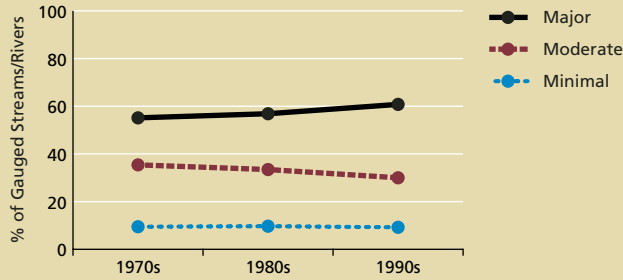




SYSTEM DIMENSIONS	CHEMICAL AND PHYSICAL	BIOLOGICAL COMPONENTS	HUMAN USES
Extent Pattern	Nutrients, Carbon, Oxygen Contaminants Physical	Plants and Animals Communities Ecological Productivity	Food, Fiber, and Water Recreation and Other Services

● Changing Stream Flows

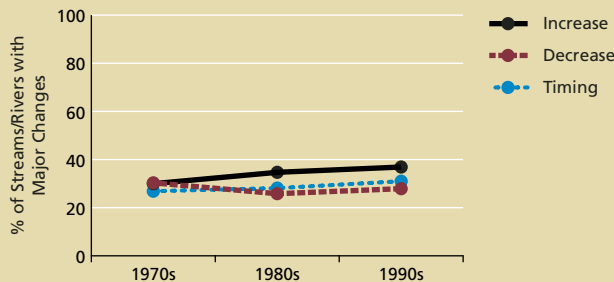
Alteration of Key Flow Characteristics (compared with 1930-1949)



Major: more than 75% increase or decrease in flow, or more than a 60-day change in timing of low or high flow
Moderate: between 25% and 75% increase or decrease in flow, or a 30- to 60-day change in timing of low or high flow
Minimal/stable: less than 25% increase or decrease in flow, or less than 30-day change in timing of low or high flow

Data Source: U.S. Geological Survey; analysis by Colorado State University. Coverage: lower 48 states.

Major Changes in Low Flow (compared with 1930-1949)

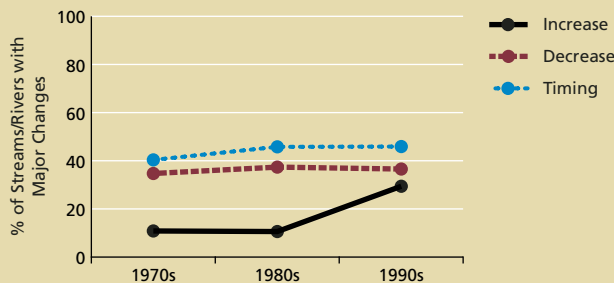


Low flow: Average annual 7-day low flow

Data Source: U.S. Geological Survey; analysis by Colorado State University. Coverage: lower 48 states.

Note: For the low-flow and high-flow graphs, totals may add to more than 100%, because both the timing and magnitude may change in a single stream or river.

Major Changes in High Flow (compared with 1930-1949)



High flow: Average annual 1-day high flow

Data Source: U.S. Geological Survey; analysis by Colorado State University. Coverage: lower 48 states.

Note: For the low-flow and high-flow graphs, totals may add to more than 100%, because both the timing and magnitude may change in a single stream or river.

What Is This Measure, and Why Is It Important?

This indicator describes changes in the amount and timing of river and stream flow by reporting the percentage of monitored streams or rivers with major, moderate, and minimal changes in low flow, high flow, and the timing of these two extreme events. The indicator also describes the nature of major flow changes. Flow characteristics were measured for three recent 10-year periods and compared against 1930–1949 as a reference period.

How a stream flows—the volume of its high and low flows, and when these extreme flows occur—is critical in determining what plants and animals live in the stream or river. For example, low flows define the smallest area the stream or rivers will occupy and thus the amount of fish habitat that will be available year-round; high flows shape the river channel and clear silt and debris; and some species require certain flows at specific periods, such as spawning season.

Changes in flow can be caused by dams; by pumping water for drinking, irrigation, or other uses; by groundwater pumping (which reduces flows into the stream); by changes in the type and amount of development and other land cover in the watershed; or by changes in long-term weather patterns, such as droughts or wet periods.

What Do the Data Show? The percentage of streams or rivers with major changes in the size of their highest or lowest flow, or in the timing of these flows, increased slightly from the 1970s to the 1990s. In addition, the number of streams or rivers whose high flows were well above those in the 1930–1949 reference period rose markedly from the 1980s to the 1990s.

The reference period used here included periods of relatively low rainfall, but it also predated much development activity (dam building, irrigation, etc.) that might affect flows. Therefore, it is more useful to focus this indicator on increases or decreases in the number of streams or rivers with major changes in flow, rather than on the actual number of streams or rivers with such changes. Finally, it is not possible to use these data to identify the cause of flow changes.

The technical note for this indicator is on page 249.