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Study regarding the behavior of torrents correction works from Teregova River Watershed

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Abstract Under our country's relief, rock and precipitation, creating a condition very favorable potential torrent, the main factors that led to the onset of rain events in the mountain and hilly in our country and hence disruption of hydrological regime of most water courses, consisted of altering the functions of protection of vegetal cover, and disturbance of physical-biological functions of soils. In particular, by exploiting irrational and savage destruction of forests - the important factor regulate the water flows - have been created to the outbreak of intense torrential phenomena, which resulted in almost all branches of the national economy suffers, every year, directly or indirectly, significant damage. Torrential corrections in hydrographical basin are needed because of the beneficial effects they can produce.

Key words

torrents, hydrographic basin, morphometric and hydrological calculations

The recent natural disasters in Europe and worldwide product warn that modern society is becoming every day a company risk. Hydrological risk, including the risk of flash floods and flooding, is one of the most important. When asked if we know or not know how to manage the risk of this kind, the most likely answer is that we learn more and more in this direction, even if preventing and fighting flash floods are long the attention of several branches of engineering including engineering and forestry (6). Although there was no unified strategy on the time scale and financial allocations (usually insufficient) ranged from one stage to another, however torrential flood alleviation works in forest area were conducted in all major river basins and systems in our country.

Production successive new floods and flash floods motivated new financing, design and execution of works in more and more torrential basins (2).

But this way of approaching action meant the same time, distraction from an activity that is equally important: close supervision and constant monitoring of work already executed their proper maintenance, rehabilitation of damaged by flash floods, reinstatement safe systems of which these works belong.

Faults and failures recorded in the works of the landscaped river expresses - the frequency and intensity - a measure of the degree of risk from flash floods. In other words, obtaining statistical data based on the frequency and magnitude of these events, the national forestry may knowingly manage issues related to the design, execution and monitoring work fighting flash floods in the country's forest area, up to the preparation maps of areas at risk presented by these phenomena (3).

Torrential correction within river basins is necessary due to the beneficial effects they can produce. One of them would be that if the storage dams where necessary a series of torrential correction, namely the construction of dams bursting pressure and to stop silt brought by rivers, which would reach the bottom of the dam and its yield would decrease considerably (1). There have been some calculations which show that more profitable are these works of correcting torrents only if they clean the bottom of these dams silt.

Another effect of torrential correction would protect social objectives - economic, localities that have high risk of flooding. Through these works torrents correction can improve, often even eradicate rivers overflowed out if rainfall lengthy as the construction of dams bursting pressure or by building dams (5).

That's also a beneficial role would be and where the slopes have been deforested or irrational cuts were made and where can arise very powerful torrents that without those papers torrents correction could give rise to subsidence, erosion or other forms of destruction of the soil(4).

Material and Methods

The proposed theme, although predicted results to date, will bring a significant contribution to the development of scientific knowledge, the more so as, to date, no systematic research have done, at the statistical communities that aim regularities in the

occurrence, distribution and magnitude of damage/failures recorded in the work built on torrential river basins. So, our research relies on just such an approach. Will be investigated not only works damaged and out of service (as was done in our previous research), but will be considered in all work performed on torrential river.

Statistical distributions will be made will be investigated both traditional and modern methods implemented computer, with the opportunity to highlight the statistical variability and statistical regularities in the occurrence, development and manifestation of faults / failures correlated with nature, typology damaged work and work positioning affected parties. The magnitude (intensity) of each of the recorded events will be investigated by the appropriate assessment criteria and scales, which will be identified and introduced, for the first time, the author's present research.

Thus, the objective is expected the following steps:

1. To strip data-type descriptions of the works, highlighting the parts affected in each case, in two studies, as follows:

a) Notwithstanding the nature of behavioral events recorded;

b) Taking into account the nature of behavioral events recorded.

2. Composition of frequency distributions by grouping works, classes of number of behavioral events recorded, the number of faults recorded and the number of failures recorded in all cases for several versions of the class interval;

3. Calculation, analysis and interpretation of statistical indicators obtained frequency distributions;

4. Adjusting these distributions after some of the theoretical distributions that can capture regularities investigated.

According to current standards of flood forecast maximum liquid flow generated by rainfall on small basins and will be forwarded to the following probabilities of exceeding:

1. Probability calculation works properly in normal operation;

2. Play probabilities corresponding special operating conditions of the unit objectives.

Small-scale faults are allowed and may be removed or repaired without removing the goals that must be defended. In both cases, ensuring maximum flow is determined by the weight class that is designed to work in the basin studied, and this class is determined by reference to the category of important objectives endangered by floods.

Construction of water reservoirs for hydropower, land improvement works of settlements, the lines of communication are considered and classified as state standards. For compliance, will take into account the duration of expression of the work, is permanent or temporary, and their functional role, is primary or secondary.

Teregova torrential basin has an area of 200 hectares, as measured at ground surface and is part of Reşiţa Forest included in Forest Department Reşiţa, Romsilva.

Teregova catchment's area is 200 ha. The total length of the river is 2350m; bed length principle of the total length of the river, the main river bed has a length of 1300m. First order tributaries length is 1000m, second order tributaries length is 1000m and third-order tributaries length is 800 m.

The entire area of land that comprise forest basin is in public ownership and is managed by the Forest Reşiţa, in the Directorate of National Forestry. This administration is under the Forest Code (Law no. 26/1996). Hydrographic basin Teregova is located in the south-west of Romania, on the Nera River, in the Banat Mountains.

Results

Orders river are some numbers that is assigned after a certain rules a whole considered the origin whites to spillage or a channel segment between two confluent. Scientific importance and systematic practice of river networks flow from the fundamental principle of variation jumps. This principle implies that two whites that formed downstream of the confluence join them one nine channel presenting qualitatively different from the beds that generated it.

To establish Order River we use Strahler's system. Assign terminal segments of Order I do not get tributaries. Segments resulting from the union of two segments of Order I have to deal with second order segments. Segments resulting from the union of two segments forming the second order third order segments. The union of two segments of different orders kept senior segment. Systematic ordering of the river system serves hydrological calculations. Order a criterion for stratification hydrographical basin in morphometric and hydrological studies as follows first order, second order, third order.

To remove the bias introduced morphometric and hydrological calculations by the maximum length of the basin are used to determine and use in calculations of average length of the basin, denoted L_b. For this basin Unit Production I is assimilated to a rectangle, of the same area (F) and the same perimeter (P_b) in the basin considered.

Applying this formula is to obtain the average length of 3050m Teregova river basin. Quantitative expression of the form basin plan involves comparing its shape with a geometrical figure reference. Consider a hypothetical circular basin, whose surface is equal to the basin studied by comparing actual basin perimeter (P_b). This reporting relationship is obtained coefficient of Gravelius.

Gr = P_b / P_r = 1, 76- elongated basin is very strong.

It plays a major role in the whole basin morphometric parameters.

The average altitude of the basin makes streams of matter and energy content of torrential basins and influence of these basins hydrological cycle and potential mechanical energy expressed relief in the emergence and development of torrential processes. Because the basin is a small pond, relatively homogenous in mind, the average altitude of the basin can be determined using the formula:

$H_{med} = (H_{min} + H_{max})/ 2 = (2800 + 1360) 2 = 2080$m

The significance of hydrological and technological order and the frequency with which they engage in various calculations, the slope is central to the whole river basin morphometric parameters.

Basin slope triggering condition and development torrential phenomena and for determining or adapt many of the elements of design, calculation procedure is based on slope relationship between successive contour lines, slope basin-wide (Ib) and obtain the formula $Ib = \Delta H / F \times \Sigma l_i$

ΔH – gap between two successive curves.

l_i - sum contour lengths.

Table 1

Contour length of the hydrographical basin

Contour length (m)		
1/800	280	m
2/900	320	m
3/1000	360	m
4/1100	400	m
Total	1360	

$I_b = (\Delta H/F) \times \Sigma l_i$- slope = 0,030%

Is one of the parameters on which time of concentration of runoff in the basin and the amount of erosion on the slope. At the same time it is a very good indicator of drainage. By calculation can find the maximum length of slopes which are real long or medium length calculation length of slopes which although has valence shell morphometric and hydrological incontestable order.

The maximum length of a river basin slope is represented by the largest component of slope length. Thus, a site plan with contours, each of these lengths are measured as the largest slope line which connects the river system and watershed runoff revolving topographic slope that separates slopes of considered adjacent. In calculating the average length of slopes using the method proposed by Horton who could live with one hypothetical rectangular basin with the same surface hydrographic network which is equal in length to the complex basin considered.

Thus, we obtained two slopes hypothetical whose lengths are equal to the average length of actual basin slopes. Calculating the slope length is the hydrological significance level is given by the length fictitious versions with the main bed of the basin determines the average concentration of runoff in the basin.

$L_{cv} = F/2L_a$= 2000000 / 2 x 2800 = 357,14 → basin's classification of Clinciu as falling within large basins.

$L_r = L_b$

Rational formula generated by a downpour is expressed as:

$Q_{max} = 0,167 \times F \times C \times i_{iqo}$;

C-coefficient drainage basin average (0,75);

i_{iqo}- average rainfall intensity probability calculation with equal duration time of concentration of runoff in the basin;

F - basin area in ha.

The mean concentration of runoff is the time in minutes required water flow to the distance between the farthest point and section for calculating hydrological basin.

$T_C = T_V + T_a$

T_C = 25 minutes

$T_v = 0,5 \times L_v / I_v$

T_v =6,26 minutes

Flow curve variation with respect to time is elementary flow unit hydrograph considered. It is based on the method developed by Gaspar and Apostle, and thus the amount of silt is projected separately trained separately drainage on slopes and drainage volume of silt on the riverbed trained.

W_{av} - average slope sediment transport;

W_{aa} - year average volume represented by silt bed;

$W_a = W_{av} + W_{aa} \rightarrow W^{ater}{}_a = 342, 22\ m^3$

Conclusions

General analysis of the results allows the following conclusions and recommendations useful major for practical work correcting torrents and forest management in accordance with it.

Torrential floods annually produce any direct or indirect national forestry sector. In the forest basin Valley Minis, with an area of 8353 ha, torrential processes occur annually, affecting mostly transport network by clogging or washing embankment, drainage culverts blocking section or dislocation their decks and retaining walls roads through them.

The torrential valleys of upper basin of the River Valley Minis, landslides occurred on slopes and banks are in the forest stock occurred landslides due to the large amount of precipitation and geological substratum brittle. From these rain amounts of silt transported to some valleys thawed rising and 2.5-3 m, some consolidation works is actually buried in the mass of silt.

Lack of maintenance works, while negatively influence their behavior, worsening damage is recorded or multiplied with each flash floods, while there is a risk of total or partial shutdown of them and destroying the integrated system of which they are part.

A significant number of failures were due to the use of local materials for the preparation of concrete for a reduction in the cost of execution, an action that has turned against the manufacturer and the recipient, because the concrete result was poor quality work being subject to extensive degradation processes.

Analyzing in detail each fault in part from those affecting the safety of operation and durability work has shown that fissures, cracks and seepage area particularly affected body spilled degradation by erosion affected spillway and undermining slab met four cases.

Especially infiltration is occurred due to lack of concrete steps and breaks the grip of the two layers. Undermining their aprons and breakage was due to lack terminal abutment teeth or lack energy sinks.

Burial works silt mass is due mainly due to exceeding slope design and capacity retention works. In this situation silt are abundant, and concentrated on the river, can asterisk a single downpour job.

To increase the life of the work and to reduce their damage can develop some practical advice:

- Use only quality concrete execution of the work, without having to use local material (gravel and sand) from the riverbed in their preparation. Preferably is bringing concrete mixer from the nearest station Minis Valley area.

- Be respected constructive solutions in projects, making each terminal lug work aprons or drains. Where sinks teeth, they are strongly bonded slab plate to prevent their breakage during floods.

- The torrential valleys where they have been overcome and buried in mass of silt, to return to their rehabilitation and construction of other works upstream cross for silt retention.

- Because petrography brittle substrate characterizing Minis Valley basin is recommended increasing embedment depth of the foundation and work beyond the limits set in the projects execution.

- The damaged works to intervene with the shirt and restoration works structural parts to stop the degradation to which they are subjected.

- To reduce the transport of sediments, forest owner, afforestation works to interfere with alluvial sources if they are unstable or woody vegetation is not natural conditions to install.

- On behalf of the beneficiary, to be belonging to the forestry of the study area, a designated person that after each major event to record failures and malfunctions appeared to take remedial action in a timely manner.

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