: Lesy a lesníctví ve střední Evropě, časť II. časopis Živa

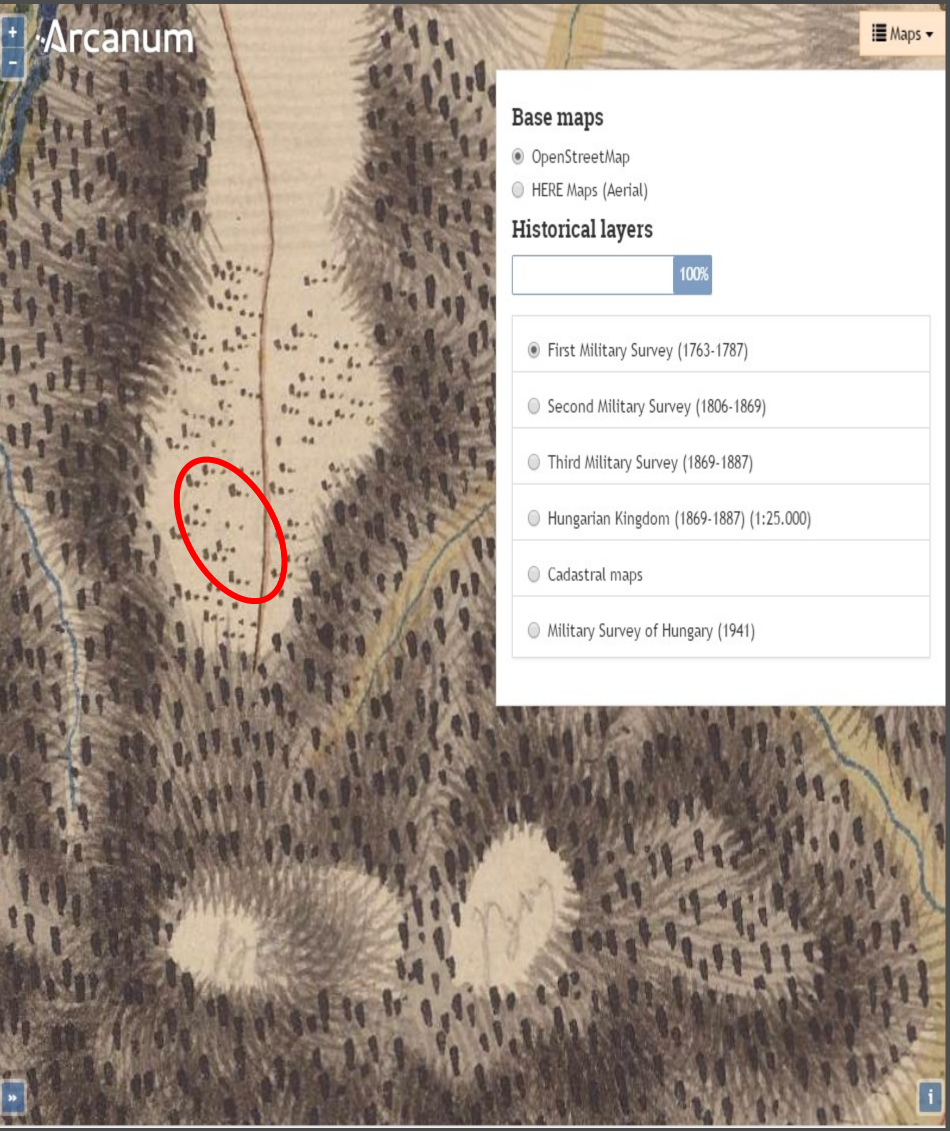
- **po zmene manažmentu zmena fytocenóz**
  - menší vplyv človeka = návrat ku klimaxu

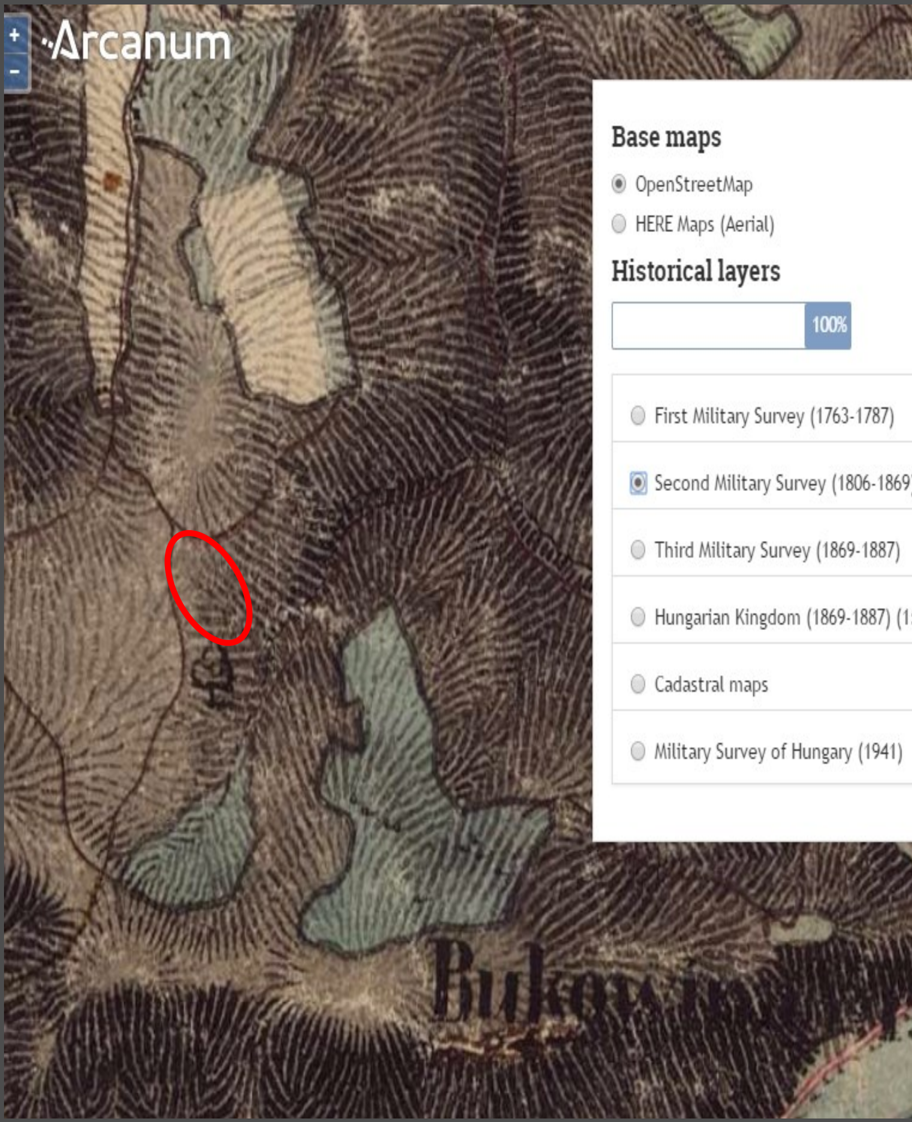
Heterogenita vo využívaní krajiny v Slovenskom krase v roku 1950 (Máliš et al. 2020)

Figure S4. Aerial photography from 1950 showing high heterogeneity in the land use including pasture woodlands (D) and in stripes fragmented arable fields. Forests were cut at rather large areas and managed at this particular area as coppice-with-standards. Tree standards – solitary trees kept over several cutting periods are clearly visible (E).

Máliš et al. 2020

Príklad vývoja na lokalite Hrabiny v Kremnických vrchoch pasienkové dubiny 18. stor. – dubiny 19. stor. – hrab/dub/buk koniec 20. stor.





Hrabiny

1950

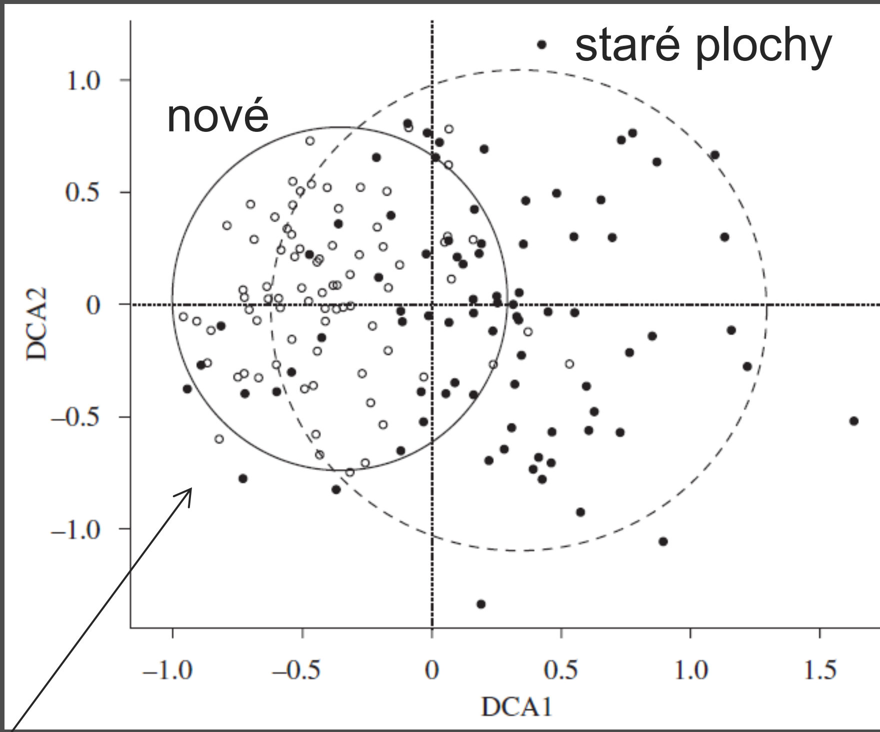
2020


COPPICE

Reakcia fytocenóz na zmeny hospodárenia v lesoch

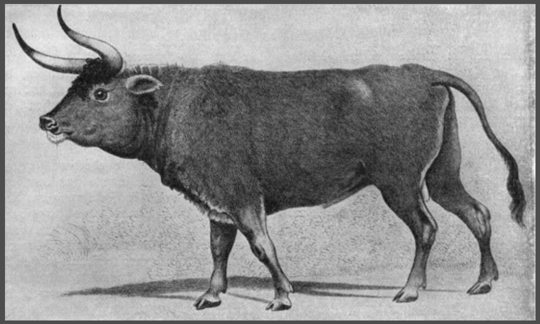
- **zánik historických foriem manažmentu lesov – adaptácia fytocenóz na novú formu manažmentu**

- **biotická a taxonomická homogenizácia** (McKinney & Lockwood 1999; Keith et al. 2009)
- súčasný stav a trend v celej temperátnej Európe, u nás predovšetkým **v dubinách** 1.-3. vs
  - nástup indiferentných druhov, pokles počtu druhov, ústup svetlomilných tráv a trávovitých typov, nástup hrabu a cenných listnáčov namiesto dubov



Reackia fytocenóz na zmeny hospodárenia v lesoch

- zmeny lesnej fauny
  - postupné vyhubenie veľkých herbivorov
    - pratur, divý kôň, los, zubor
  - vyhubenie predátorov
  - premnoženie jeleňa a diviaka po 2. sv. vojne
  - introdukcia nepôvodných druhov
    - muflon, daniel, jeleň sika



Posledný pratur zahynul v r.1627 v Poľsku

Vera, F. W. M. (2000). *Grazing ecology and forest history*. CABI publishing.

Vplyv veľkých herbivorov na dreviny, druhové zloženie a štruktúru krajiny

- podľa oplôtkových štúdií a paleoekologických údajov

Table 1. Examples of the impact of large herbivores on woody plants, species composition, and landscape structure as found in contemporary (exclosure) studies and from the paleoecological record

Process	Contemporary pattern	Paleoecological record
Large herbivores reduce the abundance of woody plants.	Higher woody plant cover in exclosures and after removal of large herbivores (12–16)	Landscapes of previous interglacials seem to have been more open than after Pleistocene extinctions in the early Holocene (81, 82).
		Moas may have maintained mosaics of open canopied woodland and scrub (95).
Large herbivores induce shifts in woody species composition.	Under intense browsing, unpalatable and thorny species thrive and palatable species are suppressed (14, 37, 40).	Increase in palatable and shade-tolerant hardwoods immediately after the Pleistocene extinction in North America (75, 78).
	Browsing may also promote browsing-tolerant species (102).	Increase in unpalatable trees during historically high herbivore densities in European forest (111).
	Under intense herbivory, light-demanding trees and shrubs are promoted (35, 39).	
Large herbivore impact is mediated by soil fertility.	More thorny shrub species in fertile habitats may indicate higher browsing pressure (35).	Vegetation openness was greater in fertile lowland areas, compared with less fertile upland areas (82).
	Higher elephant impact on treefall at fertile soils (22)	
Herbivores modify vegetation responses of woody plants to climate and soils.	In tundras, herbivores can inhibit shrub encroachment with climate warming (87), but this effect is site-dependent (88).	Mosaic forest tundra in northeastern Siberia during the Last Interglacial, with browsing tolerant trees frequent—likely (at least partly) due to large herbivores (86).
	In savannas, woody species cover does frequently not reach its abiotic potential due to fire and herbivory (115, 116).	Large herbivore presence maintained the mammoth steppe in northeastern Siberia, which disappeared after Late Pleistocene extinctions (70, 85).
		Higher openness of vegetation in last interglacial than expected based on climate and soil may be mediated by large herbivores (81).
Herbivores reduce fuel load for fires.	Herbivores reduce herbaceous biomass and fire frequency, which benefits woody species, unless these woody plants are also browsed (30, 116, 117).	Increased fire activity immediately after the Pleistocene extinctions (73–76, 78)

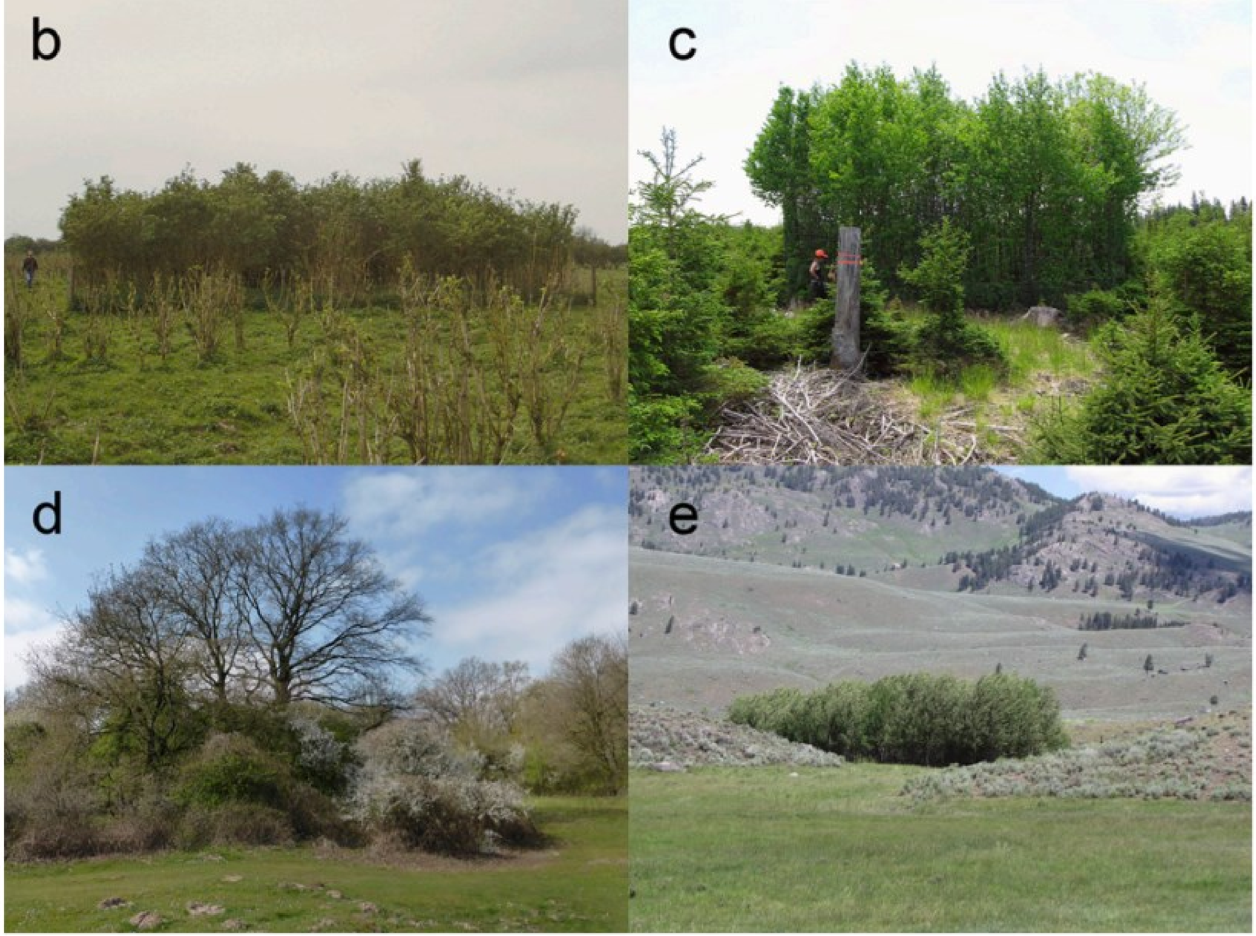


Fig. 1. Modern exclosure experiments demonstrate strong impacts of large herbivore assemblages on woody plants. (*A*) In subtropical savanna, a diverse large herbivore assemblage (>5 kg) greatly reduces the abundance of woody plants outside the 302-ha exclosure (upper part of the picture) (12). The 3D infrared color indicates woody vegetation (in red, more intense red revealing more gross primary productivity) and herbaceous vegetation (in green–blue). Fire is controlled both inside and outside of the exclosure [Carnegie Airborne Observatory image (122), Kruger National Park, South Africa (12)]. (*B*) In temperate wetland grasslands, Heck cattle, Konik horses, and red deer (*Cervus elaphus*) break down the established elderberry woodland (*Sambucus nigra*) where it is not protected by fencing (123) (Oostvaardersplassen, The Netherlands). (*C*) In the boreal forest, after logging, white-tailed deer strongly influence the recruitment of woody species, with the exclosure dominated by palatable deciduous species whereas a spruce parkland developed under intense browsing (38) (Anticosti Island, Quebec, Canada). (*D*) Thorny shrubs (*Prunus spinosa*) function as natural exclosures, where they protect establishing palatable oak (*Quercus* sp.) from herbivory (35, 47) (Borkener Paradies, Germany). (*E*) In temperate sagebrush and grassland vegetation, American bison (*Bison bison*) and elk (*Cervus elaphus*) strongly suppress establishment of palatable trees (*Populus* sp.), which abundantly regenerate inside the exclosure (center of the picture) (Yellowstone National Park, United States). *C* courtesy of Bert Hidding.

Vplyv herbivorov a intenzity pastvy na lesné spoločenstvá a štruktúru krajiny

pnas.org/content/pnas/113/4/847.full.pdf

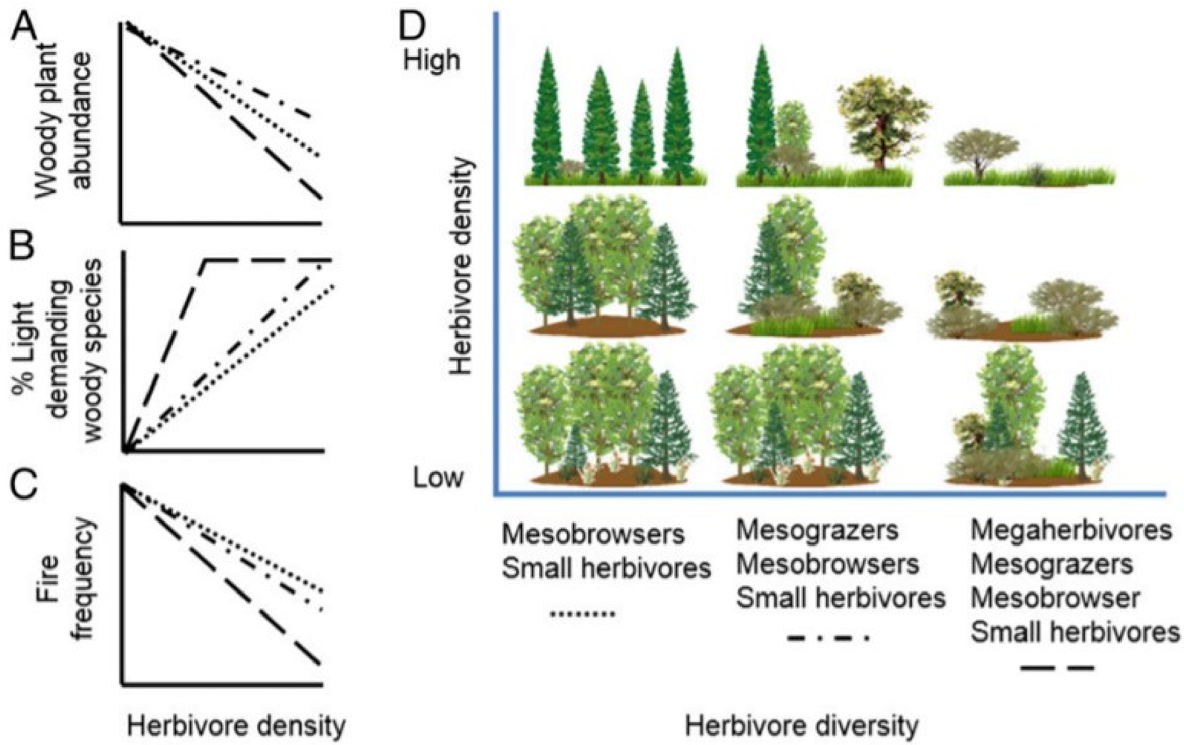


Fig. 2. Hypothesized impact of large herbivore removal on landscape structure, proportion of light-demanding woody species, and fire frequency. All of these landscapes represent sites where the climate and soil allow trees to dominate. The dotted and dashed lines in *A–C* correspond to the three herbivore assemblages indicated on the *x* axis of *D*. The three herbivore combinations represent a series of herbivore diversity indicating simplification from the full Pleistocene fauna to the common late Holocene condition. We predict that removal of megaherbivores would result in (*A*) increased woody plant abundance, (*B*) reduced percentage of light-demanding species, and (*C*) increased fire frequency, depending on the densities of the remaining wild herbivores. (*D*) The resulting landscape structure. In essence, over time, the landscape developed in many areas from open in the Late Pleistocene, with high densities of diverse herbivore assemblages (*D, Top Right*), to defaunated wild herbivore communities controlled at low densities in the Holocene, resulting in a wooded landscape (*D, Bottom Left*), unless livestock is introduced, which could take over the role of native extinct grazers, resulting in a wood pasture (*D, Middle*). In the wood pasture, palatable light-demanding trees can regenerate within the protection of light-demanding thorny shrubs. When browsers are not managed, they can reach high densities, resulting in an open landscape with unpalatable, light-demanding trees (*D, Top Left*).

Herbivori zvyšujú druhovú bohatosť vďaka šíreniu „nelesných“ druhov (štúdia z Francúzska)

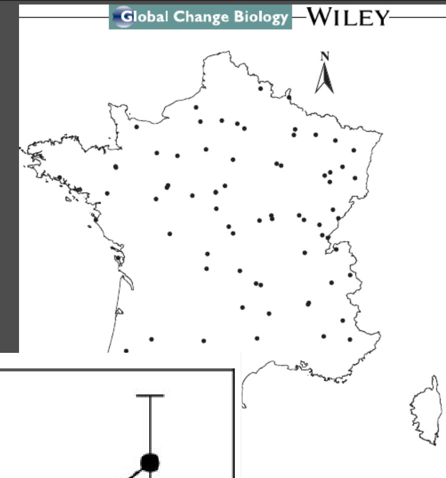
DOI: 10.1111/gcb.13899

PRIMARY RESEARCH ARTICLE

WILEY Global Change Biology

Ungulates increase forest plant species richness to the benefit of non-forest specialists

Vincent Boulanger[1] | Jean-Luc Dupouey[2] | Frédéric Archaux[3] | Vincent Badeau[2] | Christophe Baltzinger[3] | Richard Chevalier[3] | Emmanuel Corcket[4] | Yann Dumas[3] | Françoise Forgeard[5] | Anders Mårell[3] | Pierre Montpied[2] | Yoan Paillet[3] | Jean-François Picard[2] | Sonia Saïd[6] | Erwin Ulrich[1]



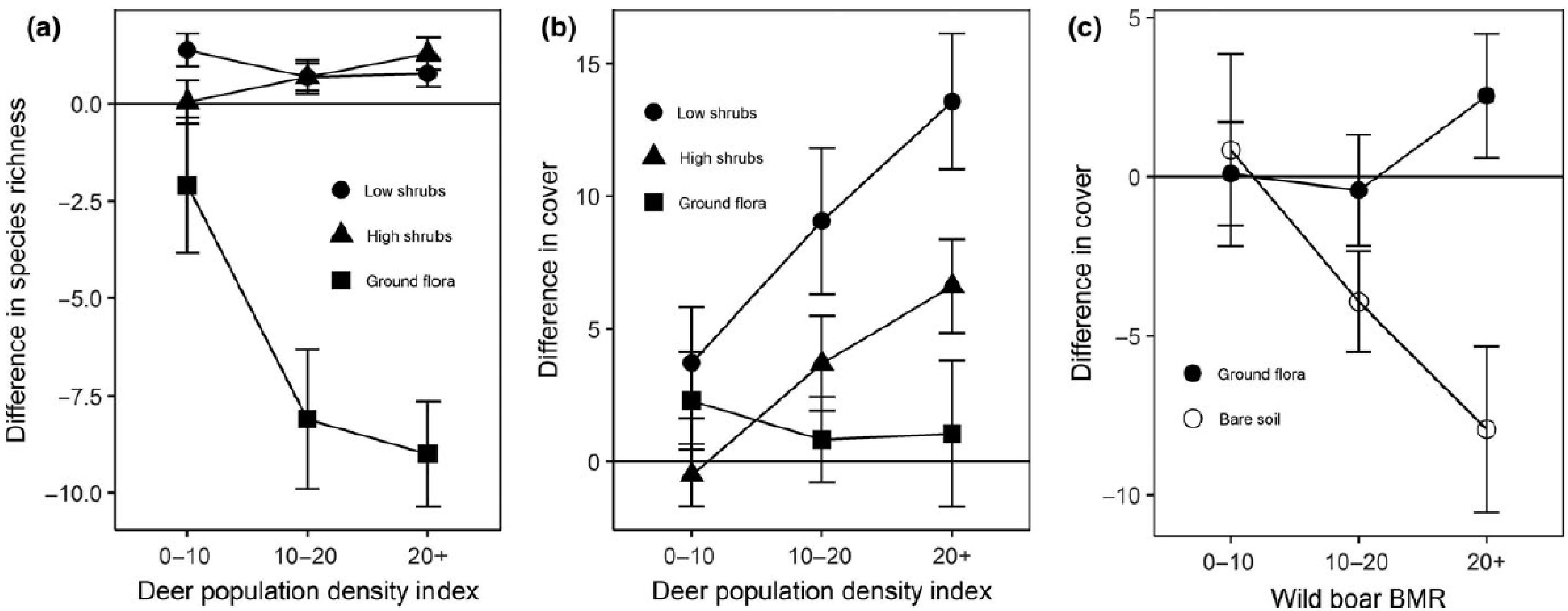


FIGURE 4 Differences between paired exclosure-control plots (inside minus outside exclosure) after 10 years of ungulate exclusion for species richness (a) and cover (b) of herbaceous layer, low shrubs and high shrubs in relation to indices of deer population densities based on hunting statistics transformed as equivalents of basal metabolic rates of the number of red and roe deer killed per 100 ha. (c) Differences between paired exclosure-control plots (inside minus outside exclosure) after 10 years of ungulate exclusion for cover of herbaceous layer and proportion of bare soil in relation to wild boar BMR

- po vylúčení pastvy narastá počet aj pokryvnosť druhov drevín
- klesá počet druhov bylín

DOI: 10.1111/gcb.13899

PRIMARY RESEARCH ARTICLE

WILEY Global Change Biology

Ungulates increase forest plant species richness to the benefit of non-forest specialists

Vincent Boulanger[1] | Jean-Luc Dupouey[2] | Frédéric Archaux[3] | Vincent Badeau[2] | Christophe Baltzinger[3] | Richard Chevalier[3] | Emmanuel Corcket[4] | Yann Dumas[3] | Françoise Forgeard[5] | Anders Mårell[3] | Pierre Montpied[2] | Yoan Paillet[3] | Jean-François Picard[2] | Sonia Saïd[6] | Erwin Ulrich[1]

[1]Office National des Forêts, Département Recherche, Développement et Innovation, Fontainebleau, France
[2]INRA - Université de Lorraine, UMR 1137 Ecologie et Ecophysiologie Forestières, Champenoux, France

Abstract

Large wild ungulates are a major biotic factor shaping plant communities. They influence species abundance and occurrence directly by herbivory and plant dispersal, or indirectly by modifying plant-plant interactions and through soil disturbance. In for-

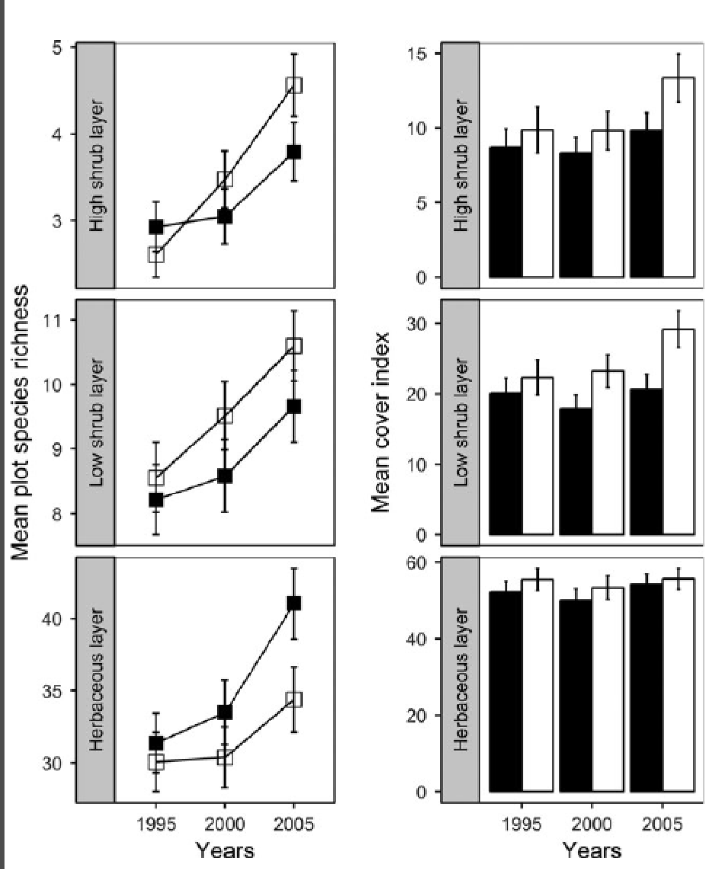


FIGURE 2 Mean species richness and cover index of high shrub (2–7 m), low shrub (0.3–2 m) and herbaceous (<0.3 m) layers in exclosure and control plots at the three sampling dates: 1995 (year of exclosure establishment), 2000 (5 years after ungulate exclusion) and 2005 (10 years after). Error bars represent the standard error of the mean. Black: control plots. White: exclosure plots

Pasienkové dubiny a silvopastorálne systémy


Očová; V. Dlhý 2018

Gavurky

- Pliešovská kotlina
- dub letný
- pastva HD
- prevaha nelesných druhov pasienkov
- počet druhov okolo 70 na 400 m2

Vplyv pastvy na horské lesy

Forest Ecology and Management 258 (2009) 347–356

Contents lists available at ScienceDirect

Forest Ecology and Management

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

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?

Tomáš Vrška [a,*], Dušan Adam [a], Libor Hort [a], Tomáš Kolář [b], David Janík [a]

- na začiatku novoveku jedľa expandovala na úkor buka vďaka:
  - pastve dobytka v lese
    - preferuje listnáče
  - hrabaní opadu
    - obnažená pôda vhodnejšia pre jedľu
  - redukcii divej zveri
    - preferuje jedľu

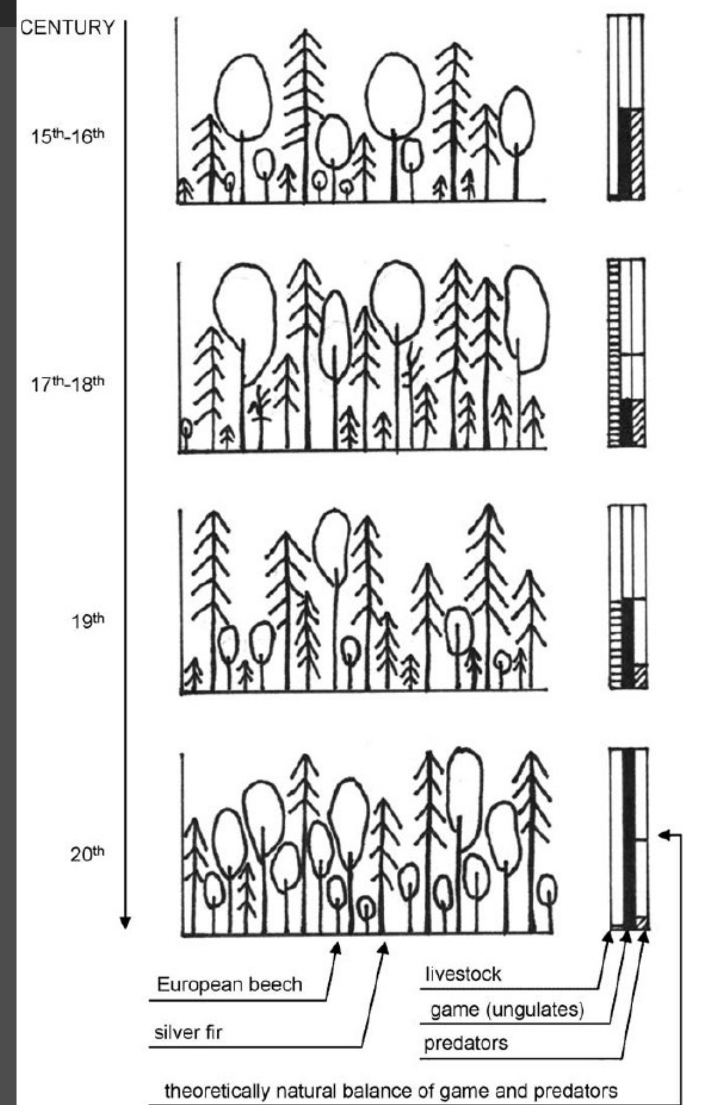


Fig. 2. Diagram of human impact on Carpathian fir–beech forests.

Zmeny v drevinovom zložení západokarpatských horských lesov na základe palynologického výskumu rašelinísk

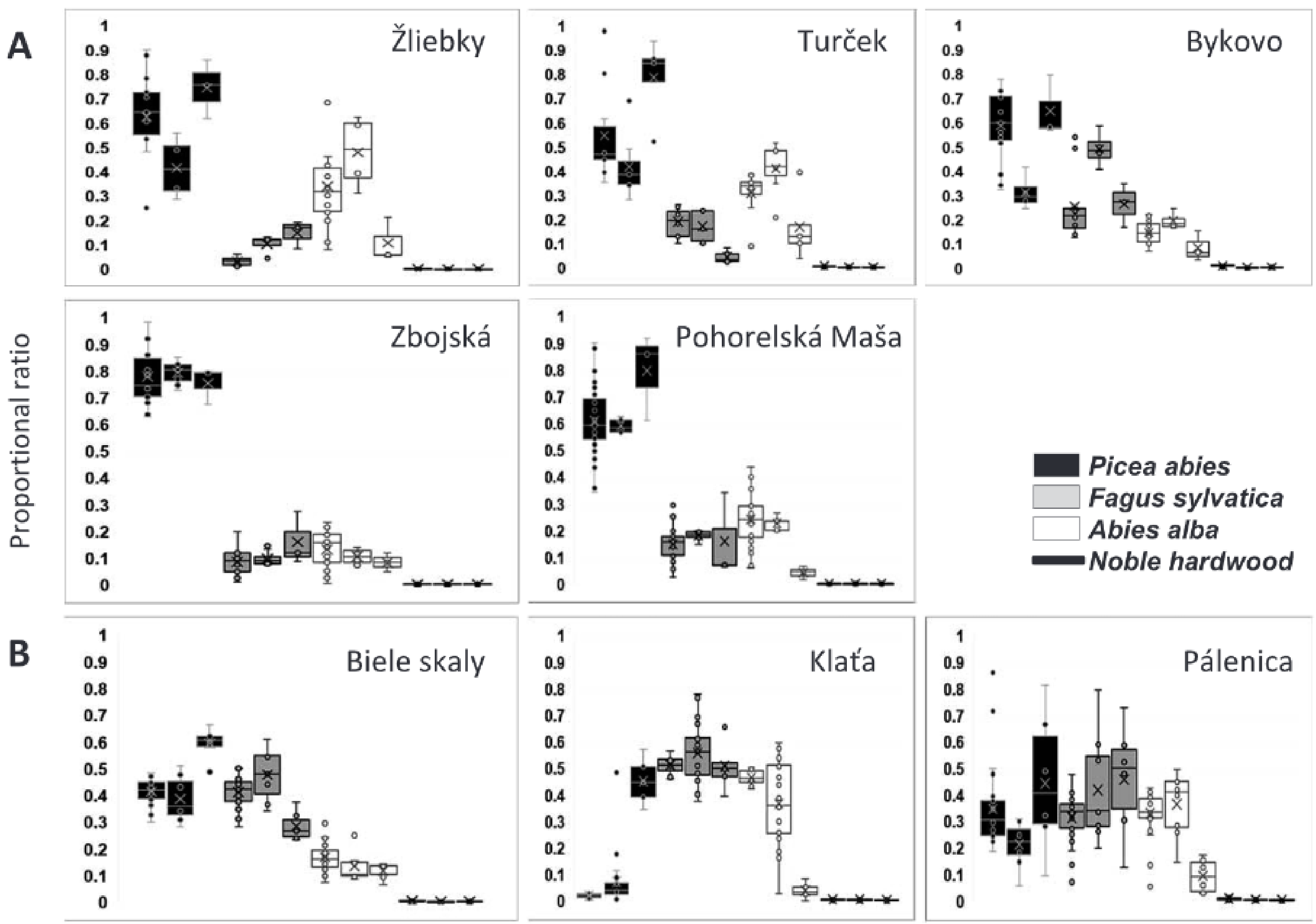


Fig. 2. – The variation in the relative proportion of individual tree taxa in the pollen records during the consecutive periods studied: the period of untouched late-Holocene climazonal woodlands (Period 1, left box), the period from the beginning of systematic human intervention (Period 2, central box) and the period of modern development of spruce plantations (Period 3). Group A includes sites where spruce pollen prevail over beech

Vplyv uhliarstva

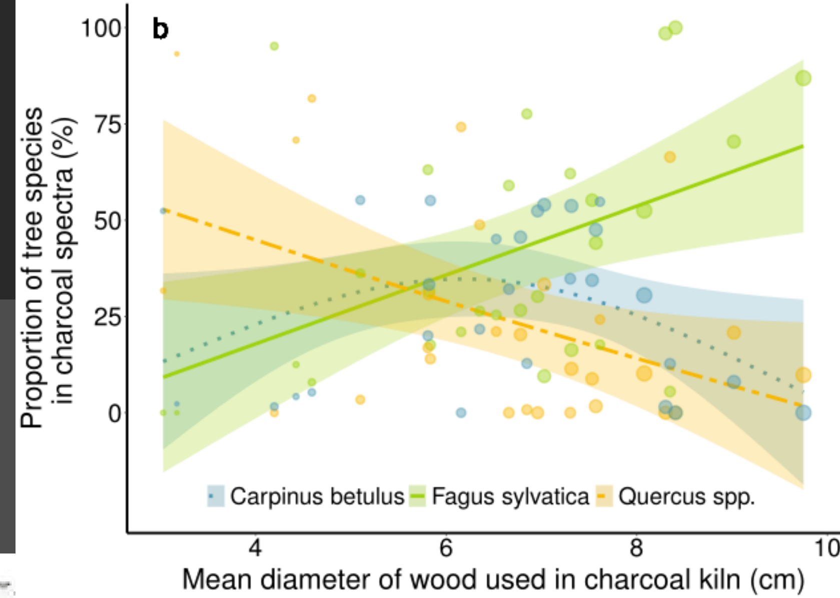
Received: 22 July 2019 | Revised: 22 June 2020 | Accepted: 2 July 2020
DOI: 10.1111/jvs.12923

SPECIAL FEATURE ARTICLE

Journal of Vegetation Science

Historical charcoal burning and coppicing suppressed beech and increased forest vegetation heterogeneity

František Máliš[1,2] | Přemysl Bobek[3] | Radim Hédl[3,4] | Markéta Chudomelová[3] | Petr Petřík[3] | Karol Ujházy[1] | Mariana Ujházyová[5] | Martin Kopecký[3,6]



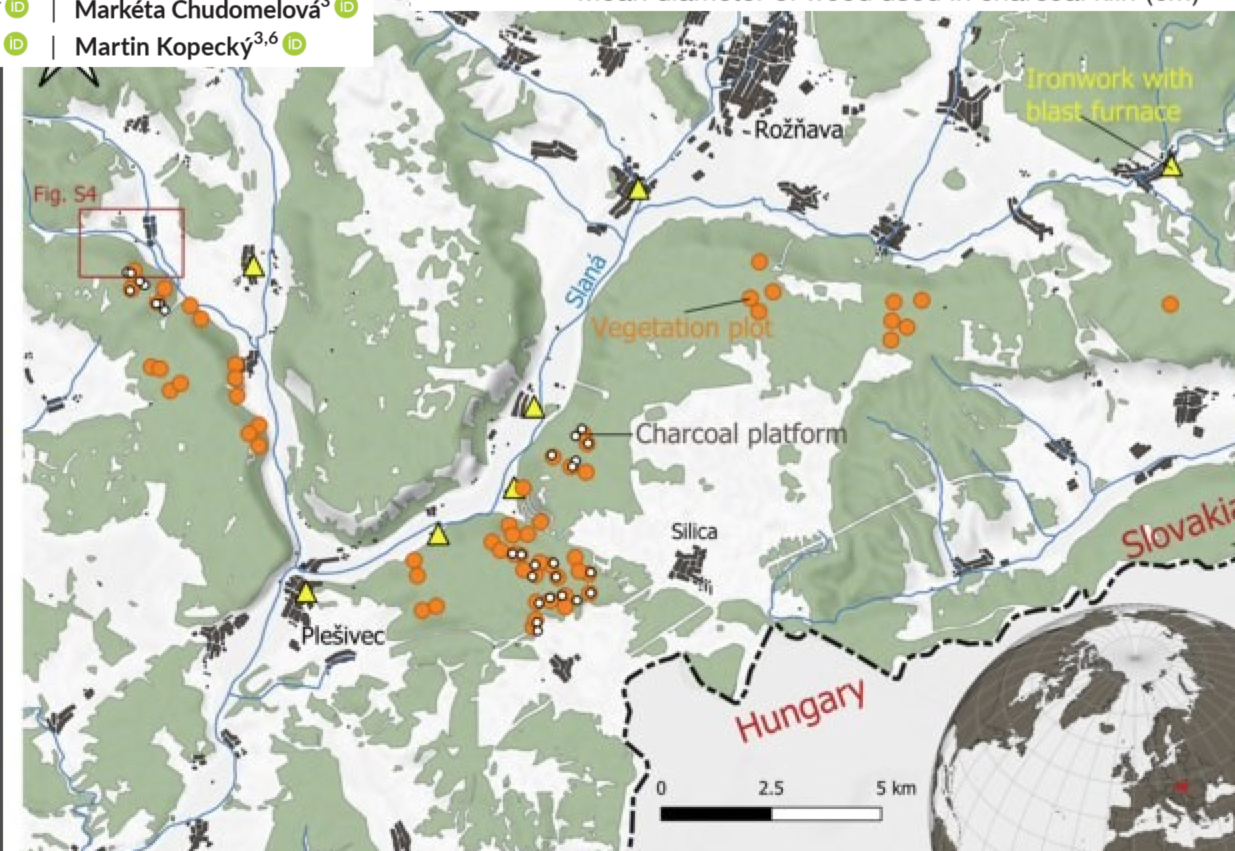


Figure S6. Charcoal kilns were easily recognizable in field as clearly artificial terrain plateaus of oval shape with dark (black) coloured topsoil layer rich in charcoal remains. Tree in the front left is an example of thinning applied to transform coppice stands to high forests (see also Fig. S5).

Milierisko – terasa po pálení dreveného uhlia s pozostatkom dubovej pňoviny prevedenej po 2. sv. vojne na vysoký les

Máliš et al. 2020

Výmladkové hospodárenie – nízke lesy a ich prevody

- historická forma hospodárenia
- krátky cyklus (5–40 rokov) - lúpaninové dubiny na trieslovú kôru pre „koželužný“ priemysel 15–20 ročné, ostatné 20–40 ročné
- od 50-tych rokov prevody na vysoké lesy

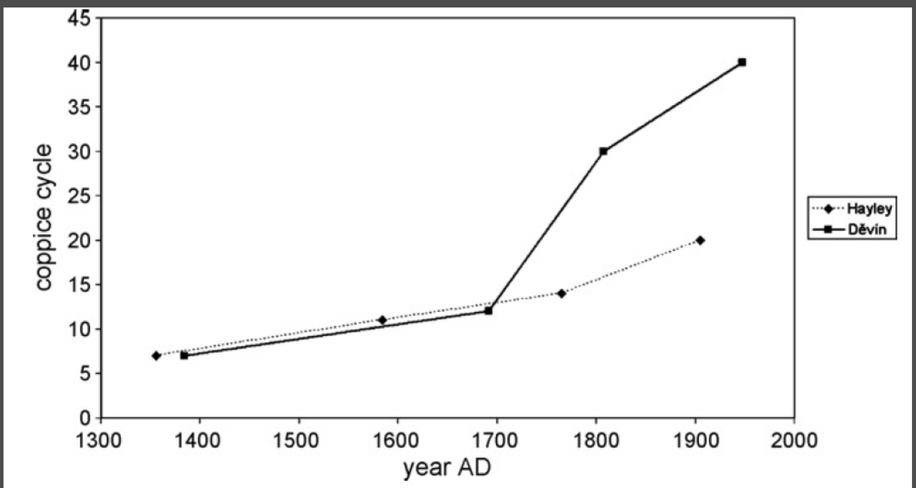


Fig. 3. The lengthening of the coppice cycle in Děvín and Hayley Woods. The values are almost identical except for the last two centuries, when in Děvín the cycle got considerably longer. Note that the two Woods are ca. 1300 km from each other. Hayley data are based on Rackham (1975).

Szabó 2010: Driving forses...For. Ecol.and Manag. 256

Stínka výmladkov v lúpaninových dubinách sekerou (lepšia výmladnosť)

Sigotský a kol. 1953: Prevody nízkych lesov

Príklady výmladkového hospodárenia v Taliansku


Coppice with standards. Chestnut.


Coppice with standards. Downy oak.


Coppice with standards. Holm oak.


Coppice with standards. Turkey oak.


Uneven aged coppice. Beech.


Uneven aged coppice. Beech.

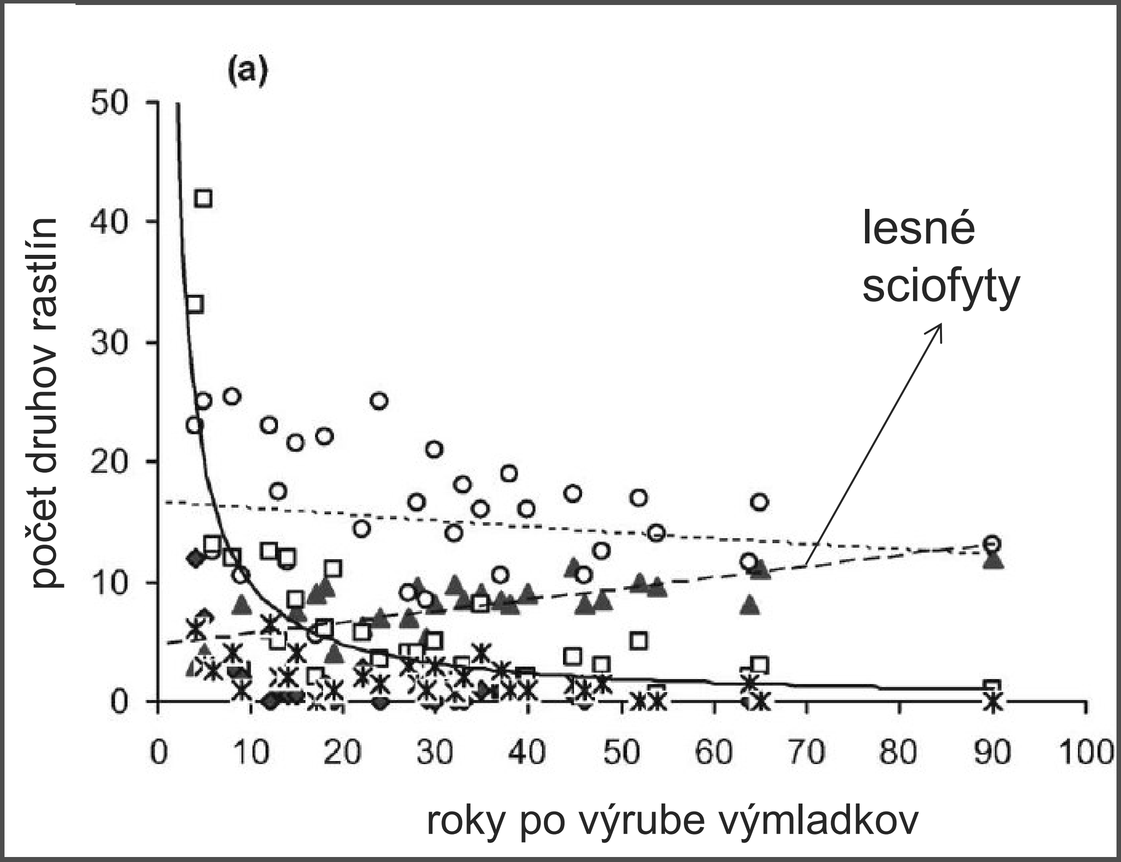
COST ACTION FP1301
EuroCoppice

COST is supported by the
EU Framework Programme
Horizon 2020

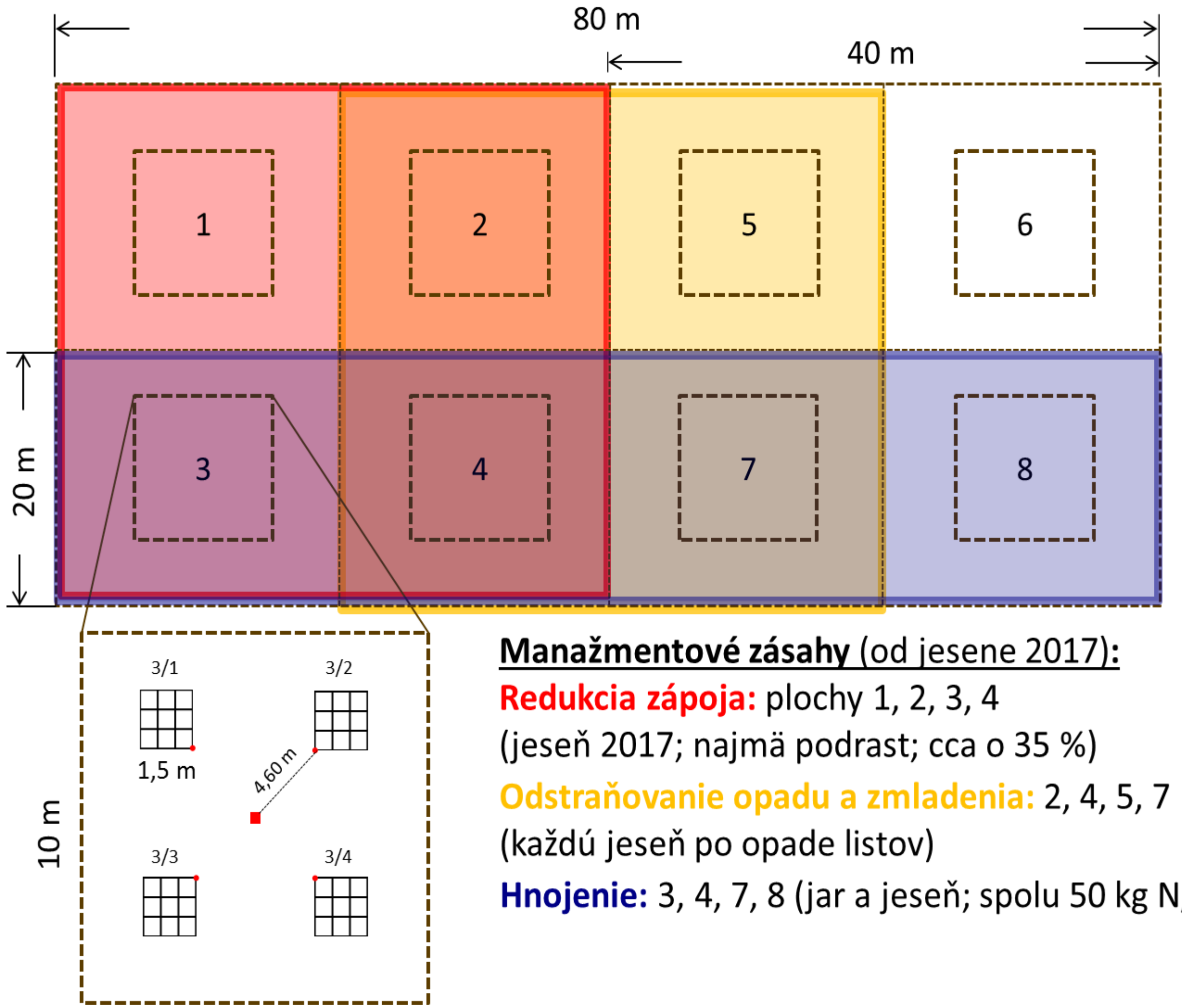
„Prestarnutý“ výmladkový les - polykormón (trs) duba v Českom krase s mladším hrabom, ktorý nastupuje v lesoch s dlhľou rubnou dobou

Výmladkové hospodárenie – vývoj diverzity po prevode na vysoký les

- diverzita lesných druhov rastie s vekom porastu ale celková diverzita klesá po expanzii tiennych drevín



Experiment v dubinách VšLP
slt *Fageto-Quercetum*

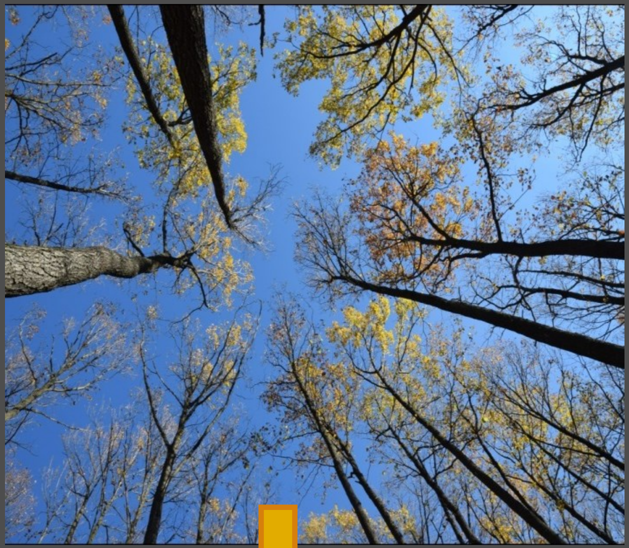


<u>**Manažmentové zásahy** (od jesene 2017):</u>

Redukcia zápoja: plochy 1, 2, 3, 4
(jeseň 2017; najmä podrast; cca o 35 %)

Odstraňovanie opadu a zmladenia: 2, 4, 5, 7
(každú jeseň po opade listov)

Hnojenie: 3, 4, 7, 8 (jar a jeseň; spolu 50 kg N/ha)



simulácia historického manažmentu, redukcia živín

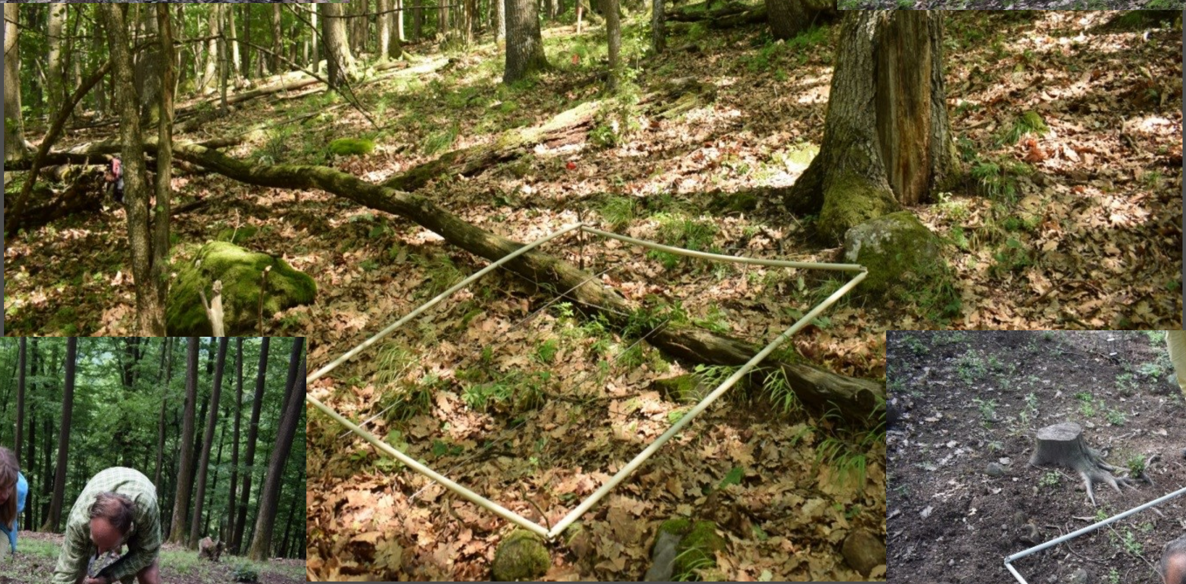
eliminácia hraba; návrat pôvodných druhov? termofilizácia ?

simulácia eutrofizácie - zvýšenie počtu nitrofytov? pokles diverzity?



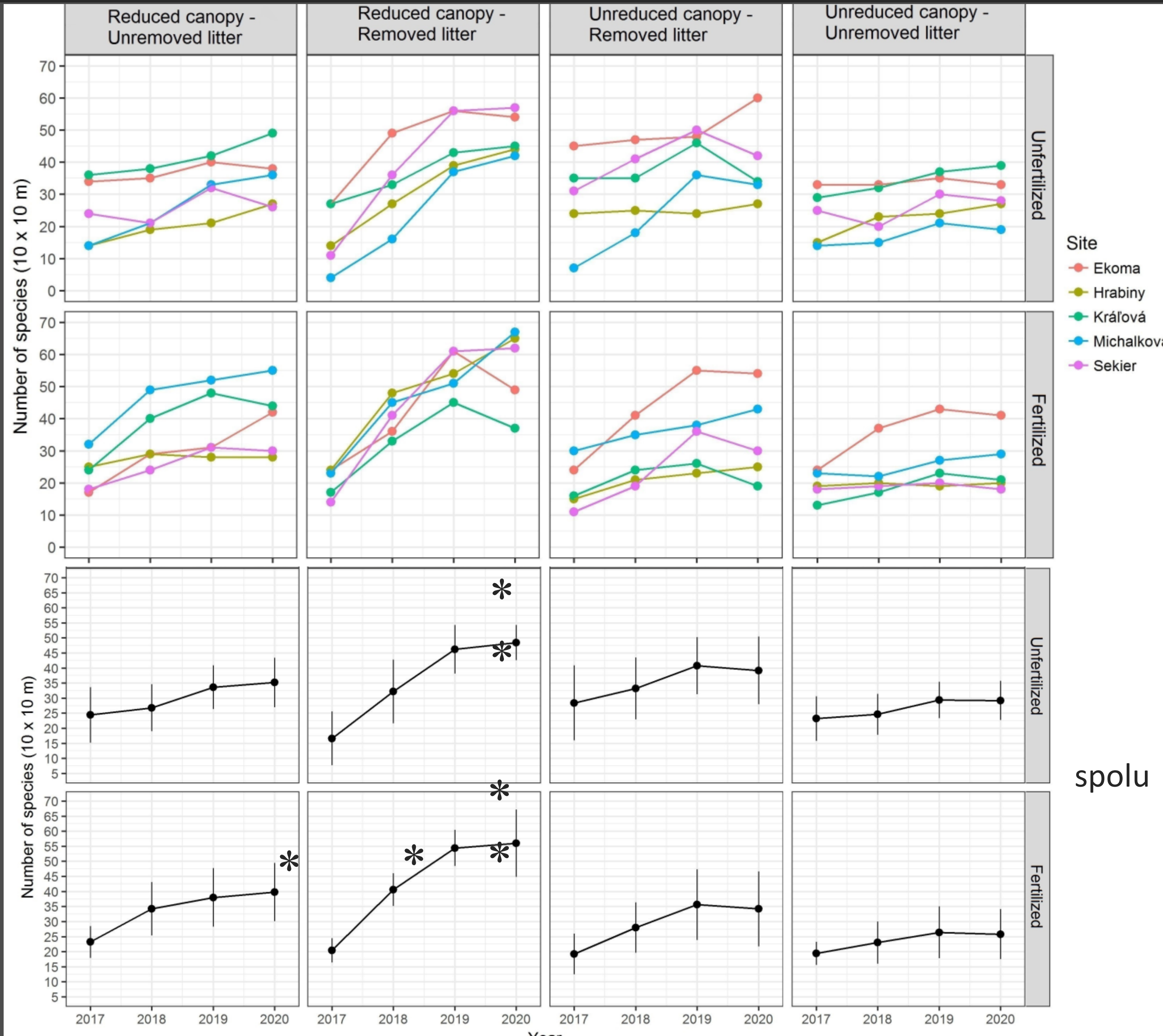




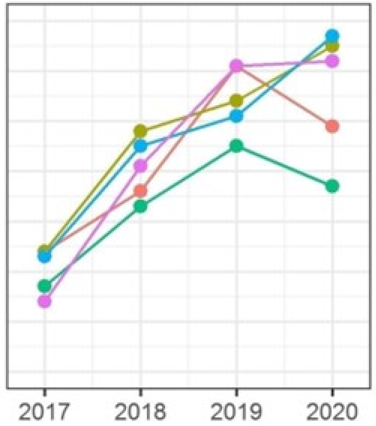
prezencie druhov na štvorcoch 0,5 x 0,5 m

Významný nárast druhovej bohatosti na hrabaných a presvetlených plochách



spolu

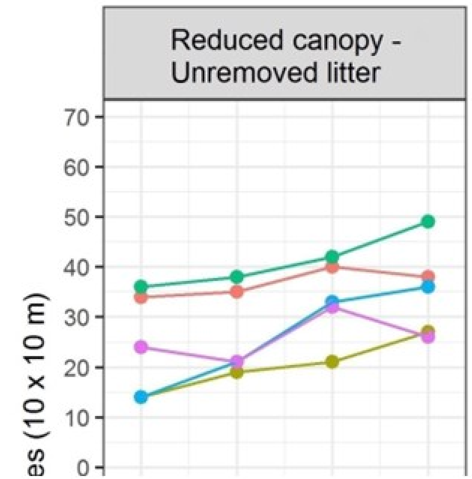
H4 - hrabaná, rúbaná, hnojená



Hrabiny

	SR	E3	E1
2017:	24	90 %	70 %
2020:	64	70 %	70 %

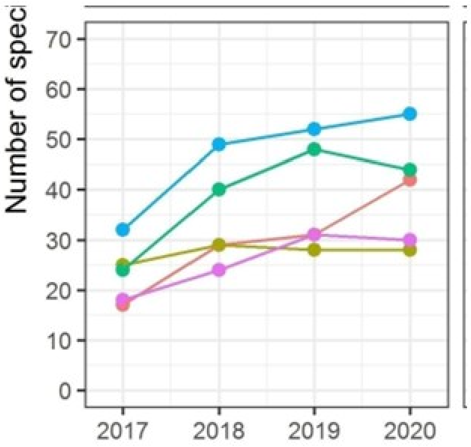
H1 - rúbaná



Hrabiny

	SR	E3	E1
2017:	15	85 %	15 %
2020:	27	75 %	60 %

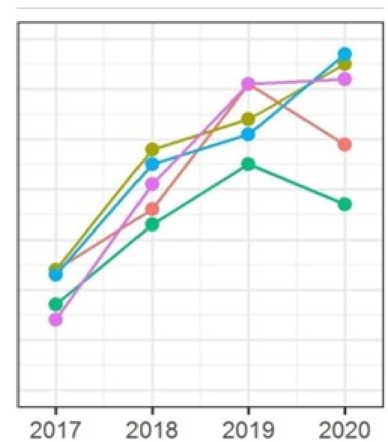
K3 - rúbaná, hnojená



Kráľová

	SR	E3	E1
2017:	24	65 %	30 %
2020:	44	60 %	60 %

K4 – rúbaná, hrabaná, hnojená



Kráľová

	SR	E3	E1
2017:	17	60 %	17 %
2020:	37	50 %	60 %

Poa nemoralis


2019
Myosotis sylvatica, Veronica chamaedry


2019
Fallopia convolvulus


2020

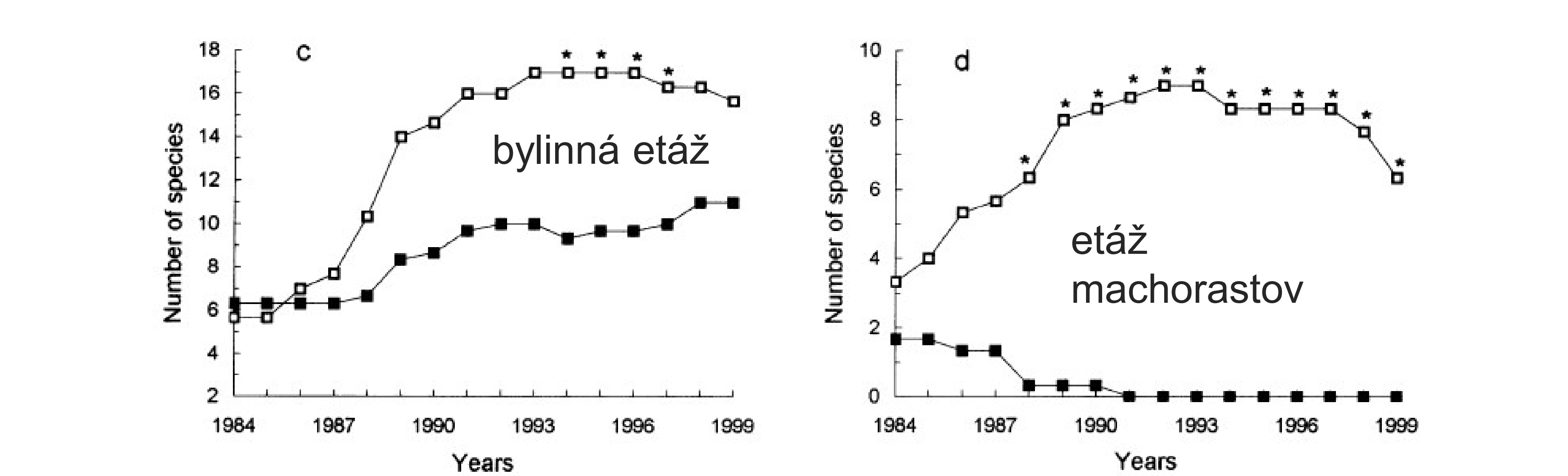

2020


2020
nehnojené
hnojené 4 roky


2020

Vplyv hrabania opadu na podrast

- nárast druhov bylín a machov pri hrabaní opadu v borovicovo-dubovom lese



prázdne štorce = priemer z hrabaných plôch; plné = priemer z nehrabaných