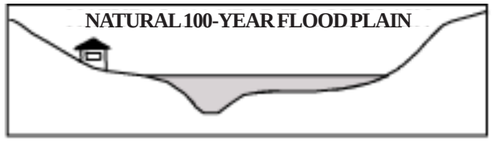
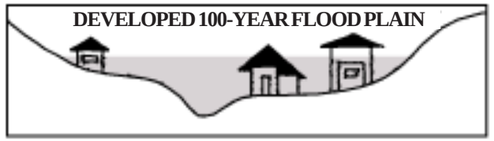
Flood and Land Management

Floods are inevitable. People and property will continue to be lost to flooding. However, there are steps that can be taken to reduce the loss.

- Floodplains should be respected. Instead of building houses and businesses in these areas, communities could use floodplains for parks and open space. To help ease the stress of a flood downstream, it is important that floodplains be allowed to flood.





BUILDING ON FLOOD PLAINS INCREASES THE RISK OF FLOOD HAZARDS

- Upstream wetlands should be protected or reconstructed, if necessary. During floods, wetlands act like huge sponges, absorbing flood water and holding it until the flood has subsided. They can help greatly to control the size of a flood.
- Vegetation buffers, patches of natural plant growth, along streams and rivers should be protected and restored. In addition to helping to control erosion, these help control floods by holding some of the water flowing into the waterways. And as an added benefit, they also absorb nutrients, such as nitrogen and phosphorus, and contaminants, such chemical pesticides, thereby protecting the quality of our water supply.

For More Information

"Special Issue on Flooding." *BioScience.* Vol. 48, No. 9, September 1998. The American Institute of Biological Sciences, 1444 I Street, NW, Suite 200, Washington, DC 20005. 202-628-1500. http://www.aibs.org.

The Ecological Society of America, 1707 H Street, NW, Suite 400, Washington DC 20006. 202-833-8773. esahq@esa.org; http://www.esa.org.

Federal Emergency Management Agency, 500 C Street, SW, Washington, DC 20472. 202-566-1600. http://www.fema.gov.

"Sharing the Challenge: Floodplain Management into the 21st Century." Interagency Floodplain Management Review Committee. 1994. United States Government Printing Office. http://www.gpo.gov.

"Higher Ground: Voluntary Property Buyouts in the Nation's Floodplains, A Common Ground Solution Serving People at Risk, Taxpayers and the Environment." National Wildlife Federation, Customer Services, 11100 Wildlife Center Drive, Reston, VA 20190-5362. 703-438-6000. http://www.nwf.org/floodplain/higherground/index.html.

USGS National Water Information Center. 1-800-ASK-USGS. http://water.usgs.gov/wrd005.html.

All photos: The Federal Emergency Management Agency

All graphics: U.S. Geological Survey

Prepared by the Ecological Society of America
1707 H Street, NW, Suite 400, Washington, DC 20006
phone 202-833-8773 · fax 202-833-8775
http://www.esa.org · esahq@esa.org
Fall 1998

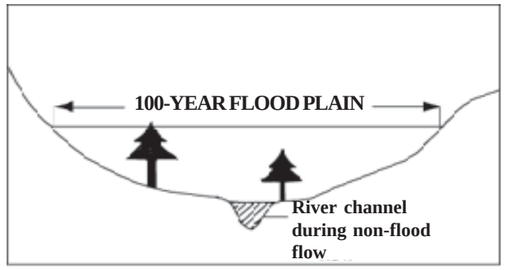
FLOODS

From Biblical accounts to modern-day disaster movies, humans have had a fear and fascination with floods. Few acts of nature match the power of floods. Some floods have been known to wash away entire cities. In the United States alone, the average annual cost of flood damage is more than $4 billion, with about 35 lives lost.

Ecological Society of America

Flooding 101: The Basics

Many natural occurrences can lead to floods. Most floods are very short-lived, relatively small, and are caused by storms that produce more water than waterways can handle. Rivers can also flood when dams fail, when ice jams or landslides temporarily block a channel, or when snow melts rapidly. In coastal areas, floods can also be caused by high waves and tides brought on by powerful marine storms.



FLOOD PLAINS NORMALLY ARE DRY

Floodplains are lands bordering rivers and streams that are normally dry but become covered with water during floods. By giving the excess water a place to go, floodplains help control the extent and severity of floods. Placing buildings and other structures in floodplains can be dangerous for two reasons: 1) the structures can be damaged by floods; and 2) by blocking the flow of water (thereby increasing the width, depth, or velocity of flood waters) such structures increase flooding and flood damage on adjacent property.

How Are Floods Measured?

The size of floods are measured on a "recurrence interval" system. After studying a waterway, scientists can estimate the probability that a flood of a certain size will occur. For instance, if research shows that there is a ten percent chance of a flood occurring on an annual basis, this flood would then be classified as a "10-year flood." If there is only a one percent chance of a flood occurring, this would be classified as a "100-year flood." Under this system, the larger the interval, the bigger the flood. The massive flooding that occurred in the Missouri and Mississippi rivers in 1993 was classified as a 100-year flood. However, that does not mean that a flood of this size cannot happen more frequently than once every 100 years.

Benefits Of Floods

Many people may not realize that floods, both large and small, play an important role in the functioning of ecosystems. Humans look at floods as disasters or catastrophes, something to be prevented, if possible. However, viewed from the perspective of natural systems, such occurrences are not only normal, they are also essential for survival.

Like a puzzle, there are many different pieces that make an ecosystem. Many ecosystems develop with regular flooding as one of the key components. If this natural flooding is inhibited by human influence, a crucial piece of the puzzle is removed, thereby changing the ecosystem.

For instance, scientists have discovered that many fish species depend on normal flooding to wash wood debris into the water, which they then use for shelter. Additionally, floods inundate wetland areas, creating critically important spawning and nursery sites for numerous fish species. Besides being beneficial to fish, floods provide important refuge and feeding areas for waterfowl and habitat for a wide variety of other game and non-game species. Floods also help to give many native species a “leg-up” on invasive species. Flood control on the Rio Grande River eliminated annual spring floods, reducing germination and survival of native cottonwoods and willows and creating favorable conditions for non-native trees. When researchers reintroduced spring floods to the river, they found that the native trees did much better.

Periodic floods also transport the eroded soil and other materials that are essential for delta areas and coastal marshes to persist over time. For example, the reduced flow of normal sediments in river waters as a result of levees and other flood control structures is resulting in the loss of more than 30 square miles per year of marsh and delta habitat along coastal Louisiana.

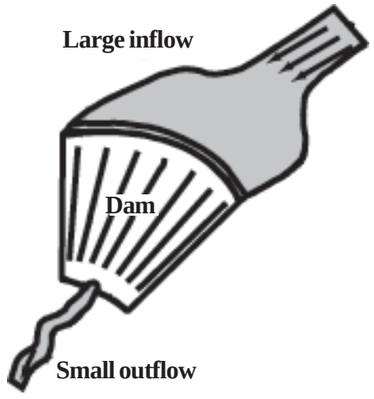
Managed Floods

While many people see floods as a force of destruction, scientists recognize that floods can be a force for restoration. Scientists use managed floods, the controlled flooding of a specific area, for restoration and for study. These floods can help bring ecosystems closer to their natural state and can teach scientists much about the effects of floods.

The lessons learned through research and observation of natural floods over the past decade have led to the use of managed floods as a restoration tool in many different ecosystems. For example, flows were reestablished in the Kissimmee River basin in Florida and seasonal flooding was reintroduced along portions of the Rio Grande in New Mexico.

In 1996, a very powerful managed flood was conducted on the Colorado River in Arizona. This flood gave scientists a rare opportunity to intensively study a strong flood. Follow-up research shows that the flood increased sand bars and improved backwater areas which provide important habitat for young fish. Additionally, the managed flood cut down the number of non-native fish.

Constructed Flood Control



Flood-control dams have been built on many streams and rivers to hold excess water and reduce flooding downstream. Although the same volume of water must eventually move down the river, the peak flow can be reduced by temporarily storing water and releasing it when river levels have fallen. Levees are artificial river banks built to control the spread of flood waters and to limit the amount of land inundated by floods. Levees provide protection from some floods but can be over-topped or eroded away by large floods.