

# Forest use in the Apuseni mountains, Romania

## Introduction

The montane forests of the study area near Ghetari, Apuseni mountains, consist of ca. 80% **mixed forest** with beech (*Fagus sylvatica*), fir (*Abies alba*) and spruce (*Picea abies*) (fig. 1, 2), and of ca. 20 % **conifer forest** dominated by spruce, mainly in valley bottoms and frost hollows.

Non-regular forest use could be encountered in all forest types, with selective "creaming off" through extraction of the conifers, and subsequent wood pasture near the settlements. It can be predicted, that within 15 to 20 years the resources of valuable conifer timber will have been extracted. As a consequence, mixed forests are in process of transition to broadleaved forest. The canopy of spruce forests more and more will be opened up. It can be expected, that some coniferous forests will be converted to grassland.



Fig. 1: Mixed forest between Ghetari and Gârda de Sus

**Mixed forests** of the study area were composed of conifers (115 m<sup>3</sup>/ha; >34 cm dbh) and broadleaves, mostly beech (200 m<sup>3</sup>/ha; >34 cm dbh; tab. 2).

The annual increment of volume in average is 5,7 m<sup>3</sup>/ha (2/3 to 3/4 beech).

Tree stumps can be assumed to represent the amount of extracted timber within the last 10 years, i.e., 181 m<sup>3</sup>/ha; in average, ca. 18 m<sup>3</sup>/ha were exploited annually.

Conifer logs with large diameter (>34cm dbh) represent ¼ of the extracted timber from mixed forest. This selective "creaming off" promotes the transformation in stands dominated by deciduous trees, mainly beech, or conversion to wood pasture.

It can be concluded, that within 15 or 20 years the source of conifer timber will have been depleted.

**Spruce forests** underlie a similar decrease in timber volume. At present, they contain ca. 270 m<sup>3</sup>/ha standing timber. The annual increment is 5,9 m<sup>3</sup>/ha, the annual extraction 20 m<sup>3</sup>/ha. Within 15 to 20 years, all valuable timber will have disappeared.

## Change of the forest structure

Selective removal of trees changes the forest structures. In the Ghetari district, 20 % of the forested area have gaps ("lückig"), and 29 % are light ("locker").

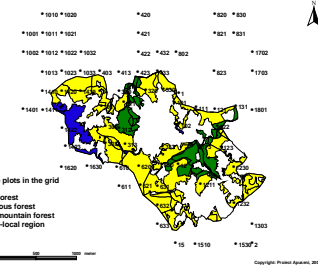


Fig. 2: Study area: Forest types and systematic localisation of sample plots

**Aim** of this study was to quantify the effects of non-regular forest use and wood pasture in the forests around Ghetari.

**Methods** were a combination of stand inventory, vegetation records, an inventory of the tree regeneration and selected site parameters on 78 systematic sample plots. Light conditions were measured in the center of the circle, and 4 other points in the sample plot. Small-scale patterns ("mosaic elements") of the vegetation.

**Conclusions** were drawn from 32 plots in mixed forests, and from 12 plots in spruce forest.

## Timber volume

- The **mixed mountain forest** contained a timber volume of ca. 430 m<sup>3</sup>/ha – ca. 100 m<sup>3</sup>/ha more than listed in the forest management plan.

- The **forests dominated by spruce** had a timber volume ca. 110m<sup>3</sup>/ha lower compared to the corresponding values in the forest management plan.

	Number of trees per hectar (n/ha)	Timber volume (m <sup>3</sup> /ha)	Volume of stumps (m <sup>3</sup> /ha)	Timber volume in forest manage – ment plan (m <sup>3</sup> /ha)
<b>Mixed forest</b>	631	430 m <sup>3</sup>	180 m <sup>3</sup>	340 m <sup>3</sup>
<b>Spruce forest</b>	530	270 m <sup>3</sup>	200 m <sup>3</sup>	380 m <sup>3</sup>

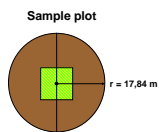
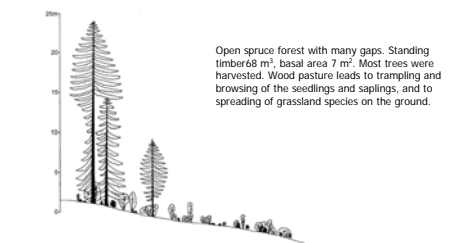
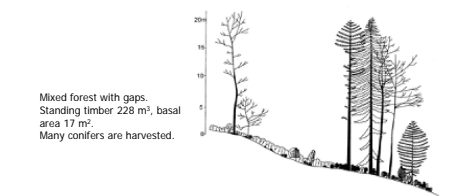
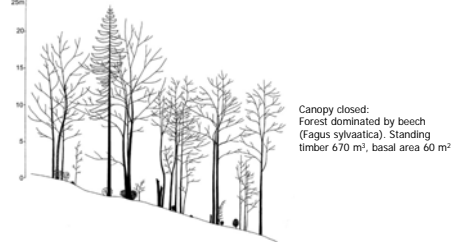
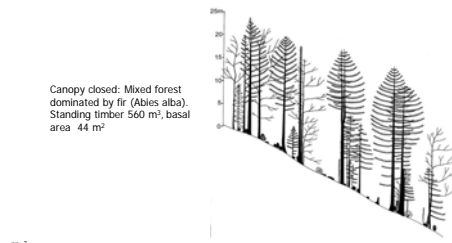
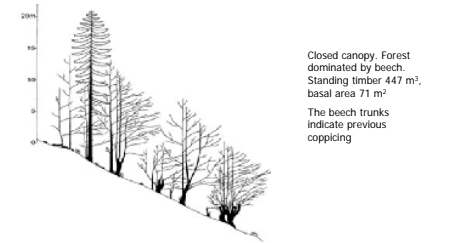
Tab. 1: Number of trees, volumes of timber and tree stumps in mixed forest (32 plots) and forest dominated by spruce (12 plots)

## Non-regular forest use

**Tree stumps** can be regarded as **indicator of non-regular use of forest** (fig. 5, 6). In mixed forest, the timber volume represented by tree stumps can be calculated 180 m<sup>3</sup>/ha, and in spruce forest even 200 m<sup>3</sup>/ha (tab. 1).

Based upon literature values of natural decomposition of dead wood, it can be concluded, that ca. 75 % of the tree stumps originate from harvesting during the last 10 years (13 % of the last 1 to 2 years).

Most of the studied forest area is legally protected. Only timber from storm-fallen trees can be used legally, and sums up to 0,4 m<sup>3</sup>/ha and year.



Each **sample plot** was composed of a circle of 1000 m<sup>2</sup> (radius = 17,84 m; analysis of forest structures), and a square of 100 m<sup>2</sup> in the center (recording the tree species regeneration and ground vegetation; fig. 3).

Fig. 3: Design of a sample plot

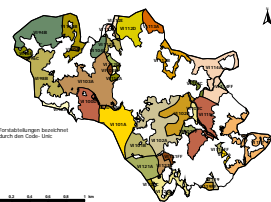


Fig. 4: Forest sections around the village of Ghetari.



Fig. 6: Wood pasture



Fig. 5: Open forest in conversion to grassland

	Volume of stand (m <sup>3</sup> /ha)		Potential volume calculated from tree stumps (m <sup>3</sup> /ha)		
	CW	DW	CW	DW	TS nd
< 10cm dbh	0,7	1,2	0,4	0,4	0
10 - < 14cm	1,5	3,6	1,4	2,4	0,3
14 - < 20cm	4,6	13,3	5,9	3,2	1,1
20 - < 24cm	4,8	11,3	8,6	3,4	1,1
24 – 34cm	34,7	47,4	32,9	8,9	3,8
> 34cm	<b>115,3</b>	<b>199,8</b>	<b>75,0</b>	27,6	4,7
	161,6	276,7	124,3	45,9	11,1
<b>Total</b>		438,3		<b>181,5</b>	

Tab. 2: Average timber volumes in diameter classes, showing the potential volumes of tree stumps, and the standing volumes in the mixed mountain forest; in m<sup>3</sup>/ha (CW = coniferous wood, DW = deciduous wood, TSnd = tree species not identified)