Natural Hazards
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Lecture – 33
Floods and Related Hazards Part II

So, welcome back. So, in previous lecture, we have discussed many things many important aspects ok. So, I will just recall it.

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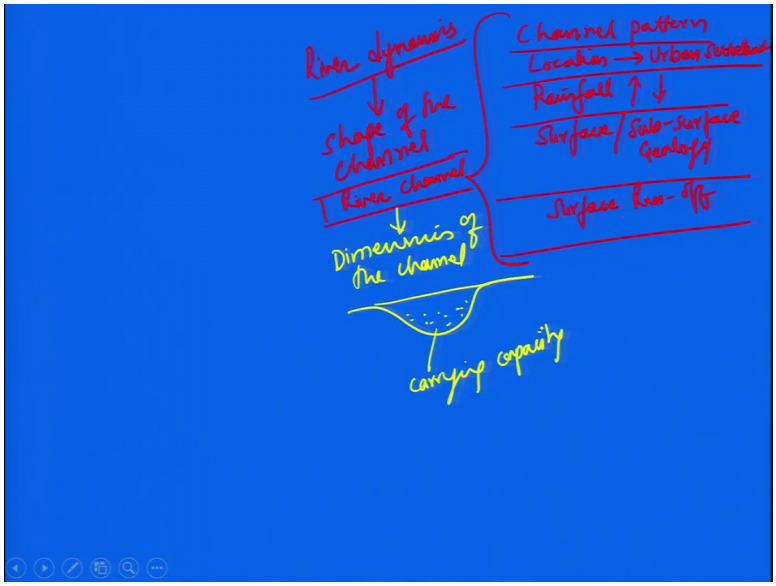

So, one was the channel pattern and location that is for urban settlement. Then we are having we were talking about the precipitation that is a rainfall. Then we also talked about that of course, if this was high, but it is low and then we talked about the surface subsurface geology which will affect the surface run off.

So, these are few things which we were talking about. Now along with this the most important part is we need to understand the river dynamics where we can talk about the this shape of the channel; channel I am talking about the river channel. Then in this we can further also talk about the carrying capacity. And then before this video, we can also talk about the dimension of the channel and this is your cross sectional area. It is very important and then comes the carrying capacity.

So, for this we need to understand clearly the river dynamics. Now to understand the floods it is important to understand the dynamics of the river system.

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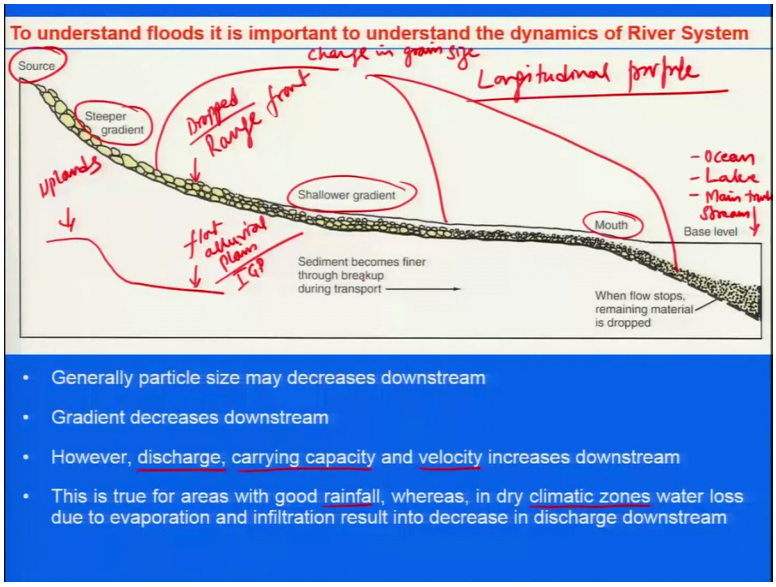

So, if you take the longitudinal profile and this is from the source to where it ends it is journey. So, this could be either ocean, lake body or any main trunk stream. So, what we see is that it has steeper gradient from the place with where it originates. Then the gradient becomes shallower close to the mouth becomes finer. And this is the place when flow stops, remaining material is dropped.

Of course in some location were here also the material will be dropped. And this will happen close to the range fronts. That is range front is here mountain range front where stream flows from the hilly areas and the bulge into the flat lands or the flat plain flat alluvial. In our case, we have very good example of indo gangetic plain and you are having Himalayas here, but this we can find anywhere where you are having mostly the hilly terrains; so uplands.

Now, along with the gradient change in the gradient what we can see as the change in the grain size. So, generally particle size may decrease downstream gradient decrease downstream; however, discharge carrying capacity and velocity increases downstream. This is true for areas with good rainfall whereas in dry climatic zones waterlog loop loss due to evaporation and infiltration result in to decrease and discharge downstream.

So, most important what we are talking here is the discharge, carrying capacity and the velocity. Force along with that that rainfall and in climatic zones and in which part of this river journey we are sitting at; that is a gain important. So, that will let us know that whether this region, will come under the flooding state or not. So, cohesive operation infiltration is an another important factor which we have also discussed in the previous slide.

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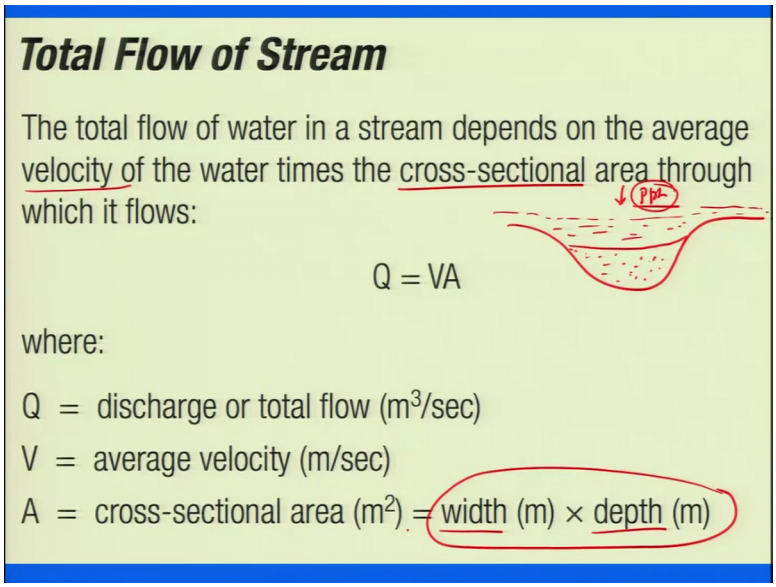

So, the total flow of stream we can say that the total flow of water in a stream depends on average velocity of the water times the cross sectional area through which the water will flow. So, the cross sectional area is important. So, if you reduce the cross sectional area by filling up the channel, then this is the new cross sectional area which is left out. And if you keep your precipitation constant even if you have changed this, then you are bound to see at this river comes very quickly in flooding state even if the precipitation is comparatively less during that part. So, it is been given as Q equal to V a that Q is the discharge or total flow V is average velocity and A is the cross sectional area. So, this will talk about the width and the depth. So, along with the precipitation, that this is this parameter is extremely important. Because if you reduce the cross sectional area, then you are increasing the chances of having the floods very quickly in the region.

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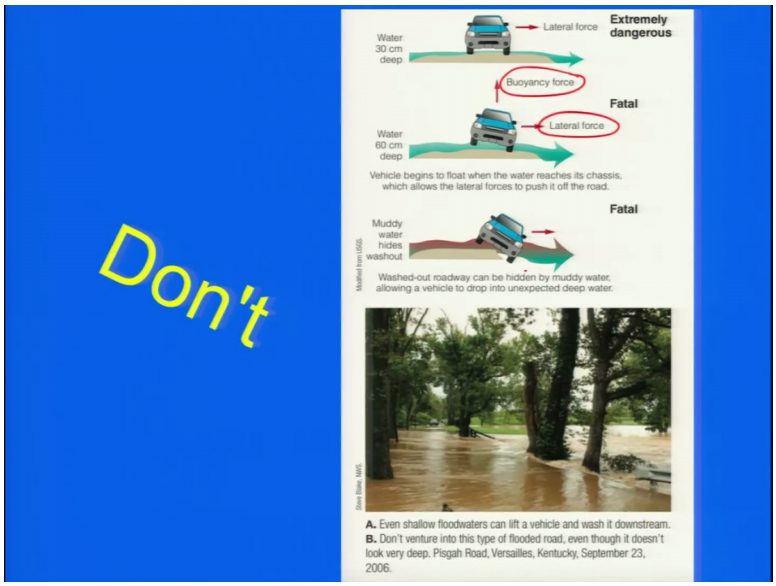

Now, another very important most of us must have seen a news while during the monsoon season, in any area which is coming in the flooding state. And we have very excitingly people will cross the region which is in. For example, this photograph shows the road has been covered by the floodwaters and we try to cross it and with great brave, we show over braveness and we can easily cross this, but this can result in to the that you will be dragged along the water flowing water.

So, the lateral force will lift your vehicle easily and once it has been lifted slightly snd so, that will create your buoyancy forces and will drag your vehicle. So, in some news channels or the videos we have seen that even the heavy loaded trucks had been swept away during the while they are crossing this the roads covered by flood waters.

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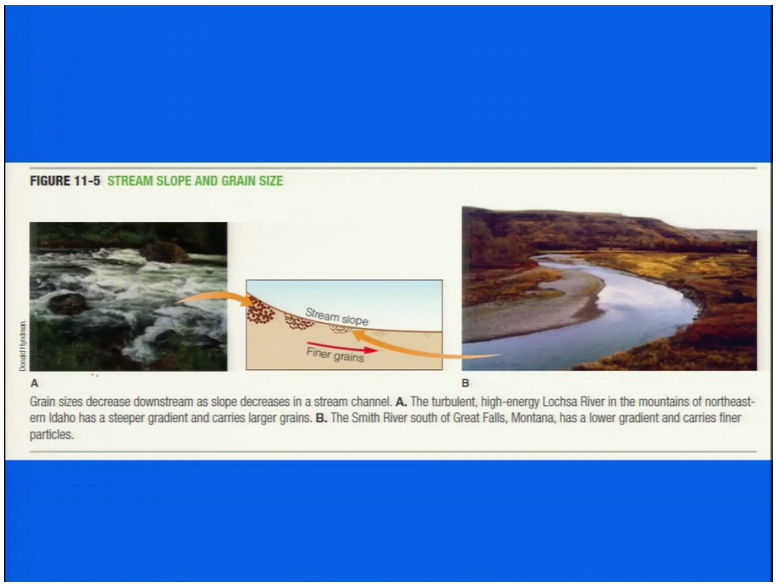

Coming back to again the stream stop and crane size 3. So, in the in the upper ridges or in the watershed areas close to the source what we see of course, we understand that there will be colder particles which will be carried by the stream the velocity will be much higher and as you move further down the grain size reduces. So, the grain size decreases downstream as slope decreases. And in stream channel a photograph shows turbulent high energy it taken from Lochsa river which has a steeper gradient and it carries larger grains. And another river has a lower gradient and carries finer particles.

So, the landforms which are also associated with these two different locations along the same rivers will vary from place to place.

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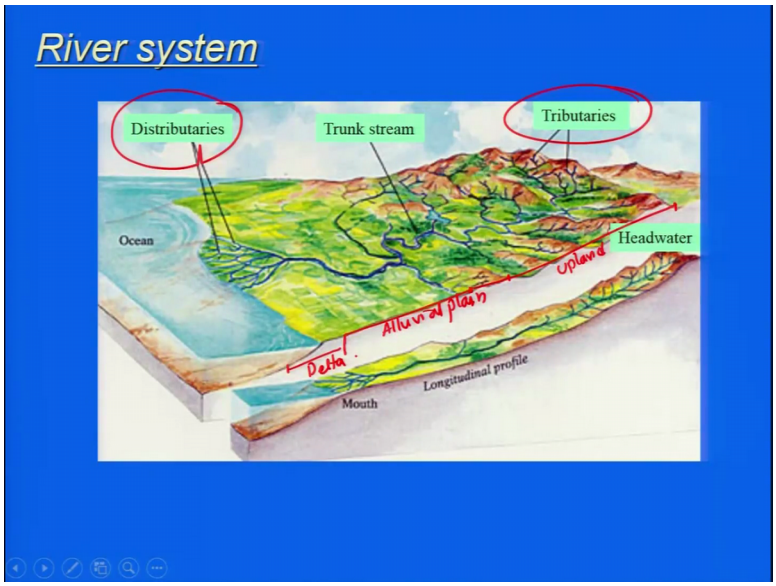

So, the river system in total if you take, right from it is source what we see is that if you have an headwaters. And this is what we are having the longitudinal profile right up to the mouth. So, you have tributaries which will contribute the water to the trunk stream as well as the road eroded sediments to the tungsten. And trunk stream will act as an conduit or an transporting agent which will carry the material right up to that is mouth where you see is mostly the distributaries.

So, we have tributaries and we have distributaries. So, if you put this here that we have the tribute is joining the trunk stream and then, you are having distributaries the force in this direction. And when I was talking that where exactly you are located because this part will be your the flat area close to the front or maybe you can go up to this one and this area is alluvial plain region.

This is your upland on the headwaters and this portion is of course, the fewer marine area mainly we are having the deltas.

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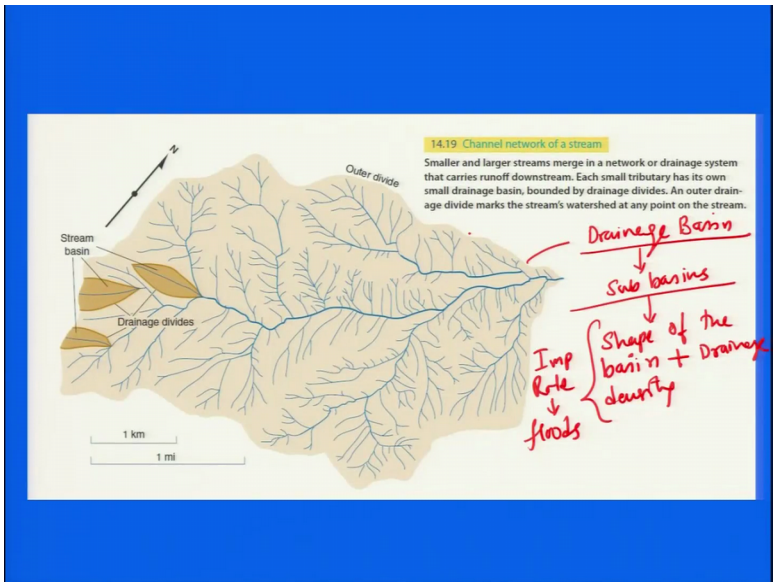

So, what we were looking at we have the previous slide and have the mainstream and then we are having the tributaries which are feeding the main stream. And this whole area which fed the; but it is feeding the main stream is termed as your drainage basin.

So, main drainage basin of the trunk stream will have sub basins. We will see later that the shape of the basin the drainage density will play an important role and flooding events. So, these are your sub basins and the part also we told this as in the drain a divide we will come to that in the next slide probably that we have.

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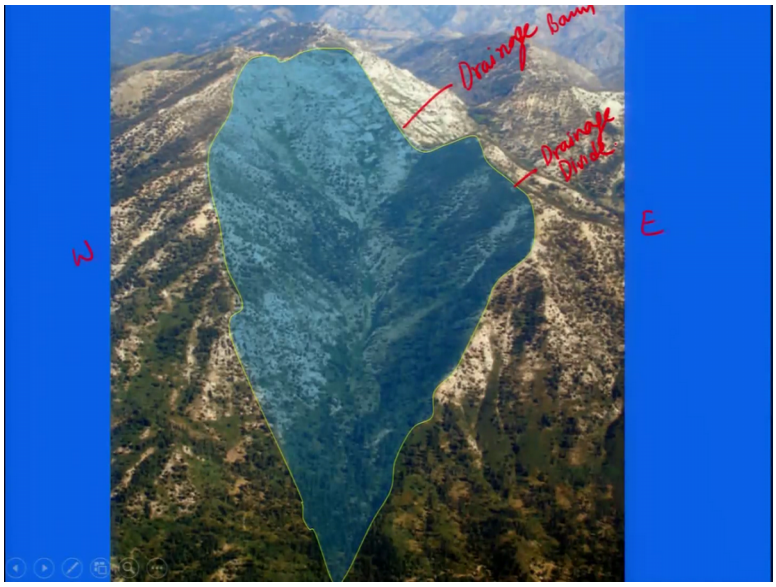

So, we have an very clear cut demarcation over here. So, this pin if we take this as for example, there is an east and west. So, some of the stream and this means stream that is some of the streams are flowing in this direction some are flowing in this direction ok. So, flowing in west flowing in east and this marks the boundary between that. So, this is your drainage basin or you can say this part this whole area is termed as drainage basin. And this line and remove this one and which has been shown out in the yellow is your drainage divine.

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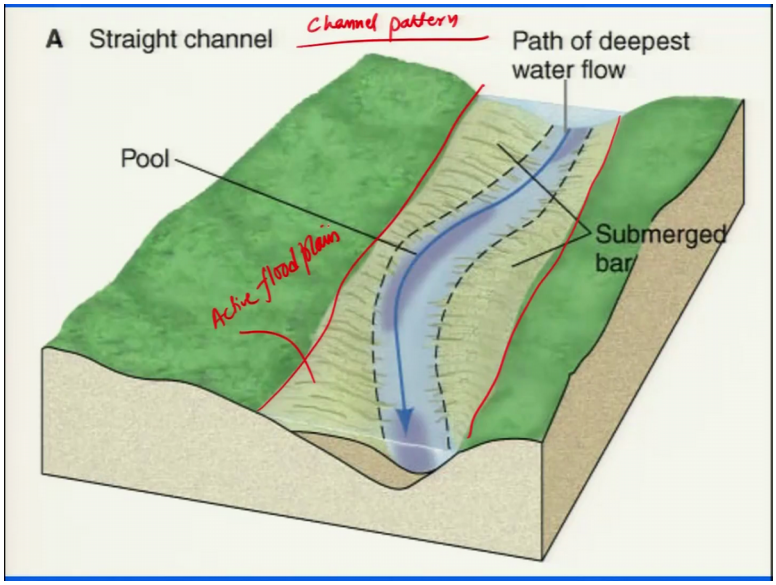

So, as we were talking about that we need to understand the river dynamics, to understand the flood. For that we need to also understand the different type of channel pattern. That is this and how it is straight, but it is winding up. So, this is an example of straight channel where maximum flow depth or the deepest part will be in the center. So, this what is we marked by dash line is your active straight channel. And this portion it have been shown here is your active flood plain.

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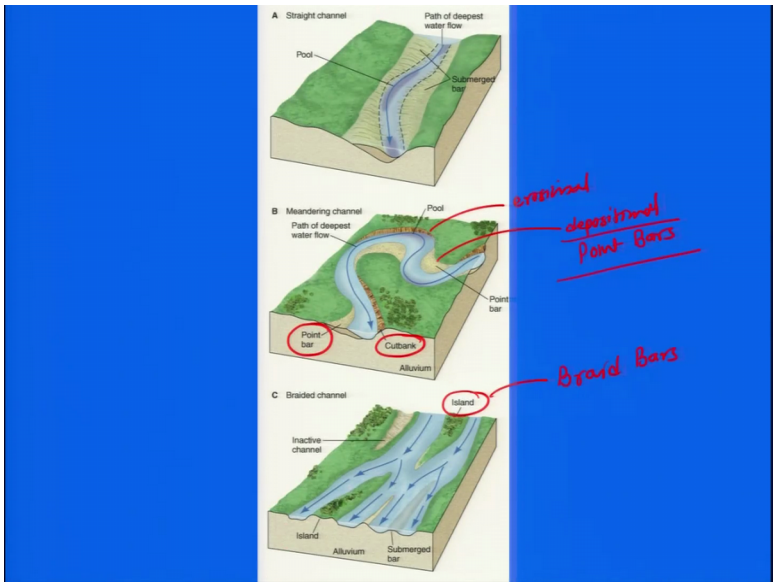

So, in total if we take, we can broadly classify the channel either it is straight and the second is the meander and third is the prayed braided channel. So, in one of the slide I was showing from Uttarakhand and Uttarkashi which talks about that, if you have the construction on the outer bend of the meandering channel. It is flowing like that and this portion is the depositional side is an erosive side as in tendency to keep carving this part or eroding erode this part will result into the collapse or cliff collapse because of the undercutting.

So, we have meandering channel. So, one side that is your outer side is erosional and the inner side is depositional. And then braided streams are mostly will have in multiple streams which rejoins again or bifurcate into one stream getting bifurcated into multiple streams. And the area between the 2 streams are termed as here island or braid bars. And in this case what we call this as an point bar.

So, this is and cutting bank that is erosive and then this one is your depositional bank where you will find point bars.

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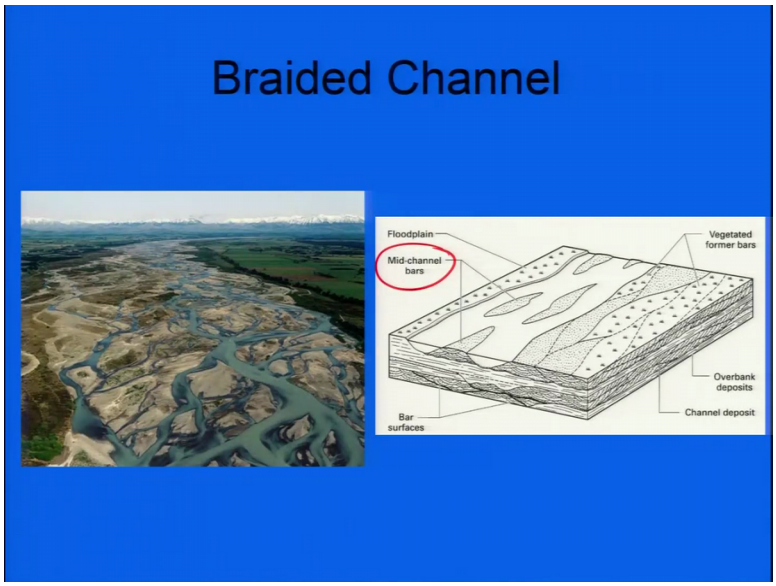

Braided channel: so, you have braided channel bar or mid channel bar. So, what we see is not in straight channel. We will have and really the width of the valley will be narrow, but in case of even meander also it will not be much, but in case of braided river we will have very wide valley.

So, I will stop here and we will continue in the next lecture.