# CHAPTER V

# RESULTANT LANDFORMS OF ABANDONED CHANNELS

## 5.1 Introduction:

Abandoned channels are the result of meander neck and chute cut-off and channel avulsion. In this regard, it is said that channel infilling is considered a more useful record of channel abandonment processes (Willem H.J.Toonen et al. 2012). The investigator here focuses mainly on the study of various channels abandonment style and associated sedimentary landforms with them in the study area.

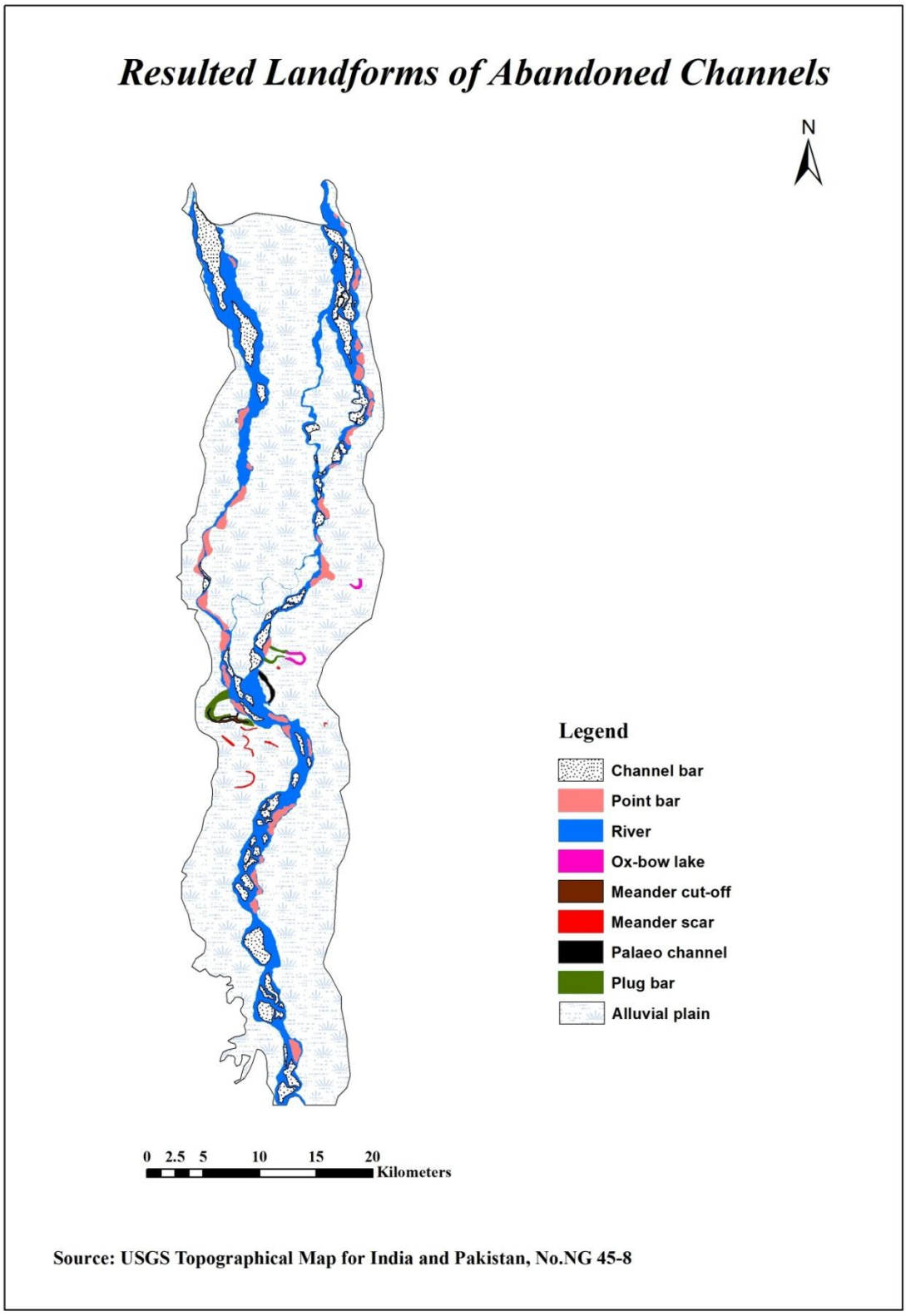
The common type of abandoned channels are: i) oxbow lake: which are formed by single meander bend neck and chute cutoff (Fisk,1947; Lewis and Lewin,1983; Hooke,1995, Larsem, 2011) and ii) channels abandoned over multiple meander lengths, left inactive due to an upstream avulsion (Smith et al., 1989; Southamer and Barendsen, 2000). In the study area, both types of channel abandonment are found and which left a wide scope of the study of associated sedimentary landforms within them.

## 5.2 Resultant sedimentary landforms associated with abandoned channels:

In the study area, following resultant landforms are identified at the time of field study in different reaches of River Sankosh. These are:

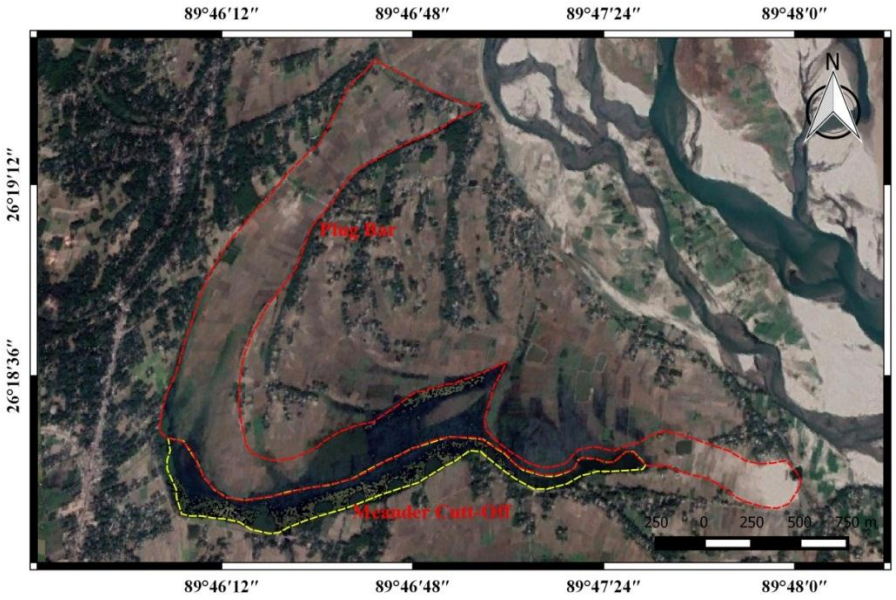
### 5.2.1 Meander cut- off:

Meander cut-off is the most important mechanics of channel abandonment. When meander bends cut-off initiates, this effectively reduces the length of the flow path and at the same time it increases the channel gradient in the new channel. As a result, transport capacity is remarkably reduced within the abandoned bend and triggers mixed load accumulation and starts the preservation of underlying channel bed forms. It can also be mentioned that when a cut-off meander actually forms, some portions of the former main channel become sited in isolating the meander bend from the rest of the river.




**Map 5.1: Resulted Landform of Abandoned Channels, 2018**

In the study area, it is observed that Khalishamari beel is located on the right bank of Sankosh River and Kamandanga beel is situated on the left bank of Sankosh River. Both are considered as meander cut offs that have become abandoned channels at present. These are formed due to the accumulation of mixed load for a long period of time and where preservation of underlying channel bed forms has occurred. Some portion of both meander cut-off is occupied by the local people inhabiting the surroundings of these abandoned channels and the area of these channels shrink day by day (Map 5.2).

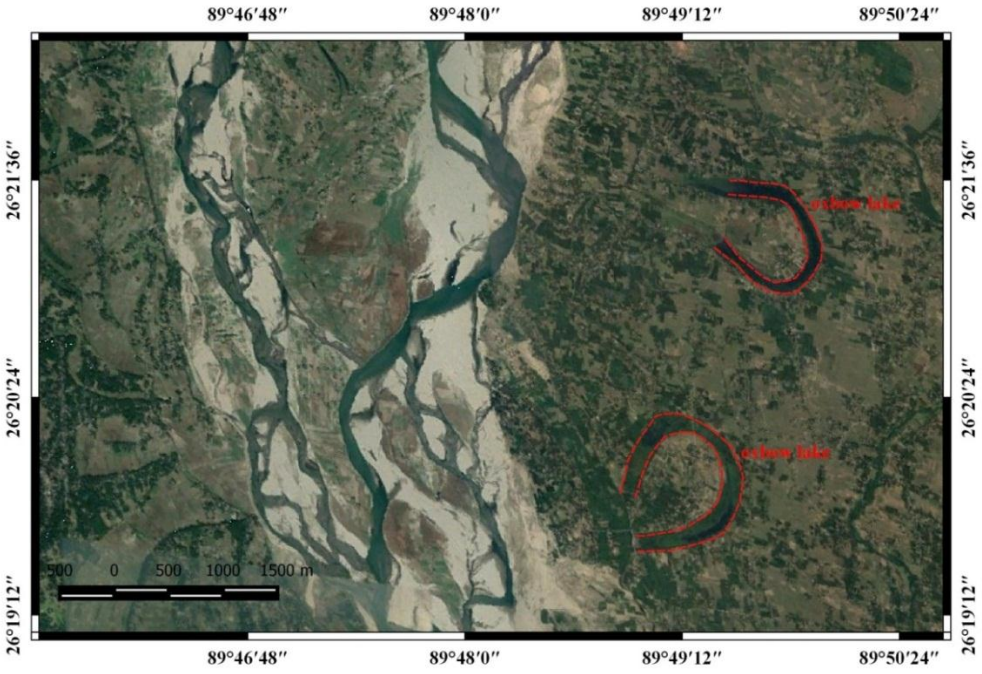



**Map 5.2, Meander Cut-off (Khalishamari beel)**

### 5.2.2 Ox-Bow Lake:

Abandoned channels remain as ox bow lakes in the flood plain. It is observed that after the initial cut off event during a flood, sedimentary processes begin to seal off the channel, especially during the initial and subsequent floods. Ultimately, the bend of meander can become a disconnected ox bow lake in the flood plain (Willem H.J.Toonen et al. 2012). After that these abandoned meanders (Ox-Bow Lake) carry a very small percentage of the discharge during rare high magnitude floods only. It is also mentioned that ox bow lakes are considered as the resultant depositional landforms of abandoned channels in the study area.

During the field study it is observed that a number of ox bow lakes are formed in the both bank of Sankosh River in the lower reach of the study area. In this regard, Kamandanga beel and Ghirtinga beel (Map 5.3) have been shown in the map. Both the ox bow lakes have formed due to the neck cut-off mechanism. These are the sources of huge aquatic resources which have much economic value and at the same time, people use water of these ox bow lake for irrigation and other domestic purposes.

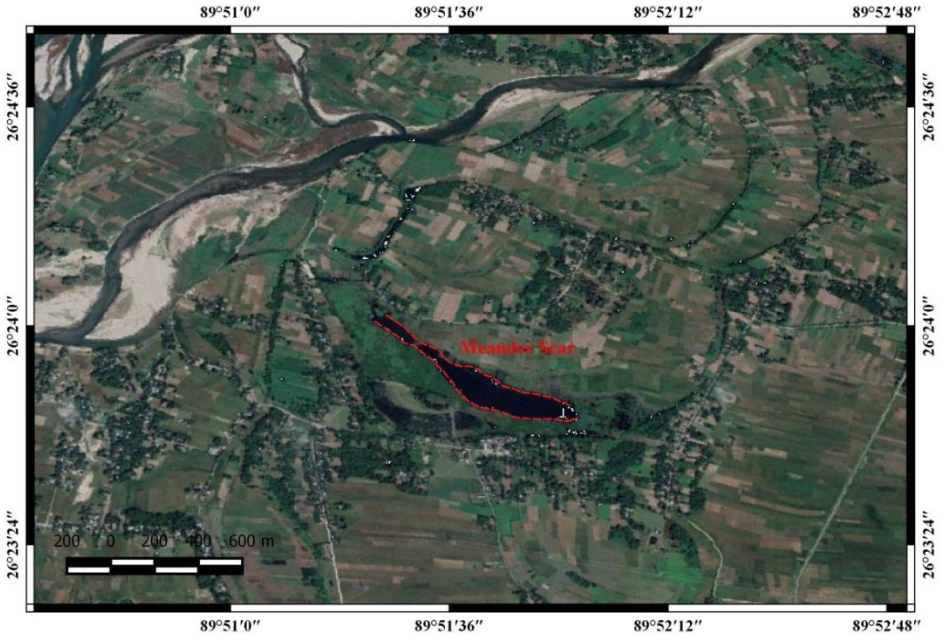



**Map 5.3: Ox Bow Lake (Kamandanga beel and Ghirtinga beel)**

### 5.2.3Meander Scar:

Flood plains of large rivers are littered with numerous ox bow lakes. In addition to the ox bow lakes, it is mentioned that the adjacent point bar deposits occur on the inside of a migrating meander and it tends to build numerous crescent sandy ridges that are parallel. These types of features are known as meander scars. It is also called the remnants of a meandering water channel, currently found within the river channel.

In the study area, numbers of meander scars are found in the left and right bank of Sankosh River. A meander scar has been identified on the left bank of Sankosh River (Map 5.4) at the village Garumarachar –II in the study area. This meander scar previously was a meander bend of the main channel and then due to continuous channel fills it is disconnected from the main channel and has remained as a meander bend cut-off for long time. At present it is situated as a remnant of meander channel. Lowering of water depth, shrinkage of its area, increase of human settlement etc are observed during the field survey as the main problems of this meander scar.




**Map 5.4: Meander Scar**

### 5.2.4 Palaeo channels:

A palaeochannel is a remnant of an inactive river or stream channel. It has been filled up or buried up by younger sediment for a long time. A palaeochannel is distinct from the over bank deposit of currently active river channels. It is mentioned that palaeochannels can be easily identified as broad erosional channels into a basement that underlines a system of depositional sequences that may contain a number of episodes of deposition and represent meandering

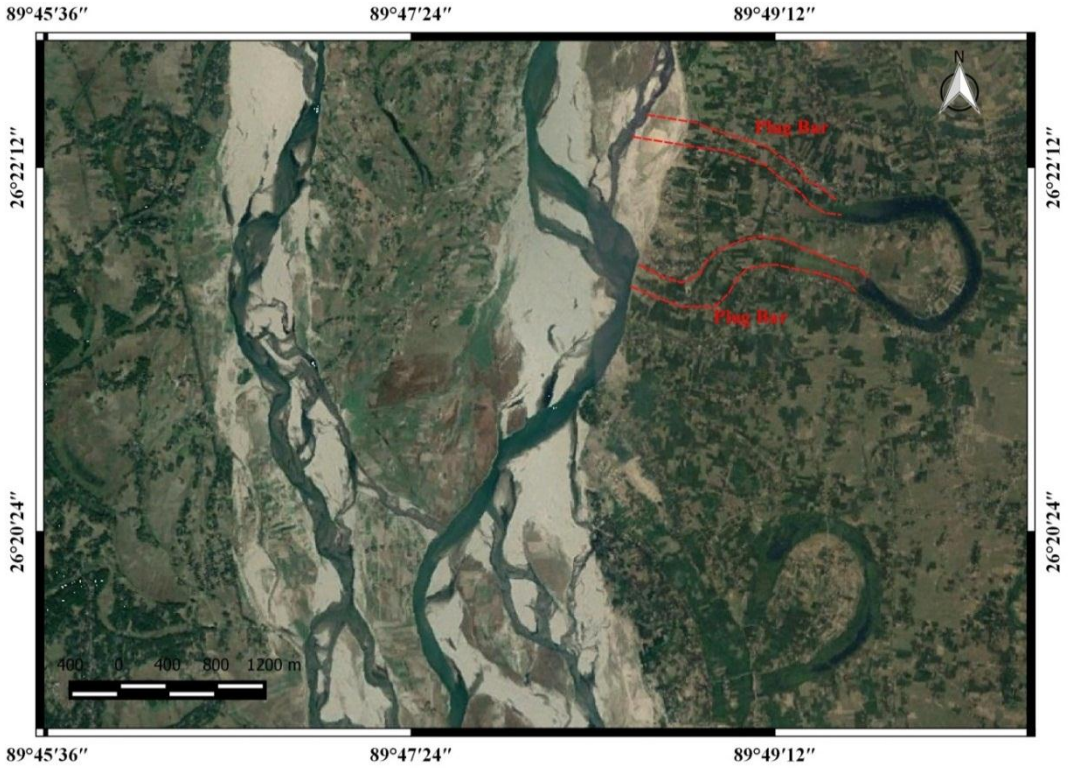
peneplain streams. Palaeochannels form when river channels continuously aggrade and so, sediment deposition occurs on their bed in a sequence. Palaeochannels may also be preserved on non-depositional floodplains in which the main river migrates or avulses away from its previous river course on a short term basis.

It is evident that in the study area the existence of numerous palaeochannels is found. Older erosional surfaces and levels, sedimentary records, climate change, history of rainfall, history floods are notably mentioned as evidences in this regard in the study area. It was the main channel in the past but due the meander cut-off and westward shifting of the main channel it remained as abandoned channel for a long period of time and at present it became a palaeochannel in the study area due to sequential deposition for a long time. Moreover, it is also observed that, a number of palaeochannels occur on the right bank of the river Sankosh which were also the evidence of the former main channel shifting in the study area.

### 5.2.5 Plug bar:

The plug bar is defined as a bed sediment bar form at the entrance of a bifurcation channel, hindering flow into a channel (Fisk,1947; Gaghiano & Howard 1984; Hooke,1995). Bulle (1926) It is observed that the entrances of the channels are connected to inner bends which is considered more susceptible to plug bar formation because of huge bed load supply. It is also evident that plug bar formation is characterized by high sedimentation rates during the onset of abandonment.

In the study area, plug bar is recognized as an important depositional feature which formed at the entrance of meander bend cut off of Sankosh River and accelerates the process of channel abandoning. During the field survey it is observed that plug bar formation has occurred along and around the Khalisamari & Kamandanga beel. (Map 5.5). Khalishamari beel is an example of chute cut-off and its entrance received huge amount of sediment for the formation of plug bar. Continuous deposition of sediment at the entrance is finally formed as a plug bar at the entrance of Khalishamari beel in the study area.




**Map 5.5: Plug bar**

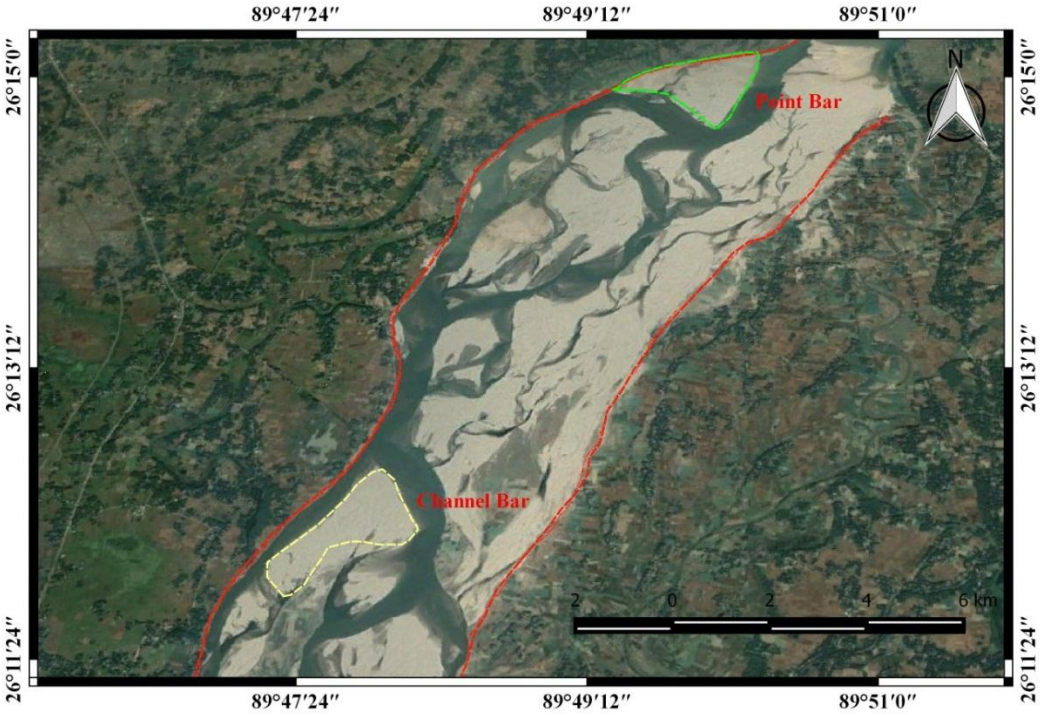
### 5.2.6 Point bar:

This alluvial river has formed numerous meander bends and the water flows within these bends in a helical pattern. It is mentioned that the water in the meander bends erodes concave banks due to the centrifugal force. It is also mentioned that greater the radius of curvature of the meander bends, lesser is the centrifugal force that acts on it. In this condition, the thalweg gradually shifts towards the concave bank due to continuous bank erosion. Naturally eroded materials from the concave bank are transported towards the downstream and deposited on the convex bank of the main river. According to Sakalowsky (1974) and others, the materials of the concave bank are transported across the channel and are deposited on the opposite convex bank. On the other hand, Leopold and Wolman (1960), Friedkin (1945), Martvall and Nilsson (1972) and others have mentioned that the eroded materials of the concave bank are also deposited on the convex bank of the same side of river. However, point bars are formed on the convex bank due to the deposition of transported material from the concave bank.

Point bars are depositional features in the alluvial regime of the basin associated with meandering channel. These features are found in the course of the River Sankosh where the river has formed numerous meander bends. It is mentioned that these types of point bars are formed along left and right banks of the River Sankosh. These point bars are characterized by deposition of silt and clay in the study area (Map 5.6).

### 5.2.7 Channel bars:

The process of bar development is closely related to the occurrences of flood and morpho-dynamics of the river and channels. The process of growth of a bar is highly influenced by the rate of bank erosion of the river than the development of new channels. The bars are generally matured within the duration of eight and ten years in relation to the both relative height and vegetarian cover.




**Map 5.6: Point Bar and Channel Bars**

The channel bars are also considered as important depositional landforms. These are associated with the braided channels which are observed at the lower reaches of River Sankosh in the study area. Most important characteristics of these channel bars are: i) Coarser deposits occur near the point of the rivers entering the plain and ii) deposition of clay and silt are found in the channel bars at the downstream reaches of the study area.( Map 5.6.)

**5.3 Discussion and Conclusion:**

Abandoned channels are considered as the former active channel. They are also recognized as depression in the landscape and located at the position of a formerly active channel, though typically and considerably with reduced width and depth (Willem H.J. Toonen. et al. 2012). These abandoned channels are represented as various geomorphological features over the flood plain of the concerned river. From the above discussion it is mentioned that various types of erosional and depositional landforms have developed along, around and on the bed of abandoned channel. In study area, erosional landforms i.e. meander cut-off and depositional landforms i.e. ox bow lakes, meander scars, point bars, plug bars and channel bars are found, which have been developed in different parts of Sankosh river. All these erosional and depositional landforms have developed along and around the abandoned channels by the process of channel fills for a long period of time and created much morphological diversities in the study area.

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