The Pahernik Marteloscope

Field guide

Univerza v Ljubljani
Biotehniška fakulteta

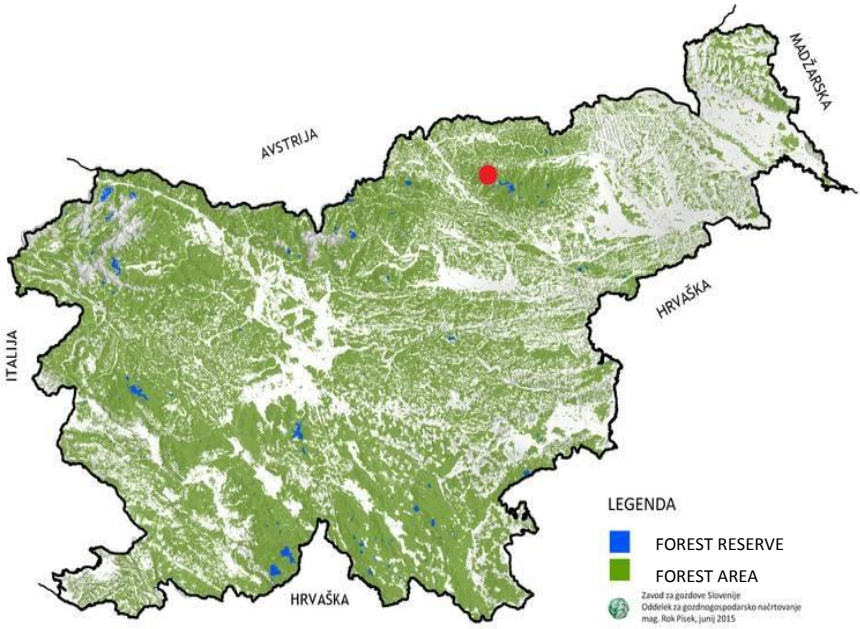
Pahernikova ustanova

The Pahernik forest

Slovenia is one of the most forested countries in Europe. Forests cover more than 60 % of the land area. The Pahernik family forest is located in the Pohorje region in northern Slovenia and covers an area of 570 hectares.

Franjo Pahernik is regarded as one of the pioneers of applying close-to-nature forest management principles in Slovenia. He ensured to take into account natural development processes in forest management during a time where the planting of Norway spruce was common and seen as most profitable. Since the early 20th century, a gradual transformation of pure Norway spruce stands towards more natural species composition took place. Degraded pastures and meadows were reforested with native tree species. Main silvicultural tools were planting, tending and selection cutting. Slovenia therefore has a long history in applying close-to-nature forest management with some of its best examples found in the Pahernik forest region. Pahernik forest belongs to the most productive forest sites in Slovenia. They display some outstanding large and old trees including for example, one of the largest trees in Slovenia, a spruce reaching a height of 50 meters and a dbh of 142 cm.

Overall in the Pohorje region 3.2 % of the forest area are unmanaged with 879 ha of forest reserves and 958 ha of protection forests. Around 90 bird and 1780 fungi species have been recorded in the region.



.....in figures

570 ha
Total forest area

10.8 m^3/ha
Annual increment

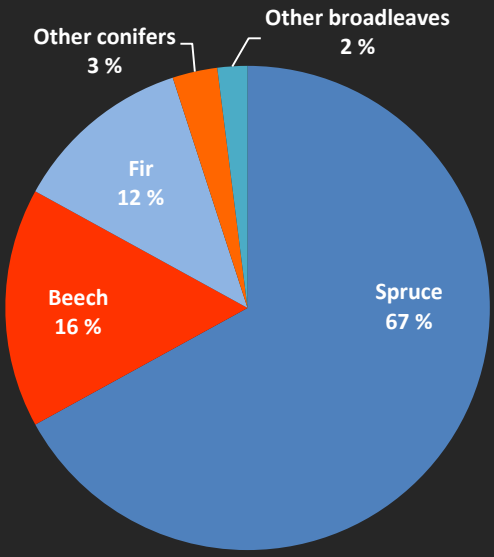
453 m^3/ha
Actual average stock

6,154 m^3
is the total annual increment

4,580 m^3
is the annual felling rate

36.8 m/ha
of forest roads and

117 m/ha
of skidding tracks



About **1,780**
different fungi and

90
bird species

82 %
Conifers

18 %
Broadleaves

Managing forests for multiple use

Pahernik forests are mixed forests of spruce, beech and fir with a high average growing stock and wood quality. Most of the forest is multilayered, uneven-aged, with small areas of single-tree selection stands and pure spruce forests. They are included in the network of Pro Silva Europe.

Multi purpose forests

Managing forests for resilience and sustainability sets the frame for close-to-nature forest management. Main management principles build on development processes found in natural forests as set out by Pro Silva. Such principles are applied in Pahernik forest.

This ensures that multiple forest functions are addressed by striking a balance between ecological and socio-economic functions based on sustainability criteria while being profitable. Ecosystem conservation, the protection of soils, and timber production are equally important.

A well developed forest infrastructure guarantees that timber can be extracted with low impact on other forest functions. Logging is done manually by chainsaw while timber is moved by cable to forest roads. Main management goal is an increase of the overall growing stock for producing quality timber and high economic return. Thus the felling rate is usually lower than the annual increment.

Conservation of biodiversity is considered important in Pahernik forest. This is reflected by half of the area (331 ha) being designated as *NATURA 2000*.

Rare and protected species are found and include e.g. the capercaillie (*Tetrao urogallus*). Targeted management measures are applied in order to improve capercaillie habitat conditions. Around 14 ha of old forest are set aside allowing for free development.

About half of Pahernik forest is situated on steep slopes (20° – 30° and more) emphasizing the importance of the protective function.

They are frequently used for research and serve a wide community from science and practice for conducting training courses and excursions. Further the Pahernik Foundation provides financial support to students and scientists for implementing research activities based on scholarships and grants.

96 %

are forests managed for timber production

72 ha

are designated as special biotopes

14.3 ha

Strict forest reserves (ecocells)

570 ha

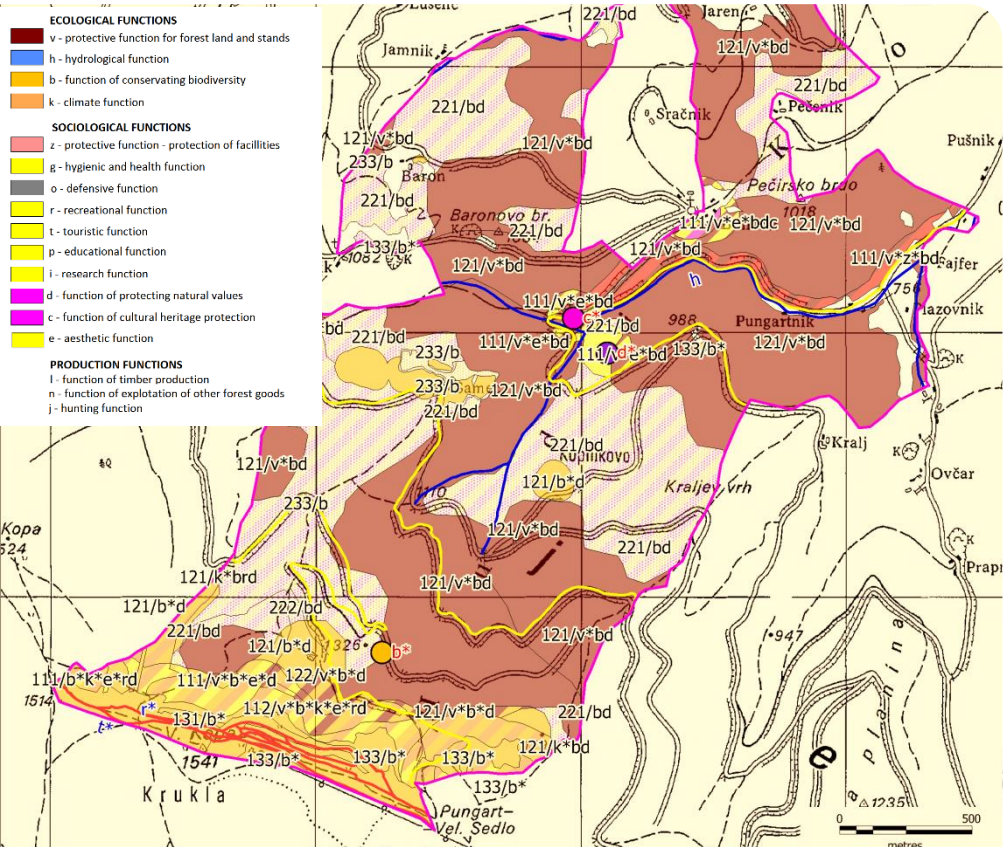
used for training and education

331 ha

are *Natura 2000* areas

0.7 m³/ha

average amount of deadwood

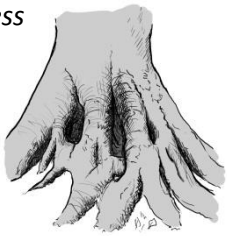


Habitat structures

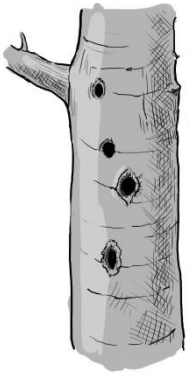
Large quantities of deadwood and a high density of old microhabitat-bearing trees are characteristic elements of natural forests, especially of the old-growth phases. These phases are often absent or rare in managed forests, even in forests under close-to-nature management. Also in selective harvests and thinnings, 'defective' trees referring to these old-growth phases (hollow, dead and languishing trees) are often removed. Yet, an important share of forest biodiversity is strictly or primarily dependent on these elements for their survival, especially 'saproxylic' species, those are species depending on deadwood.

Most species dependent of old-growth-elements and phases have become threatened. Conservation of biodiversity in commercial forest stands is mainly a question of conservation of adequate amounts of deadwood and retention of such microhabitat structures.

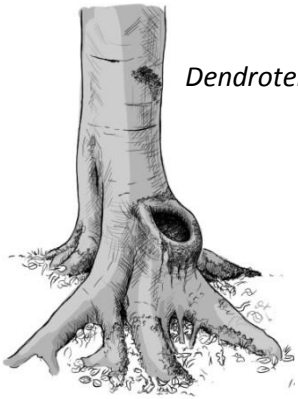
Root buttress cavities



Cracks and scars



Woodpecker cavities



Dendrotelmata

….and biodiversity

Aegolius funereus

Tetrao urogallus

Fomitopsis rosea

Rosalia alpine

Rhinolophus hippo-sideros

Hericium coralloides

Site conditions

Altitude:	**1050 m.a.s.l.**
Forest ecological region:	**Dravsko Pohorje**
Soil:	**mostly acid brown soil (district cambisoil)**
Geology:	**Pohorje tonalite– grandiorite (40%) and dacit (38%) and slate soil (8%)**
Mean annual temperature:	**6° C**
Annual precipitation:	**1400 mm**
Natural forest community:	**Polygonatum verticillatum-Luzulo-Fagetum**

Pahernik forest is composed of a variety of different forest communities. They include Polygonatum verticillatum-Luzulo-Fagetum with 50 % the most common followed by Dryopterido-Abietetum (38 %). Further are present Luzulo-Fagetum (5 %), Luzulo sylvaticae-Piceetum (4 %) with the remaining area displaying Luzulo-Abieti-Fagetum prealpinum, Blechno-Fagetum and Aceri-Fraxinetum on ravines and slopes.

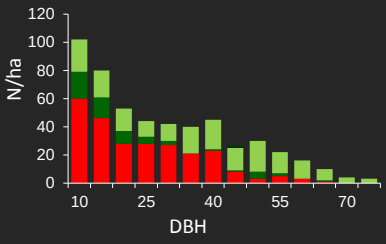
Species *Luzula luzuloides, Athyrium filix-femina, Calamagrostis arundinaceae, Oxalis acetosella, Senecio fuchsii, Prenanthes purpurea, Hieracium muroum, Luzula sylvatica, Polygonatum verticillatum, Veratrum album, Veronica urticifolia, Vaccinium myrtillus.*

Stand characteristics

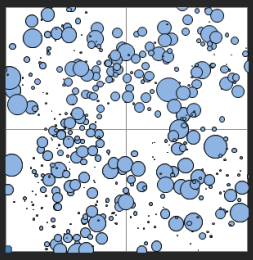
The Pale rri k Marteloscope is located in an uneven-aged stand with a mixture of spruce, beech and fir. The stand is a classic example of single-tree selection systems, also represented by its dbh distribution curve.

Stand data

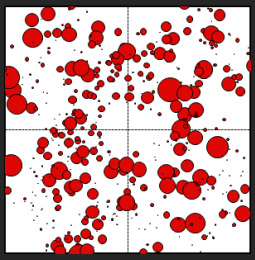
N [stems/ha]	524
BA [m²/ha]	48.31
Volume [m³/ha]	523
Habitat value [points]	3,166
Economic value [Euros]	23,786.-



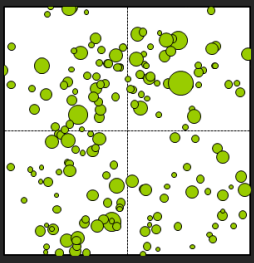
Volume [m³]



Economic value [Euro]



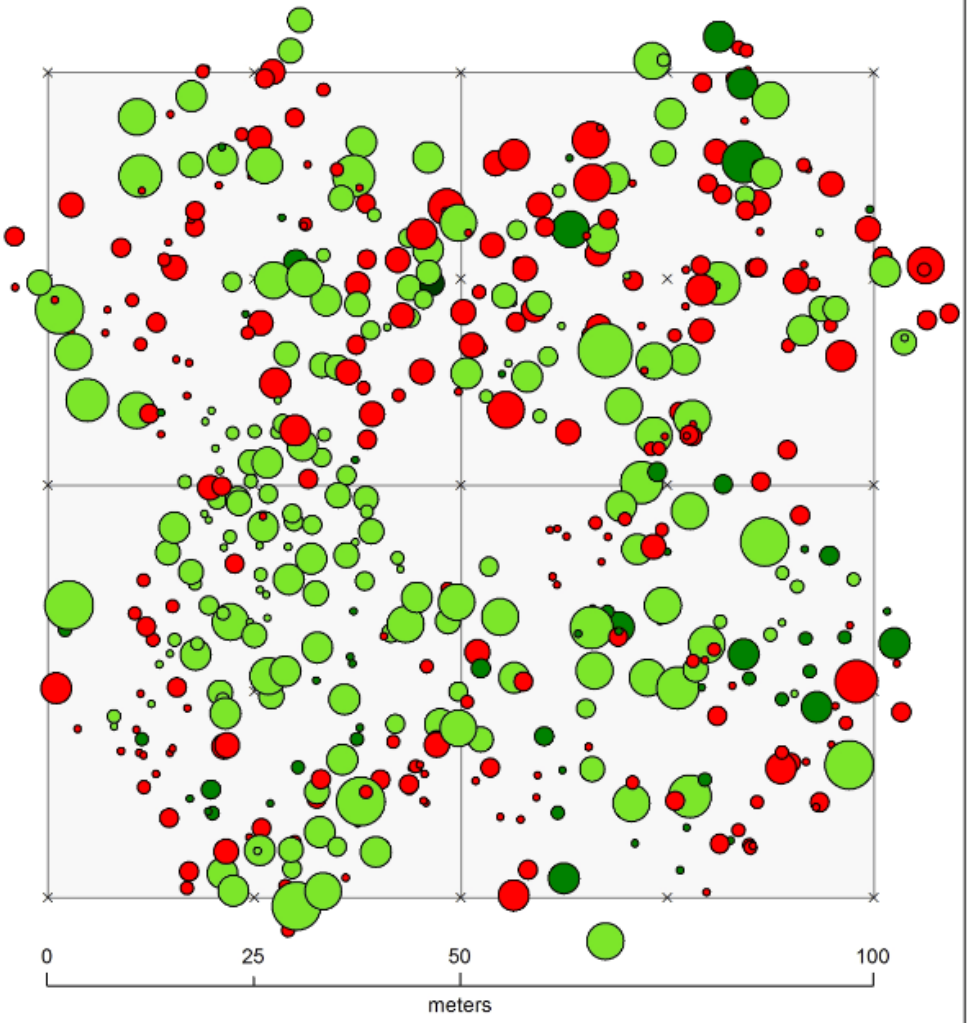
Habitat value [points]



The **economic value (in €)** is estimated for each tree based on volume, stem quality and corresponding local timber price lists.

The **habitat value (in points)** is assessed for each tree based on tree microhabitats, taking into account rarity of each habitat and duration for it to develop.

The evaluation of the habitat value is based on a comprehensive catalogue of tree microhabitats. It comprises 23 saproxylic and epixylic features such as cavities, large dead branches, cracks and loose bark, epiphytes, sap runs, or trunk rot characteristics. Tree microhabitats are of prime importance for specialized and often endangered forest species of flora and fauna.



Tree species dbh [cm]

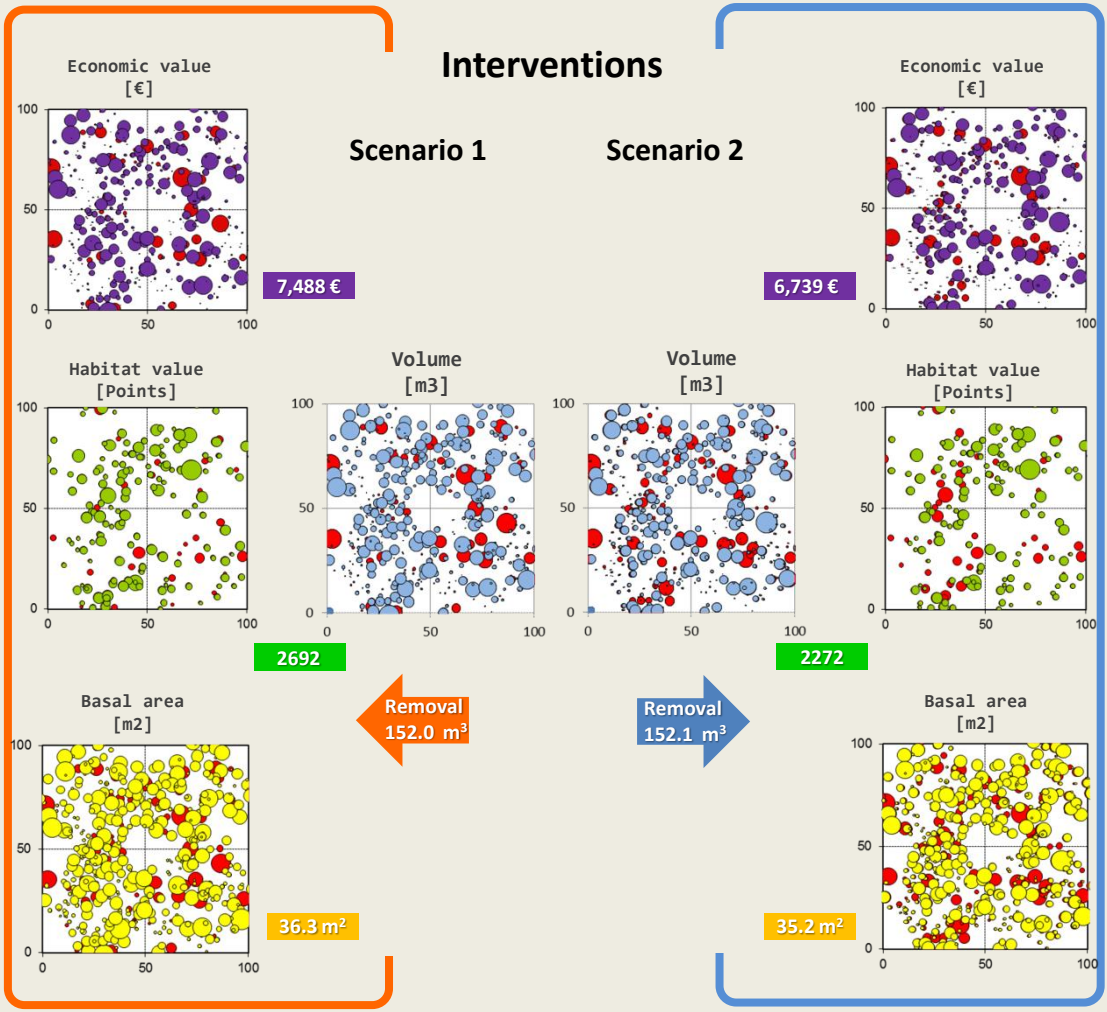
beech	7,5 - 15,0	55,1 - 65,0
spruce	15,1 - 25,0	65,1 - 75,0
pine	25,1 - 35,0	75,1 - 85,0
fir	35,1 - 45,0	85,1 - 95,0
	45,1 - 55,0	

Example of interventions

A comparison of two interventions is shown as a result of a virtual tree selection exercise in the Marteloscope Pahernik. The harvested volume was the same for both scenarios. Due to high quality trees in the stand, the economic value of harvested trees is not so different between the two scenarios, but the habitat value is higher for scenario 1.

Scenario 1: - Positive selection of habitat trees, harvesting high quality trees

Scenario 2: - Strict removal of competitors to high quality trees, harvest of target diameter trees



Integrate+ is a demonstration project funded by the German Federal Ministry of Food and Agriculture (BMEL) to establish a European network of demonstration sites for the integration of biodiversity conservation into forest management.

The Integrate+ project runs from December 2013 to December 2016 and builds on a partner network from research and practice with a focus on implementation of integrative management and enhancing transnational exchange of experiences.

Sever, K., Kraus, D., Schuck, A., 2016. The Pahernik Marteloscope field guide. Integrate+ Technical Paper No. 7. 12 p.

European Forest Institute, 2016

www.integrateplus.org