

# **Comparative analysis of dead wood in managed and virgin forests in the beech stands**

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## Introduction

Within the politics of forest management, dead wood is considered as an indicator of their sustainable management. In the last decades, it was recorded a significative growth of scientific interest on dead wood and on its ecological role in the forest ecosystems.

Despite its enormous importance, dead wood is, at the moment, at critical level (very low) in the forests of many European countries, especially due to inadequate management practices in the forests with production role and even in the protected areas. The removal of dead wood from the forest is one of the main threats on the survival of nearly one third of the species from the forest ecosystem and it is in direct connection with a large number of threatened species which are included in the red list

The principle of sustainability (together with the principle of multi-functionality of forests) is a basic principle, which should be implemented in all the activities involved in the contemporary forest management.

The implementation of the durability principle in forestry is closely related to the knowledge about growth and development processes of a forest ecosystem. Therefore, in the phases of aging and degradation of the forest in these ecosystems important quantities of dead wood accumulate if it is not removed by diverse silvicultural operations

Unfortunately, the absence of the phases of aging and decomposition, rich in dead wood, is one of the main ecological deficiencies of the forests in the economic circuit.

## Material and Method

The comparative study of the dead wood from a virgin forest and a forest with simial composition, subject to the management regime, was carried out based on the data collected in eight circular sample plots of 2500 m<sup>2</sup> each, installed at 1200 m (two in the virgin forest and two in the managed forest), respectively 1350 m altitude (two in the virgin forest and two in the managed forest).

The sample plots are located in South-Western Romania, in the Semenik Massif, on the territory of Caraș-Severin County, within the Izvoarele Nerei Nature Reserve, the stands having 180 years in age and two managed forests from the vicinity, located in Văliug Forest District, the stands having 100 years in age.

The diameters of the dead wood pieces were measured using a forest calliper. In the case of the fallen dead wood pieces, they were measured only the ones having at least 15 cm at the thick end, and for the standing dead trees they were measured only the pieces having a minimal diameter of 6 cm. the heights were measured using the Vertex equipment and the leghts using a steel tape. They were inventoried the standing dead trees which had at least 1.3 m in height and the fallen dead wood pieces having the minimum length of 3 m.

For the determination of the decomposition class it was used a system of 5 classes of decomposition of dead wood, class A – fresh (green) dead wood, class B – hard dead wood (without sap, the knife enters very difficultly in the direction of the fibers), class C – softer dead wood, the knife enters easily in the direction of fibers but not in the direction perpendicular on the fibers, class D – soft dead wood, the knife enters easily also on the direction perpendicular on the fibers and class E – very soft dead wood or dust which hardly stays together. At the same time, each piece of dead wood was classified into one of the 7 types of dead wood .

## Results and Discussion

Distribution of the total number of standing dead wood per hectare on altitudinal levels in the sample plots from managed forest and virgin forest

Table 1

Altitudinal level	Sample plot	Managed forest (number of trees)	Virgin forest (number of trees)
1200 m	1120	152	
	2120	112	
	101		16
	102		28
average		132	22
1350 m	1135	48	
	2135	12	
	118		28
	119		24
average		30	26

Distribution of the total number of fallen dead wood per hectare on altitudinal levels in the sample plots from managed and virgin forest

Table 2

Altitudinal level	Sample plot	Managed forest (number of pieces)	Virgin forest (number of pieces)
1200 m	1120	156	
	2120	184	
	101		52
	102		60
average		170	56
1350 m	1135	108	
	2135	56	
	118		56
	119		144
average		82	100

## Results and Discussion

Distribution of the volume of fallen dead wood per hectare by decomposition classes in the managed forest and the virgin forest in the sample plots at 1200 m altitude

**Table 3**

<b>Decomposition class</b>	<b>Managed forest</b>	<b>%</b>	<b>Virgin forest</b>	<b>%</b>
A	0.00	0	0.00	0
B	4,39	42	9,46	18
C	3,63	35	18,13	35
D	2,33	22	19,53	38
E	0,07	1	4,72	9
<b>Total</b>	<b>10,42</b>		<b>51,84</b>	
<b>%</b>	<b>17</b>		<b>83</b>	

Distribution of the volume of fallen dead wood per hectare by decomposition classes in the managed forest and the virgin forest in the sample plots at 1350 m altitude

**Table 4**

<b>Decomposition class</b>	<b>Managed forest</b>	<b>%</b>	<b>Virgin forest</b>	<b>%</b>
A	0.00	0	0.00	0
B	2.96	24	11,68	20
C	0,55	4	14,12	25
D	5,33	44	26,14	46
E	3,39	28	5,15	9
<b>Total</b>	<b>12,23</b>		<b>57,09</b>	
<b>%</b>	<b>18</b>		<b>82</b>	



## Results and Discussion

**Distribution of standing dead wood per hectare by decomposition classes in managed forest and virgin forest in the sample plots at 1200 m altitude**

**Table 5**

<b>Decomposition class</b>	<b>Managed forest</b>	<b>%</b>	<b>Virgin forest</b>	<b>%</b>
A	0.00	0	0,28	1
B	17,09	89	32,68	90
C	0,91	5	3,13	9
D	1,06	6	0.00	0
E	0.00	0	0.00	0
<b>Total</b>	<b>19,06</b>		<b>36,09</b>	
<b>%</b>	<b>35</b>		<b>65</b>	

**Distribution of standing dead wood per hectare by decomposition classes in managed forest and virgin forest in the sample plots at 1350 m altitude**

**Table 6**

<b>Decomposition class</b>	<b>Managed forest</b>	<b>%</b>	<b>Virgin forest</b>	<b>%</b>
A	0.00	0	0.00	0
B	1,15	31	3.50	17
C	1,89	51	16.47	82
D	0,67	18	0.0.13	1
E	0.00	0	0.00	0
<b>Total</b>	<b>3,71</b>		<b>20.01</b>	
<b>%</b>	<b>16</b>		<b>84</b>	

## Results and Discussion

Diversity of dead wood by decomposition classes, type of dead wood and diameter classes in the sample plots at 1200 m altitude

Table 7

Shannon index	Virgin forest (1200 m altitude)	Managed forest (1200 m altitude)
$H_{CD}$	1,35	0,91
$H_{TLM}$	1,54	1,50
$H_d$	1,00	0,09
Simpson index	Virgin forest (1200 m altitude)	Managed forest (1200 m altitude)
$D_{CD}$	0,29	0,47
$D_{TLM}$	0,26	0,25
$D_d$	0,39	0,96

Diversity of dead wood by decomposition classes, type of dead wood and diameter classes in the sample plots at 1350 m altitude

Table 8

Shannon index	Virgin forest (1350 m altitude)	Managed forest (1350 m altitude)
$H_{CD}$	1,30	1,17
$H_{TLM}$	1,55	1,60
$H_d$	0,95	0,37
Simpson index	Virgin forest (1350 m altitude)	Managed forest (1350 m altitude)
$D_{CD}$	0,29	0,35
$D_{TLM}$	0,27	0,24
$D_d$	0,42	0,78

## Conclusions

- The quantities of dead wood are normally much lower in production forests than in virgin forests or those that are not in the productive cycle, because the large pieces of wood are extracted from the first category of forests. In the stands included in the productive cycle, usually only small branches and trees (dead as a result of the natural elimination process) and only scarce large logs are found. In managed forests, there is a positive correlation between the age of the stand, its volume and the quantity of dead wood. Also, the intensity of young stand care interventions and silvicultural harvesting interventions affects the quantity of dead wood.

According to the requirements of the FSC Certification Standard, after logging, a quantity of dead wood must be preserved.

In Romania, in most cases, the way forestry is applied is quite conservative, with strong links to traditional practices. This aspect can sometimes trigger conflicts of opinion with new management concepts.

Recent research on the adoption of new forest management practices has revealed that implementing innovative approaches can be challenging due to an increased reliance on technical norms with which forestry personnel have become familiar and due to a lack of agreement among forestry professionals regarding the selection of trees that should become deadwood .



**THANK YOU!**