

The "100-Year Flood"



Photo by Geff Hinds, Tacoma News Tribune

Flood designations are based on statistical averages, **not** on the number of years between big floods.

The estimates are only as good as the available data. Flood designations are updated as more data are collected or when the conditions change in a river basin.

Streamflow data that have been collected since 1975 on the Chehalis River near Doty indicate that the estimated streamflow of a "1-in-100 chance flood" is higher than it was 20 years ago.

The earlier flood designation was accurate on the basis of the data that were available at the time; more large floods happened after 1975 than from 1940-1975.

The change in the flood designation after 20 years of additional data collection highlights the importance of continued river monitoring.

Annual peak flow data for 1995 and 1996 are provisional and may change.

BIG FLOODS COULD HAPPEN AGAIN IN WASHINGTON DURING ANY YEAR

Rivers across the Nation seem to be rising to record flood levels almost every year. In Washington, more than one 100-year flood has happened on a few rivers in just the past several years. How can 100-year floods happen so often?

WHY DON'T THESE FLOODS HAPPEN EVERY 100 YEARS?

The term "100-year flood" is misleading because it leads people to believe that it happens only once every 100 years. The truth is that an uncommonly big flood can happen any year. The term "100-year flood" is really a statistical designation, and there is a **1-in-100 chance** that a flood this size will happen during any year. Perhaps a better term would be the "1-in-100 chance flood."

The actual number of years between floods of any given size varies a lot. Big floods happen irregularly because the climate naturally varies over many years. We sometimes get big floods in successive or nearly successive years with several very wet years in a row.

HOW ARE FLOODS DESIGNATED?

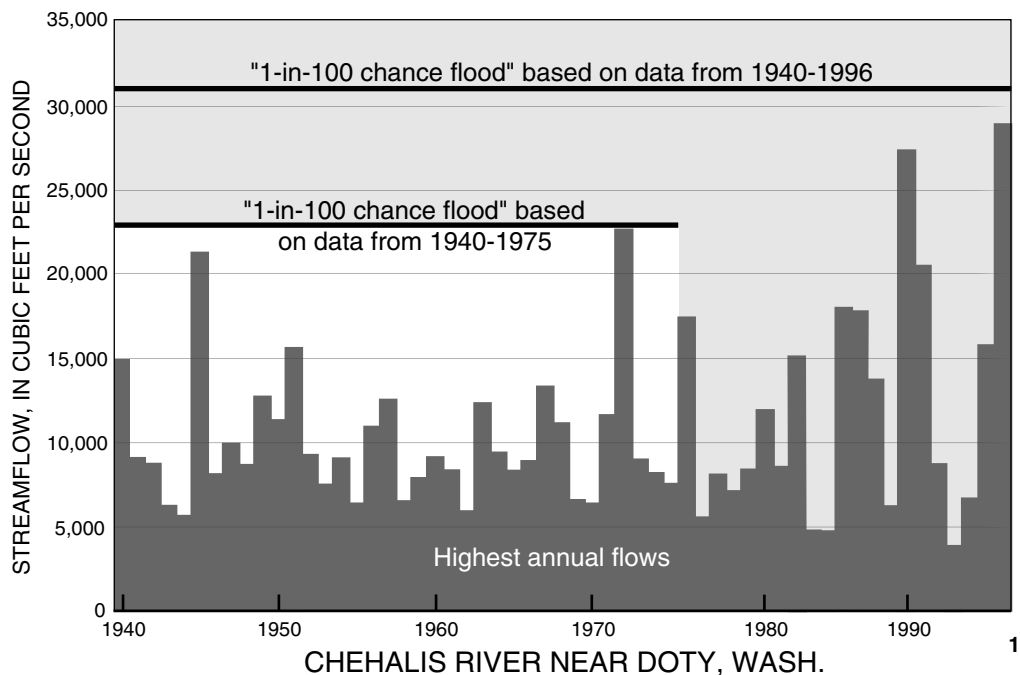
Scientists collect data and study past floods to get a minimum of 10 years of information about the river; a longer record provides a better estimate of the "1-in-100 chance flood." Scientists use statistics and observe how frequently different sizes of floods occurred, and the *average* number of years between them, to determine the probability that a flood of any given size will be equalled or exceeded during any year.

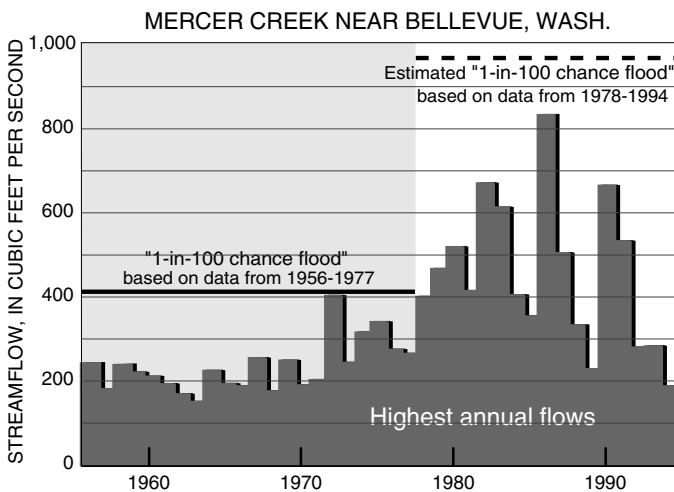
MANY FLOOD DESIGNATIONS WILL CHANGE OVER TIME

As more data are collected, or when a river basin is altered in a way that affects the flow of water in the river, scientists re-evaluate the frequency of flooding. Dams and urban development are examples of some man-made changes in a basin that affect floods.

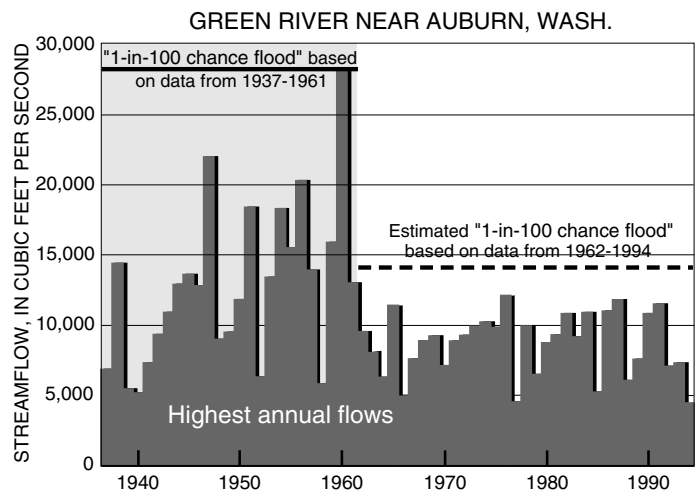
THE USGS COLLECTS ESSENTIAL DATA FOR UNDERSTANDING FLOODS

Scientists at the USGS measure streamflow in rivers across the State during every major flood. After flood waters recede, the USGS may be funded to locate





Rapid urban development in the Mercer Creek Basin since 1977 has increased the estimated magnitude of the "1-in-100 chance flood" at Bellevue, Wash.



The completion of Howard Hanson Dam on the Green River has decreased the magnitude of the "1-in-100 chance flood" at Auburn, Wash. since 1961.

and survey "high-water marks" where debris and mud lines indicate the highest extent of flood waters. These post-flood surveys are used to estimate maximum flows at sites that could not be reached during the floods and also to map the areas covered by the floods.

If you live on the designated floodplain, the chances are about 1 in 2 that you will experience a flood during your lifetime. Prepare for a flood as you would for any natural disaster, and make evacuation plans for your family.

--Karen Dinicola is a hydrologist with the USGS in Tacoma, Washington

DO YOU LIVE ON A FLOOD PLAIN?

The areas affected by past floods have been mapped by the Federal Emergency Management Agency and many other government agencies. Because of continuing changes in river channels and land use in many basins, the maps may not reflect current information for your area. Inquire at your City or County Building or Planning Department.

FLOODS WILL CONTINUE TO HAPPEN

Although we can lessen effects of some floods, they are part of the natural cycle of every river and benefit instream habitats by moving material downstream and renewing stream-beds. As floods get bigger and spread farther, flood waters slow and deposit sediment on the floodplain. This natural process created valuable farm-lands in river valleys of the Pacific Northwest over thousands of years.

The U.S. Geological Survey has served the public and Federal, State, and local governments since 1879 by collecting, analyzing, and publishing detailed information about the Nation's mineral, land, and water resources. The USGS has been studying the water resources of Washington State since the turn of the century. This information is in a variety of map, book, electronic, and other formats and is available by contacting:

U.S. Geological Survey
1201 Pacific Ave., #600
Tacoma WA 98402
(253) 428-3600
Fax: 428-3614

Selected data and interpretive reports are available on the USGS Washington "home page" on the World Wide Web at this URL --

<http://wa.water.usgs.gov>

Glossary of Flood Terms

A **flood** is any relatively high streamflow that overtops the natural or artificial banks of a river.

Discharge is another term for streamflow; it is the measured volume of water that moves past a point in the river in a given amount of time. Discharge is usually expressed in cubic feet per second.

One **cubic foot per second** (cfs) is about 450 gallons per minute. The average discharge of the Columbia River in September at The Dalles, Oregon, is about 120,000 cfs, which would fill the Seattle Kingdome in less than 10 minutes. The average discharge of the Puyallup River in September is about 1,700 cfs at Puyallup, Wash.

The **floodplain** is the relatively flat lowland that borders a river, usually dry but subject to flooding. Floodplain soils actually are former flood deposits.

The *average* number of years between floods of a certain size is the **recurrence interval** or **return period**. The *actual* number of years between floods of any given size varies a lot because of the naturally changing climate.

A **hydrograph** is a graph that shows changes in discharge or river stage over time. The time scale may be in minutes, hours, days, months, years, or decades.

The **river stage** is the height of the water in the river, measured relative to an arbitrary fixed point.