will instead run off into rivers, overtaxing their
capacity. Areas considered safe a decade ago may
now be flood prone.

A direct relationship exists between the volume
of flood water and the height of flood water. Water
poured into a glass with ice in it will reach a higher
level than the same amount of water poured into
an empty glass. Similarly, when builders fill low-
lands to erect a structure or build a barrier near
a body of water, the area that water can flow into
is reduced because of these encroachments. When
a flood does occur, the water will rise to a higher
level in the new, smaller area.

This phenomenon was illustrated when, in 1973,
the city of St. Louis, Mo., located on the Missis-
sippi River, experienced its second highest flood
height even though it was only the seventh largest
flood volume. Development around the river
reduced the area available for the water to flow
into, causing a higher flood level.

A floodplain is the flat land or low land adjoin-
ing or extending from the channel of a river,
stream, ocean, lake or other body of water that may
have been or may be covered by floodwater. A
flood occurs when these bodies of water overflow
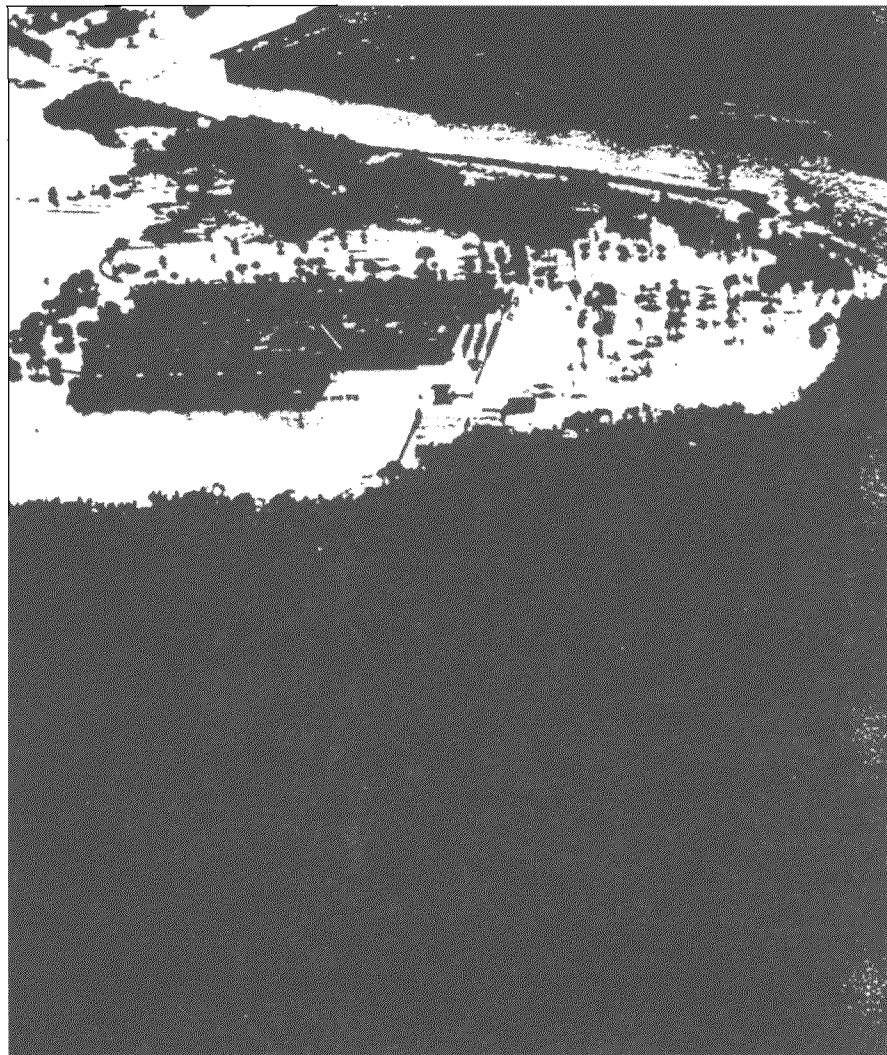or breach their boundaries.

Statistical probabilities

Flood severity is designated by its recurrence
interval—50 years, 100 years, 500 years, etc. The
greater the interval, the greater the severity of the
flood. There is, in many cases, a total misconcep-
tion that because a 100-year flood has already
occurred, you are safe for the next 99 years. This
couldn't be further from the truth! A 100-year
flood, although expected only once a century,
still has a 1 percent chance of occurring in any
one year.

Similarly, a 50-year flood would be expected
twice in a century, but there is a 2 percent chance
it will occur in any one year. And, a 50-year flood
will not necessarily occur at regular 50-year inter-
vals. For instance, a 50-year flood may not occur for
70 years, then it may occur several times in suc-
cessive months.

Still confused? Take out a coin. If you were to
call "heads" and flip the coin, you would have a
50-50 chance of it landing heads up each time. This
same probability is true for each coin toss, even
if you toss it 100 times, 500 times, etc. In fact, the
random nature is illustrated by the fact that you
may have to flip it 50 times before it lands heads
up, then it m ay land heads up every time after that.
Conversely, if it lands heads up 10 times in a row,
the chances are not at all reduced that the next
time you flip it, it will land heads up.

The 50-, 100- or 500-year flood designation
merely refers to the statistical average time
between floods of a specified severity. Probability
also tells us that while there is a 1 percent prob-
ability of the 100-year flood occurring each year, in
100 years, there is a 63.2 percent chance of having
the 100-year flood. In 200 years, there is a 63.2

▲
**Heavy rains over-
taxed the capacity of
the San Luis Rey
River in California,
causing it to breach
the dike protecting
this facility.**

percent chance of having the 200-year flood, and
in 500 years, a 63.2 percent chance of having the
500-year flood.

After assessing the chances of experiencing a
flood at a particular facility, determine what might
cause flooding and what steps to take to minimize
damage.

Causes

Heavy rain

Rain can cause rivers to overflow into the sur-
rounding floodplain. Large, long rivers such as the
Mississippi and Ohio in the U.S. and the Rhine
and the Danube in Europe, have extensive water-
sheds, i.e., many tributaries that feed into them.
On these rivers, it may be possible to predict the
arrival of a flood crest traveling downstream, in
some cases, flood notice of up to two weeks. Riv-
ers that don't have extensive watersheds will rise
rapidly with only a couple of hours notice at best.
These are known as flash floods. Once a flood-
plain such as the ones seen on the Mississippi
becomes inundated, flood conditions are likely to
continue for many days or even weeks, whereas a