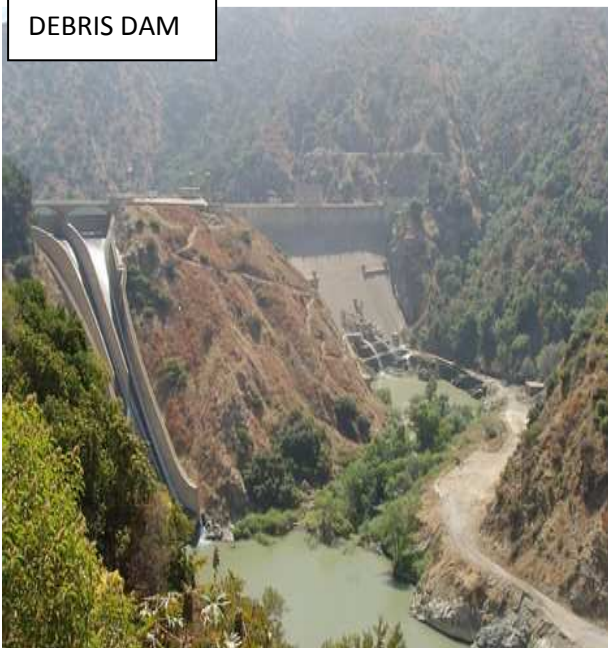


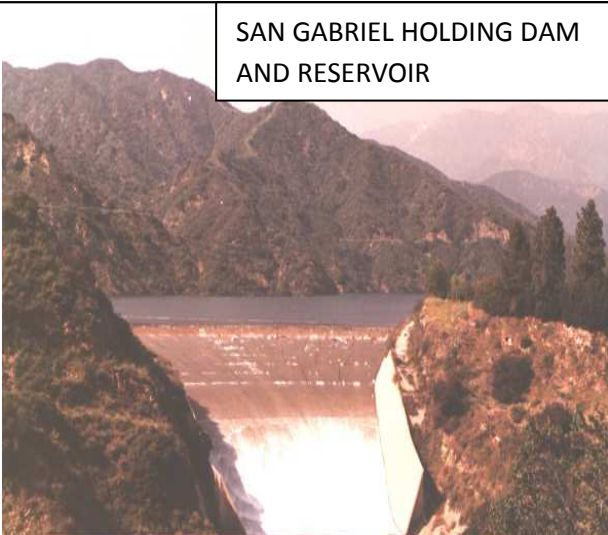
FLOOD CONTROL –RIVER BASIN MANAGEMENT

1. Reforestation of the upper San Gabriel catchment in the San Gabriel mountains to increase interception and evapotranspiration, and reduce overland flow. This is taking place in the Angeles National Forest and the San Dimas Forest Experiment where scientists study the habitats, ecosystems and hydrology to try to reduce flooding and educate the public.
2. Debris dams have been built on the edge of the uplands to reduce the transport of sediment into the river. This reduces braiding and makes the channels more efficient.
3. Holding dams such as the San Gabriel dam have been built to hold back the flood water in a reservoir and lower the flood hydrograph. These schemes are multi-purpose as they also provide water for the ever growing city of Los Angeles, allow irrigated crops to be grown and increase the amount of Hydro-Electric power production.
4. Spreading grounds have been designated such as the one behind the Santa Fe dam. These are allowed to fill with excess water after the winter storms, but are generally dry in the summer months and are used for recreational purposes.
5. Within Los Angeles itself the levees beside the river have been raised to help prevent flooding and the channel has been straightened and deepened, and lined with concrete to speed up the flow of water. This reduces erosional and depositional processes, but has had a negative impact on habitats, ecosystems and biodiversity.

DEBRIS DAM



SAN GABRIEL HOLDING DAM AND RESERVOIR



IMPROVED CONCRETE CHANNEL IN LOS ANGELES



FLOODING IN THE SAN GABRIEL BASIN

Physical factors / causes

- The Mediterranean / semi-arid climate of California has a low annual rainfall total of only 250-450 mm, but 90% of it falls in the winter months, often as sudden, torrential storms
- Summer has drought conditions and river channels may be dry, but in winter flash floods and mudflows are common
- The vegetation cover is sparse scrubland with bare patches of rock and soil. Very little of the rainfall is intercepted and very little is lost by evapotranspiration meaning that there is a great deal of overland flow (surface runoff) into the rivers and streams
- Slope are steep in the San Gabriel mountains promoting overland flow and limiting infiltration
- Much of the rock and soil is exposed and soft making soil erosion common, silting up channels making them higher than flood plains and inefficient in their transmission of water
- The Hydrograph of the river is 'flashy' with a steep rising limb and a short lag time making flash floods common

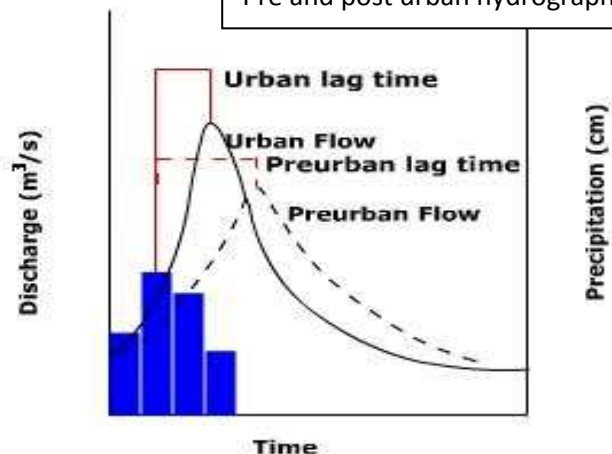
Human activities make the floods worse and more frequent :-

- Deforestation has occurred in the San Gabriel mountains and on the Los Angeles coastal plain. This has been due to both clearance for agriculture and for urbanisation
- Deforestation leads to more overland flow and less interception which means that more water reaches the channel more quickly causing rapid rises in discharge and an increased chance of a flood.
- Deforestation also increases the chances of soil erosion as the rainfall hits the ground directly and the soil is not held together by tree roots. This increase in sediment is washed into rivers which make the channels braided and less efficient, and raises the river beds above the level of the surrounding flood plains.
- Wildfires, both natural and those caused by arsonists and careless tourists, often destroy what vegetation there is to increase the chance of floods
- Rapid urbanisation has now covered most of the lowland area of the Los Angeles basin, as low rise, low density housing and suburbanisation have produced the '60 mile city' Los Angeles,. This urbanisation is now spreading up into the San Gabriel mountains to the north
- Urbanisation destroys the vegetation and covers the surface with impermeable brick and concrete which prevents infiltration and promotes overland flow and floods

Relief and vegetation in the San Gabriel mountains



Pre and post urban hydrographs



geography john

GEOGRAPHY

CASE STUDY REVISION BOOKLET

THE SAN GABRIEL RIVER BASIN IN SOUTHERN CALIFORNIA - USA



FACTFILE :-

- The San Gabriel river is found in the semi-arid (Mediterranean) area of S California
- It flows from the San Gabriel mountains southwards for 100km to the Pacific Ocean
- It flows through deep valleys and canyons in the mountains and over the flat Los Angeles Basin
- Heavy winter rainfall causes seasonal flooding, such as 1938 when over 100 people died
- Flash floods continue to be a problem