A CASE STUDY ON PROJECT DELAY IN KELANTAN

NUR SHAHIDAH BINTI AHMAD SOBRI

A report submitted in partial fulfillment of the Requirements for the award of the degree of Bachelor of Civil Engineering

Faculty of Civil Engineering and Earth Resources
UNIVERSITI MALAYSIA PAHANG

JUNE 2012

ABSTRACT

In 2004, Kelantan is one of the states that most affected by the flood event. The disaster has caused a lot of damages and losses to resident. Although flood is difficult to avoid, the impact still can be minimize by some actions and precaution. The objectives of this study are to identify the worst area affected by flood in Kelantan and identify the flood mitigation projects that have been implemented in Kelantan. Data needed in this study are rainfall data, water level data and the details on the implemented project. At the same time, site visits and investigation were also conducted to understand the existing condition as well as the problems faced in the studied area. Besides that, set of questionnaires also were distributed among residents in some district in Kelantan. From the analysis, the area that has been identified worst affected by flood are Tumpat, Pasir Mas and Kuala Krai. Some of the flood project mitigation was applied at Bukit Sireh and Taman Warisan in Kuala Krai and the same goes to Jalan Sirat. In the end of this study, recommendations in order to overcome this flood problem in study area such as constructing a strong levee at low lying area as well as deepening and widening of the river and the drainage have been proposed..

ABSTRACT

Negeri Kelantan merupakan salah satu negeri yang paling teruk terjejas akibat kejadiaan banjir pada tahun 2004. Bencana tersebut telah mengakibatkan banyak kerosakan dan kehilangan kepada penduduk-penduduk di Kelantan. Biarpun bencana banjir sukar dielakkan, tapi kita masih boleh untuk mengambil langkah berjaga-jaga dan mengurangkan masalah banjir. Objektif kajian ini adalah untuk mengenalpasti kawasan yang paling teruk dilanda banjir di Negeri Kelantan dan mengenalpasti projek-projek penebatan banjir yamg telah di buat untuk mengatasi masalah banjir ini. Antara data-data yang diperlukan untuk kajian ini adalah seperti data hujan, data paras air sungai dan projek-projek mengenai penebatan banjir. Lawatan dan penyelidikan di tapak jugak turut dijalankan untuk memahami keadaan sebenar dan mengetahui masalah yang sedang dihadapi. Selain itu, borang soal selidik turut diedarkan pada penduduk di Negeri Kelantan. Berdasarkan analisis dan kajian yang dibuat, kawasan yang paling teruk mengalami banjir di Negeri Kelantan adalah di kawasan Tunpat, Pasir Mas dan Kuala Krai. Antara projek penebatan yang telah dibuat adalah di Bukit Sireh dan Taman Warisan di Kuala Krai dan di Jalan Sirat, Kota Bharu. Antara cadangan yang telah dikemukakan bagi mengatasi masalah banjir di Negeri Kelantan adalah seperti membuat tembok penahan banjir terutamanya dikawasan yang rendah serta membuat pelebaran dan pendalaman sungai dan longkang.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

BACKGROUND

1.1 Introduction

Flood is defined as water body that rises and overflow submerged the land. It had taken place in many parts in the world. Flood is one of the major natural disaster to human, it is one of the serious and often occur in high intensity for a period of heavy rains. Its impact upon human lives and activities had been severe especially in the recent decade (Smith & Ward, 1999). One-third of all losses due to nature's forces can be attributed to flooding and recently, losses generated by flood disaster have increased drastically. The impact of flood can be more significant as it endanger human, animal life and cause economic losses where it cause damages to any type of structure, including bridges, cars, building, sewer system, roadways and canals. Even worse, it also cause human and livestock die due to drowning and can also lead to epidemics disease. With the continuing development in flood-prone areas, the impact is expected to increase significantly.

Malaysia is one of the countries that developed rapidly. Various infrastructure and development was undertaken and established for economic development. With the vital infrastructure and densely populated area, the impact of flood are more significant, worst case might also happen due to unplanned development in public areas and residential. Part of the area in Peninsular Malaysia especially at the east coast will be facing Monsoon season. The high risk flood victims are people who live at the lower land and near to sea-side as the disaster is forecasted to happen once or twice a year. (The *Star, Dec)*

Flood that normally occurs in Malaysia is the flash flood. This is due to the unpredictable climate change and normally starts in the middle of October to January every year. The impacts of flash floods are usually worst as it swept the residential areas, affect the public health and give a bad impact to the environment.

In Malaysia, the states of Kelantan, Johor, Penang and Kedah experience flooding in various scales. Figure 1.1 and Figure 1.2 show the flood prone areas in the Peninsular Malaysia.

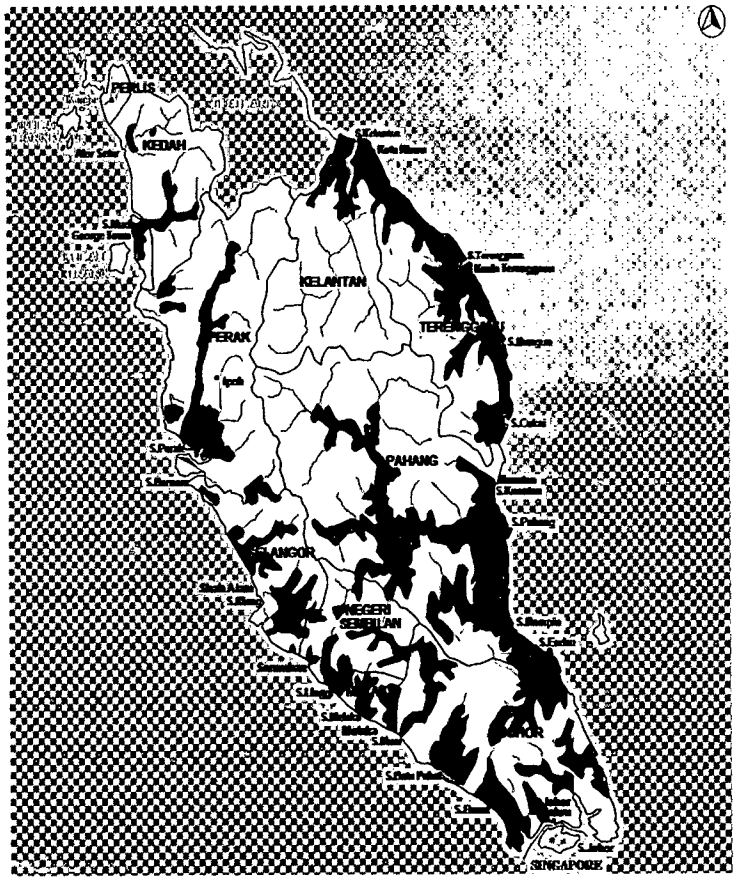

Figure 1.1: Flood Prone areas in Malaysia (DID, 2012)

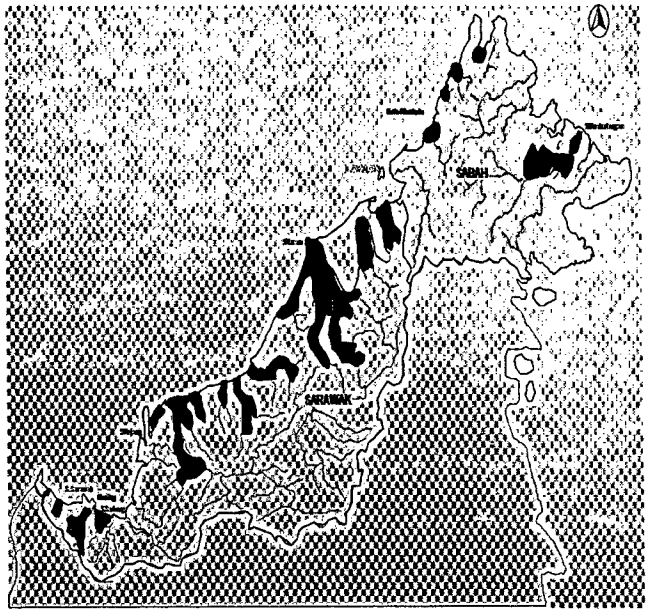

Figure 1.2: Flood Prone areas in Malaysia, Sabah and Sarawak (DID, 2012)

Kelantan is situated at the east coast of Peninsular Malaysia. Due to its geographical location, it is exposed to the North-East Monsoon from November to March every year. The monsoon has invariably brought heavy rainfall over prolonged period, causing an almost annual recurrence of flood between the end of November till early January (JPS, 2006). The " *Laporan Banjir 2005/2006*" reported three deaths an estimated RM 12.1 million worth of JPS structures being damage during the past flood that occurred from 19 to 23 November 2005 and from 8 to 26 December 2005. Damages to public and private properties, disruption to societal activities and the cost of evacuation doubtlessly posed greater losses.

1.2 Problem Statement

Flooding is the main issues pertaining to storm water. Primarily, the monsoon flood due to the overflowing of Sungai Kelantan is the main cause of the flooding that takes place in the catchment. The whole,town has a natural low and flat terrain which compounds the flood problem.

Heavy rains brought by the northeast monsoon winds that blown between November to March each year resulting in floods in almost all provinces in Kelantan

state. Apart from the heavy of rain, other factors such as changes in the topography and local drainage make the worsen the situation.

Flood in 2004 was the worst flooding recorded since 1926 and was reported happened due to heavy rainfall event on 8th to December 12th, 2004. It caused much damage to property and loss of life. An effective flood forecasting system is needed to reduce loss of life and damages caused by floods.

In January until Mid-December, 2011, 9 people were killed in flash flooding in Kelantan. Even some actions and improvement taken in some places in Kelantan, the flood problem is still unsolved.

1.3 Objectives

The purposed of this study is to investigate and defines the major cause of flood in Kelantan with aim to solve the flood problems in the above mentioned areas. In order to achieve this targeted aim, several objectives have been outlined:

1. To identify the worst areas in Kelantan that affected by flash flood

2. To study the flood mitigation project done by authority in order to inprove the affected areas.

3. To propose action to be taken in order to minimise the risk and impact of flash flood.

1.4 Scope Study

This study involved areas that experienced severe floods in Kelantan. Data used in this study are the rainfall data and the flow recorded on 2010/2011.

1. To carry out a literature review and find out the latest development in this research area.

2. To collection all related data and informationfrom JPS and identify the worst affected area in Kelatan.

3. To prepare a set of questionnaire in order to study the evacuation process and response from victims.

4. To Propose an idea to improve the existing flood prevention system.

1.5 Significant of Study

From this study, it is hope that the proposed approach or method can minimize the loss properties and life. Moreover, it is hope that this study will come out with some values that can give ways and ideas on how to minimize the effect of flood.

CHAPTER 2

LITERATURE REVIEW

2.1 Flood

Flooding also is a natural and recurring event for a river or stream. Statistically, streams will equal or exceed the mean annual flood once every 2.33 years (Leopold et al, 1964). Flooding is a result of heavy or continuous rainfall exceeding the absorptive capacity of soil and the flow capacity of rivers, streams and coastal areas. This caused a watercourse to overflow its banks onto adjacent lands. Floodplains are, in general, those land most subject to recurring floods, situated adjacent to rivers and streams. Floodplains are therefore "flood prone" and are hazardous to development activities if the vulnerability of those activities exceeds an acceptable level.

2.2 Flood Definition

Flood can be defined as an excess of water in place that is normal dry. There are several different types of floods. The most common is where a river over flow its banks due to a large input of rainfall. Another definition of flood is an overflow inundation that comes from a river or other body of water and cause or threatens damage (Varsney, 1974).

Saul (1992) stated that a flood commonly is considered to be unusually high stage of the river. It is often described as that stage at which the stream channel becomes filled and above which it over flows its banks. Floods affect many of the engineering structures such as bridges, embankments, tanks and reservoirs. In order

to reduce the effect cause by flooding, proper safe guards must be made for the safe of the maximum flood expected such as by implementing the structural and non-structural measures in flood protection and mitigation. To implement the measures requires the studies on the hydrological characteristics of a river catchment, shape and size of the catchment, topography, types of soil, channel configuration, stream flow data and rainfall data are necessary.

The floods happen when the river capacity is not enough to carry the water that has entered the river network and bank overflow, which is called floodplain. In the flood also, there are several factors how to determine the size of flooding, rainfall intensity and duration, how dry or wet land, topography and many more. Therefore the flooding is the complex natural phenomenon.

Flooding is the most significant natural hazard in Malaysia in terms of population affected, frequency, area extent, flood duration and social economic damage. Having 189 river basins throughout Malaysia, including Sabah and Sarawak, the rivers and their corridors of floodplains fulfill a variety of function both for human use and for the natural ecosystem, where they are fundamental parts of the natural, economic, and social system wherever they occur. However, these rivers pose a threat of flooding the surrounding areas if unnatural periods of rain occur (Ministry of Natural Resources and Environment Malaysia, 2007).

Besides of that, flood is the part of the natural cycle or a "Hydrologic Cycle" where in this cycle, the energy of the sun causes water to evaporate and form clouds which move inland and become rain. This rain will then runoff either directly through the river system or is absorbed into the soil to later form groundwater flow.

2.3 Flood Severity Categories

2.3.1 Minor Flooding

Causes inconvenience. Low-lying areas next to watercourses are inundated which may require the removal of stock and equipment. Minor roads may be closed and low level bridges submerged.

2.3.2 Moderate Flooding

In addition to the above, the evacuation of some houses may be reqiured. The traffic routes may be covered. The area of inundation is substantial in rural areas requiring the removal of stock.

2.3.3 Major Flooding

In addition to the above, extensive rural areas and urban areas are inundated. Properties and towns are likely to be isolated and major traffic routes likely to be closed. Evacuation of people from flood affected areas may be required.

2.4 Types of Floods

Floods are categorized and named in several distinct ways. At the geography, the physical features in the area or the source of the flood water can be:

2.4.1 River Flooding

This is the most common type of flooding. When the actual amount of river flow is larger than the amount that the channel can hold, river will overflow its banks and flood the areas alongside the river. And this may cause by reasons like snow melt or heavy spring rain.

2.4.2 Flooding from the sea or coastal floods

Coastal flood usually occur along coastal areas. When there are hurricanes and tropical storms which will produce heavy rains, or giant tidal waves created by volcanoes or earthquakes, ocean water may be driven onto the coastal areas and

cause coastal floods. Heavy storms or other extreme weather conditions combined with high tides can cause sea levels to rise above normal, force sea water to the land and cause coastal flooding. Proper flooding defences need to be in place to safeguard life and property. The Environment Agency constantly monitors sea levels and releases flood warnings when required.

2.4.3 Urban flooding

In most of the urban area, roads are usually paved. With heavy rain, the large amount of rain water cannot be absorbed into the ground and leads to urban floods.

2.5 Hydrologic Cycle

The hydrological cycle is a conceptual model that described the storage and the movement of water. The water of this earth can be stored in reservoirs, such as oceans, lakes, rivers and so on. Water moves from one reservoir to other reservoir by process like condensation, evaporation, precipitation, sublimation, deposition, runoff, transpiration, melting, infiltration and groundwater flow. In the atmosphere, it can be found that the oceans supply more evaporated water. Of this evaporated water, only 91% can be return to the ocean basins by precipitation way. The remaining 9% is transported to areas over landmasses where climatological factors induce the formation of precipitation. The resulting imbalance between rates of evaporation and precipitation over land and ocean is corrected by runoff and groundwater flow to oceans. The flows of the hydrologic cycle refer in the Figure 2.1.

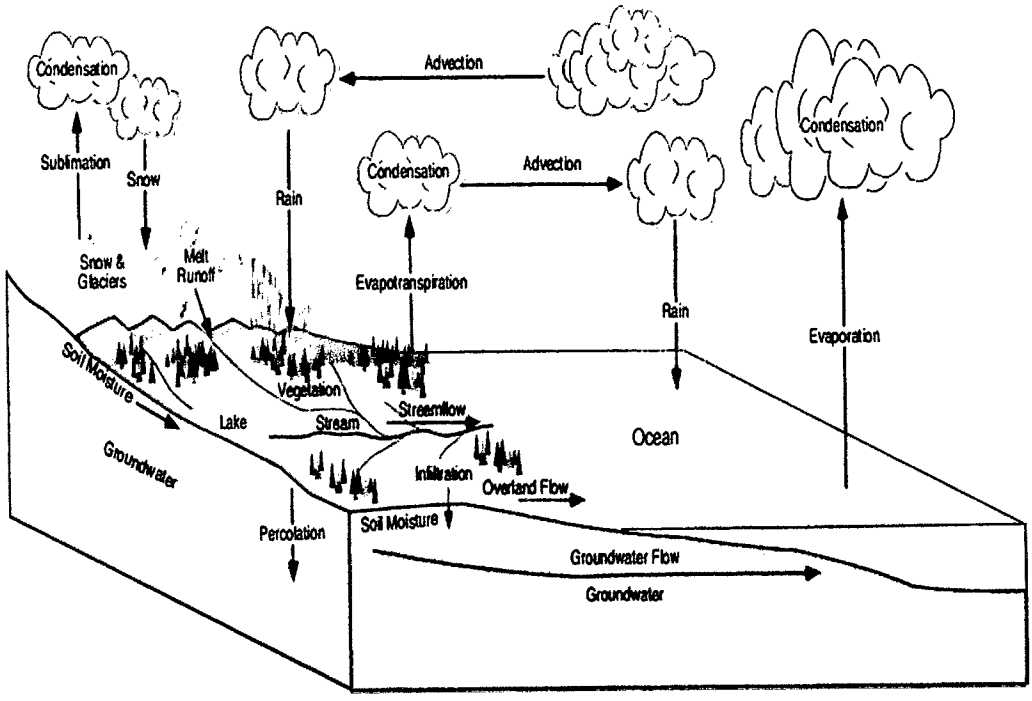

Figure 2.1: Flow of the hydrologic cycle

2.6 Flash Flood

Flooding can be divided into different categories according to duration which is

a) Slow-Onset Floods

Usually last for a relatively longer period, it may last for one or ore weeks, or even months. This kind of flood is last for a long period, it can lead to lose of stock, damage to agricultural products, roads and rail links.

b) Rapid–Onset Floods

This flood last for a relatively short period, they usually last for one or two days only. This kind of flood lasts for a shorter period, it can cause more damages and pose a greater risk to life and property because there are generally

much less time to take preventative action, and flow of water is faster and more dangerous.

c) Flash Floods

This flood occurs in relatively short period. It may occur within minutes or a few hours after heavy rainfall, often from severe thunderstorm. It causes the greatest damages to society.

A flood caused by heavy or excessive rainfall in a short period of time, generally in 6 hours. They can occur within minutes or a few hours excessive of rainfall. They also can occur even if no rain has fallen for instance after a levee or dam has failed.

2.6.1 Flash Flood Conditions and Losses

The problem of flash flood is one of the greatest difficulties to solve. It is generally agreed that flash floods have the following characteristics:

1. They occur suddenly, with little lead time for warning

2. They are fast-moving and generally violent, resulting in a high threat to life and severe damage to property and infrastructure

3. They are generally small in scale with regard to area of impact

4. They are frequently associated with other events, such as riverine floods on larger streams and mudslides.

5. They are rare (Gruntfest and Handmer,2001)

Several important factors arise as a result of these characteristics. First, area prone to flash flood need to be prepared. Because such events usually come as

surprises, warning and preparation are essential. However, because they are rare the motivation to invest time and resources info such activities is low. Because flash floods usually affect relatively small areas, losses resulting from them do not always generate much long term response, unless there is high loss of life. However losses per unit (acre, square mile or kilometer) of area affected tend to be high compared to other events like riverine floodsor hurricanes. Finally, it is sometimes very difficult to attribute specific losses to flash flood events, particularly when they occur in combination with other events. Thus, losses may be underestimated in many instances.

2.6.2 Causes of Flooding

The causes of flooding can be determined by storm, heavy rainfall and failure of a construction in the water system such as weir. Figure 2.2, 2.3, and Figure 2.4 show the flood taken place after heavy rainfall.

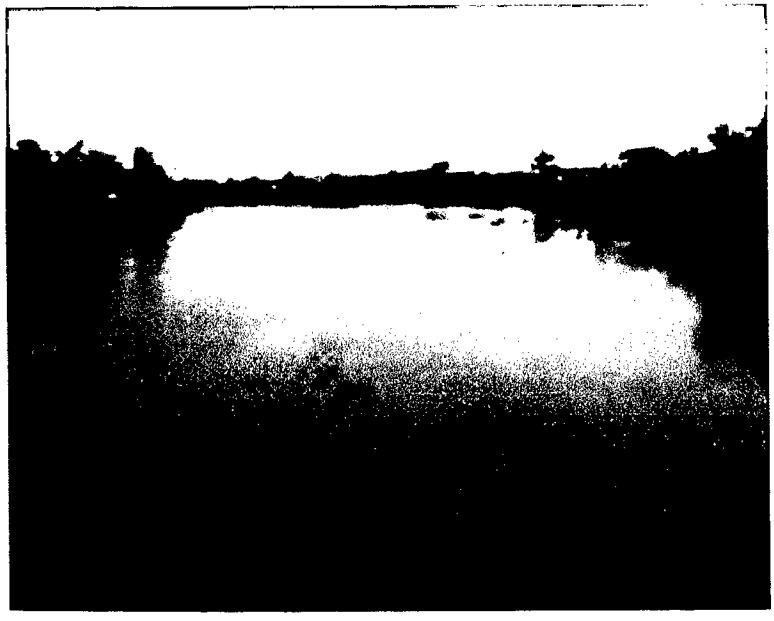

Figure 2.2: Creeks overtop their banks

Figure 2.3:Drainage system back up because they can not cope with the volume of water or blocked by rubbish.

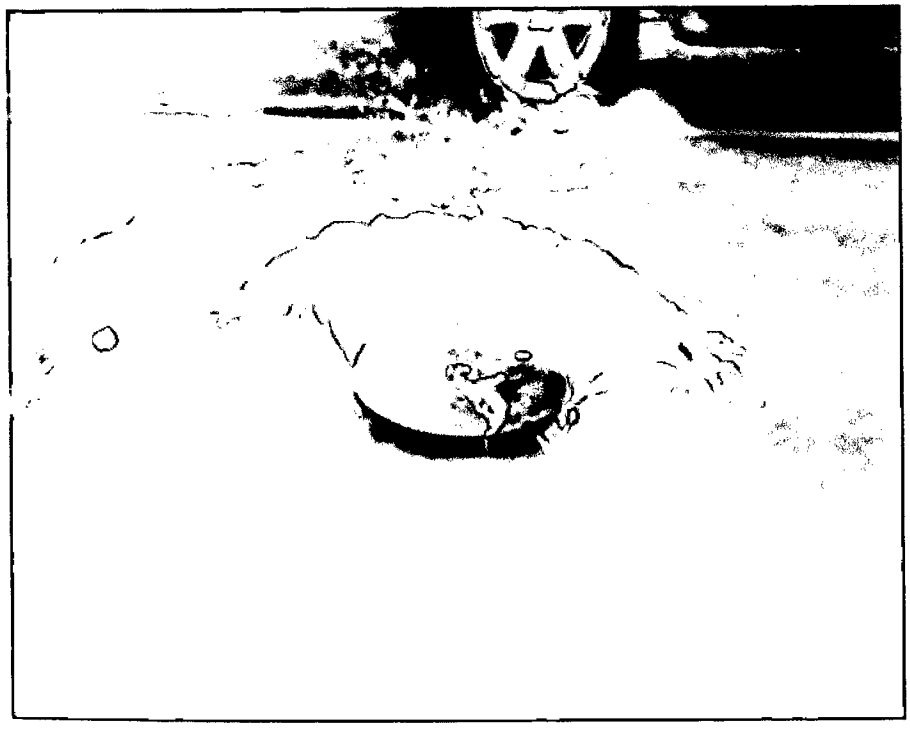

Figure 2.4: Sewers overflow because of illegal connections and the sewer system cannot cope with the increased volumes.

2.7 Floodplain

Floodplains are land areas adjacent to rivers and streams that are subjected to recurring inundation. Floodplain can defined as a strip of relatively smooth land bordering a stream and overflowed at a time of high water (Leopold et al, 1964). Adapter from Strahler, A.N. and Strahler. A.H. Environmental Geoscience: Interaction between Natural System and Man can be seen in the Figure 2.5.

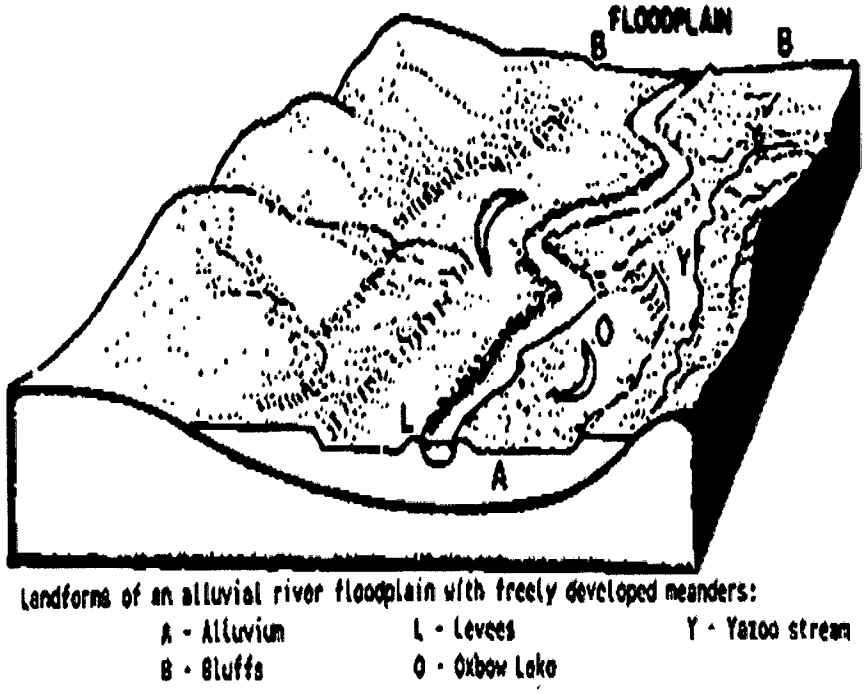

Figure 2.5: Floodplain

2.7.1 Changing Nature of Floodplains

Floodplains are neither static nor stable. Composed of unconsolidated sediments, they are rapidly eroded during floods and high flows of water, or they are may be the site on which new layers of mud, sand, and silt are deposited. As such, the river may change its course and shift from one side of the floodplain to the other. Figure 2.6 portrays this dynamic pattern whereby the river channel may change within the broader floodplain and the floodplain may be periodically modified by floods as the channel migrates back and forth across it.

Floodplain width is a function of the size of the stream, the rates of down cutting, the channel slope, and the hardness of the channel wall. Floodplains are uncommon in head water channels because the stream is small, the slopes and rate of down cutting are high, and the walls are often exposed bedrock.

In moderately small streams the floodplain is commonly found only on the inside of a bend, but the location of the floodplain alternates from side to side as the stream bend from one side of the valley to the other.

Larger streams, particularly those with low channel slopes, develop broad floodplains. As these plains develop, the sideward migration of the river channel produces oxbow lakes, sloughs, natural levees, and back swamp deposits that are disconnected from the present channel. If a river carries fairly coarse sediment during a flood, it tends to be deposited along the channel bank as a natural levee. This may result in the formation of a perched channel where the channel bottom is continually raised to a point where it may actually be higher than the surrounding topography. This condition can result in surface water elevations contained within the channel being considerably higher than the land surface elevations immediately outside these levees, which results in a flooding potential that is much worse than that in the typical situation where the channel is at the bottom of a U-shaped cross section of the floodplain.

These features change with time. Widening of a river channel and destruction of part of the floodplain by major floods is common and has been observed in semiarid regions. As is the case with these regions having a high erosion potential, the phenomenon of channel migration during flooding events will often cause a large portion of flood waters to be carried in a channel that did not exist prior to the onset of the flooding event. This phenomenon occurs all too frequently in arid regions, where high velocity flood waters make drastic changes in the channel configuration during the flooding event. This can cause the area of inundation to be considerably different than in its original state.