



# Křivoklát

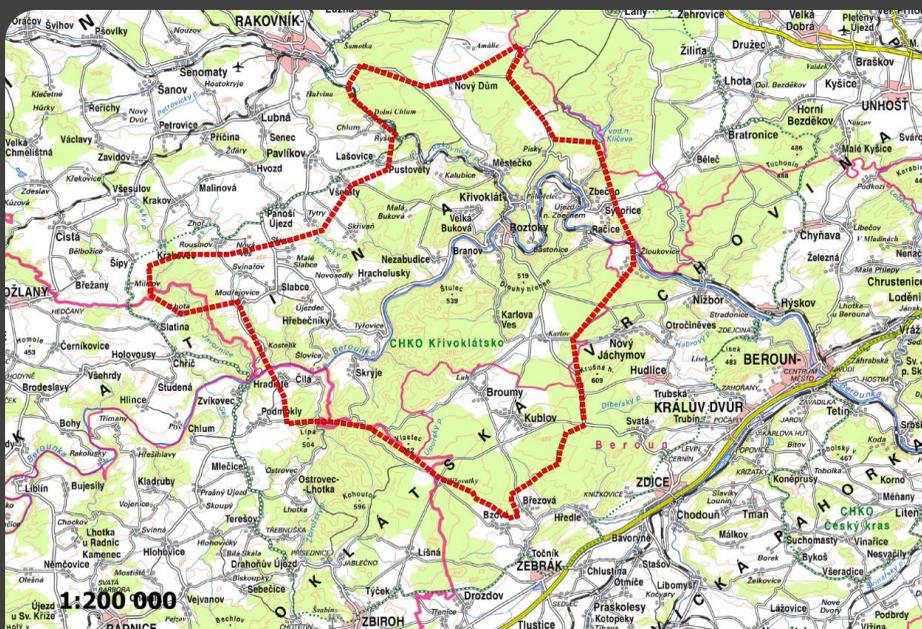
## Demo sites

Field guide



# The Křivoklát Forest Management Unit

'Křivoklát Forest Management Unit (FMU)' is the organizational unit of the state forest enterprise 'Lesy České Republiky'. It is situated in Central Bohemia and named after one of the most significant royal residences in the Czech Republic, the castle Křivoklát. The forest extends alongside the banks of the *Berounka River*. Forest management in Křivoklát finds its roots in the declaration of 'Forestry Parks'. The first of its kind was established in 2010. Křivoklát is further part of the 'International Model Forest Network'. The overall rationale of forestry parks is that they are areas for "nature and people". Therefore, one important aim is to preserve and enhance natural values of a forest while at the same time ensuring forest ecosystem integrity. Křivoklát forest has not changed very much during the last 200 years and thus provides a show window into the history of local, cultural landscape development. A large diversity of tree species are found with more than half comprised of broadleaved and mixed stands, unlike many other forests in the country. Hunting has a long tradition in Křivoklát forest as it was royal hunting ground. Game damages were considerable in the past, but have been visibly reduced due to effective management. Most common today are red deer, mouflon, fallow -and roe deer. Křivoklát forest is in close proximity to the City of Prague and frequently visited. High numbers of visitors require well established recreational facilities. Forest managers thus face the challenge to ensure that the all ecosystem services are addressed and provided including recreation. Currently a debate is ongoing whether to establish a national park in the Křivoklát region.



**13,429 ha**

Total forest area

**219 m<sup>3</sup>/ha**

Actual average stock

**95,352 m<sup>3</sup>**

is the **annual increment** measured over the total forest

**7.3 m<sup>3</sup>/ha**

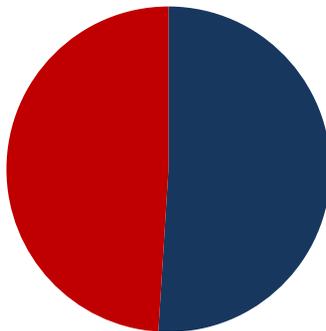
Annual increment

**4 m<sup>3</sup>**

is the annual cutting-rate / ha

**51 %**

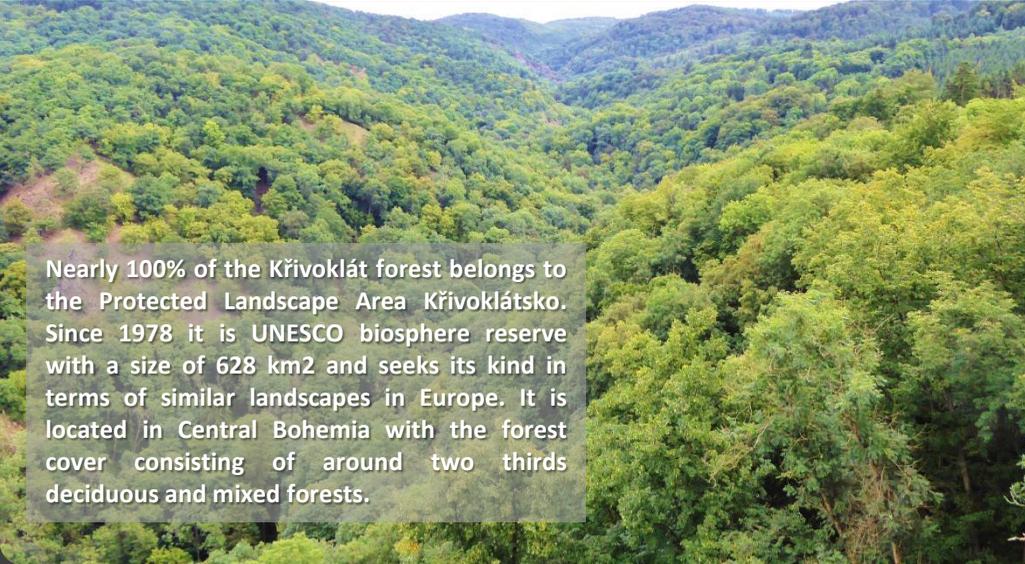
Broadleaves



**49 %**

Conifers

# Křivoklátsko Protected Landscape Area



Nearly 100% of the Křivoklát forest belongs to the Protected Landscape Area Křivoklátsko. Since 1978 it is UNESCO biosphere reserve with a size of 628 km<sup>2</sup> and seeks its kind in terms of similar landscapes in Europe. It is located in Central Bohemia with the forest cover consisting of around two thirds deciduous and mixed forests.

More than 1800 species of vascular plants and at more than 50 woody species have been conserved here to this day. Křivoklátsko is a breeding ground for some 120 bird species and other animals, one of which is on the Red List of rare and vulnerable species.

The species richness in Křivoklátsko is the result a variety of landscape types and natural features as well as the historical development of the area. The landscape mosaic found in the Křivoklátsko uplands is characterised by an extensive variation of geological characteristics and soil types. The impressive Berounka river valley further displays a wide range of climatic conditions while the areas historic development of settlements contribute to its uniqueness.

The steep and inaccessible slopes of the Berounka river valley are dominated by indigenous woody forest species. There are also outcrops even of typical thermophilous fauna and flora species. The river has created deep valleys and canyons over thousands of years. Sunlight only barely reaches the riverbed during summer due to the dense canopy formed by deciduous trees. Temperature is therefore rather low for most of the year and can correspond to climatic conditions of mountainous regions. Such temperature inversion is typical and contributes to the areas' richness in biodiversity. There are a number of smaller scale protected areas embedded in Křivoklátsko including four 'national nature reserves', 15 other nature reserve areas and five nature monuments.



# Habitat structures

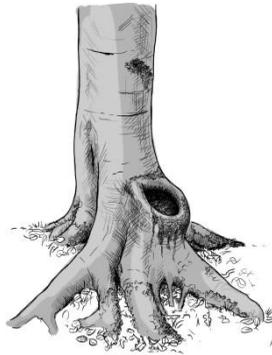
Large quantities of deadwood and a high density of old microhabitat-bearing trees are characteristic elements of natural forests, especially of the old-growth phases. These phases are often absent or rare in managed forests, even in forests under close-to-nature management. Also in selective harvests 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, that is 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 retention of such microhabitat structures.

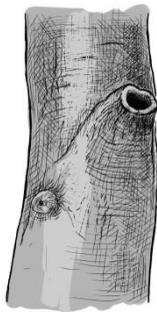
**Bark loss**



**Dendrotelmata**



**Branch holes**



**Cracks and scars**



## ...and biodiversity



*Dryocopus martius*



*Ficedula albicollis*



*Phymatodes pusillus*



*Necydalis ulmi*



*Dicranum viride*



*Laetiporus sulphureus*

## Site 1: “Trittstein” habitat



Site 1 is part of a new integrative biodiversity concept that comprises of several hierarchical elements forming together a network of stepping stone habitats (“Trittstein” in German) in managed forests. The centerpiece of this new concept is a carefully selected and cross-linked system of set-aside (see Site 1) and extensively managed forest areas (see Site 2). Single elements to be found in these areas include deadwood islands and habitat trees, old growth patches, and strictly protected reserves.

Site 1 was set aside from management due to the high abundance of highly relevant structures for biodiversity. On the following pages selected trees of the stand are presented with their microhabitat structures and associated biodiversity

# Selected trees and their microhabitats

**Tilia cordata, 73 cm dbh**

1



CV 24



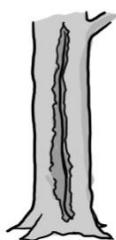
CV 31



*Osmoderma eremita*



*Tenebrio opacus*



IN 32



BA 11



*Pipistrellus pipistrellus*



*Barbastella barbastellus*

2

## Larix decidua, 48 cm dbh



IN14



*Sesiidae (Lepidoptera)*



*Siricidae (Hymenoptera)*

3

## Fagus sylvatica, 45 cm dbh



CV 25



EP 12



*Ischnomera caerulea*



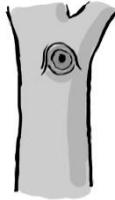
*Bolitophagus reticulatus*

# ... and their microhabitats

## Fagus sylvatica, 30cm dbh



EP12



CV12

4



*Bolitophagus reticulatus*



*Elateridae (Coleoptera)*

## Fagus sylvatica, 64 cm dbh



IN21



CV26

5



*Homoptera (Flat-bugs)*



*Strix aluco*

6

## *Fagus sylvatica*, 54 cm dbh



CV12



CV31



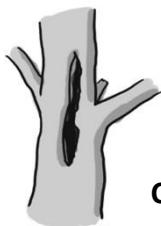
*Tenebrionidae* (Coleoptera)



*Parus major*

7

## *Fagus sylvatica*, 72 cm dbh



CV24



*Elater ferrugineus*



*Osmoderma eremita*

## ... and their microhabitats

8

Snag with open top cavity, decay stage 3-4



*Lasius fuliginosus*

CV26

9

Downed and fine woody debris from branches, sun exposed, decay stage 2

10

Downed and coarse woody debris from broken crown/limb, shaded, decay stage 2-4



*Oudemansiella mucida*



## Site 2: Habitat and elite trees selection



Site 2 is also a complimentary part of the stepping stone habitats concept.

On a 60 x 60 m area (0.36 ha) 8 elite trees were selected and marked with white ribbon. This corresponds to only 22 trees / ha with promising quality where future silvicultural efforts will be concentrated. However, there are still quite many indifferent trees that can be harvested in the course of careful interventions: in this example direct competitors were selected for immediate removal (marked with orange dot) and after 5 years some secondary competitors will be harvested (marked with pink dot).

As a special tribute to the old-growth characteristics of the stand 10 habitat trees were selected and marked with a green wave-line. These will ensure a structural retention of the most valuable biodiversity relevant elements in the stand

0.36 ha

Demo site area

270 m<sup>3</sup>/ha

Actual average stock

17.5 m<sup>3</sup>/h

Actual volume of elite trees

35.4 m<sup>3</sup>/h

Volume of removals per decade

68.1 m<sup>3</sup>/h

Predicted volume of elite trees in 50 years

81.8 m<sup>3</sup>/h

Volume of selected habitat trees

16.5 m<sup>3</sup>/h ●

Volume of direct competitors to elite trees



18.9 m<sup>3</sup>/h ●

Volume of secondary competitors

Around 30 %

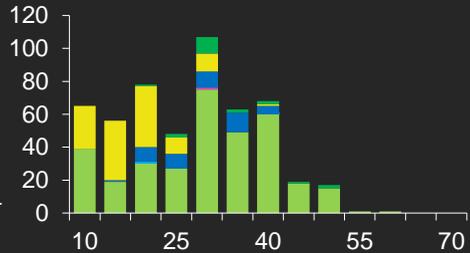
of total stand volume is set-aside for biodiversity

# Site 3: The Křivoklát Marteloscope

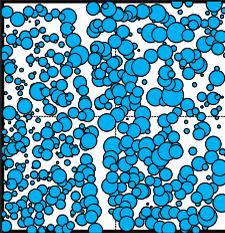
Site 3 comprises of the **Křivoklát** Marteloscope and is located in a beech dominated stand mixed with oak, hornbeam and larch

## Stand data

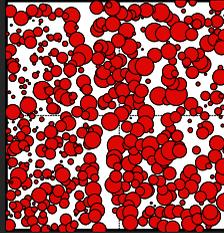
N [stems/ha]	523
BA [m <sup>2</sup> /ha]	34.2
Volume [m <sup>3</sup> /ha]	436
Ecological value [points]	1,935
Economic value [CZK]	569,439.-



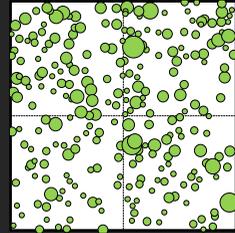
Volume  
[m<sup>3</sup>]



Economic value  
[CZK]



Habitat value  
[points]



The **economic value (in CZK)** 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.

# Site conditions

Altitude:	460 m.a.s.l.
Forest ecological region:	8 – Křivoklátsko a Český kras
Soil	Cambisols
Site description:	Rhyolite
Mean annual temperature:	7.5 – 8.5 °C
Annual precipitation:	530 mm
Natural forest community:	<i>Querceto – Fagetum eutrophicum</i>

*The site occurs on mild waved slopes with mostly shady exposure. Soil types are mesotrophic modal cambiosols. They are of medium to large depth, with strongly skeletal characteristics underneath. Humus form is mull or mull moder. The main tree species *Fagus sylvatica* is complemented by *Acer platanoides* and *Acer pseudoplatanus* at the expense of *Quercus petraea*. The mixture is further complemented by *Tilia cordata* and *Carpinus betulus*.*

*Typical vascular plants for this site are *Gallium odoratum* and *Mercurialis perennis*.*



# Notes:



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.



Lenka Lehnerová, Andreas Schuck, Ulrich Mergner and Daniel Kraus, 2016. Křivoklát demo sites – field guide. Integrate+ Technical Paper No. 21. 20 p.

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