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Abstract. The article is about the questions study of procedure in waterbed with modern GIS (Geographic Information System) technologies. Data from the Landsat satellite innovation technology was used. Map of Sox River has been created with using satellite data. Existing parameters of waterbed and surface of water in it are analysed. Chart is created that makes link between surface of water and discharge in Sox River. Based on the graphic, deformational processes are analysed. The obtained data were compared with field geodesic studies.

1. Introduction

Today, there is a growing interest in GIS from various fields. This information helps to draw conclusions about changes and events in nature. A detailed study of these changes has been made by many scientists through this program. Currently, GIS is widely used in water accounting. GGIS is able to collect, analyze and deliver custom information to users. That is, GIS is a system of devices and software that serves to receive, store, analyze and transmit Earth data to the user. The researches described how to achieve a quick assessment of their processes.

In recent years, there have been numerous negative human anthropogenic changes on the Earth. It is important to identify these changes in a timely manner so that they can be prevented. Because the size and extent of changes are unstable, they require speed and accuracy, scientifically sound conclusions, and the development of useful measures. Targeted research is important around the world, with the aim of developing a variety of risk-based measures to Remote Sensing (RS) of the land, creating a systematic, electronic, rapid and accurate network of ground water information. Establishment of a global system of land and water management through GIS systems, organizing global surveillance and analysis based on Earth satellites, thus reducing redundant resources, improving results accuracy, creating different models, databases, rural and water resources. It is important to implement it in agriculture. The availability of GIS-based remote sensing data analysis today has increased the use of GIS in various fields [1,2].

One of the most important issues is the evaluation of river bed creation processes and development of the calculation methods and technology for river deformation and its prediction. At present, provides many researches in the field of improvement of analyze techniques and technologies, a detailed and reliable assessment of the situation, and getting economic efficiency. The development of these processes requires the use of modern technologies [1,2,3,4]. Today, GIS technologies and techniques started to use widely as a modern technology between different specialists of different branches for the solution of different problems in this sphere. And those techniques and technologies gave possibility to analyze situation quick and accuracy. Spatially, using Remote Sensing technologies

with GIS let us to study changes from distance during long duration. Furthermore, these images can also give information about areas where the access for person is difficult and also difficult to navigate and explore [5,6].

Today, the interest of different sectors to GIS is growing. This information will help to analyze natural process and phenomena. A detailed study of the changes has been carried out by many scientists with using this program and gave accurate results. The ability to analyze the remote sensing data in GIS programs without difficulty has heightened the degree of its use in various fields. Until launching very high-resolution satellites there were less researches in irrigation systems and water sectors, there was only few researches which done with using GPS (Global Position System) devices [7,8,9]. In those researches created schematic maps and database of irrigation systems and water objects. Water losses in these objects and their exploitation have been studied in places with providing field experiments. Because, middle and low-resolution satellite images can let scientist and specialists to extract water objects in those images or gave pure not accurate information about those small objects. As noted above, over the past decade, the launch of satellites with extremely high-resolution sensors has allowed using their images in water sectors. This paper presents the results of using GIS technologies, the determination of the flow and hydraulic and hydrological parameters of the river. It should be noted that research in this area is the first step in Uzbekistan's assessment of the riverbed processes with using GIS.

GIS gives possibility to collect, analyze, and deliver data for users. That is, GIS is a hardware and software system that serves to receive, store, analyze, and deliver information about the Earth. ArcGIS software plays an important role in this system [10,11,12,13]. Special features include object properties (statistics, map, geometry, and more). The prospect of using this program in science is intensely developing, as it is more advantageous to gather all data.

2. Methods and materials

The Landsat archive-high-resolution satellite systems were used to assess the deformation processes in the river. The ability to easily analyze the RS data in GIS has increased its use in various fields. These images also explore areas that are difficult to navigate and explore. However, initially they were of low resolution and were not available in the water sector. Therefore, to date, there has been little research on the use of water in the water. Mostly, most of the research has focused on land use and land classification by analyzing middle and high-resolution images. ArcGIS plays an important role in this system. Specific information includes properties of an object (statistics, maps, geometry, etc.). The prospect of using this software in science is rapidly evolving as it has the advantage of incorporating it into all data [10,11,12,13].

Research area is Soxsoy river which situated in Fergana valley. In this analysis used ArcMap program of ArcGIS software and Landsat 8 satellite images of Soxsoy river in different watery periods. One of the key factors in the evaluation of river processes is the change of river parameters over time. Landsat 8 satellite images were downloaded from the GloVis official site [14,15]. All downloaded images where analysed and extracted water from those images with using NDWI index. In images analysis of many scientific researches the NDWI index was used, which is developed by McFeeters (1996), created from NIR and Green bands [14,15]:

$$NDWI_{McFeeters} = (G-NIR)/(G+NIR) \quad (1)$$

there: G-Green band of sattelite images, NIR-Neaar infrared band of sattelite images.

After extraction according to created shape file of the water created the maps for each downloaded image (Figure 1). And recriated new shape files of river area and water area.

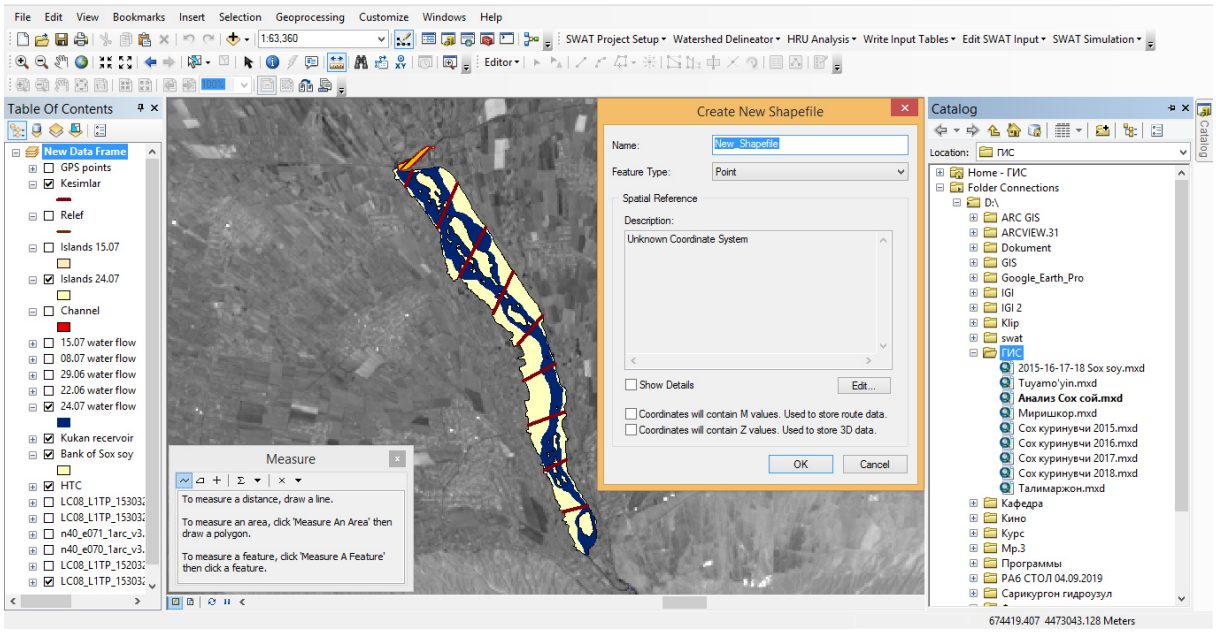

Figure 1. Creation of shape file of the river with using ArcMap.

GPS and GPS data were used to verify the accuracy of the mapped maps. Initially, the geodetic survey was conducted to study the existing parameters of the Sox River. Nine invariants were selected for each kilometre along the length of the stream. At that point, 7 stationary points were selected in each station, and at these points measurements were made with the nivelir and GPS device.

For each point, the levelling works were completed and mapped (Table 1).

Table 1. Geodesic measures.

№		Right		Centre		Left	
PC 12	659	657	656.8	565.38	656.48	657.7	658.55
PC 22	648.75	647	645.63	646.68	647.25	647.7	648.55
PC 32	638.23	637.09	636.11	636.18	634.78	634.58	635.8
PC 42	623.8	622.8	622.72	623.8	623.48	623.65	625.03
PC 52	613.97	612.02	612.47	612.32	613.12	612.12	612.4
PC 62	602.15	600.65	600.8	599.8	599.55	599.2	599.5
PC 72	590.9	588.45	588.6	588.95	586.7	586.6	588.8
PC 82	579	575.3	575.8	576	575.9	574.75	575.75
PC 92	567	564.3	564.85	565.3	564.7	566.6	567

Subsequently, measurements were made with each GPS device and mapped to the table (Table 2). There was a difference between nivelir and GPS-based results. The maximum value of these differences was 2 meters.

Table 2. GPS measures.

№		Right		Centre		Left	
PC 12	659	658	656	658	655	656	659
PC 22	645	643	641	643	643	645	646
PC 32	634	633	635	632	632	632	633
PC 42	624	620	621	623	620	621	625
PC 52	611	610	611	612	612	611	612
PC 62	600	600	600	601	599	599	600
PC 72	593	591	588	590	587	588	589
PC 82	580	577	577	578	575	578	580
PC 92	569	565	565	566	564	565	568

Measured hydraulic parameters of the flow according to created shape file size with using ArcMap's Attribute Table interface (Figure 2).

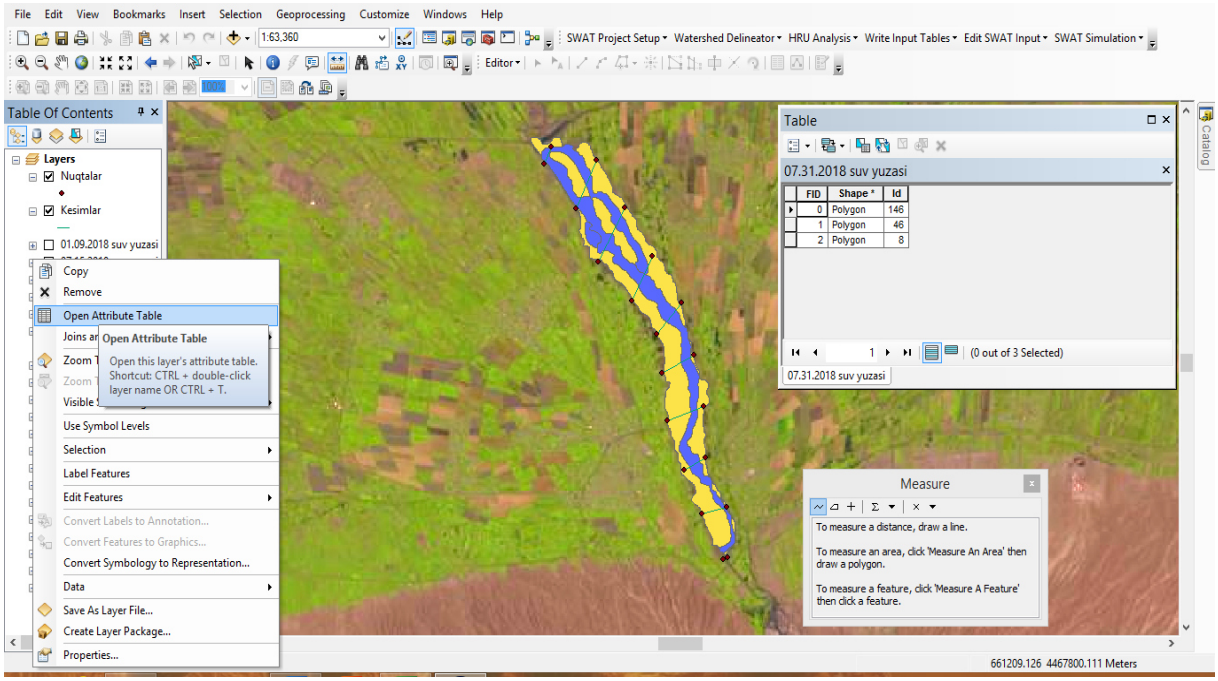

Figure 2. Shape file information in ArcMap program.

According to the date which downloaded Sox River satellite images collected water discharge data on those date in the field experiments and water surface data and discharge data of same date generalized in one table. Calculated interconnection process of the dynamics of riverbed creation and distribution processes of river sediments. Deformation processes in rivers and canals are directly dependent on the amount, structure and distribution of sediments. In the solution of the above-mentioned issues, it is necessary to solve the problem of study and management of the flow of sediment in the canals and rivers [16-20].

3. Results and discussion

Created interconnection graph of the average daily water discharge and the water surface area which measured by ArcGIS in our analysis (Table 3).

Table 3. Data of Sox Soy.

Date	Area, ha	Discharge, m^3/s
6/29/2018	127.06	28.17
7/15/2018	222.07	95.87
7/31/2018	231.07	48.2
8/16/2018	209.08	67.17
9/1/2018	191.09	34.6
9/17/2018	113.09	4.28

Given the fact that the Sox Soy River only has water during the summer months (June, July, August), and Landsat 8 satellites shoot every 16 days, it can capture 6 or 7 times a season. The stream flow in the Sox valley is similar to that of the precipitous rivers, so the river is prone to deformation. Because of the wet season, the average water loss is higher than that of other rivers. Hydraulic elements of the river are also variable. Based on the above-mentioned values, a graph of dependence of water consumption on the flow surface area (Figure 3) is developed.

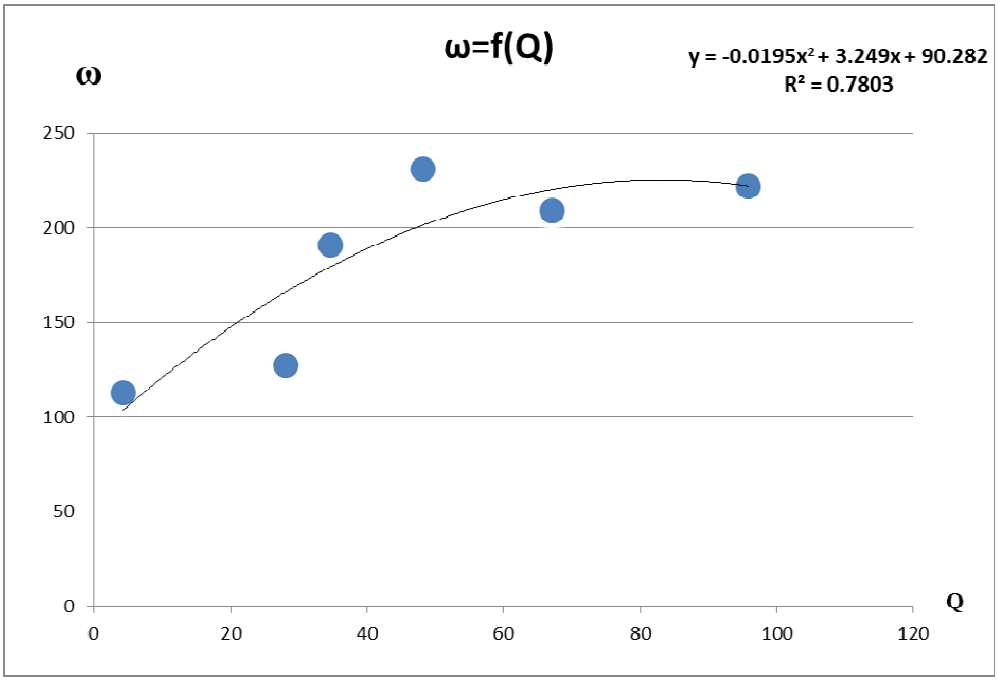

Figure 3. Interconnection of water discharge and water surface.

Due to the above graphic, on can see the change in the water surface area depends on the water discharge. The water discharge in the range of 0-50 m^3/h, with the increase of water discharge, leads to an increase of water surface area. However, after the average water discharge exceeds 50 m^3/h, it can be seen that there is a violation of this law. This indicates that the sediment washing process in the

bottom of river, i.e. the deformation of the river starts, when the average water discharge of the Sox River exceeds 50 m^3/h.

4. Conclusion

In our research, we evaluated the formation of the river bed by using the data of the Landsat image and field experiment date of the same time. As a result of the analysis, came to the conclusion that using remote sensing technologies with GIS for analyzing deformation processes in the rivers provides quick, accurate and economically useful identification of the processes during long period. And it give economize the time and resources to create a reliable and high-quality database. Using the long term Landsat images, gave opportunity to create maps and develop a database and gave possibility to predictions of formation of process for the future.

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