

MOTIVATIONS

- multifunctionality of managed forests: profitability and economical sustainability, ecosystem functionality, social needs → simultaneous requirements
- paradigm shift in silviculture towards continuous cover forestry (CCF)
harmonization between the functions is essential
- in Central European broadleaved forests, the most widely applied tool is the creation of artificial gaps
- gap shapes, sizes and the methods of gap-cutting vary from region to region, from managers to managers → lack of ultimate guidelines → numerous uncertainties: where, how and when to create gaps
finding best available practices to help practitioners
- the effects of the gap-cutting schemes and other aspects of the harvests on forest site conditions, natural regeneration and multi-taxa diversity are still poorly understood in the European oak-dominated forest
well-designed, multi-taxa experiments are necessary

FRAMEWORK OF THE EXPERIMENT

Gap-cutting

TYPE of gap-cutting

in one step in two steps

gap SIZE

small (0.15 ha) large (0.3 ha)

gap SHAPE

circular elongated

Control

Forest site

- air temperature
- air humidity
- direct and diffuse light
- soil temperature
- soil moisture
- soil nutrient content
- soil physical properties

Regeneration and biodiversity

- ground beetles
- spiders
- dipterans
- soil fauna
- vascular plants

STUDY DESIGN

surveys and measurements at two spatial levels:

1. gap-level
near to the gap-center sampled in every year

2. subplot level (41 quadrats/gap)
sistematically arranged subplots within the gaps, sampled once in two years

all variable groups

direct and diffuse light
soil moisture
herbs and saplings

10 ha, homogeneous stand

Before-After Control-Impact design → temporal control

complete block design → spatial control

6 treatments in 6 blocks as replicates

the whole area is fenced → ∅ effects of ungulates

all tree individuals were mapped (DBH > 5 cm)

Treatment types

Removed trees

Remaining trees

5 cm

DBH

REALIZATION OF THE GAPS

Gap (treatment) types:

Large circular Large elongated Small circular Small elongated Extended

Gap centers

Excluded from sampling

Fence

0 50 100 m

STUDY SITE

- location: Pilis Mts., Northern Hungary (47°40' 13" N, 18°54' 55" E)
- topography: 390-460 m a.s.l., moderate (<10°), North-facing slopes
- bedrock: sandstone and limestone with loess
- soil type: Luvisols and Rendzic Leptosol, soil depth 0.5–1.5 m
- regional climate: humid continental (9.0–9.5°C; 650 mm/yr)
- vegetation type: sessile oak – hornbeam forest (91G0)
- stand type: mature (~90 yrs old), managed stand
- upper canopy layer: h≈22 m, DBH≈37 cm
- secondary canopy layer: h≈14 m, DBH≈18 cm
- dense herb layer (>100%): *Carex pilosa* and *Melica uniflora*

AT SK UA HU RO RS SI HR

TECHNICAL DETAILS

Stand structure

measuring the pre- and post-treatment state; focusing on the the gap-filling and regeneration patches

detailed maps and stand models: Field-Map System (IFER Ltd.) and ground-based LiDAR (Trimble TX6)

Gap level variables – sampled in the gap centers

Forest site conditions

total, diffuse and direct components of light (WinSCANOPY) – yearly, in July

air temperature and relative humidity at 130 cm (Votcraft DL-210TH) – continuously with 15-min logging interval

air, surface and soil temperature at 15, 0, -8 cm and soil moisture to -14 cm (TMS-4) – continuously, 15-min logging interval

litter and soil samples – twice a year (May, September)

Understory vegetation

cover of all species in a permanent 2 m × 2 m plot at the center of the gaps – two samplings per year (April, July)

Regeneration of sessile oak (*Quercus petraea* agg.)

growth, health status and survival of permanent seedlings in a 3 m × 3 m plot – one sampling per year (August)

Enchytraeid worms

abundance of all species; three soil cores per gap and wet funnel method – two samplings per year (May, September)

Dipterans

abundance of all species; one Malaise trap per gap – twice a year, two weeks sampling interval (May, September)

Groundbeetles and spiders

abundance of all species; three pitfall traps per gap – twice a year, one month sampling interval (May, September),

CREDITS

Notes: This experiment belongs to Péter Ódor's Lab (Forest Ecological Research Group) at Centre for Ecological Research, Hungary. Contact: ☎ +3628360-122/107 ✉ odor.peter@okologia.mta.hu; kovacs.bence@okologia.mta.hu. We are open to any collaborations!

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Forest Ecological Research Group

