USGS
science for a changing world

Streamgages–Measuring the Pulse of our Nation's Rivers

What is a Streamgage?

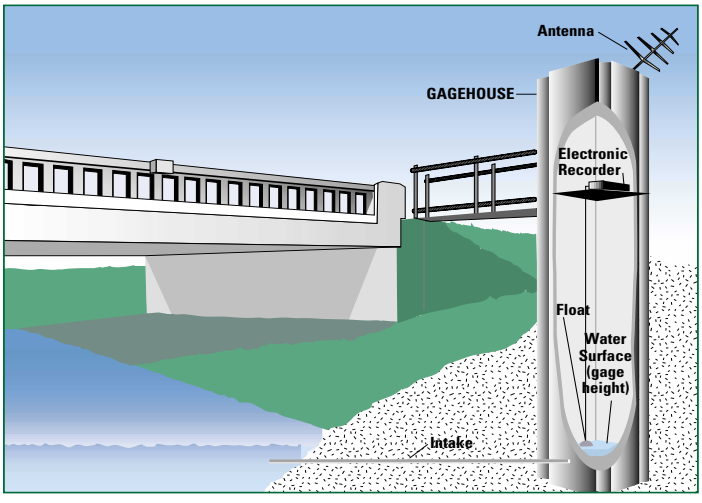
Information on the flow of rivers is a vital national asset that safeguards lives, protects property, and ensures adequate water supplies for the future. The U.S. Geological Survey (USGS) operates a network of about 7,000 streamgages nationwide.

A streamgage is a structure located beside a river that contains a device to measure and record the water level in the river. Generally, these measurements occur automatically every 15 minutes, and at about 5,000 of these streamgages the data are sent via satellite back to a USGS office once every 4 hours, and more frequently in times of flooding. There, USGS computers use a site-specific "rating curve" to convert the water-level (or "gage-height") data into information about the flow of the river (measured in cubic feet per second). To keep the rating curve accurate and up-to-date, USGS hydrologic technicians visit each streamgage about once every 6 weeks to measure the flow directly.

The flow and gage-height data are then made available to users over the Internet (http://water.usgs.gov/nwis/). Users access data for immediate use and in data sets that describe the average conditions, long-term variations, and trends in flow.

Good Planning & Good Decisions Depend on Good Information

Families, communities, and businesses need information about rivers in their areas to help them make good decisions.



- County or city planners need to know what area should be zoned as flood plain so that families and businesses will not build in locations that are vulnerable to floods.
- Families and businesses need warnings of impending floods to help them decide about evacuating and to decide about moving valuables (heirlooms, furniture, cars, boats, appliances) out of harm's way.
- Communities need information to plan for their future water supplies.
- Communities and farmers need information about river conditions to help them develop strategies to help them through a drought.
- State and county highway departments need information so they can design adequate bridges, culverts, and roadways that will function safely during floods.
- Watershed organizations and regulatory agencies need river-flow information (along with water-quality data) to develop cost-effective plans to improve and protect water quality.
- Families planning to canoe, kayak, or fish need information to avoid unsafe river conditions and to preclude costly trips to remote river locations when conditions are not suitable for recreation.

Information at Risk

The streamgaging network is operated as a partnership between the USGS and over 800 Federal, State, tribal, and local agencies. This partnership has great value but has been showing significant instability in recent years. There is widespread agreement among stakeholders that a new shared plan is needed to reverse the loss of streamgages and to provide for a stable and modern system for the future.

What are the Issues?

- Streamflow forecasts for the Nation are produced by the National Weather Service. These forecasts depend on 1) weather data, 2) weather forecasts, 3) river forecast models, and 4) streamflow data. Losses in funding at the USGS and many partner agencies have resulted in the loss of about 300 streamgages that are critical to the NWS forecasts. This has compromised their ability to provide many communities with the accurate and timely streamflow forecasts and flood warnings they need.
- During the 1990s, many long-term streamgages were discontinued due to lack of funding. These streamgages (with records of 30 years or more) are of great value to planning and to the scientific study of variations and trends in flow. On average, each year of the decade saw a net loss of about 70 of these important streamgages.
- Increased stresses on the Nation's water resources have increased the need for streamflow information. At the same time, advances in technology (e.g. satellite telemetry, the Internet, acoustic measurement methods) have increased the potential usefulness of streamflow information. In spite of these trends the network of streamgages has been shrinking and the pace of modernization of the technology has been slow. To achieve its true potential, the network needs to be fully modernized and gaps in coverage need to be filled.

A Shared Plan

The National Streamflow Information Program (NSIP) provides a plan to reverse the losses of crucial streamgages and to provide for a stable and modern system for the future. The USGS is working with the Interstate Council on Water Policy and a wide range of partners and users of the information to come to agreement on a shared plan for the future.

Core NSIP Streamgages to be fully USGS funded	
Existing USGS Streamgages	2,791
Old USGS streamgages to be reactivated	867
Streamgages operated by other agencies	278
New streamgages needed	485
Total number of streamgages in design	**4,421**

Lives at Risk

The instability in funding for streamgages means that sometimes the search for funding partners is unsuccessful, and critical needs go unmet, as was the case along the Licking River in Kentucky in 1997. The consequence was lives and property put at risk and lost from floodwaters in Falmouth, KY. The river crested higher and earlier than the National Weather Service had predicted. The NWS underestimated the flood danger because their forecasts did not have critical information from a USGS streamgage upriver, which had ceased to operate 3 years earlier because a funding partner could not be found. "Without that gage," said Mark Callahan, NWS, Louisville, KY, "we were blind."

The NSIP plan calls for a carefully designed core of streamgages that would be fully funded by the USGS, along with a much larger set of streamgages funded through partnerships to provide the breadth and depth of coverage needed by the ever-growing user community.

The plan also identifies these needs:

- Add real-time satellite reporting capability at about 1,700 streamgages.
- Flood harden about 3,000 streamgages.
- Build backup computer and communication systems to improve system reliability.
- Replace satellite radios in all streamgages with newer high-transmission rate radios to increase data throughput.
- Enhance accessibility and form of data provided to users.
- Research and development on methods of data collection and analysis.
- Special data-collection efforts for flood and drought emergencies.

Is Progress being made towards NSIP Plan Goals?

Yes; increased federal appropriations in FY 2000 and FY 2001 will resulted in:

37 new streamgages built and operating
73 streamgages reactivated and operating
127 streamgages modernized
15 streamgages flood hardened

FOR MORE INFORMATION:

For additional information on USGS water programs in each State, please see http://water.usgs.gov. For current information on progress towards the plans for the National Streamflow Information Program, please go to http://water.usgs.gov/nsip or contact:

J. Michael Norris
U.S. Geological Survey
National Center, MS 415
12201 Sunrise Valley Drive
Reston, Virginia 20192
mnorris@usgs.gov
(703) 648-5301