ANALYSIS OF THE LINKS BETWEEN THE AFFORESTATION OF SMALL WATERSHED AND ITS TRIBUTARIES FLOW CRIŞ PRESENT IN FOREST FUND

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Abstract

The aim of this work is the analysis of afforestation of the Crişul Repede and Crişul Negru's hydrographic subbasins, respectively the Iada Valley, Brătcuţa, Finiş, Tărcăiţa, Văratec and Crişul Pietros respectively, in order to value the water flow and its power in the forestry sector. The exponential correlation type realized between afforestation and of the multiannual flows of the small hydrographic basins from the Crisuri (Rivers) is statistically significant.

Key words: *links, hydrographic basin, flows, afforestation*

INTRODUCTION

The Crişul Repede River springs from the Apuseni Mountains in the south east of the Huedin Depression at an altitude of 710 meters. It flows to the north west until it reaches Ciucea from where it heads to the west (towards Oradea). It has a longitudinal profile characterized through an average slope of 3‰ and it has a hydrographic basin with a surface of 2973 km² (7.***1)

The Crişul Negru River springs from the Bihor Mountains from an altitude of 1460 meters. It collects its water from the west slopes of the Bihor Mountain and from the slopes concentrated in the Beiuş-Vaşcău depression, from a hydrographic basin situated in the west part of the country, having a surface of over 4400 square kilometers and it drains, in its superior parts, the west slope of the Bihor-Vlădeasa Mountains, the south-west slope of the Pădurea Craiului Mountains and a great part of the Codru Moma Mountains. The length of the basin is of 100 km and its width is of 70 km (Bîdiliţă F.,2009)

►The Iada Valley river that divides the mountain massifs of Pădurea Craiului and the one of Vlădeasa Mountain. This river has a length of 46 km from its springs (from Vlădeasa Mountains) until it flows into the Crişul Repede River. It has an average slope of 22 ‰, a hydrographic basin's surface of 215 km² and the surface of the forestry fund is crossed by 13251 hectares (8***2).

►Brătcuţa Valley springs from the Pădurea Craiului Mountains. It has a length of 14 km and an average slope of 35 ‰. It crosses a forestry fund of 2020 hectares; it has a hydrographic basin of approximately 50 km² and it

flows into the Crişul Repede River as a left tributary. It is a very appreciated touristic area.

►Crişul Pietros River has its spring from The Boga Spring and it has a length of 32 km until it flows into The Crişul Negru River being a right tributary of the latter (Teoran A.A.,2010), in a basin that has a surface of 200 km^2. The longitudinal profile has an average slope of 36 ‰, and the average depth in the warm periods is of 0,4 m and the average width of the transversal profile is of 7m.

►The Aleu Valley springs from The Bihor Mountains; it is a right tributary of the Crişul Pietros River, it has a length of 12 km and it crosses a forestry fund surface of 2456 hectares. It has a hydrographic basin with a surface of almost 40 km^2 and it is characterized through a longitudinal profile with an average slope of 95 ‰ and with natural slope breakdown (Zăvoianu, I. 1978).

►The Galbena Valley that drains the whole basin of Padiş-Cetăţile Ponorului starts through the Galbena Karstic Spring reaching an average altitude of 1077 m. It has a huge flow and a noisy stream course. The length of the valley is of 8 km, the average slope of 110 ‰, the surface of the hydrographic basin of 31 km^2 and the one of the forestry fund that it crosses is of 4087 hectares.

► Crăiasa Valley crosses a hydrographic basin of 32 km and a forestry fund of 1873 hectares overlayed on a very appreciated touristic area (near the Bears' Cave), having a total length of 10 km.

► The Finiş Valley springs from the Codru-Moma mountains which it crosses on a distance of 25km in a basin with the surface of 85 km^2 and with a forestry fund surface of 2318 hectares (10.***4) until it flows into the Crişul Negru River as its left tributary.

►The Tărcăiţa Valley is formed at the confluence of Şesuţa and Râpoasa Valleys from the Codru-Moma mountains. It has a length of 19km in a basin with a surface of 52 km^2 and it is approximately parallel with The Finiş Valley; the average slope of the longitudinal profile is of 26 ‰.

► The Văratec Valley, a left tributary of The Crişul Negru river, situated in the area of the Vaşcău Forestry Ward from the Oradea Forestry Department. This valley springs from the Codru-Moma mountains with altitudes between 600 and 1000 m, fragmented with steep and deep valleys, limestone plateaus, with beautiful karstic phenomena (dolinas, steepness, karstic springs) (9.***3).

The main objective of this work is the analysis of afforestation of the Crişul Repede and Crişul Negru's hydrographic subbasins, respectively the Iada Valley, Brătcuţa, Finiş, Tărcăiţa, Văratec and Crişul Pietros respectively, in order to value the water flow and its power in the forestry sector.

MATERIAL AND METHODS

Because flows are influenced by natural factors (De Azagara A.M., Hevia J.N.,1996), was analyzed in this paper the influence of afforestation on them.

In order to establish the existent relations between the multiannual average flows (1991-2010) and the forestation degree of the respective hydrographic basins there were tested many types of correlative links.
The multiannual average flows in the period taken into account were determined in the control sections of the respective valleys and rivers, in the hydrometric stations from the national network (Man T.E. et. all,2010), the processed values coming from the Romanian Waters – Water-Rivers Department, and we thank them for that.

The multiannual average flow for the studied valleys is between 0,228 m³/s on Crăiasa Valley and 2,378 m³/s on Crişul Pietros River (Table 1).

The forestation degree was established on partial surfaces and integrally by the data centralization of the forest sectors.

RESULTS AND DISCUSSION

The multiannual average flow for the studied valleys are presented in the table 1.

Table 1.
Multiannual average flows (m³/s) in the control sections of some valleys from the forestry sector
(1991-2010) (after Romanian Waters – Waters-Rivers Department)

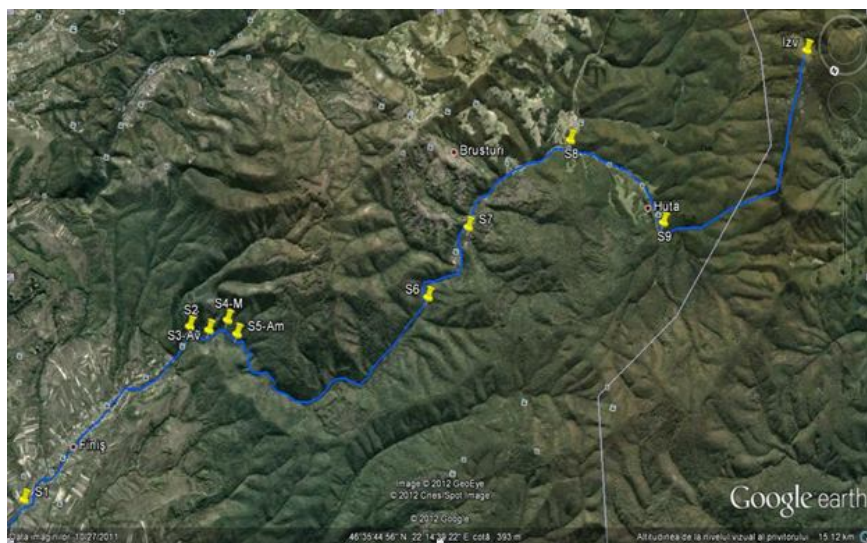| Nr. crt.	Valley	Annual average flows		Multiannual average flows(m³/s)
		Qmax/year (m³/s)	Qmin/year (m³/s)	
1.	Iadei	2,346/1994	1,606/2006	1.954
2.	Brătcuța	0.395/2005	0.218/2009	0.313
3.	Crişul Pietros	2,655/2010	1,983/1999	2.378
4.	Aleu	0.472/1999	0.353/2005	0.424
5.	Galbena	1.605/1994	1.367/2002	1.485
6.	Crăiasa	0.260/2001	0.181/2010	0.228
7.	Finiş	0,644/1994	0,523/1999	0.588
8.	Tărcăița	0,515/1992	0,355/1997	0.421
9.	Văratec	0,402/1998	0,295/2001	0.352

Fig.1- Satelite image of the Tărcăiţa hydrographic subbasin (source: www.google.earth.com.)

The value of the forestation degree is synthetically presented in the Table 2, on partial surfaces and totally. These are between 90,50 % for the Galbena Valley basin and 35,13 % for the Crăiasa Valley basin.

Table 2

The forestation degree (%) on total and partial surfaces of the hydrographic basins

S (km²) Basin	S1 (total)	S2	S3	S4	S5	S6	S7	S8	S9
Iada Valley	215.10	198.75	155.03	121.00	108.25	102.45	76.72	59.69	52.48
% pad	78.82	81.33	83.27	85.19	86.49	88.23	91.67	97.70	98.00
Brătcuţa Valley	45.47	35.73	33.39	27.49	19.90	13.33	/	/	/
% pad	58.14	60.59	62.71	65.45	68.34	70.81	/	/	/
Aleului Valley	36.19	34.50	33.97	33.40	32.49	18.30	6.91	/	/
% pad	71.77	76.42	79.54	80.62	81.51	84.37	92.21	/	/
Galbena Valley	31.07	28.61	23.04	20.37	20.11	20.00	19.57	11.18	/
% pad	90.50	93.32	96.43	98.10	99.04	99.03	96.88	99.90	/
Crişul Pietros	181.55	151.21	95.38	59.78	58.84	57.96	50.61	18.67	/
% pad	68.44	70.59	73.37	77.17	80.69	83.75	83.14	88.24	/
Crăiasa Valley	32.51	13.57	8.54	7.93	5.54	5.44	4.70	2.32	/
% pad	35.13	63.07	74.85	80.48	83.76	89.86	91.85	90.90	/
Finişului Valley	85.86	70.23	65.87	65.35	64.47	58.03	52.17	41.61	13.93
% pad	70.76	78.94	80.11	80.93	81.78	79.53	78.64	88.50	91.20
Tărcăiţa Valley	52.13	47.25	45.57	45.04	44.51	36.34	23.41	18.05	13.01
% pad	69.54	74.74	77.54	79.53	79.58	78.43	82.52	84.48	84.20
Văratec Valley	58.09	56.64	32.97	31.88	31.53	25.82	19.34	9.47	/
% pad	66.35	70.85	73.47	72.63	73.18	71.89	72.92	69.20	/

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Regarding the study on the formation methods of the flows of the small hydrographic basins from the forestry fund of the Rivers hydrographic basin there were tested the influences of the forestation degree upon the multiannual average flows.

If the forestation degree of the hydrographic basins (given in %) influences the evolution of the multiannual average flows there takes place an interesting aspect. From the above graphical presentation results that the relation between those is one of statistically significant (Giurgiu V.,1972), exponential type (R=0,681). This presents us that if at increases of the forestation degree between 40 and 50%, the multiannual average flows have an increase only of 0,11 m^3/s, in the case of some forestation degrees of 80-90% the influence upon the flows is much more important, it increases about 0,5 m^3/s (Figure 2).
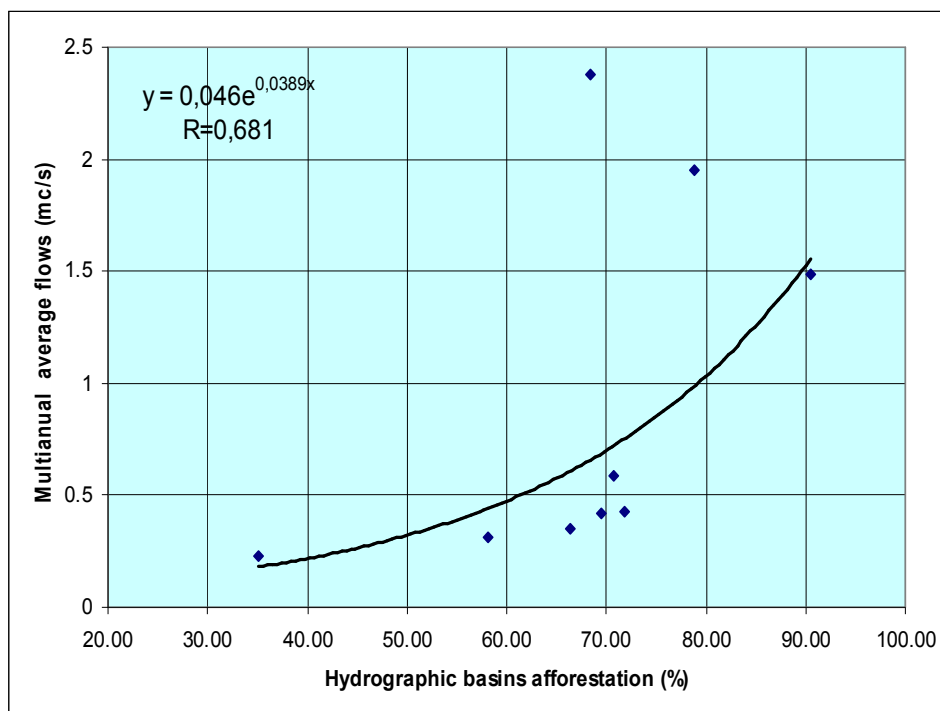

Fig. 2.- The influence of afforestation subbasins over the multi annual flows in the control section

CONCLUSIONS

For the studied valleys the multiannual average flow is of 0,228 m^3/s on Crăiasa Valley and of 2,378 m^3/s on The Crişul Pietros River.

The afforestation value are between 90,50 % for the Galbena Valley and 35,13 % for the Crăiasa Valley

Although the main contribution in the formation of the multiannual flows, measured in the control sections of the small hydrographic basins from the Rivers' forestry fund it has the features of the hydrographic basin, the forestation degree becomes also very active in the formation process and respectively in dynamics of these flows.

REFERENCES

1.Bîdiliţă Florina.,2009 - Bazinul Crişului Negru – studiu de geomorfologie cu privire specială asupra reliefului fluvial şi fluvio-denudaţional- Teză de doctorat-Universitatea din Oradea Facultatea de Istorie, Geografie şi Relaţii Internaţionale Departamentul de Geografie, Turism şi Amenajarea Teritoriului, 298 p
2.De Azagara A.M., Hevia J.N.,1996- Hidrología Forestal-El ciclo hidrológico, Secretariado De 14.Publicaciones E Intercambio Editorial Universidad De Valladolid, 286 p.
3.Giurgiu V.,1972- Metode ale statisticii matematice aplicate în silvicultură, Editura Ceres, Bucureşti 566 p
4.Man T.E., Sabău N.C.,Bodog M.,2010- Hidroamelioraţii, Editura Aprilia Print, Timişoara, 258p
5.Teoran A.A.,2010- Din minunăţiile naturale ale Bihorului, Editura Arca, Oradea, 168 p
6.Zăvoianu, I. 1978 - Morfometria bazinelor hidrografice, Editura Academiei, R.S.R., Bucureşti, 217 p.
7.*** 1 Atlas Cadastral, Apele Române, Direcţia Apelor Crişuri
8.*** 2 Amenajamentul O.S. Remeţi
9.*** 3 Amenajamentul O.S. Vaşcău
10.*** 4 Amenajamentul O.S. Codrii Beiuşului