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Study of Complex Landscape Gully Erosion and Theirs, Density and Density Mapping

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Abstract: Mapping of ravine erosion in complex landscape conditions in the world practice of erosion management, linear forms of ravine erosion are usually mapped by deciphering aero-space-photographs (AFS-CFS), as well as traditional mapping methods - using topographic maps. The article provides for the regularities in the manifestation of the growth and development of the ravines of the Namangan adyrs, studied the linear forms of erosion with the identification of their morphological and morphometric characteristics.

Keywords: Gully erosion interpretation, aerial photography, aerial space photography, photographic plans, topographic maps, scale, density, density.

Mapping gully erosion in complex landscape conditions needs to be considered [1].

As a result of studying the distribution of ravines in the Adyrs. We compiled maps of the density and thickness of ravines on a scale of 1:10000. To characterize the gullies of the Adyrs, indicators of density, density and frequency of ravines were used. Namangan adyrs are divided by density into 6 gradations [2, 3].

I – Less than 0.1 km/m^2

II – 0,11- 0,30 km/m^2

III – 0,30 – 1,0 km/m^2

IV – 1,01 - 3,0 km/m^2

V – 3,01 – 5,0 km/m^2

VI – more than 5.01 0.1 km/m^2

And also in 6 gradations of density

I – Less than 0.1 pcs. / sq. km; not ravaged.

II – 0.11-0.60 pcs. / sq. km; weakly ravaged.

III – 0.61 – 1.5 pcs. / sq. km; gully.

IV – 1.51 - 5.0 pcs. / sq. km; medium gully.

V – 5.01 – 10.0 pcs. / sq. km; heavily ravaged.

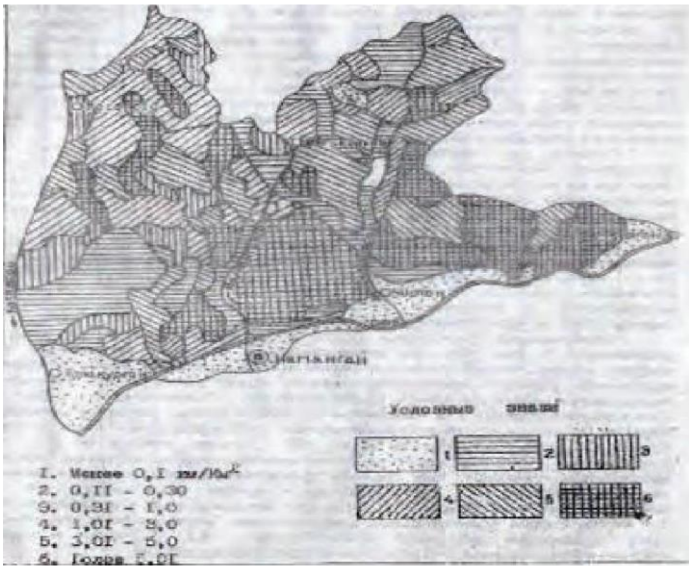
VI – more than 10.01 pcs. / sq. km; very heavily enchanted.

To develop measures to combat gully erosion, it is necessary to study the patterns of manifestation, growth and development of linear forms of erosion, identifying their morphological and morphometric characteristics [4, 5].

The morphology and morphometry of ravines on the Adyrs is closely related to the structure and dissected terrain of the area, the area of the drainage basin, the lithology of underlying rocks and types of economic use [6, 7].

The morphometry of ravines on adjacent adyrs is directly proportional to the depth of local erosion bases, the degree of relief dissection and the implementation of irrigation structures. Of the 695 ravines surveyed, about 60% had an average length of no more than 25 m. According to the law of rectilinear movement of concentrated runoff of temporary water flows on heavily ravaged lands, the number of elongated ravines decreases to 9% over time. Therefore, the use of space photographs in deciphering the linear forms of erosion on the adyrs is not very effective, because a resolution of 1: 200,000 images is insignificant when deciphering short (less than 25 m in length) adyr ravines [8, 9].

Density and thickness of ravines. To identify the pattern of distribution of ravines in the adyrs of the Namangan region, we compiled maps of the density and density of ravines on a scale of 1:100,000 (Fig. 1).



Such large-scale maps allowed us to account for linear erosion patterns smaller than 10 m. According to the density map of the entire studied northeastern part of the Namangan region, the maximum indicators (more than 10 pcs. /sq. km.) are found on the irrigated lands of the Chartak, Aikiran, Peshkaran, Uichinsky, Yangikurgon adjoining adyrs with easily mixed light gray soils on loess-like rocks. Here the density of the gully network reaches 63.1 pieces. / sq. km., which is considered one of the highest indicators in the Middle region [10, 11]. Such a high density of ravines, according to our recommendations (Nigmatov et al. 1994), does not allow the frequent use of radical reclamation methods with the preservation of the soil layer of the ravine areas [12, 13].

In the ravine of the dangerous territories of the Adyrs, from organizational and economic measures into the practice of the agro-industrial complex, we introduced a complex of soil systems for conservation agriculture: bi-annual accounting and assessment of eroded lands on farms [14].

In the world practice of erosion, it is customary to map linear forms of gully erosion by interpreting aerial-space photographs (AFS-KFS), as well as traditional mapping methods - using topographic maps. Analysis of diverse FSCs and their field interpretation showed that it is difficult to interpret small-sized ravines and gullies (up to 300 m) from images at the initial stages of development, as well as in shaded and shady areas of slopes characteristic of mountainous regions and adyrs. Only a field survey and their interpretation made it possible to correct office data and obtain reliable information, which is very difficult. Mapping the area affected by ravines using AFS scales of 1:16000-1:47000 showed that it is impossible to obtain sufficiently detailed information on the scale of regions and districts, which is explained by the following circumstances:

1) low (25-30%) availability of APS on the territory of Uzbekistan:

2) the absence of APS for the most ravine-hazardous areas - populated and technogenically disturbed areas, where the greatest activation of erosion processes can be expected (settled areas, reservoirs, quarries, etc.);

3) different timing of surveys (5-10 years) and different scales (1:16,000 – 1:60,000) of available AFS for the same flight areas or types of terrain [15, 16].

The availability of large-scale topographic maps for the entire territory of the republic makes it possible to assess land ravages using traditional methods. However, it was necessary to clarify the possibilities of using these methods in the complex landscape and geomorphological conditions of Uzbekistan, since most traditional methods were developed for the flat territory of the European part of the former Union. Methods of continuous or selective determination of gully indicators for key areas using sheets of large-scale topographic maps, cartographic determination of density fields, continuous or selective determination of the density and density of ravines in river catchment areas (Ravine Erosion, 1999) - all this is not very suitable for mountain areas. Indicators of gullying entirely for a watershed, a topographic sheet, or any selected geometric figure (square, circle, rhombus, etc.) make an error, since this generalizes the material for completely different types of relief, not to mention its forms and elements [17, 18].

The proposed methodology for compiling gully maps takes into account all the features of the distribution of ravines in complex landscape and geomorphological conditions. When analyzing gullying, the basis of a territorial unit is the type of terrain, which takes into account both the altitudinal zone and the morphology of the primary relief on which ravines develop. If earlier, according to the method developed for flat areas, it was necessary to take a sheet of topographic map, divide it into a network of squares or river catchments and determine the characteristics of gully from them, now according to the proposed method one should first highlight it on this topographic sheet (M. 1:10.000 or 1:25,000) types of relief, and then using them to determine the number of ravines, length, density of the gully network, contour area, and by dividing the number by the area, calculate the density of the ravines, that is, dividing the length of the gully network by the area - the density of the gully network. This, of course, somewhat complicates the work, especially if there are no ready-made maps of landscape-geomorphological zoning for a given area, but it makes it possible to obtain more accurate data differentiated by types of relief and landscapes for subsequent zoning against ravine activities. Topographic map data is refined for key areas for each type of relief using AFS materials at scales 1:16,000 – 1:30,000 for mountains and smaller scales (1:25,000 – 1:60,000) for desert zones. Data from key areas make it possible to calculate a correction factor for selected areas strictly according to relief types [19, 20].

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