RESEARCH ON STANDS HYDROLOGICAL MAPPING FROM ANIEŞ HYDROGRAPHIC BASIN

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Abstract. Hydrographic area of Anies River basin drains the southern slope of Rodna Mountains. Watershed area as geographical location falls within the geographic coordinates: North latitude: 24°41' to 24°52'; East longitude: 47°22' to 47°35'. Permanent hydrographic network density of Anieş Valley hydrographic basin is between 12.8 m / ha and 29.3 m / ha. Lungimea totală a reţelei hidrografice din subbazinele torenţiale studiate este de 63,1 km, din care cu degradări 2,9 km (4,6 %). The hydrographic network total length from the torrential sub-basins studied is 63.1 km, of which the degradation 2.9 km (4.6%).

Keywords: hydrological mapping, torrent, hydrographic basin, surface drainage

INTRODUCTION

Research on hydrological regime and hydraulic works were performed on the main thread of Anieş from km 4 to km 8 and the left and right tributaries of rivers Anieşul Mare and Anieşul Mic, areas with torrential correction works, protection of the shores or support and protect the axial forest road Anieş and the forest roads Anieşul Mare, Anieşul Mic, Blidireasa and Mihăiasa. Between superficial power sources have the largest share rains (60-70%), snowfall is less abundant (30-40%). Regarding the hydrological regime, there is an increase of flows in March, with the thaw and snowmelt, and lasting until May due to spring rains. July marks the beginning of the decline, which is increasing gradually until August-September; following the November increases and then decreases in winter, with minimum flow values in December and January. Distribution, orientation and flow regime are dictated by physical and geographical conditions of natural units which are treated. Among them a special role has the landscape that, either directly or indirectly through climate and vegetation changes as a result of vertical natural setting impose some particularities of the hydrographic network.

MATERIAL AND METHOD

As a result of heavy rains that occurred in recent years across the studied region have been several powerful flash floods from which hydrographic network was damaged, affecting economic objectives located in the area. Destructive nature of the torrential manifestations and the extent of degradation occurred, require measures to prevent or at least reduce the intensity of these phenomena and reduce damage. From administrative point of view, the analyzed territory is on jurisdiction of the village Rodna, Bistriţa-Năsăud county. Action planning of torrents from the torrential hydrographic basins mentioned is initiated in order to reduce the intensity of rainfall events and avoid losses to the economic and social objectives presented in Table 1. In the Anieş basin have been identified 14 torrential formations requiring interventions with torrential correction works whose territorial - administrative situation is shown in Table 2, which is useful for subsequent mapping of basin stands.

Table 1

Social-economic objectives protected against torrential manifestations

Torrential hydrographic basin	Name of the protected objective	Importance class	Level of protection standardized		Vulnerability level
			Dimens.	Verif.	
1	2	3	4	5	6
H.B. Anieş	Forest road: 145D	IV	5%	1%	III
	Forest road: 146D	IV			III
	Forest road: 147D	IV			III
	Forest road: 158D	IV			III
	Forest road: 159D	IV			III
	Forest road: 160D	IV			III
	Forest road: 161D	IV			III
	Forest fund	IV			I
	Agricultural fund	IV			I
	Water catchments	IV			II
	Center of the Anieş village	IV			II

Table 2

Structure of uses

T.H.B. studied	Total surface	From which :					
		Forest fund			Agricultural fund		
		Total	From which :		Total	From which :	
			of state	private		arable	Pastures Meadows
1	2		4	5	6	7	8
Popii Stream	322,6	148,2	148,2	-	174,4	-	174,4
Butucilor Stream	525,6	217,2	217,2	-	308,4	-	308,4
Mihaiasa Stream	428,9	313,7	313,7	-	115,2	-	115,2
Roşu de Sus Stream	165,5	131,5	131,5	-	34,0	-	34.0
Raven (landmark 203)	37,8	37,8	37,8	-	-	-	-
Raven (landmark 311)	124,7	124,7	124,7	-	-	-	-
Raven (landmark 323)	57,5	52,6	52,6	-	4,9	-	4,9
Valea Sacii Stream	876,5	619,1	619,1	-	257,4	-	257,4
Raven (landmark 168)	61,5	53,4	53,4	-	8,1	-	8,1
Blidiresa Stream from which :	834,4	782,4	782,4	-	50,0	-	50,0
Blidiresa Mare Stream	243,2	193,2	193,2	-	50,0	-	50,0
Raven (a.u. 45)	25,2	25,2	25,2	-	-	-	-
Valea Largă Stream	101,2	101,2	101,2	-	-	-	-
Raven (a.u. 64)	11,2	11,2	11,2	-	-	-	-
Raven (a.u. 128)	32,7	22,3	22,3	-	10,4	-	10,4
Tomnatec Stream	556,4	397,3	397,3	-	158,6	-	158,6
Raven (a.u. 146)	16,4	16,4	16,4	-	0,0	-	0,0
Ulmului Stream	87,0	80,2	80,2	-	6,8	-	6,8
Total torrential sub-basins	4127,4	2996,7	2996,7	-	1128,2	-	1128,2

In order to reduce rainfall events were mapped stands from the basin, then were proposed and executed hydraulic works with role of consolidation, water retention and discharge in 14 torrential sub-basins related to the torrential formations listed in Table 2

RESULTS AND DISCUSSION

Regarding the structure of the forest fund from the studied torrential sub-basins, it is observed that 99.1% (2970.9 ha) of the area is covered by forest, and 0.9% (25.9 ha) of land is occupied with other destinations (roads, land administration, land for hunting food, unproductive land, etc.).

Forest average share in the torrential basins is 80%, it varies from 68.2% (Raven a.u. 128) to 100% (Butucilor Stream).

Functional zoning. The total area of forest in the sub-basins studied (2970.9 ha), stands from the II-functional group is 71.3% (1822.2 ha), while those in Group I are totaling 1148.7 hectares and are classified in the functional category 1-2A, with role of soil protection on terrain with large slopes.

Analyzing the current state of forest fund, the following conclusions can be made:

- Generally stands can ensure exercise with continuity, on long-term, of protection and production functions, and increased environmental stability and operational effectiveness of the forest;

- In terms of age, the area ratio on age classes is balanced, resulting hydrological balance is maintained in the future;

- Plantations were executed lately especially with spruce, it is recommended that in the future to introduce mixed species stands that contribute to increased resistance and also increase their intake hydrology;

- Low consistency is achieved more frequently in trees installed on land surface and the rock that occurred windfall, resulting in high levels of discharge coefficient due to low retention and infiltration.

From the analysis of presented elements appears that forest fund provides a good hydrological protection.

According to the above characteristics to determine the effectiveness of hydrological uses, revealed the following categories (Table 3):

a) in forest fund:

- A category– hydrological efficiency of stands with high totals 209.0 hectares representing 7.0% of the land area in the study. In this category are included stands between 20 and 100 years, top class production with normal continuous litter, soils with high infiltration capacity leading low coefficient of discharge;

- B category – includes stands with middle hydrological efficiency 1967.3 ha (65.6%) 0.7 consistency, aged 20 to 100 years and stands 0.6 consistently covered with cuts of regeneration, with normal litter continues with the undergrowth developed provide good soil protection;

- C category – reduced hydrological efficiency include consistency stands between 0.1 and 0.5, the land surface rock with thin litter interrupted, young stands unfinished solid state, representing 816.9 (27.3%) of the total;

- D category – low hydrological efficiency corresponds nude showing various forms of land degradation and land for afforestation. These lands have a total area of 3.6 ha (0.1%).

b) in agricultural fund:

Hydrological efficiency was assessed by analogy with forest fund:

- Category B comprises mown hay, good quality and wooded grassland with an area of 8.1 ha (0.7%);

- Category C includes land occupied by pastures with an area of 756.8 ha (67.1%);

- Category D includes degraded pastures occupying a total area of 363.8 ha (32.2%). In order to increase the efficiency hydrological stands will adopt specific cultural works that will improve the consistency and composition track and balancing the age class structure.

Table 3

Hydrological mapping of forest fund uses

Basin name Hydrographic Subb.	UM	Surface	Hydrological categories								
			A	Total	Bl	B2	B3	Total	CI	C2	D
1	2,	3	4	5	6	7	8	9	10	11	12
Popii Stream	ha	148,2	78,4	50,5	27,0	-	23.5	18,4	17,0	1,4	0,9
	%	100,0	52.9	34,1	18,2	-	15.9	12.4	11.5	0.9	0.6
Butucilor Stream	ha	217,2	-	164,9	56,6	1,5	106.8	50,6	28.3	22,3	1,7
	%	100,0	-	75,9	26,1	0,7	49,2	23,3	13.0	10,3	0,8
Mihaiasa Stream	ha	313,7	16,6	190,0	16.3	7,3	166,4	107,1	81.3	25,8	-
	%	100,0	5,3	60,6	5,2	2,3	53, 0	34,1	25.9	8,2	-
Roşu de Sus Stream	ha	131,5	-	39,0	39,0	-	-	92.5	79.4	13,1	-
	%	100,0	-	29,7	29,7	-	-	70,3	6 0 ,4	10,0	-
Raven (landmark 203)	ha	37,8	12,8	25,0	17,5	6,8	0 .7	-	-	-	-
	%	100,0	33,9	66,1	46,3	18.0	1.9	-	-	-	-
Raven (landmark 311)	ha	124,7	-	117,1	6,1	111,0	-	7,6	1,6	6,0	-
	%	100,0	-	93,9	4,9	89,0	-	6,1	1,3	4,8	-
Raven (landmark 323)	ha	52,6	-	36,5	-	36,5	-	16,1	-	16,1	-
	%	100,0	-	69,4	-	69,4	-	30,6	-	30.6	-
Sacii Stream	ha	619,1	52,0	420,3	40,1	178,9	201.3	146,8	147,7	-	-
	%	100,0	8,4	67,9	6,5	28,9	32,5	23,7	23,9	-	-
Raven (landmark 168)	ha	53,4	-	53,4	-	-	53,4	-	-	-	-
	%	100,0	-	100,0	-	-	100,0	-	-	-	-
Blidireasa Strem from which:	ha	782,4	22,1	496,1	26,9	317,4	151,8	263,2	116,4	146,8	1,0
	%	100,0	2,8	63,4	3,4	40.6	19.4	33,6	14.9	18,8	0,1
Blidireasa Mare Stream	ha	193,2	-	87,8	-	76,1	11,7	104,4	93,9	10,5	1,0
	%	100,0	-	45,4	-	39,4	6,1	54,0	48,6	5,4	0,5

Raven (a.u. 45)	ha	25,2	9,2	16,0	16,0	-	-	-	-	-	-
	%	100,0	36,5	63,5	63,5	-	-	-	-	-	-
Valea Largă Stream	ha	101,2	-	101,2	70,2	-	31,0	-	-	-	-
	%	100,0	-	100,0	69,4	-	30,6	-	-	-	-
Raven (a.u. 64)	ha	11,2	-	11,2	-	-	11,2	-	-	-	-
	%	100,0	-	100,0	-	-	100,0	-	-	-	-
Raven (a.u. 128)	ha	22,3	-	-	-	-	-	22,3	5.6	16.7	-
	%	100,0	-	-	-	-	-	100,0	25,1	74,9	-
Tomnatec Stream	ha	397,3	-	326,4	-	228,9	97,5	70,9	42,0	28,9	-
	%	100,0	-	82,2	-	57,6	24,5	17,8	10,6	7,3	-
Raven (a.u. 146)	ha	16,4	-	16,4	16,4	-	-	-	-	-	-
	%	100,0	-	100,0	100,0	-	-	-	-	-	-
Ulmului Stream	ha	80,2	27,1	31,7	-	3,0	28,7	21,4	1,0	20,4	
	%	100,0	33,8	39,5	-	3,7	35,8	26,7	1,2	25,4	0,0
Total hydrographic basin	ha	2996,7	209,0	1967,3	245,9	891,3	830,1	816,9	520,3	2974	3,6
	%	100,0	7,0	65,6	8,2	29,7	27,7	27,3	17,4	9,9	0,1

Based on data from land records of the village Maieru and plannings production units III Anieşul Mic and IV Anieşul Mare, conjunction with field observations, was performed mapping land affected by erosion in nature and intensity of rainfall erosion.

Mapping of degraded lands in relation with nature and intensity of erosion was made for each torrential hydrographic basin on two main groups namely:

- terrains with agricultural use;
- terrains from the forest fund.

CONCLUSIONS

Measures and proposed work are based on these observations on the current situation in the basin:

- The current state of forests reflects, on the one hand the natural evolution of its specific environmental conditions, but is determined mostly by how it was farm, the large number of parties rainfall in a relatively well wooded appearance on large scale windfall, lower altitude limit of forest vegetation, woody vegetation disappearance of alpine, lifting the bottom of the riverbed, downstream of the confluence of Anieşul Mare and Anieşul Mic are some of the consequences of forest development under the influence of anthropogenic interventions ;

- The existence of a belt of alpine (Rabla, Miraj, Laptelui, Galaţiului, Preluci etc.) without woody vegetation on it, the widths appreciable on high slope (average over 35 °), intense grazing at altitudes between 1600-2200 m, where precipitation falls in excess l000mm/an, foster the development torrent phenomenon;

- Basin has an elongated shape with short and quick slopes slopes, causing rapid water concentration of heavy rains in the main riverbed and promote torrential floods;

- The biggest erosion and transport of eroded material, are primarily confined to the beds (old warehouses, banks, dejection cones), then the slopes arising from the construction of forest roads and much of the alpine;

- Beds are relatively stable, grafted onto a substrate lithological moderately resistant to erosion and slopes have large slopes and petrographic substrate consists of rock with low infiltration potential favoring surface runoff;

- drumurile auto forestiere sunt dezvoltate pe trasee de vale şi asigură un important transport anual de material lemnos provenind din: produse principale şi secundare ;

- The forest roads are developed on valley trails and provides important annual transport wood from: main and secondary products;

- Narrow valleys determined the location of the road at the base of the slope, near riverbeds, this leads, in some areas, reduce the flow section drain liquid and solid platform on riverbed and causing flooding and road embankment;

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