

THE HYDROLOGICAL AND ANTI-EROSION EFFICIENCY OF NATIONAL FOREST FUND IN THE CONTEXT OF NATIONAL RISK MANAGEMENT. BIBLIOGRAPHIC PAPER

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Abstract. The national forest fund represents entirety the land with natural or cultural forests or the land with afforestation works. Also, are included lands who serve to production or forest administration, ponds, stream beds, other lands with lumbering destination and unproductive/degraded lands, which are contained in the forest planning.. One of the subjects put into research of this article is to determine how the forest prevents the degradation phenomenon of ecosystems. In this article is made particular references to the hydrographic basin Mures-Aranca, which is consists of the forests that occupy the lands with the most heterogeneous stationary conditions, and of the some areas from the forest fund represented by the improvement perimeters. These degradation phenomenon, such as: the landslides, the surface erosion, the bedrock surface and the deep erosion, could be prevented or combated by the degree of afforestation of a basin and the structure of forest stands. To get the efficiency of forest stands by anti-erosion and hydrological point of view, it can be used the qualitative mapping system proposed for the first time by Al. Apostol (1972), who was able to get an effective delimitation according to their structural features. Thus, were constitute 4 hydrological categories, A=high hydrological efficiency, B=medium hydrological efficiency, C=reduced hydrological efficiency, D=low hydrological efficiency. These hydrological categories assist in obtaining a statistical picture of forest vegetation from a basin and in comparing basins between them.

Keywords: forest fund, forest vegetation, erosion, forest stands, mapping, degradation

INTRODUCTION

In reply to major disasters caused by storm-waters from Romania and also as an alignment tool of the European Union initiative to be drafted Directive 2007/60/CE concerning evaluation and management of flood risk, National Flood Risk Management on the medium and long term, the period 2010-2035, approved by decision of Government no. 846 from 11.08.2010 for approval of National Flood Risk Management on the medium and long term, published in the Official Gazette no. 626 from 6 septembrie 2010, through which have been established concrete responsibilities for more ministries, so being targeted the Central Public Authority, which is responsible for the forestry to implement the measures and actions warning of floods, and also the measures and actions, which will be applied after crossing flood.

The scientific substantiation supporting both measures and preventive actions, in the implementation of the year 2011, on a proposal from the National Institute of hydrology and water management, Bucharest-ICAS has conducted studies on control of soil erosion and the improvement of torrential hydrological basins from forestry heritage of our country by having been traversed Romania's major hydrological spaces (Someș-Tisa; Crișuri; Banat; Mureș; Jiu; Olt; Ialomița-Buzău; Argeș-Vedea; Prut; Siret; Dobrogea). At the same time it was made a brief investigation of private data through the most popular and representative programs, realizations and concepts in the field of improvement hydrological basins and

degraded lands (Clinciu, 2001, 2005, 2006; Clinciu, GasPAR, 2005; Gaspar, Clinciu, 2006; Traci, Untaru, 1986).

The forests and lands for afforestation are affected by the following type of degradation: the landslides, the surface erosion, the bedrock surface and the deep erosion. The greatest power of degradation has the degradation process through the bedrock surface. The destruction of fertile soil and decreasing its production capacity is the biggest loss caused by erosion and can be found worldwide, with major implications on the development of ecosystems. In Romania, due to sloping land deforestation and abusive grazing, erosion processes have intensified, exceeding the allowable values of 2,5-4 m³/ha/year. The process of soil erosion, recorded in the forestry sector, decreases the mass production of wood with 2-5 m³/ha/year (Munteanu *et al.*, 1993).

According to Traci, 1985, it was found that after a period of 15-20 years, from torrential basins afforestation, the process of surface erosion has been reduced by up to 90% and the deep erosion due to hydrotechnical works and has been reduced by 70-80%. After the execution of biological and hydrotechnical and the passage of a period of 10 to 25 years, specific erosion and solid flow decreased from 8.8-37.0 m³/ha/year to 1.6-12.6 m³/ha/year for the reference basins (Apostol, 1975; Traci, 1985).

For the most efficient management of lands is aimed at avoiding the growth processes of degradation, maintaining and ensuring the continuity of forest vegetation to stabilize areas affected (Dîrja, 2000).

MATERIAL AND METHOD

The research documentation is based on specialty literature, ICAS archive and internet network information with a focus area regarding correlation between forest fund and Flood Risk Management. The items documented are: (1) the size and the structure of the national forest fund; and (2) the efficiency of forest stands in hydrological and anti-erosion terms.

The aim of the paper is to study if the degrees of afforestation of a basin and the structure of forest stands have a particular importance in the context of preventing the flood and erosion risks.

RESULTS AND DISCUSSION

(1)The size of the national forest fund. The forest fund structure. According to the last edition of the water cadastre and forests management planning prepared during the 1990-2013, from the total area of our country, forest fund represents the 26.7%, namely 6,331,783.4 ha. The forest fund area has the following structure regarded the usage categories:

- forests and lands for afforestation - 6,212,388.4 ha - 98.1%
- lands affected forest management - 64,199.2 ha - 1.0%
- unproductive lands from the forest fund - 39,065.3 ha - 0.6%
- lands temporarily removed from the forest fund - 16,130.5 ha - 0.3%

According to the data from table 1, it can be seen that depending on the form of predominately relief from the basins studied the rate of afforestation on major hydrological basins ranging from 8.8% to 55.4%.

Thus, the basins developed in the mountainous area have a higher percentage of afforestation towards the basins developed in the plain region whose percentage of afforestation is lower. The hydrological basin Mures-Aranca, which lies in the mountainous region, with a total area of 29,390 km² and a forest fund of 9,150.6 km², is one of the main places regarding the percentage of the forest fund. Hydrological basin Mures contain 51 lakes of accumulation, of which 18 are with a volume of more than 1 million cubic meters or a height greater than 5 m and included in its permanent collections 3 permanent accumulations, 4 impermanent accumulations and 8 dams outlet.

Table 1

The allocation of forest fund on large hydrological basins

Hydrological basin		Area		
Cadastral Code*	Name	Total	Forest fund	
		Km ²	Km ²	%
I	Tisa	4,540	1,709.0	37.6
II	Someș	17,840	5,019.2	28.1
III	Crișuri	14,860	3,759.7	25.3
IV	Mureș-Aranca	29,390	9,150.6	31.1
V	Bega-Timiș-Caraș	13,060	3,117.3	23.9
VI	Nera-Cerna	2,740	1,516.8	55.4
VII	Jiu	10,080	3,777.1	37.5
VIII	Olt	24,050	8,404.3	34.9
IX	Vedea	5,430	478.1	8.8
X	Argeș	12,550	3,282.6	26.2
XI	Ialomița	10,350	2,360.9	22.8
XII	Siret	42,890	15,881.5	37.0
XIII	Prut	10,990	1,085.3	9.9
XIV	Dunăre	33,250	3,176.2	9.6
XV	Litoral	5,480	599.2	10.9
Grand total		237,500	63,317.8	26.7

* According Water Cadastre - 1992 Edition

Analyzing table 2, and taking into account the usage categories from the contents of forest fund on hydrological basins, it could be observed that the percentages remain, with only slight variations from the mountainous region to plain region. Thus, the highest percentage in usage categories of forest fund represents the category of forests and lands for afforestation, with values between 98.7% and 94.4%. The others usage categories hold a less share, with values between 0.0% and 4.3%. Referring to the hydrological basin Mures can be seen that it does not hold lands temporarily removed from the forest fund and unproductive lands hold a percentage of only 0.5%. Thus, the forest fund on the hydrological basin Mures is intended in the largest part to usage categories forests and lands for afforestation. The forests are grouped into two functional groups, group 1- forests with special functions of protection (53.1%) and group 2- forests with production and protection functions (46.9%). The forests can be seen as a protective factor against soil degradation and pollution of water sources, because they have an important role in stopping and preventing degradation by torrential phenomenon. According to the distribution of the forest stands from the national forest fund on groups and functional categories, the forests with protective functions of water holding a percentage of 14.5%; 24.1% are forests intended mainly for the protection of lands and soils and 14.5% other special functions.

Table 2

The usage structure from forest fund on higher hydrological basins

Hydrological basin		Usage categories(%)				Total forest fund
Cadastral Code	Name	Forests and lands for afforestation	Lands affected forest management	Unproductive lands	Lands temporarily removed from the forest fund	ha
I	Tisa	98.1	1.0	0.4	0.5	170,901.0
II	Someș	98.6	0.9	0.2	0.4	501,915.0
III	Crișuri	98.6	0.8	0.4	0.2	375,967.0
IV	Mureș-Aranca	98.6	0.9	0.5	0.0	915,059.0
V	Bega-Timiș-Caraș	98.5	1.2	0.2	0.1	311,729.0
VI	Nera-Cerna	97.5	1.1	0.7	0.7	151,683.0
VII	Jiu	98.5	0.8	0.6	0.1	377,710.0
VIII	Olt	98.7	0.9	0.4	0.0	840,434.0
IX	Vedea	98.1	1.1	0.6	0.1	47,811.0
X	Argeș	97.9	1.1	0.8	0.2	328,259.0
XI	Ialomița	97.7	1.2	0.5	0.5	236,093.5
XII	Siret	98.1	1.2	0.2	0.5	1,588,152.0
XIII	Prut	97.3	1.4	0.7	0.6	108,532.0
XIV	Dunăre	94.4	1.1	4.3	0.2	317,618.1
XV	Litoral	95.1	0.7	3.9	0.2	59,919.8
Total		98.1	1.0	0.6	0.3	6,331,783.4

*According with Silvologie, Vol. VI, Amenajarea bazinelor hidrografice torențiale. Noi concepții și fundamente științifice

In hydrological basin Mures the two functional groups have a percentage roughly equal, with a percentage of 46.4% forests with special functions of protection and 53.6% forests with production and protection functions. From the forests with special functions of protection are used with high rank forests intended mainly for protection of lands and soils and those with the protective function of water because in hydrological basin Mures are carried out works to combat soil degradation and the protection, preservation and restoration of water resources surface and groundwater and aquatic ecosystems, in order to achieve good water status, for example, the permanent and impermanent accumulations, dams outlet and water intakes, works by damming and regularization, hydro technical knots, pumping stations, derivatives and adductions, small hydropower, gauging stations and posts of rain measurement, etc.

(2) The efficiency of forest stands in terms of hydrological and anti-erosion. To get the efficiency of forest stands it takes a process of tracking and land delimitation of forest stands, which leads to a statistical picture on hydrological capacity of forest vegetation from a basin, can thus achieve so comparing basins between them, as well as their engagement on emergency intervention.

The classification of each forest stand in a certain hydrological category has been achieved through the system of mapping proposed by Al. Apostol in 1972, system picked up later to be completed and adapted by Magdalana Ionescu, P. Dumitrescu și N. Lazăr (1973 – 1987). According to the mapping system and with the using forest management planning has been made a distinction between 4 categories, that have been marked according to their

hydrological efficiency in decreasing order from A to D. Category A is represented by mature forest stands with high hydrological efficiency, which are capable of providing maximum protection of the soil against erosion. These have a parameter erosion of 0.05-0.5 m³/year/ha and a maximum retention potential in stands of 17 mm. According to hydrological mapping of forest stands in 1992 this category holds a percentage of 28.2% of the area of the forest fund. The forest stands that provide medium protection of the soil and achieves an average erosion parameter of 0.2-8.0 m³/year/ha and a maximum potential of retention of 10-15 mm are those in category B, respectively, middle-aged forest stands or attacked with regeneration works and with a middle or low productivity, those occupying the highest percentage of the area of the forest fund, namely, 53.8%.

Referring to young forest stands or forest stands at the edge of the altitudinal limit of forest vegetation, which have a percentage of 15.6% of the area of the forest fund, can be seen as a result of hydrological mapping of forest stands that have a low hydrological efficiency, have a parameter erosion between 1.0-8.0 m³/ha/year and a maximum potential of retention between 7-12 mm. These forest stands are grouped under category C. The forest stands contained in category D are those that have the lowest share of area of the forest fund, 2.4%, having a lower hydrological efficiency. These will be represented by lands without forest vegetation, roads, construction and lands submissive to degradation. The parameter of erosion is included in the range 2.0-100.0 m³/year/ha and have a maximum retention potential falling in the range of 1-4 mm. Overall, the share of forest stands with high or medium efficiency is higher in the mountainous part of the hydrological basins, such as the case of the hydrological basin Mures-Aranca, where is the greater share of forest stands with medium productivity, namely, 48%, followed by the share of forest stands from category A with a 36.5%.

CONCLUSIONS

In light of the above, it can be reach to the following conclusions, namely, in those basins, in which complex improvements have been made in a high percentage of the total area of forest fund, soil erosion has been reduced substantially and torrential processes have been extinguished within a short period of time. Biological and hydrotechnical works should not focus only on the lower part of the hydrological basins, but they must be executed in the whole basin area, as needed. Considering the low level of afforestation of our country and the fact that only about half of the national forest fund longer belongs to the public property state, the rest being owned by private individuals and legal entities, it is found the liability that hold all professionals from forest fund to impress public opinion for the purposes of forest management in proportionality with their priority role, the protection of the environment factors. The forest vegetation warns utmost degradation processes (deep erosion or surface erosion, floods, landslides) because in a hydrological basin it is difficult to uncover, accurately, the contribution of each usage categories, at the emergence or stopping of this catastrophic phenomenon.

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