Relying on the streamflow characteristics from another region could lead to poor and inadequate design of facilities and structures. Thus, in order to understand and determine the regional differences in streamflow, data must be collected in all regions.

The second reason for regional streamflow information is that a critical need exists to develop techniques for estimating streamflow characteristics at ungaged sites. Because there are thousands of streams and rivers in the State, stream-gaging stations cannot be located everywhere. However, if streamflow information is collected from a select number of sites in a hydrologic region, and each of these sites has unique or different basin characteristics, techniques are available that can estimate streamflow characteristics at ungaged sites in a particular hydrologic region.

UTILIZING REGIONAL STREAMFLOW INFORMATION AT UNGAGED STREAMS AND RIVERS

Because there are so many streams in Alaska, streamflow data are collected on a relative small percentage of streams. However, one statistical technique, known as *multiple-regression analysis* can be very effective in determining streamflow characteristics at ungaged sites. In multiple-regression analysis, a mathematical equation is developed which relates flow characteristics, such as average discharge, to basin characteristics such as drainage area and precipitation. The resulting equations usually are referred to as *regional regression equations* because they can be applied to ungaged streams within a defined hydrologic area or region. For example, many of Alaska's highway bridges are designed on the basis of the flood that will be exceeded on the average of once in 50 years. Regional regression equations can provide the necessary information so that a bridge across an ungaged river can be designed in a safe and cost-effective manner. Unfortunately, in many areas of Alaska, sufficient streamflow information does not exist to develop these equations.

A PLAN TO OBTAIN REGIONAL STREAMFLOW INFORMATION IN ALASKA

In cooperation with the Alaska Department of Natural Resources, the U.S. Geological Survey has completed a study that has focused on the regional streamflow network of Alaska. Results from this study include a plan to establish new stream-gaging stations at sites in each hydrologic region of Alaska where data are most needed. Obtaining streamflow information at these new sites would provide a better understanding of the hydrology of each region, as well as provide a data base sufficient to develop regional regression equations.

The collection of streamflow data is an investment in the future. The future needs are seldom known precisely, and are often impossible to anticipate. However, past experience in Alaska and elsewhere has shown that streamflow information can provide a basis for the efficient and effective use and management of water for current and future generations.

ABOUT THE U.S. GEOLOGICAL SURVEY

The USGS provides maps, reports, and information to help others meet their needs to manage, develop, and protect America's water, energy, mineral, and land resources. Many agencies and organizations involved in water-resources projects benefit from the data provided by the USGS stream-gaging program. The USGS continues to be committed to the collection and dissemination of high-quality streamflow data as a critical part of its overall mission of providing earth science in the public interest.

For further information please write to:

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http://www-h2o-ak.usgs.gov

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DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

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REGIONAL STREAMFLOW INFORMATION IN ALASKA — AN INVESTMENT IN THE FUTURE

Alaska covers more than 580,000 square miles or about 20 percent of the area of the conterminous United States. Unique features of Alaska are its wide ranges in climate and land cover. Average annual precipitation ranges from less than 5 inches in the Arctic to more than 320 inches in the Southeast. Much of this precipitation occurs as snow. Average annual air temperature ranges from 10° F in the Arctic to 45° F in the Southeast. The land cover of Alaska ranges from tundra in the Arctic to maritime rain forest in the Southeast.

Alaska has tens of thousands of streams and rivers. Seven of the State's rivers are among the 20 largest in the United States. Of the estimated 30,000 streams and rivers in Alaska, more than 15,000 have been formally identified as supporting salmon and other fish species.

WHAT IS STREAMFLOW INFORMATION?

Streamflow is the volume of water that passes a given point in a given period of time. This volume of water per unit time is commonly known as *discharge*. Discharge is commonly expressed in cubic feet per second (cfs).

HOW IS STREAMFLOW INFORMATION OBTAINED?

The discharge of a stream or river is obtained by measuring the *depth* and *width* of a stream or river and its *velocity* (speed at which water travels). The *area* (depth multiplied by the width) multiplied by the velocity gives the discharge (volume of water per unit of time) that passes a given stream cross section.

At some locations along a stream, continuous measurements of water level are collected. The continuous water-level records along with the discharge measurements are used to create a rating table (a chart showing the relation of water level to discharge) for a stream. Rating tables are used to estimate the discharge of the stream by using only the water-level records. The advantage of having a rating table for a stream is that once the water level is known, the discharge can be estimated without having to go to the stream and make a discharge measurement.

WHO USES STREAMFLOW INFORMATION AND WHY IS IT IMPORTANT?

Streamflow information is used extensively by the general public and by Federal, State, and local agencies to make a wide variety of decisions. For example, a recreational user may want to know whether river conditions are safe for a river-rafting trip. The National Weather Service uses streamflow information to forecast flow on major rivers and streams, especially during floods.

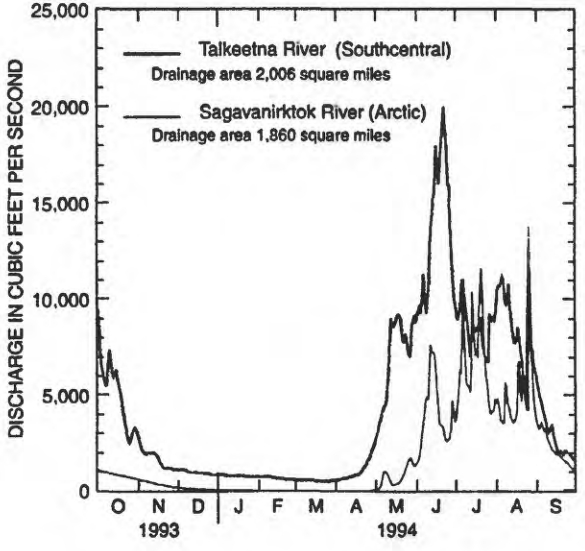
By obtaining streamflow information on a year-round basis, various flow statistics can be determined. Some of the more common flow statistics are average flow for the year, the highest or peak discharge, and the lowest discharge. These statistics are then used in a variety of water-resources design and management functions. For example, if a village needs a water-supply system, low-flow streamflow data are used to properly design a storage facility. If a highway bridge is needed to cross a waterway, peak-flow information can facilitate a safe and adequate design. If an ecosystem appears to be stressed, streamflow information may provide some clues as to the cause of the stress.

WHAT IS REGIONAL STREAMFLOW INFORMATION?

Streamflow information collected from a number of stream-gaging stations in a particular area is referred to as *regional streamflow information*. Alaska has six hydrologic regions: (1) Arctic, where the rivers flow from the Brooks Range northward into the Arctic Ocean; (2) Northwest, where the rivers flow westward into Kotzebue and Norton Sounds; (3) Yukon, the largest hydrologic region, which consists of all the streams and rivers that flow into the Yukon River; (4) Southcentral, which consists primarily of the Copper and Susitna Rivers, the streams of Prince William Sound, and the streams of the Kenai Peninsula; (5) Southeast, which consists of hundreds of small islands; and (6) Southwest, which consists of the Aleutian Islands, the Kuskokwim River, and the streams and rivers that flow into Bristol Bay, the most productive salmon area of Alaska. The climate, landforms, and other features differ from one hydrologic region to the next.

WHY IS REGIONAL STREAMFLOW INFORMATION NEEDED IN ALASKA?

Regional streamflow information is needed in Alaska for two major reasons. First, because each hydrologic region of Alaska has unique streamflow characteristics, it cannot be assumed, for example, that the low-flow, high-flow, or mean-flow characteristics of streams and rivers in Southcentral Alaska are representative of those in Arctic Alaska. In Arctic Alaska, flow generally does not occur in winter, whereas in Southcentral, a sustained flow is present throughout the winter months. Also, streams in Southcentral generally have higher discharges than those in Arctic Alaska.



These differences in regional streamflow are important for many reasons. For example, if additional petroleum development were to occur in the Arctic, knowledge of the low-flow characteristics in this region would be important in designing an adequate water-supply system. Similarly, knowledge of the peak-flow characteristics would be important in designing structures such as bridges or culverts.