

CH 5 - FLOODING (pp. 134 - 75)

Mississippi River Flooding

1. Earthen embankments, which are constructed parallel to a river to contain and reduce flooding, are called \_\_\_\_\_. Around the Mississippi, these have reduced the amount of \_\_\_\_\_ available for natural flood control by 60%.
2. The city of St. Louis, Missouri has huge floodwalls that contain the Mississippi River and keep it from flooding the city. But as Figure 5.2 shows, this creates a \_\_\_\_\_ effect that floods the area \_\_\_\_\_, including the town of \_\_\_\_\_.
3. The flat surface adjacent to the river channel that is periodically inundated by floodwater is called the \_\_\_\_\_. Even though 80% of the private levees failed during the 1993 floods, many homes, buildings, and farms were built within the floodplain behind these levees, which appear to give people a \_\_\_\_\_ sense of security.
4. Since the floods, \_\_\_\_\_ interests have convinced local governments to allow development behind levees. Weak floodplain \_\_\_\_\_ and government \_\_\_\_\_ have allowed the construction of \_\_\_\_\_ new homes and other buildings behind levees. On the other hand, some far-sighted communities have decided to move new development to \_\_\_\_\_ ground.
- 5.1 5. The small streams which collect runoff and feed a river are called \_\_\_\_\_, while the region drained by a stream is called its drainage basin or \_\_\_\_\_.
6. As a stream goes from mountains onto plains, it slows down and deposits an \_\_\_\_\_. Rivers entering these (or deltas) often split into \_\_\_\_\_ which change position rapidly, creating a hazard that is difficult to \_\_\_\_\_.

- 5.2 7. The average time between flood events is called the \_\_\_\_\_.
8. \_\_\_\_\_ typically occur in the upper part of a drainage basin, and are produced by intense rainfall of \_\_\_\_\_ over a relatively \_\_\_\_\_ area. They are most common in \_\_\_\_\_ environments with \_\_\_\_\_ topography, little \_\_\_\_\_ and following breaks of \_\_\_\_\_, levees, and \_\_\_\_\_. Most people who die in these floods are in \_\_\_\_\_, when people try to drive through \_\_\_\_\_, fast-flowing floodwater. Most autos will be carried away by \_\_\_\_\_ feet of water.
9. \_\_\_\_\_ make national news headlines. These cover a \_\_\_\_\_, and are caused by storms of \_\_\_\_\_.
- 5.3 10. Flooding is one of the most \_\_\_\_\_ natural hazards.
11. In the U.S., floods were the \_\_\_\_\_ disaster during the 20th century.
- 5.4 12. Primary effects of flooding include injury, death, and damage caused by currents, debris and \_\_\_\_\_. Secondary effects include pollution of \_\_\_\_\_, hunger and \_\_\_\_\_, and displacement of the homeless. Failure of wastewater ponds, \_\_\_\_\_, sanitary sewers and \_\_\_\_\_ contaminate floodwaters with \_\_\_\_\_ microorganisms.
- 5.5 13. Unlike many other natural hazards, humans can have significant effects on the \_\_\_\_\_ and \_\_\_\_\_ of flooding.
- 5.6 14. Land-use changes and \_\_\_\_\_ construction can affect a stream's \_\_\_\_\_ supply, which alter its \_\_\_\_\_ and channel shape.
15. Upstream from a dam, a stream will \_\_\_\_\_, deposit \_\_\_\_\_, and form a \_\_\_\_\_. Downstream, water coming out below the dam will have little \_\_\_\_\_, and this causes channel \_\_\_\_\_ downstream.
16. The rate of increase in \_\_\_\_\_ and \_\_\_\_\_

of floods is determined by the percentage of land covered by \_\_\_\_\_, \_\_\_\_\_, and cement, referred to as \_\_\_\_\_ cover, and served by \_\_\_\_\_. Urban runoff from larger storms is nearly \_\_\_\_\_ that of pre-urban conditions.

17. Urbanization also affects how \_\_\_\_\_ floods develop. Before urbanization, a delay or \_\_\_\_\_ exists between rainfall and flooding. After urbanization, there are much \_\_\_\_\_ lag times, referred to as \_\_\_\_\_. Another affect of urbanization is the reduction of \_\_\_\_\_ during the \_\_\_\_\_.

18. Low discharge concentrates \_\_\_\_\_ and causes the growth of large amounts of \_\_\_\_\_. Bridges and culverts can also block \_\_\_\_\_, forming a temporary \_\_\_\_\_, that then can let loose a \_\_\_\_\_ flood. This happens when bridge supports are too \_\_\_\_\_, or culverts are too \_\_\_\_\_.

5.7 19. Every new flood-control project has the effect of \_\_\_\_\_ people to the \_\_\_\_\_. Yet we cannot build dams or channels capable of \_\_\_\_\_ the heaviest runoff, so when flooding does occur it can be \_\_\_\_\_.

20. Measures to reduce flooding include earthen \_\_\_\_\_, concrete \_\_\_\_\_, \_\_\_\_\_ to store water, and on-site storm water \_\_\_\_\_. Unfortunately, the benefits of these are often lost due to \_\_\_\_\_ on the floodplains they protect.

21. Figure 5.28 shows that, compared to runoff from a paved area, the use of a retention pond reduces \_\_\_\_\_ and the likelihood of \_\_\_\_\_.

22. Most dams in the U.S. are on \_\_\_\_\_ land. They are poorly \_\_\_\_\_ and rarely \_\_\_\_\_.

23. Channelization of a stream can involve \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ or \_\_\_\_\_, for the purpose of controlling \_\_\_\_\_, draining \_\_\_\_\_ and improving \_\_\_\_\_. Drawbacks include the destruction of \_\_\_\_\_, adverse effects on \_\_\_\_\_ and \_\_\_\_\_.

24. The removal of ecological habitat that results from channelization has led many urban communities to carry out \_\_\_\_\_, by cleaning urban waste from the channel, protecting \_\_\_\_\_ along the stream banks, and planting \_\_\_\_\_ trees. This creates a more natural channel allowing the stream to \_\_\_\_\_, with fast, shallow \_\_\_\_\_ alternating with slow, deep \_\_\_\_\_. This may permit \_\_\_\_\_ to return.

25. Channelization of the Kissimmee River in Florida turned it into a short, straight \_\_\_\_\_. \_\_\_\_\_ quality decreased, and \_\_\_\_\_ and \_\_\_\_\_ declined. Since the lost wetlands no longer stored runoff, \_\_\_\_\_ increased.

26. Restoration of the Kissimmee cost \_\_\_\_\_ times the cost of channelization. Looking back, it would have been both \_\_\_\_\_ and \_\_\_\_\_ to not channelize in the first place.

5.8 27. The National Weather Service has recognized that most flooding deaths occur in cars, so they have a slogan “\_\_\_\_\_” advising motorists not to drive on flooded roads. In hilly areas, signs advise people to get out of their cars and climb to \_\_\_\_\_ if they see or hear flooding.

28. When insurance companies no longer wanted to insure buildings in flood-prone areas, the federal government established the National \_\_\_\_\_ Program under F.E.M.A. (\_\_\_\_\_), which maps Flood Hazard Areas, or those areas affected by \_\_\_\_\_ - year flooding. 100-

year floods don not necessarily occur every 100 years; rather they have a \_\_\_\_ percent chance of occurring in any given year.

29. Besides providing insurance, FEMA prepares \_\_\_\_\_ maps for participating communities that adopt minimum standards of \_\_\_\_\_ regulation within the flood hazard areas. New construction in flood hazard areas is limited to \_\_\_\_\_ buildings, and new construction is prohibited within the 20-year \_\_\_\_\_.

30. Early on, studies showed that development within floodplains was not only susceptible to flooding, but encroaches on the space available for \_\_\_\_\_ and can increase the \_\_\_\_\_ of floods.

31. Flood-proofing of building areas can include:

- A) raising the \_\_\_\_\_ above flood level using piles, columns, etc.,
- B) constructing \_\_\_\_\_ or \_\_\_\_\_ around buildings,
- C) using \_\_\_\_\_ construction around doors, walls and windows,
- D) installing improved \_\_\_\_\_ with pumps to remove water,
- E) designing \_\_\_\_\_ that are not damaged and easily cleaned.

32. Floodplain regulations attempt to obtain the most \_\_\_\_\_ use of floodplains while minimizing \_\_\_\_\_ and cost of protection.

33. The ideal is to “ \_\_\_\_\_,” resulting in less \_\_\_\_\_, or engineering, of the river system.

34. In North Carolina and North Dakota, the government offered residents a voluntary federal \_\_\_\_\_, and people relocated away from flood hazard areas.

35. Flooding is the most \_\_\_\_\_ natural hazard.

36. Preparing for a flood involves checking the FEMA flood hazard maps, buying flood \_\_\_\_\_, blocking doors with \_\_\_\_\_, making a \_\_\_\_\_, knowing how to turn off \_\_\_\_\_.

37. Never \_\_\_\_\_ the damage a flood can do.

38. When a flood warning is issued,

A) Be prepared to \_\_\_\_\_,

B) Observe \_\_\_\_\_ and stay tuned to reports. A weather radio is best,

C) Move people, \_\_\_\_\_ and valuable \_\_\_\_\_ or to \_\_\_\_\_,

D) Move your \_\_\_\_\_ to higher ground. It takes \_\_\_\_\_ feet of water to sweep it away,

E) Check on your \_\_\_\_\_, especially if they are elderly,

F) Do as much as you can during \_\_\_\_\_ hours, in case of power loss,

G) Keep \_\_\_\_\_ and \_\_\_\_\_ with spare clothes, \_\_\_\_\_, and food,

39. DO NOT walk in water \_\_\_\_\_, since it can  
\_\_\_\_\_, and hazards may be hidden,

40. After a flood,

A) Check home for \_\_\_\_\_ and \_\_\_\_\_ damage,

B) If insured, \_\_\_\_\_,

C) Get professional help in \_\_\_\_\_ carpets and furniture,  
and cleaning \_\_\_\_\_,

D) Contact \_\_\_\_\_ companies before turning them back on,

E) Open \_\_\_\_\_ to dry out,

F) Wash \_\_\_\_\_ and run them for a few minutes. The water  
supply may be \_\_\_\_\_ so have it checked before using,

G) DO NOT \_\_\_\_\_ items that have been in the water. \_\_\_\_\_  
and clean everything that got wet.