Geomorphological Classification and Analysis of Hamzekhanloo River Using the Rosgen Classification Model

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1- Introduction

The changes in river processes due to river discharge and sedimentation as a primary principle driving force can affect the geometry of rivers. Determining the amount of sediment and floodplain and water quality study are prerequisites for river management operations. Any change in the steady-state of the rivers will result in physical changes in the rivers and a new reaction to the rivers' behavior. Morphological studies to determine the quantity and quality of river response will predict future river behavior. The downstream river reaches of the Hamzekhanloo River basin is one of the most important agricultural areas of Germi city due to its fertile flood plains and sufficient water availability, which has undergone many changes in recent years. In this study, the Hamzekhanloo River was investigated based on the Rosgen stream classification scheme.

2-Methodology

The Hec-Ras hydrodynamic model was used to simulate the Hamzekhanloo River cross-sections and floodwater capacity. The processing of the required data for modeling purposes was performed at the ArcGIS software; the classification of stream reaches was done using the Rosgen stream classification system. Rosgen classification system predicts river behavior based on morphology and hydraulic relationship and flow sediment with specific morphology. Based on Rosgen's method, morphological characteristics of rivers are investigated at four different levels but focuses more on two levels of general geomorphic properties and morphological description. Level 1 (General Classification): Describes the morphological characteristics of the river obtained by combining

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information on catchment, landform, and valley morphology. Level two (descriptive classification) of the river.

3- Results and Discussion

The results of the Rosgen classification scheme showed that the studied river had been classified at the C class in some river reaches, which had high flood sensitivity, high vegetation control, high sediment recovery, and sediment supply potential. Also, these reaches had narrow to wide valleys, constructed from alluvial deposition with a well-developed floodplain. Meanwhile, some sections of the study river fall in the B class according to the Rosgen classification. These reaches exist primarily on moderately steep to gently sloped terrain, resulting in narrow valleys that limit the development of a wide floodplain. These streams display a low channel sinuosity, and streambank erosion rates are normally low. The sensitivity to flooding and sediment supply is high; the influence of moderate vegetation control and recovering potential is excellent. Moreover, the cross-section patterns in the river and the parameters affecting the classification and segmentation of reaches are consistent with the overall pattern on the Rosgen classification model.

4- Conclusions

The river bed of the Hamzekhanloo River is a combination of rubble, gravel, and sand. Farmers and gardeners dig the riverbed and store water to irrigate the orchard fields and gardens during the summer, and crop cultivation is observed in the river bed and floodplain. Sand mining is a common activity in the river bed to carry out the development and construction purposes of the area. Sand removal from the riverbed has led to the formation of ponds within the basin, and such alterations have altered the bed and morphology of the Hamzekhanloo River. Thus, Rosgen's model can predict the geomorphic quantification of the Hamzekhanloo River and rivers with similar conditions. This type of river channel morphological classification can be used to develop engineering designs and management implications and river restoration.

Keywords: Flood zone, Rosgen model, Hec-Ras hydrodynamic model, Hamzekhanloo River, Ardabil Province.

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