Fluctuating Lake Levels

Closed-basin lakes are susceptible to dramatic (5- to 15-foot), long-term fluctuations in their water levels as a result of variations in precipitation, run-off, and evapotranspiration. Flooding associated with this situation can last for years, examples of such lakes are the Salton Sea, the Great Salt Lake, and the Great Lakes. Short-term fluctuations can be triggered by sustained strong winds and by sharp changes in barometric pressure. Human activities, such as dredging, diversions, water consumption, and regulation by structural works, can also affect lake levels.

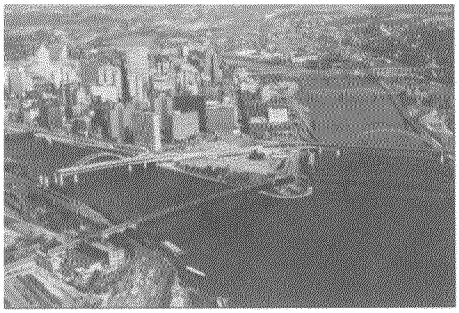
Changes in Water Levels in the Great Lakes, 1900—1986

(Lake Surface Elevation, in Feet)

Lake	Monthly Mean 1900–1986			Range (winter low to summer high monthly means)		
	Average	Maximum	Minimum	Average	Maximum	Minimum
Superior	600.61	602.24	598.23	1.2	2.1	0.4
Michigan-Huron	578.33	581.62	575.35	1.2	2.1	0.4
St. Clair	573.40	576.69	569.86	1.7	3.3	0.4
Erie	570.50	573.70	567.49	1.6	2.8	0.9
Ontario	244.73	248.06	241.45	2.0	3.6	0.7

Levels are referenced to International Great Lakes Datum 1955

Source U.S. Army Corps of Engineers



Historically, the development of the United States has proceeded along the principal waterways of the nation, where cities have been developed and redeveloped over the decades

Pittsburgh, Pennsylvania, early 1960s
(Compare this photograph with those on page 24.)

Floodplain Losses

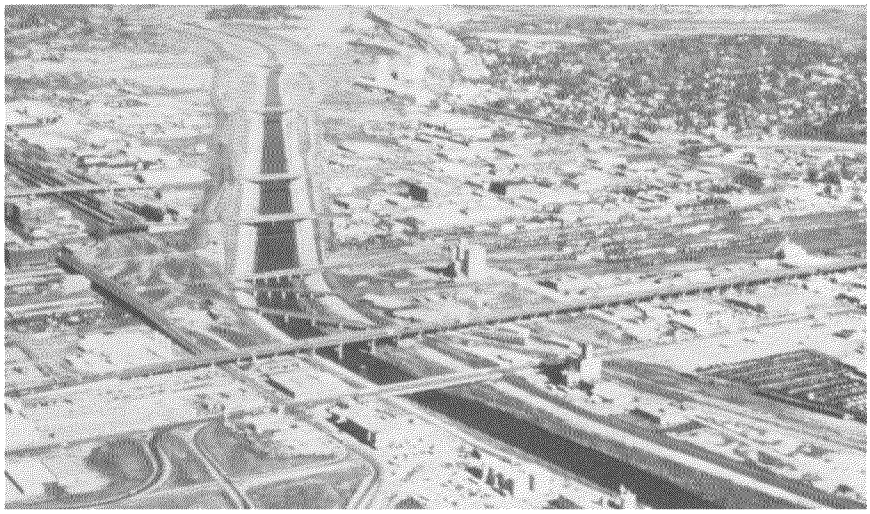
Throughout the history of the United States, the prevailing view has been that humans should use and modify the natural environment, including floodplains, to meet their needs. For centuries people have been settling on the banks of the country's rivers, streams, and oceans, taking advantage of the water supply, transportation, energy source, wildlife habitat, and other benefits floodplains provide. Unfortunately, human development on floodplains usually results in flood damages. In the United States the result of this widespread damage was a second wave of activity, during which individuals and governments enthusiastically engaged in the construction of dams and reservoirs, levees, floodwalls, and stream channelization projects in efforts to prevent or limit damages to development that was either knowingly or inadvertently placed within the floodplain. Thousands of water supply projects, particularly in the arid West, dramatically changed the natural resources of riparian areas Millions of acres of inland and tidal wetlands were filled or drained, causing loss of natural flood storage areas, a lowered capacity for filtration of pollutants and groundwater recharge, and reduction or elimination of some wildlife species.

By the late 1970s it was estimated that from 3.5 to 5.5 million acres of floodplain land had been developed for urban use, including more than 6,000 communities with populations of 2,500 or more. Annual growth in these floodplain areas was between 1 5% and 2 5% during the 1970s, roughly twice that of the country as a whole. The coastlines of the United States have been attracting people and their accompanying property and infrastructure in ever-increasing numbers for several decades. The 1980 U.S. Census units within 50 miles of the Atlantic and Gulf coastlines increased in population from 34 1 million in 1940 to 63.3 million in 1980—an increase of 85%, compared with 70% for the nation as a whole The population of Gulf Coast counties increased by 200%.

In 1991 the floodplain lands in 17,466 examined communities occupied a total of 146,600 square miles (93.8 million acres), including about 9 6 million

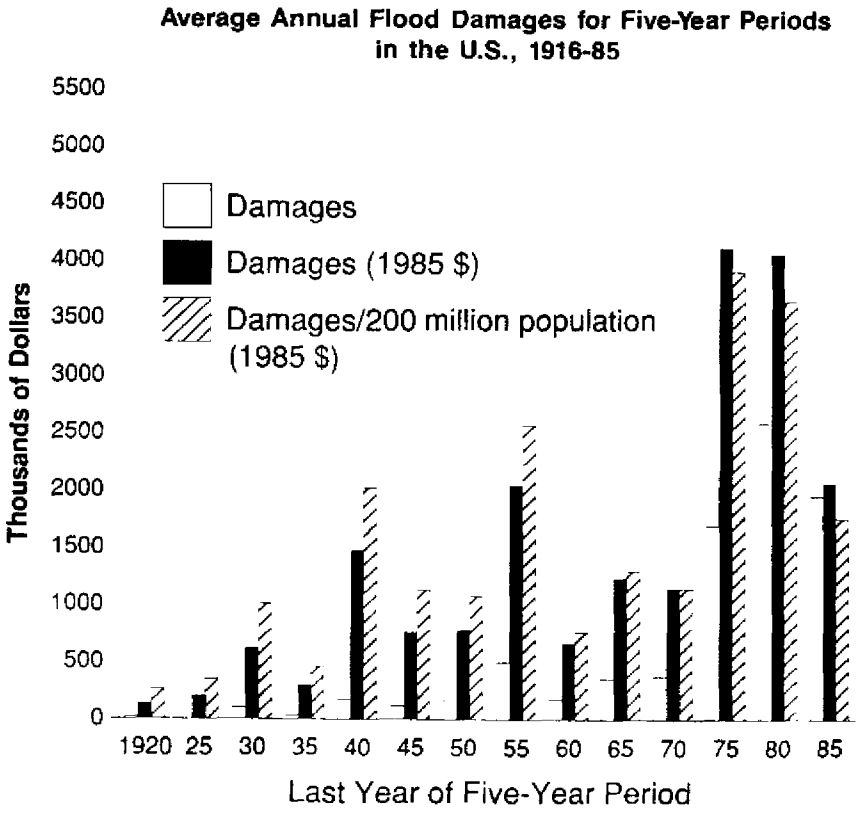
households and $390 billion in property. Florida was the state with the highest composite risk, followed by California, Texas, Louisiana, and New Jersey.

This large-scale development and modification of riverine and coastal floodplains has resulted in a major increase in the land area of the United States that may be economically developed and used, but at a high price extracted annually in deaths, personal injury and suffering, economic loss, and damage to or destruction of natural and cultural resources. There are two main kinds of floodplain losses: loss of life and property, and loss of natural and cultural resources. Both types continue to occur even with increased awareness of the value of floodplains and of the risks of floodplain occupancy The actual and relative amounts of these losses are not well quantified.

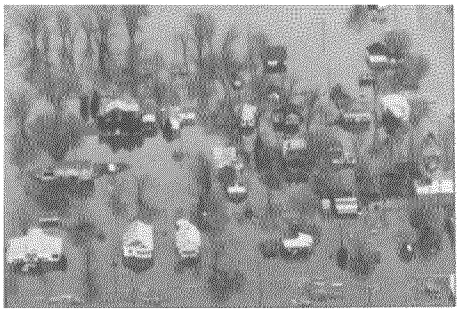


It has been estimated that 3 5 to 5 5 million acres of floodplain land had been developed for urban use by the late 1970s In many cases, this change has resulted in greatly altered river corridors and adjacent lands

Channel modification, Sioux City, Iowa



Source National Weather Service



Although there is no uniform measure of flood losses, flooding clearly constitutes the most pervasive and costly hazard facing the nation From 1965 to 1989, total assistance payments for Presidentially declared disasters amounted to almost $6 8 billion Of that, $5 2 billion was allocated for flood- and hurricane-related damage

Flooding, Prairie du Chien, Wisconsin, 1975