U.S. Department of the Interior
U.S. Geological Survey

USGS
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Reporting of Real Time River Levels in Massachusetts and Rhode Island

In times of floods and droughts, immediate access to river level data is important to officials charged with the responsibilities of protecting lives and property by taking actions to diminish the adverse effects of the emergency. The U.S. Geological Survey (USGS), in cooperation with many Federal, State, and local agencies, is the Nation's principal collector of accurate and unbiased streamflow data, and thus is the agency emergency officials rely on to provide the needed river data. The USGS operates and maintains more than 7,000 continuous-record streamflow-gaging stations on rivers in the United States; 84 of these stations are in Massachusetts and Rhode Island (see fig. 1). The river levels are recorded every 15 minutes at most of the stations; the river level data are then converted to streamflow data. Recorders equipped with telemetry (satellite radios or telephone modems) can provide almost immediate access to vital river levels.

Why monitor river levels?

The U.S.Army Corps of Engineers uses river levels to monitor rivers and regulate dams to control flooding. The National Weather Service uses river levels to issue flood warnings. State and local agencies rely on USGS river levels to monitor water uses such as those for water supplies and sewage-treatment plants, to develop regulations regarding water uses, and to ensure that river levels do not decline below certain levels as a result of use. Environmentalists, fishermen, boaters, and white-water rafters make use of river levels for the status of the rivers.

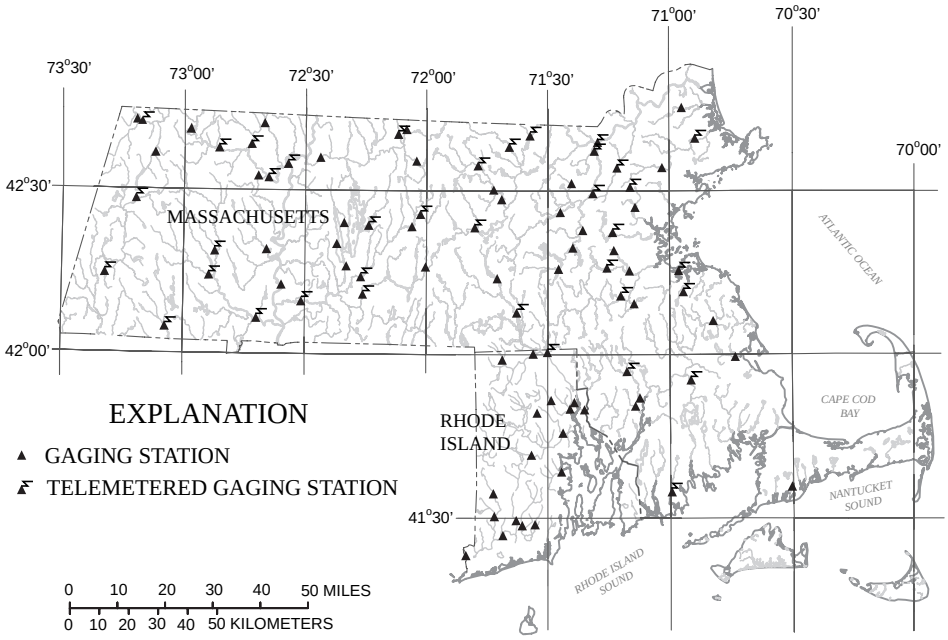

Figure 1. Locations of streamflow gaging stations in Massachusetts and Rhode Island.

Real-Time Reporting

Transmitting data to other locations by satellite radio or by telephone, almost instantaneously in times of emergency, is one of the most valuable features of a USGS streamflow station. Figure 2 illustrates how the signal containing data at a USGS streamflow station equipped with a radio is sent from the station to a satellite, to a ground receiving station, and, finally, to a USGS computer that processes the data. Alternatively, the data are transmitted directly to the USGS computer or the station is called by telephone. Figure 3 shows the telemetry attached to a USGS streamflow station. Of the streamflow stations currently (1997) being operated in Massachusetts and Rhode Island, 36 are equipped with instruments that transmit river levels by radio or telephone, usually every 4 hours ("real-time" data). River levels converted to streamflow data from 25 stations in Massachusetts and Rhode Island are then posted automatically on the USGS World Wide Web (web) site. Figure 4 shows how river levels at the Charles River, in Waltham, Massachusetts, as reported every 4 hours in "real time" by satellite radio changed in response to the flood of October 1996.

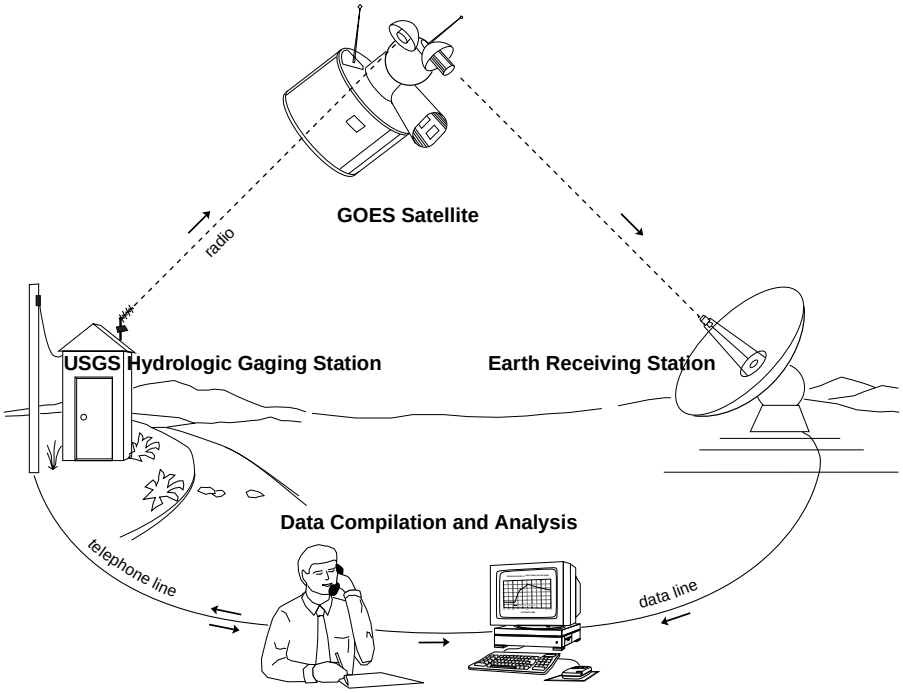

Figure 2. Satellite and telephone data transmissions from a streamflow station to a USGS computer.

Figure 3. Streamflow station Nashua River at East Pepperell, MA, with mast for antenna, rain gage, and solar panel.

Official Telephone Reporting

When a radio cannot be used to transmit from a streamflow station because of the interference of trees, buildings, or mountains within the line of sight of the satellite, needed data may be retrieved by telephone. Ten streamflow stations in Massachusetts and Rhode Island are equipped solely with telephone modems; an additional 14 stations are equipped with telephone modems and satellite radios. With a telephone, officials at USGS, Corps of Engineers, National Weather Service, and Federal, State, or local flood emergency agencies can determine what the level of the river is at the time the call is made, at any time of day or night. If needed, the telephone message can provide the level of the river, the flow rate, and even what the river level was a few hours earlier, so the rate at which the river level is changing can be determined.

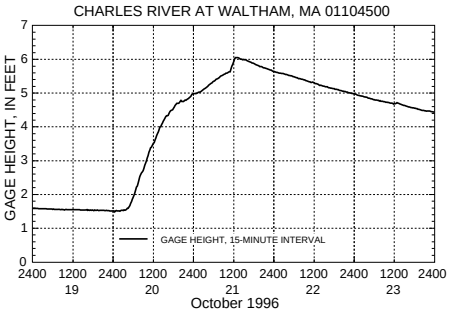

Figure 4. River level changes at streamflow station Charles River at Waltham, MA, responding to the flood of October 1996, as reported every 4 hours in "real time" by satellite radio.

On-Demand Reporting

For rivers that rise rapidly, flood warnings based on data 4- to 6-hours old may not be timely enough. The same recorder that transmits data every 4 hours also can be programmed to report more frequently, especially when rivers approach flood (or drought) levels. "On demand" data may be just a few minutes old when it is available to officials. Instruments with telephone modems also can be programmed to call specified phone numbers with warnings when the river is approaching unusually high or low levels.

USGS Public Web Site

Current data for 25 of the real-time reporting stations are presently available on the USGS web site. Historical streamflow records and ground-water data also are available at this web site. The address of the web site is:

http://mass1.er.usgs.gov

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