Photogeology In Terrain Evaluation (Part – 1)
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Lecture – 11
Fluvial Processes and Landforms

Welcome back. As I told that one of the important aspect in photo interpretation will be your landforms that is surface morphology and it is believed that the most commonly found landforms are related to the river or we can say fluvial landforms. And of course, the drainage pattern because wherever the water is available the earth surface has been curved and shaped by the erosion and deposition.

So, we will look at different types of landforms and different drainage patterns associated with the, which are on found on the surface. And this we will cover some part in this part one and in part two we will talk about its application. Nevertheless, we will also see few of them that is the application in terms of the interpretation part.

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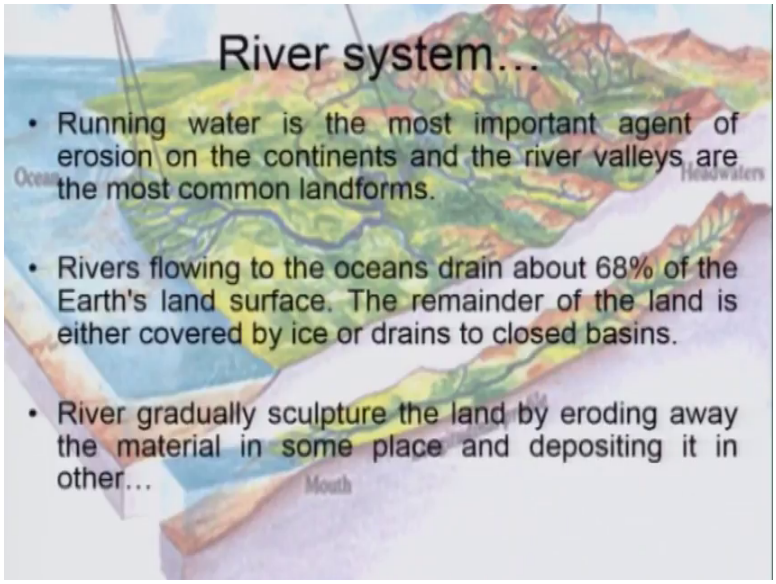

So, if you look at the river system we have the running water, is one of the most important agent of erosion on the continents and the river valleys are the most common landforms. Rivers flowing to the ocean drain about 68 percent of the earth's land surface whereas, the remainder of the land is either covered by ice or drains to the closed basin.

River gradually sculptures the land by eroding away the material in some places and depositing in it on other locations. So, most important is the sculpturing of the land surface by eroding or deposition of the material.

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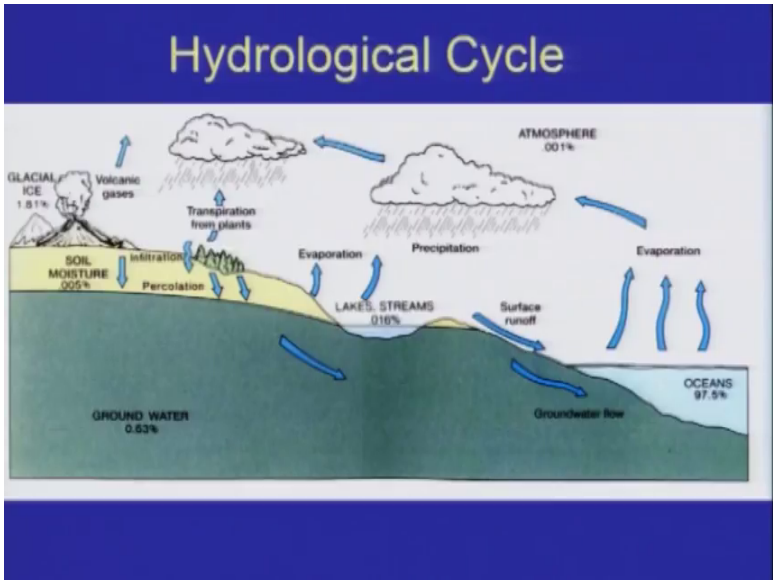

Just to begin with. So, we have the most important part here, which is important which is relevant to our course as the surface runoff. So, if you have in surface runoff, then you will be able to see the landforms which are sculptured or curved by the flowing water ok.

At the same time you will also come across the different landforms at different locations and that what we are going to talk in this lecture.

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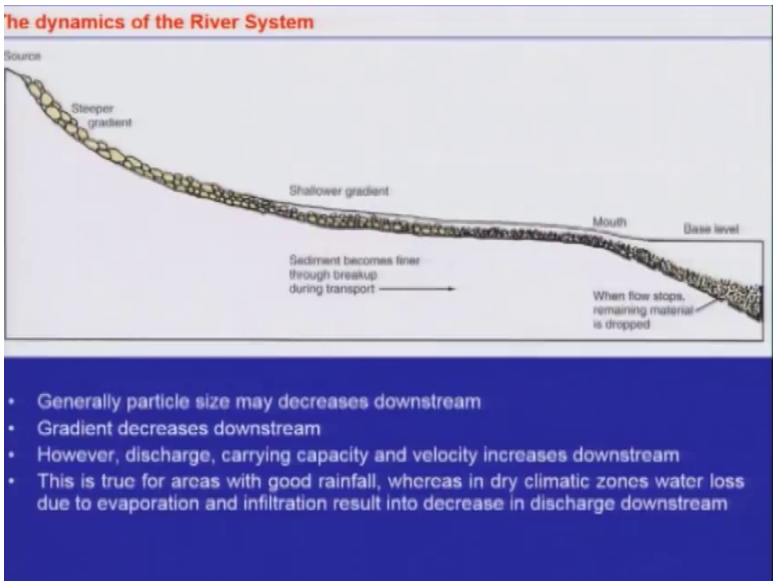

So, the dynamic of the river system if you take, we have the source and from the source through its journey having a steeple gradient shallowing down means the water body either it is an ocean or a lake.

So, through its journey, it will have different landforms and that what we are going to look at. So, how the steeper gradients will give what landforms will be seen along the steeper gradients, shallower gradients, close to the mouth and all that. So, few things are there, which can have a note that a general part particle size may decrease downstream as we have the reduction in gradient also; however, discharge carrying capacity and velocity increases downstream this is true for areas with good rainfall. So, in the areas where you are not having enough rainfall will not have very prominent landforms, whereas in the dry climate water losses do its loss due to evaporation and infiltration resulting in to decrease and discharge downstream ok.

So, in another way the areas where you are having very less rainfall basically in the areas have of the dry climatic zones, you will have very sparse drainage on the surface which has been developed because most of the water will be infiltrated or either it is gone back to the atmosphere through evaporation.

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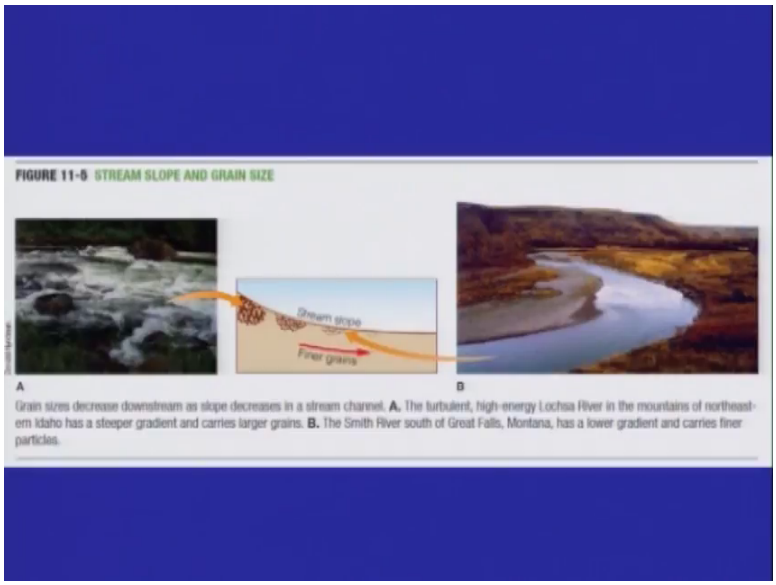

So, this is just to show that if you are having steeper gradient, you will have different landforms curved by the river as well as the grain size decreases, but that we would not be able to pick up very prominently from the photographs, but if you are having high resolution photographs you can even do that. You can identify the boulders and all that and finally, in the downstream you can look at the sandbars and all that ok.

So, as this the gradient decreases, the sediment size or the caring capacity also decreases here. And of course, the type of landforms will also change through its journey from the source area to the mouth.

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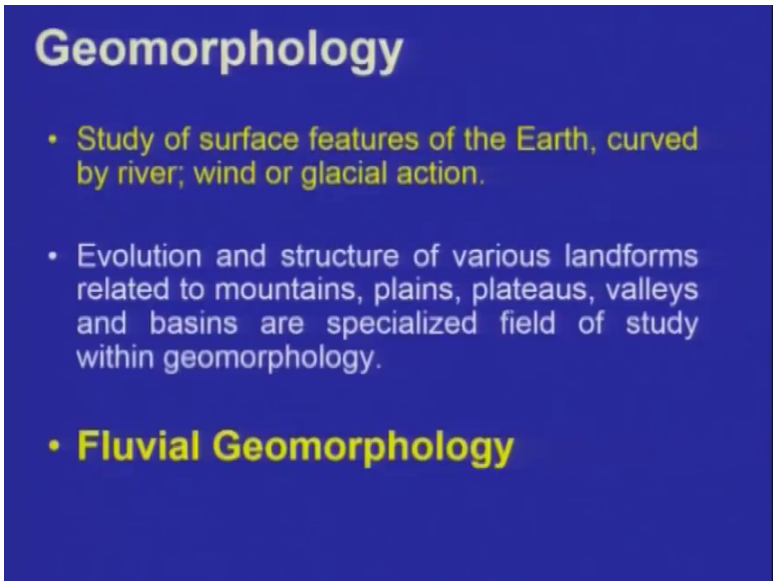

So, Geomorphology mainly is the study of surface features of the earth curved by either river, wind or glacial action. Evolution and structure of various landforms related to mountain, plains, plateaus, valleys and basins are specified field of study within geomorphology. So, the morphology of the landforms are related to the river action is termed as fluvial geomorphology. So, we will see some basic landforms which are at or associated with the river actually.

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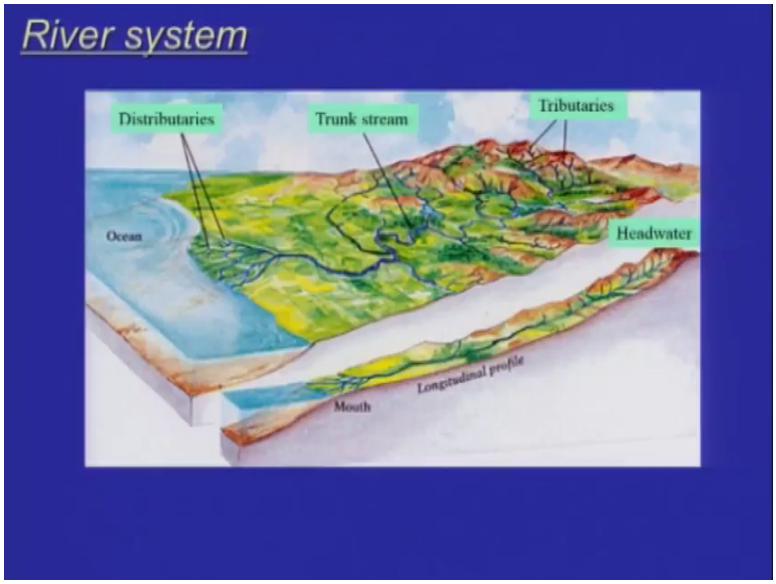

So, what is the river system in total? We have a river originating from the source area in the uplands and it flows through its course and then debouches into the ocean. As I told that over the through its journey it will curve different landforms. So, we have the drainage, which is originating in the source area and the main stream has been fed by smaller ones which we termed that as an the tributaries. Whereas, the main stream is termed as trunk stream and then we are having finally, where it debouches or meet the water body or the ocean then it is the smaller tributaries or maybe the streams which are dispersing here are termed as distributaries.

So, you have tributaries, you have trunk stream and then finally, you are having the distributaries. And this area, which is the in the uplands are termed as headwaters. So, if you look at the longitudinal profile or the river profile with respect to the oily elevation and it looks like this, you are having the higher grounds, that is the source. So, the gradient is higher than it reduces and then finally, it goes to the ocean.

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Each basin or the river system will have major basins and sub basins. So, main stream which has been seen flowing here. So, this is the upper side or the higher side and then we are having smaller tributaries which are joining here and then we are having the main trunk stream over here. So, this portion, which I am drawing the line here. We have this slope on either side, one slope is here. So, this is a ridge line, we are having slope this

side another portion is having slope this side. So, the water draining into this lower part, the smaller streams will carry that water and fed to this major stream ok.

So, these are the smallest tributaries and the ridge line divide of this basin here is termed as the drainage basin for this particular stream. So, I am putting the stream is here and there are small tributaries which are coming from here. This one in the center is the trunk stream. So, this we term this as an basin of a particular river.

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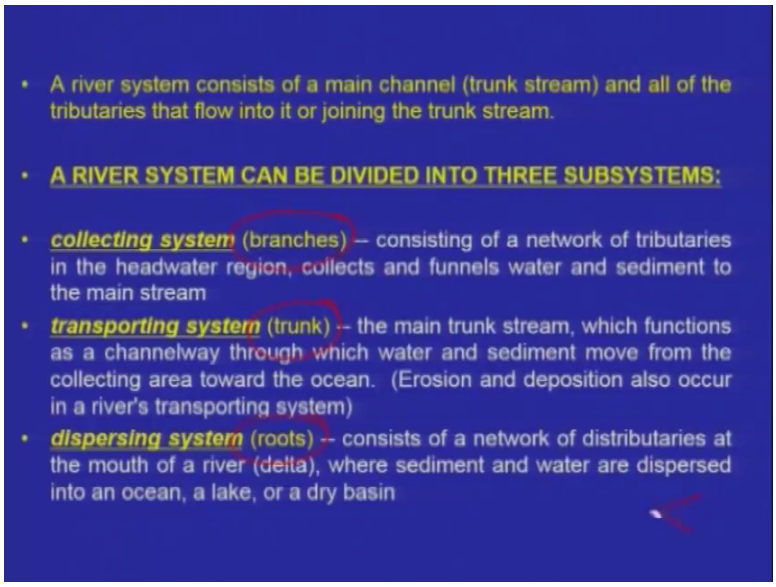

So, a drainage system consists of a main stream or we can say the main channel or trunk stream and all of the tributaries that flows into it and or joining the trunk stream.

A river system can be divided into three subsystems. One is the collecting system, consisting of a network of tributaries and the headwater area collects and funnels water and sediments into the main stream or trunk stream. Then we are having transporting system that will be through the trunk stream where the main stream which functions as this channel way through which water and sediment moves from one collecting area towards the ocean.

So, here during this journey, erosion and deposition will occur. Dispersing system consists of a network of distributaries at the mouth of the river either it is debouching into the ocean. So, we may have the land form which is termed as delta, will come we

will in coming slides we will discuss this. Where the sediments and water are dispersed into the ocean either it is a lake or a dry basin.

So, we have collection systems, we have branches, we have trunk that is a transporting system and we have roots that is your dispersing system. So, if we look at then we have from the hilly terrain, we have tributaries which are joining like this and this is our trunk stream and finally, we are having the roots, this will be the mouth and this will be your source area.

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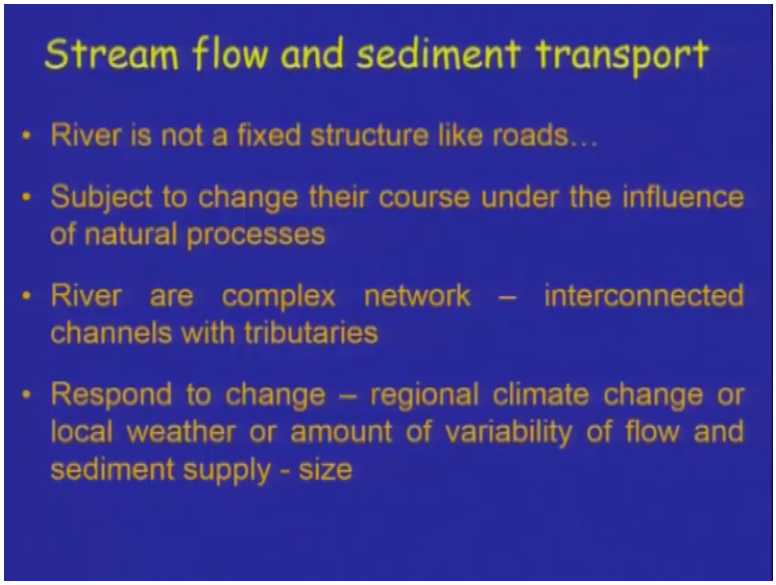

Stream flow and sediment transport, the river is not a fixed structure like road. It is subject to change its course under the influence of natural processes. Rivers are complex network, interconnected channels with tributaries respond to change either it is because of the climate change or local weathering of the material and amount of variability of flow as well as supply of material or the sediment. So, has a capability to change its course as well as the river form. So, the channel form will also change depending on this factors.

One of the most commonly seen or observed land form within the fluvial system is your alluvial fan and delta. In terms of the shape they are very much similar, but they occur at different location that we will discuss here.

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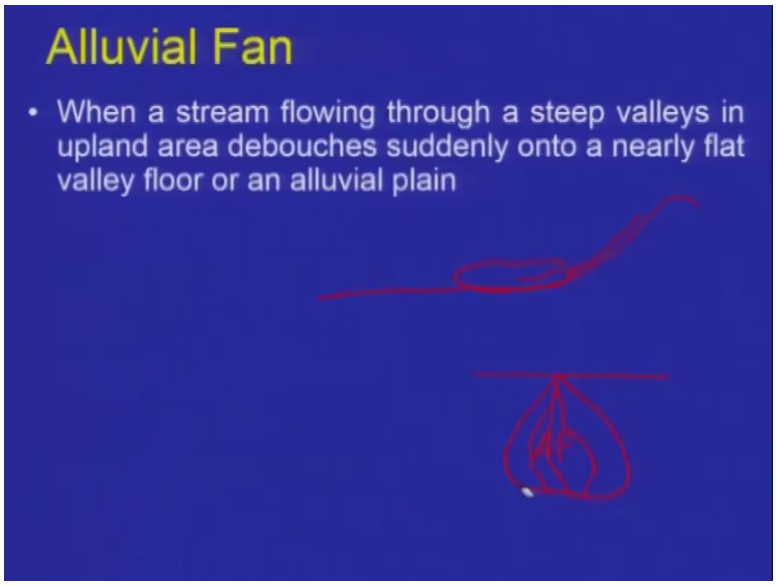

So, alluvial fan, when a stream flowing through a steeps valley in uplands debouches is suddenly on to a nearly flat valley floor or an alluvial plain. So, for example, you are having an hilly terrain here and then you are having flat terrain. So, the river coming from here will deposit the alluvial fan and because of its shape.

So, if you look at on a plant view this is the hilly terrain and at the base of this you will find a fan shape structure which is termed as alluvial fan and here you will feel you see are the channels which are mostly braided and why this is important we will discuss in next slides. So, alluvial fans are seen at the base of the steep slopes ok.

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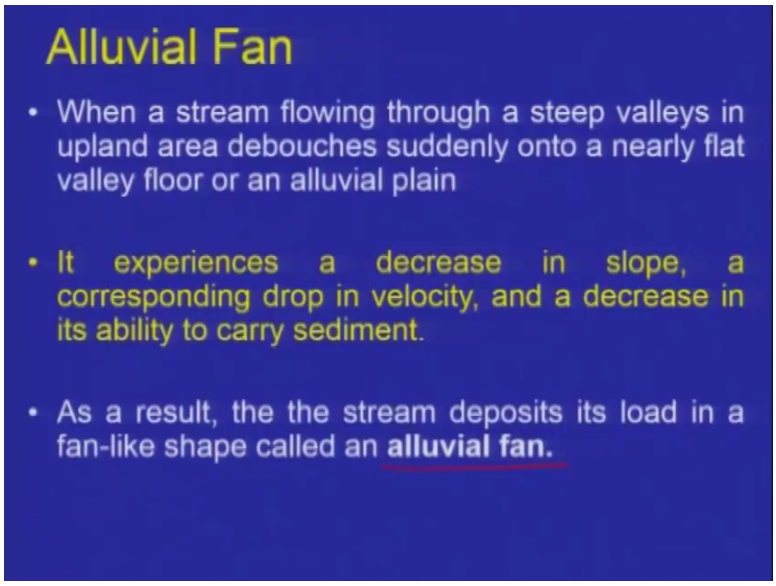

So, it experiences a decrease in slope because you are coming from a higher slope and then moving to an gentler one. So, you have decrease in slope, a corresponding drop in the velocity and a decrease in the its ability that is the ability of the river to carry the sediments

So, what it will do, it will just dump here all the sediments. So, as a result the stream deposit its load in a fan like shape called an alluvial fan. Let us look at some of the examples.

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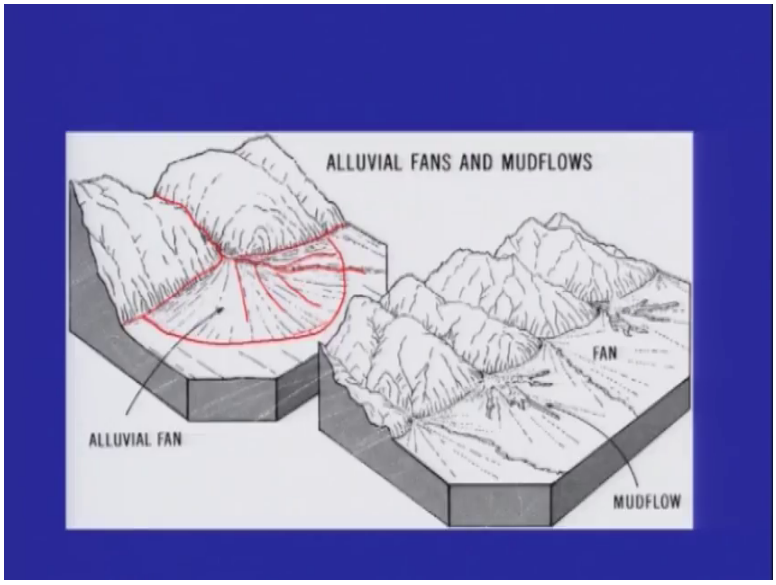

So, alluvial fan. So, this is your hilly terrain and this is your boundary here. So, the reeve stream which is flowing through this one the steeper slope suddenly gets into the unconfined areas and deposit a fan like feature which is termed as alluvial fan ok.

So, here the flow is confined whereas, here the flow is getting unconfined. The river goes here, but it will have the small distributaries which will deposit or dump the sediments because it is unable to carry forward resulting into the formation of alluvial fans. So, you may have the coarse grain alluvial fan, you may have finer grain alluvial fan which can be termed as mud fans also due to the mud flows ok.

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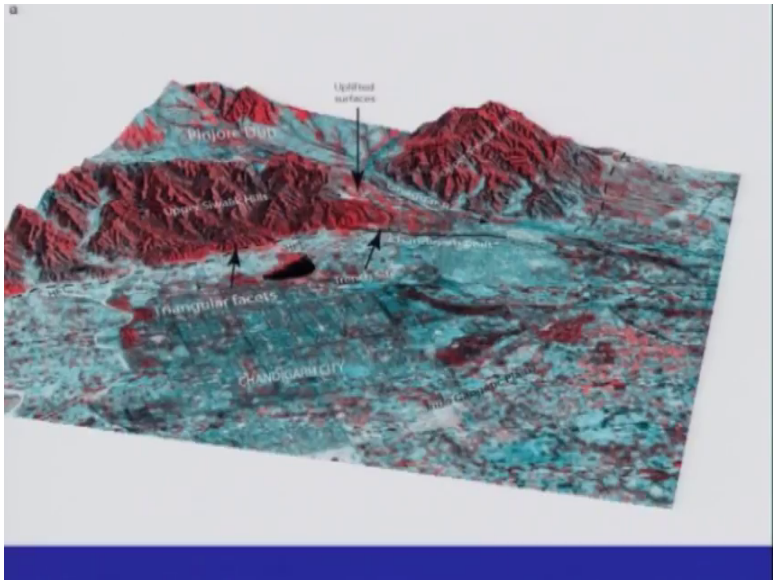

This is an example of the Himalayan front and the famous city Chandigarh, where you are having the front here and this river that is a Kaiga river has deposited the fan which exists over here like this.

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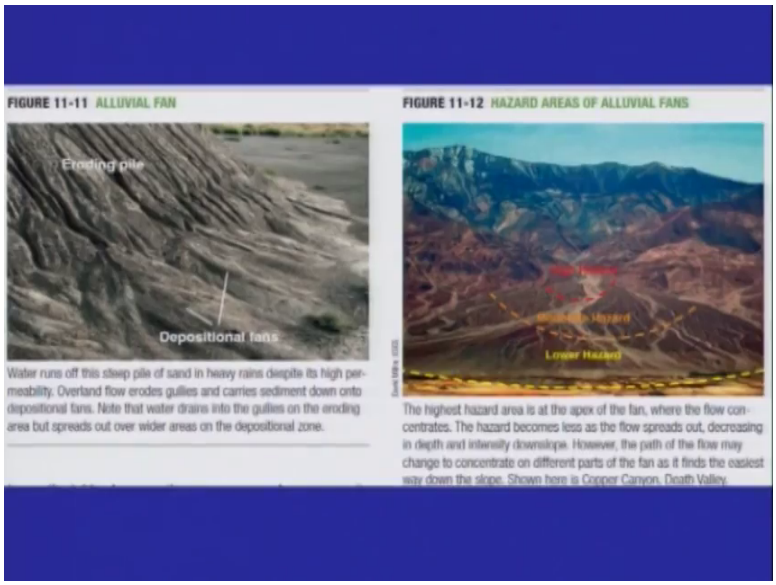

Now, just to give an idea that the fan areas are not safe at all. Close to the proximal part is having higher hazard, the medial part will have moderate hazard and the lower part will have less hazard. Now, the reason here is that this region that is the proximal part will usually have codes are deposit, medium and this will have mostly finer one. So, this will have mixture of medium to coarse, but this will be having the coarse system and mostly you will find the boulders, cobbles and pebbles here where here you will have the final gravels as well as sand and here you may end up having very finer deposits.

So, the lower portion is less hazardous. So, this is the area of the fan area. So, close to the proximal part will have higher hazard medial part will have medium or moderate hazard as a lower part will or the distal part will have your lower hazard.

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Now, fluvial landforms again this is an example of that. So, if you look at this landform here you have you are coming from steeper getting into the gentler one here.

So, this is the higher, pardon this is the boundary of the fluvial; so the proximal or the proximal part and the distal part here.

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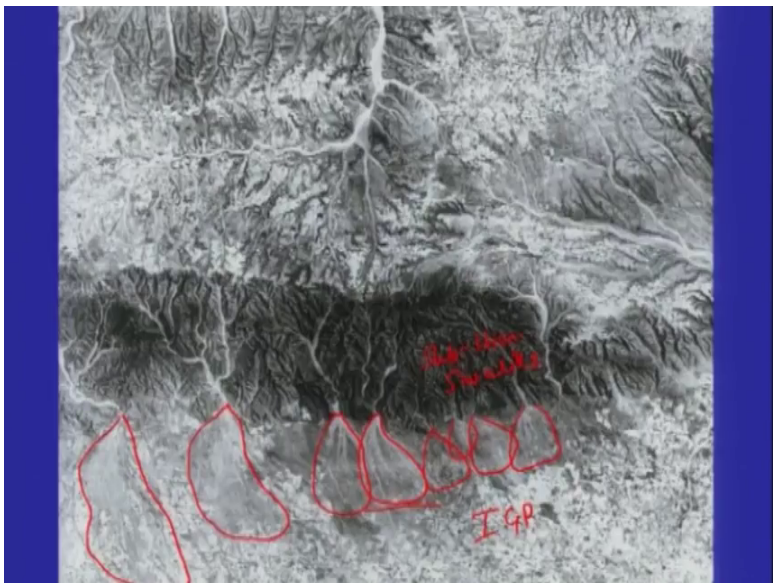

Few more examples from the Himalayas and indo Gangetic plain. So, this is the boundary between the hilly tract. So, you are having steeper slope or here you are having

gentler slope here. This is your indo Gangetic plains and this is your sub Himalaya or you say Shivaliks and this is your boundary here.

So, what we are looking at we are having confined streams or the rivers hitting undefined point and these are the, this is the point there is a proximal point here and this is your distal point. So, these are the fans, one and this is another one, this we also term this as an Koilis alluvial fan, there is another one here, another one from here and smaller one here this is an. So, you have very small fans, but you can have larger also. There is another fan here, there is another one here.

So, these are all alluvial fan.

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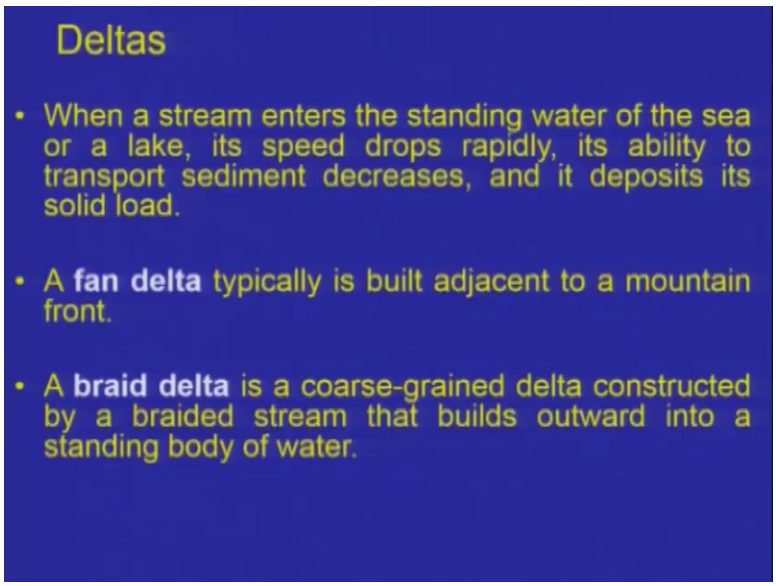

Now, deltas are also having similar shape or landforms, but they are formed when a stream enters the standing water of the ocean or a lake its speed drops that is basically the rivers velocity drops rapidly. Its ability to transport sediment decreases and it deposit its solid load. So, very much similar to the alluvial fan here also we see the similar process.

So, fan delta typically is built adjacent to the mountain fronts, where you are having mountains and the ocean contact or any water body contact is there, their you will find the fan delta. Braid delta is a coarse grain delta constructed by a braided stream that builds outward into a standing body of water.

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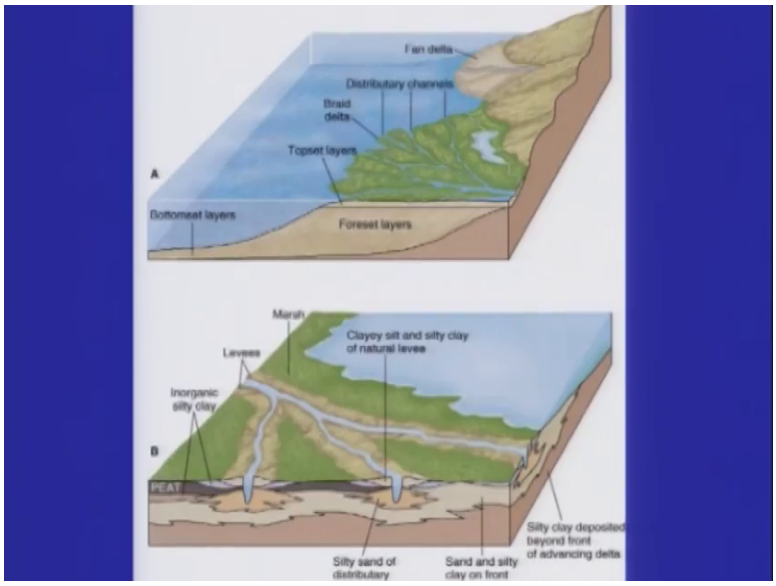

So, this is an example of few of the examples. Here you can see the fan delta and you are having the braided delta which is comprised of distributaries ok.

There are few deltas which also shows a typical shape or the form which are termed as braid foot delta. So, this looks like an braid foot which are also termed as braid foot delta.

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So, deltas, many of the world's largest streams have built massive delta at their mouths example Ganges, Brahmaputra, Yellow river, Amazon, Mississippi.

So, distributaries are long, finger like channels that branches from the main channel in a deltaic region.

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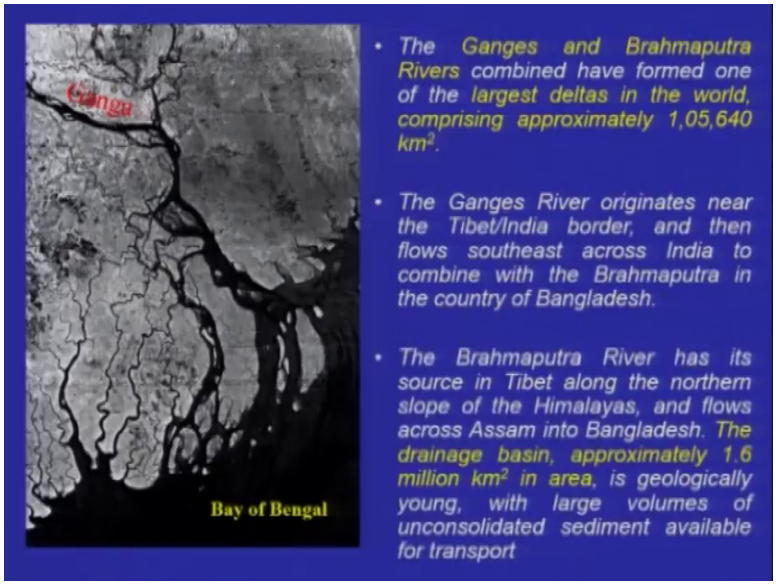

So, this is an example of world's largest delta that is been built by Ganges and Brahmaputra river approximately covering almost like 105000 kilometer square. So, fine we will stop here and we will continue in the next lecture.

Thank you so much.