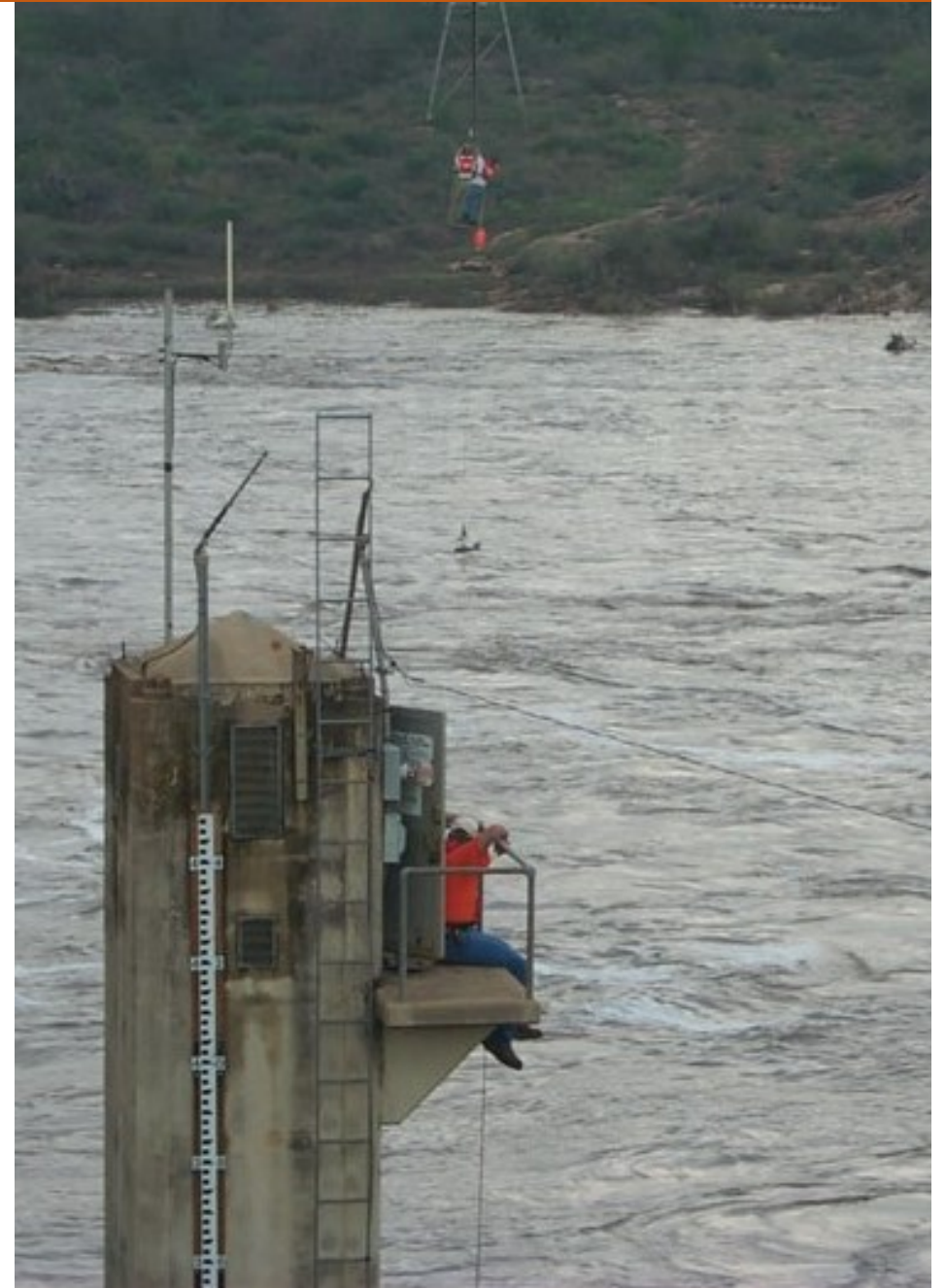
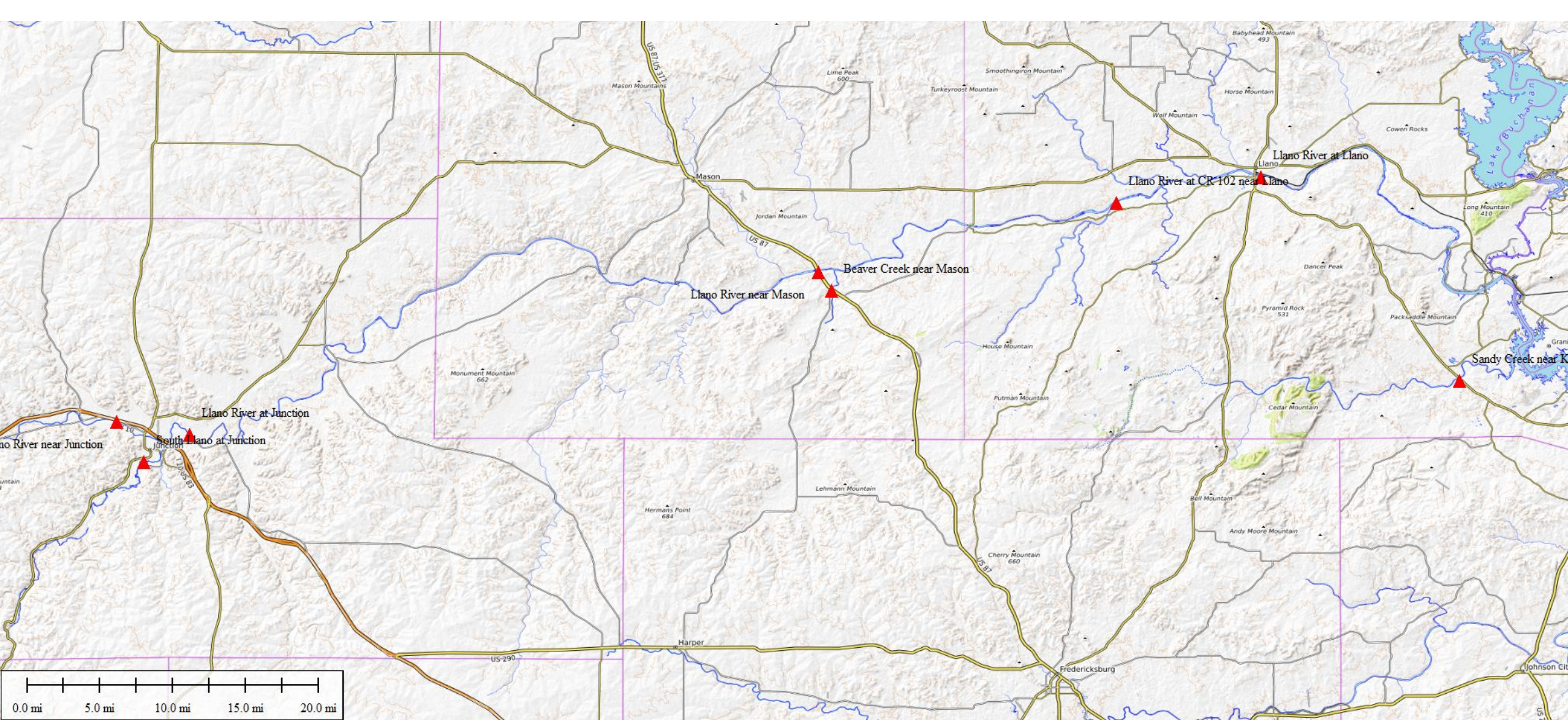


USGS Llano River Streamgaging During the Oct 2018 Flood

- USGS Streamflow Gaging Network
- How Streamflow Gages Work
- USGS Activities During the Flood Event
- Comparison of 2018 Flood and other historic Llano River Floods
- Accessing USGS Streamflow Data





USGS Streamflow Gaging Stations on the Llano River

The USGS Streamgaging Network

Streamflow Gaging Stations

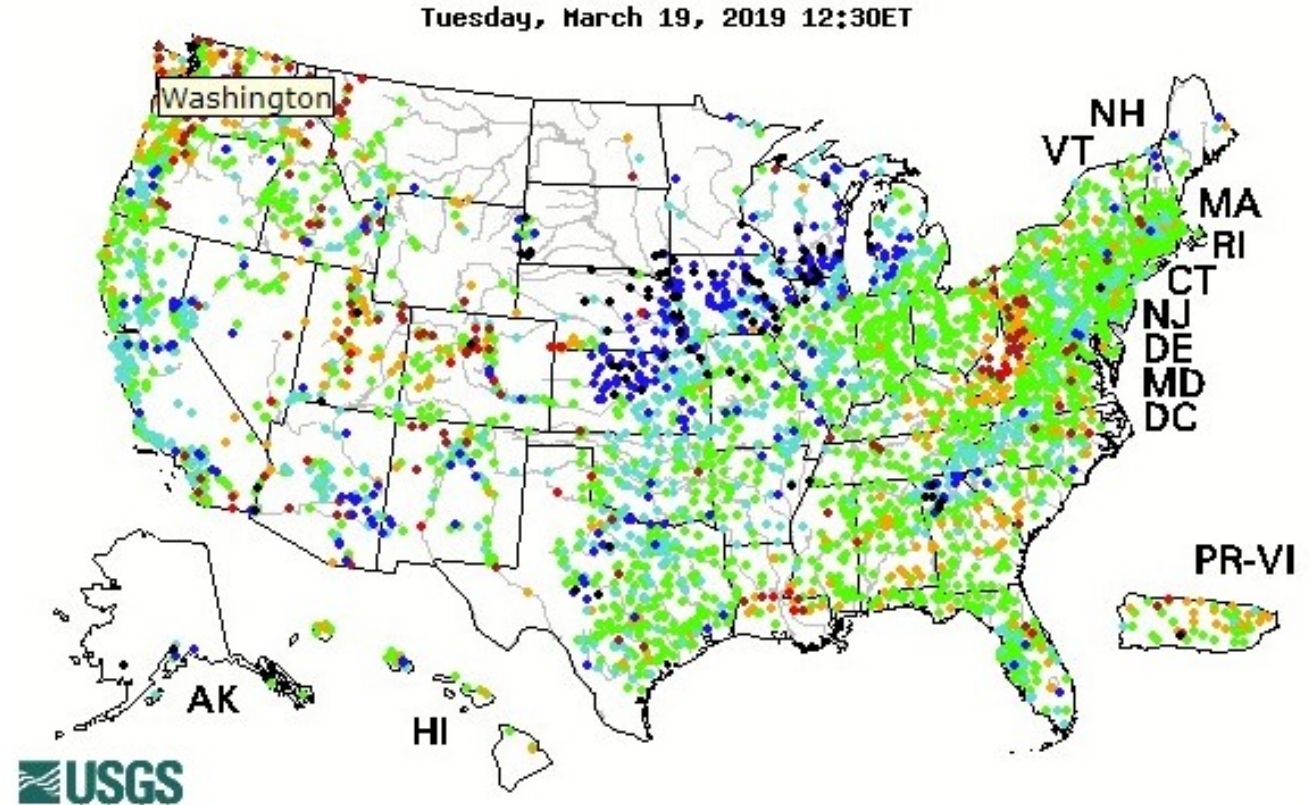
9,000 gages
99 % real-time
All on web

Network Costs

\$190M per year
850+ Partners

Funding Sources

State / Local Agencies	\$94M	49%
Other Federal Agencies	\$34M	18%
USGS Cooperative Program	\$30M	16%
USGS Nat Streamflow Info Program	\$34M	18%



USGS Streamgaging Program



- Nationally consistent methods and comparable data.
- All USGS data undergoes QA/QC review and is freely available in the form of historic data, real-time basic data, and extracted statistics.
- Data collection requires frequent in-situ calibration and is somewhat people intensive.
- Many partners contribute funding
- Streamgaging program has experienced an influx of technological innovation

Uses of Streamflow Information

Real-time

- Forecast/Monitor Floods and Droughts
- Operate/Regulate Facilities (dams, reservoirs, treatment plants)
- Monitor Ecosystem Needs
- Allocate Water Resources/Water Rights
- Plan Recreational Activities

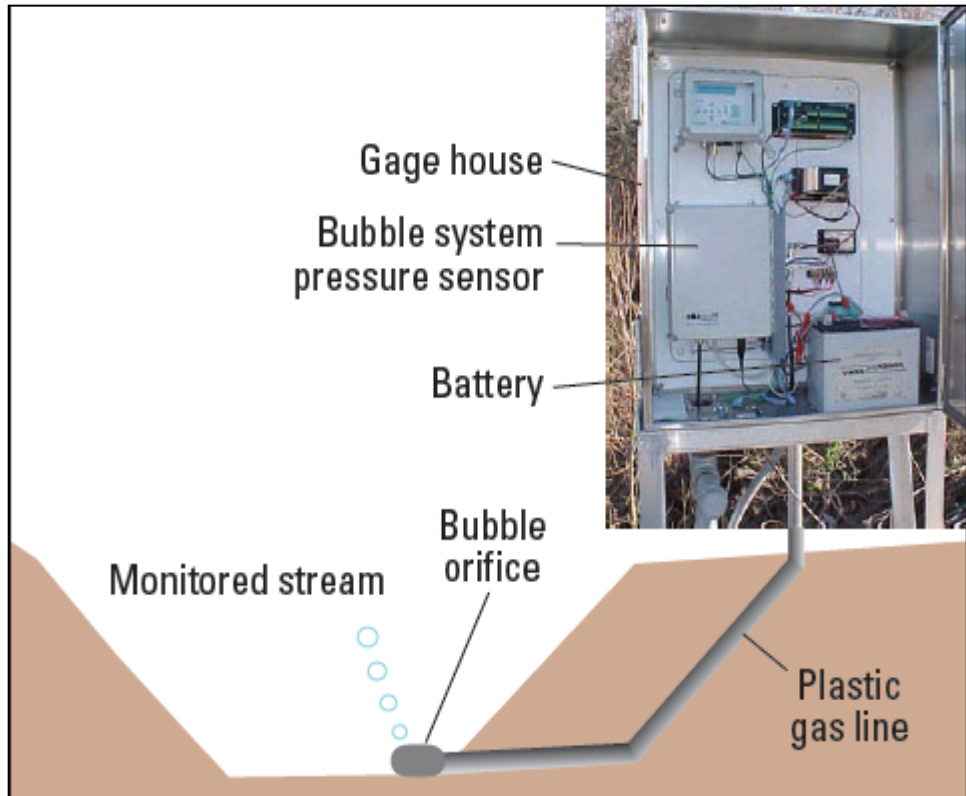
Long-term

- Design Infrastructure (bridges, dams, etc.)
- Appraise Water Availability
- Characterize Water Quality and Habitat
- Delineate Floodplains (1% flood)
- Develop Regional “Predictive” Equations for Flood and Drought
- Monitor Long-Term Streamflow Trends

How a Streamgaging Station Works

Two primary types of information we want from a streamgaging station:

- Water Surface Elevation – Stage
- Flow Rate – Discharge, or Streamflow



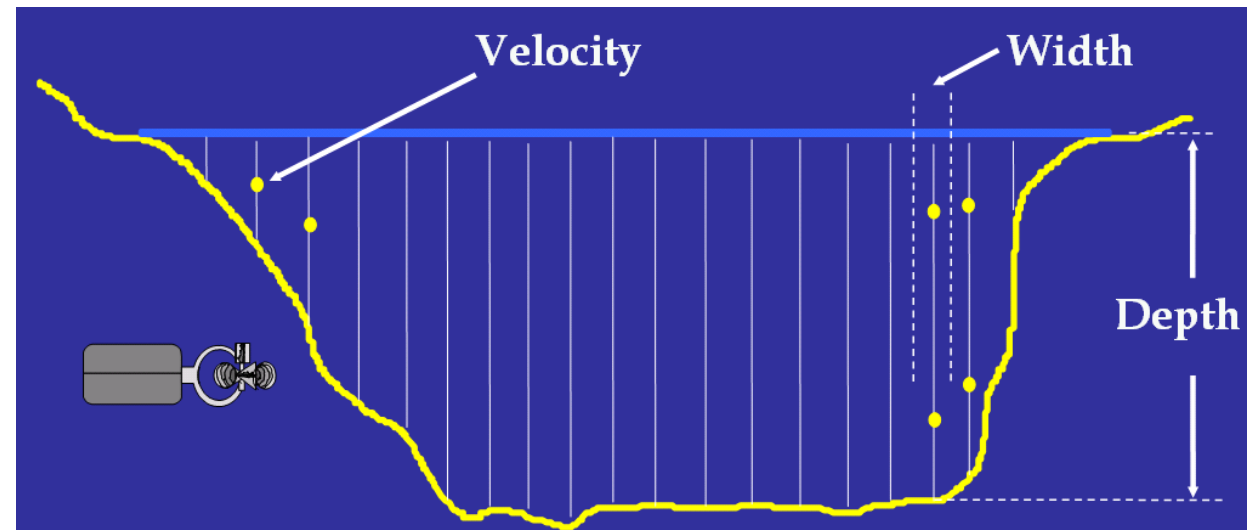
Llano River at CR 102

Stage Measurement with Gas-Bubbler System

How a Streamgage Works

Discharge Measurements

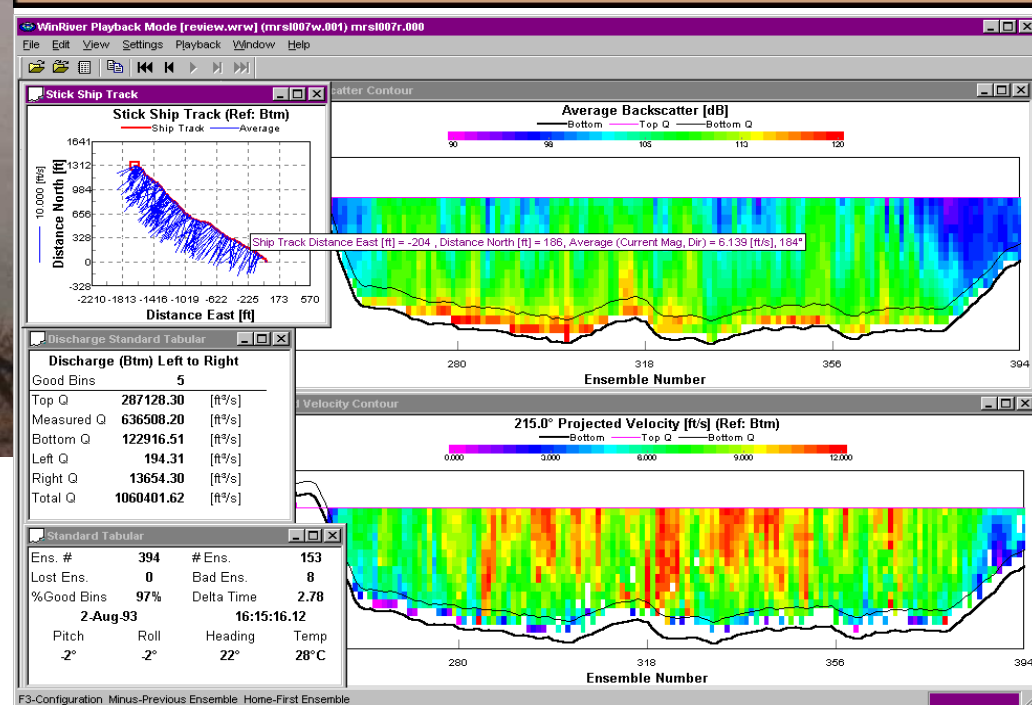
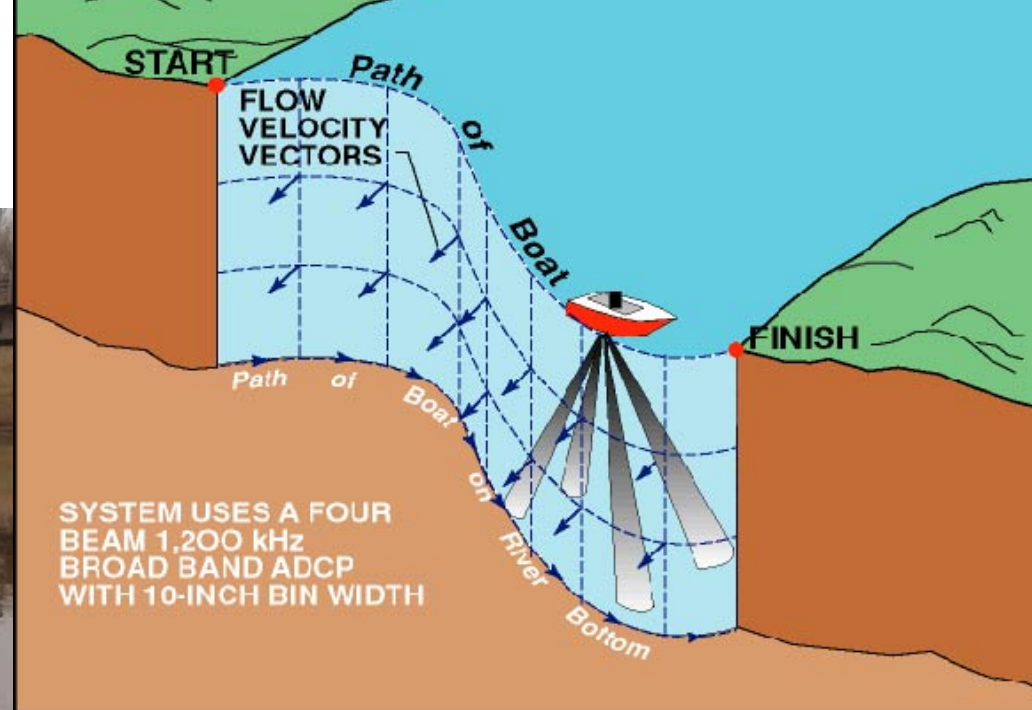
- Most Streamgages don't measure discharge directly
- Periodic field visits are made to manually measure discharge.
- Measurements can be made by wading a stream and making a collection of depth and water velocity measurements across a cross section of the stream.
- For deeper, faster rivers, measurements can be made from boats, or from bridges, or cableways.



Cableway Measurement
USGS Gaging Station
Llano River at Llano
Oct 24, 2000

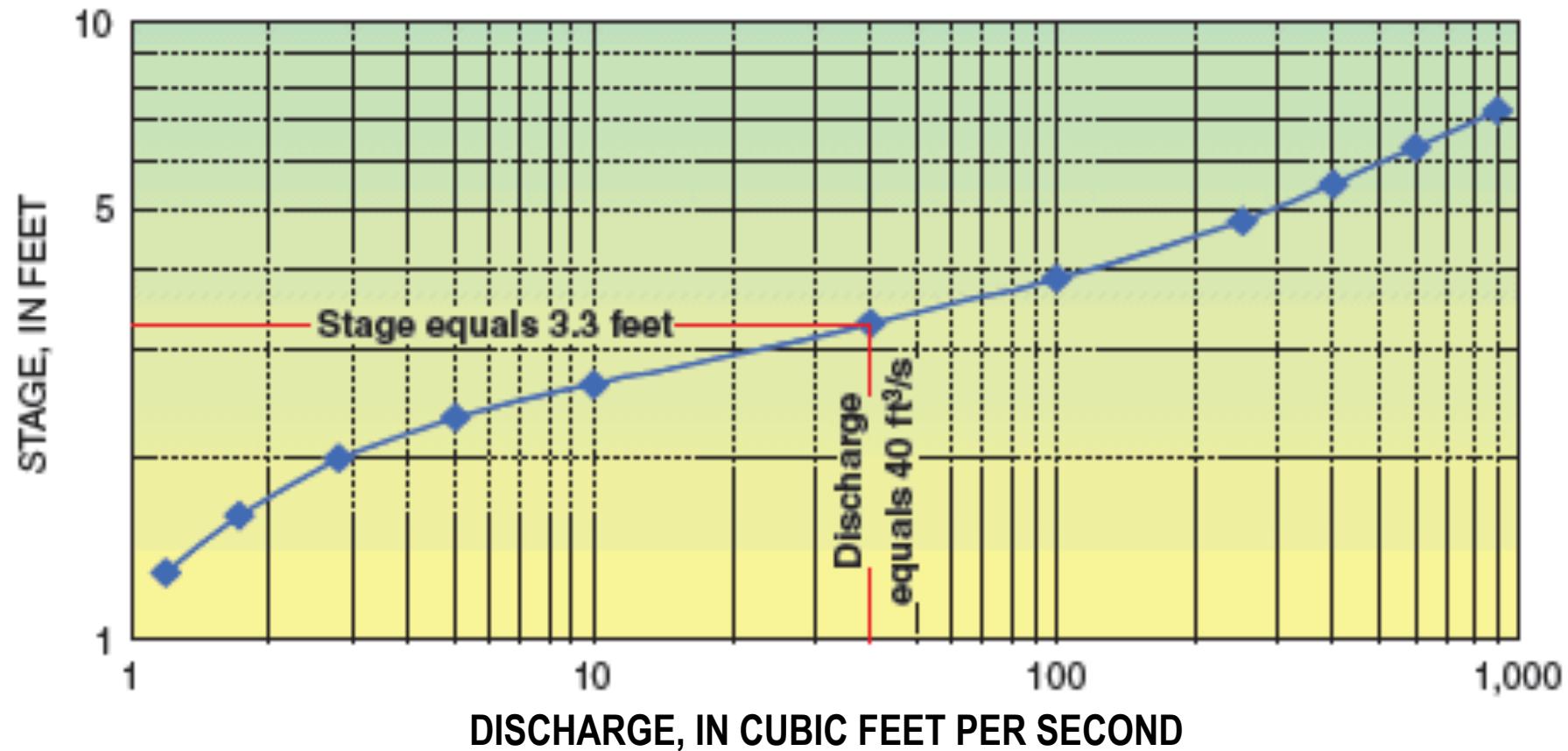
59,200 cfs
18.80 ft





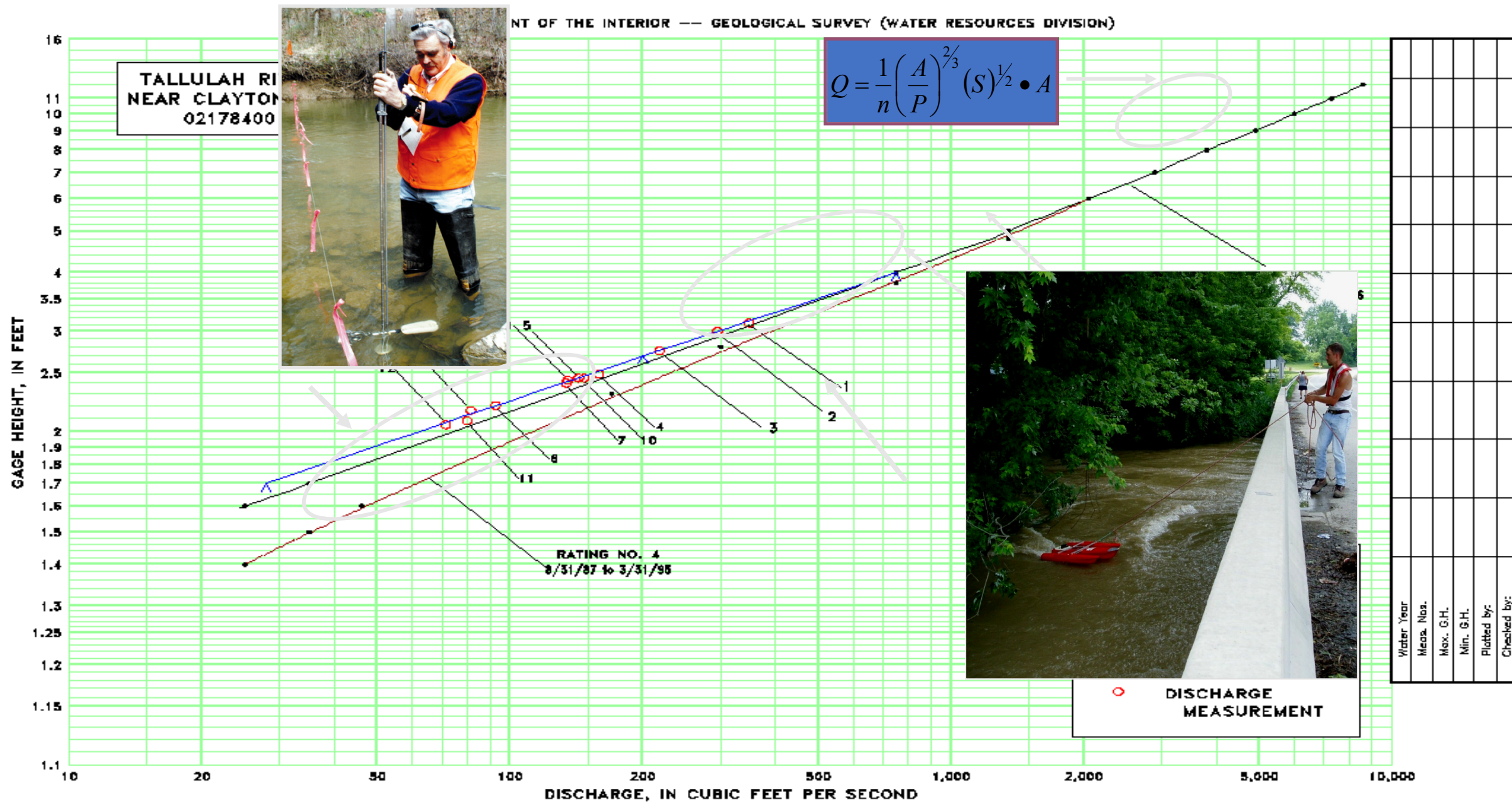
Discharge Measurement using Acoustic Doppler Current Profiler

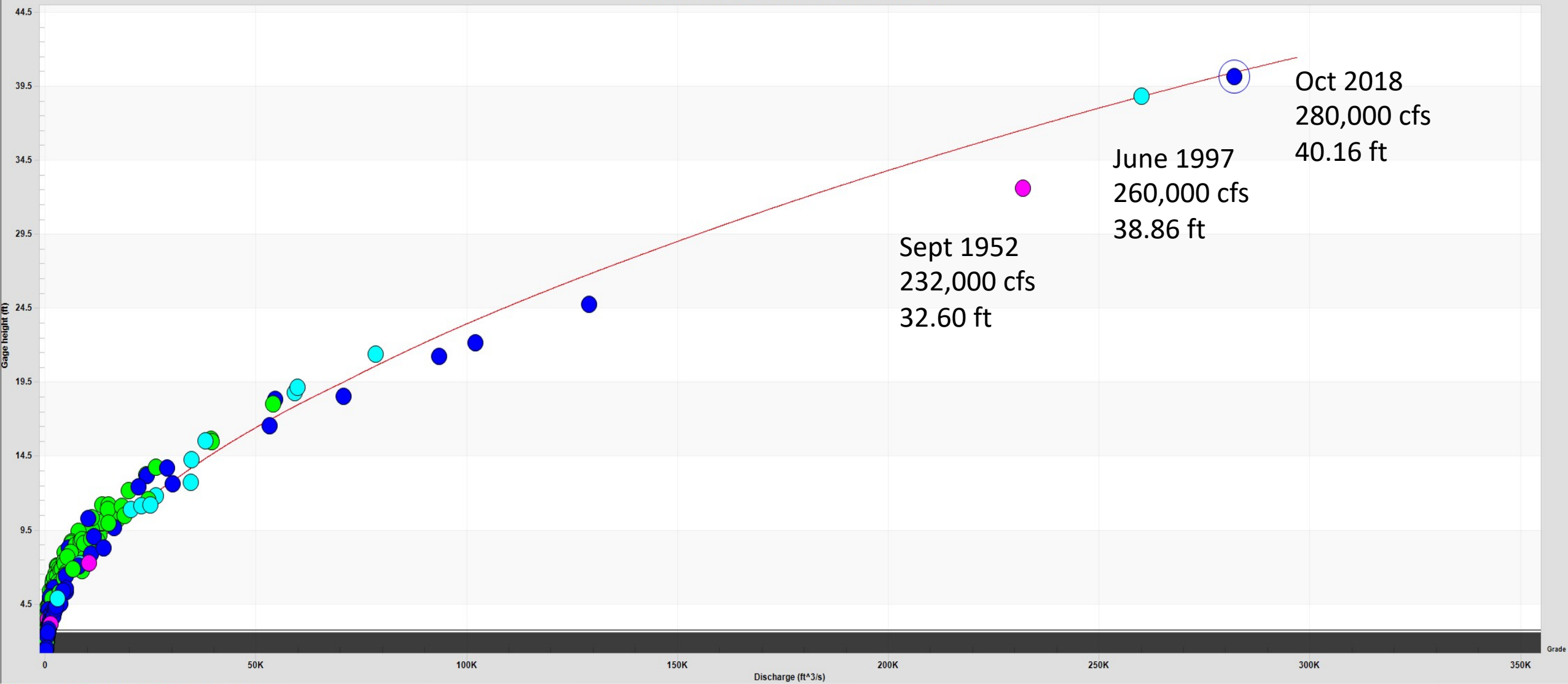
Converting Stage Information to Streamflow



Example of a typical stage-discharge relation; here, the discharge of the river is 40 cubic feet per second (ft^3/s) when the stage is 3.30 feet (ft). The dots on the curve represent concurrent measurement of stage and discharge.

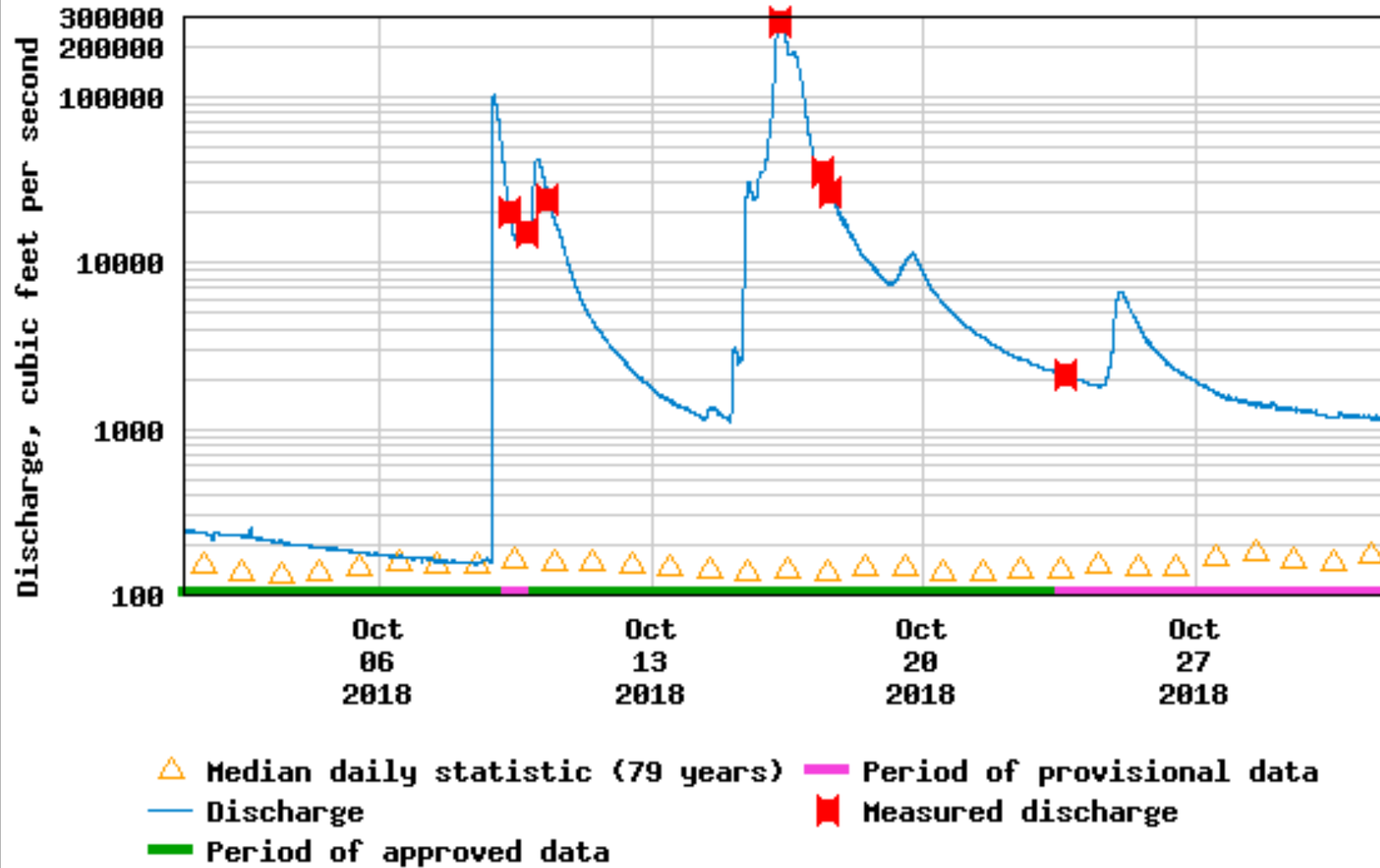
Streamflow Ratings





Stage-Discharge Rating
Llano River at Llano

USGS 08151500 Llano Rv at Llano, TX



Llano River Streamflow Hydrograph, October 2016

Summary of USGS Discharge Measurements in the Llano River basin during Oct 2018

23 Discharge Measurements at 6 stations

Indirect discharge measurements at Llano River at Llano and Llano River at Mason

Aerial Drone Stream Velocity measurement at Llano River at Mason

Installation of temporary (then permanent) gaging station at Llano River at Highway 102

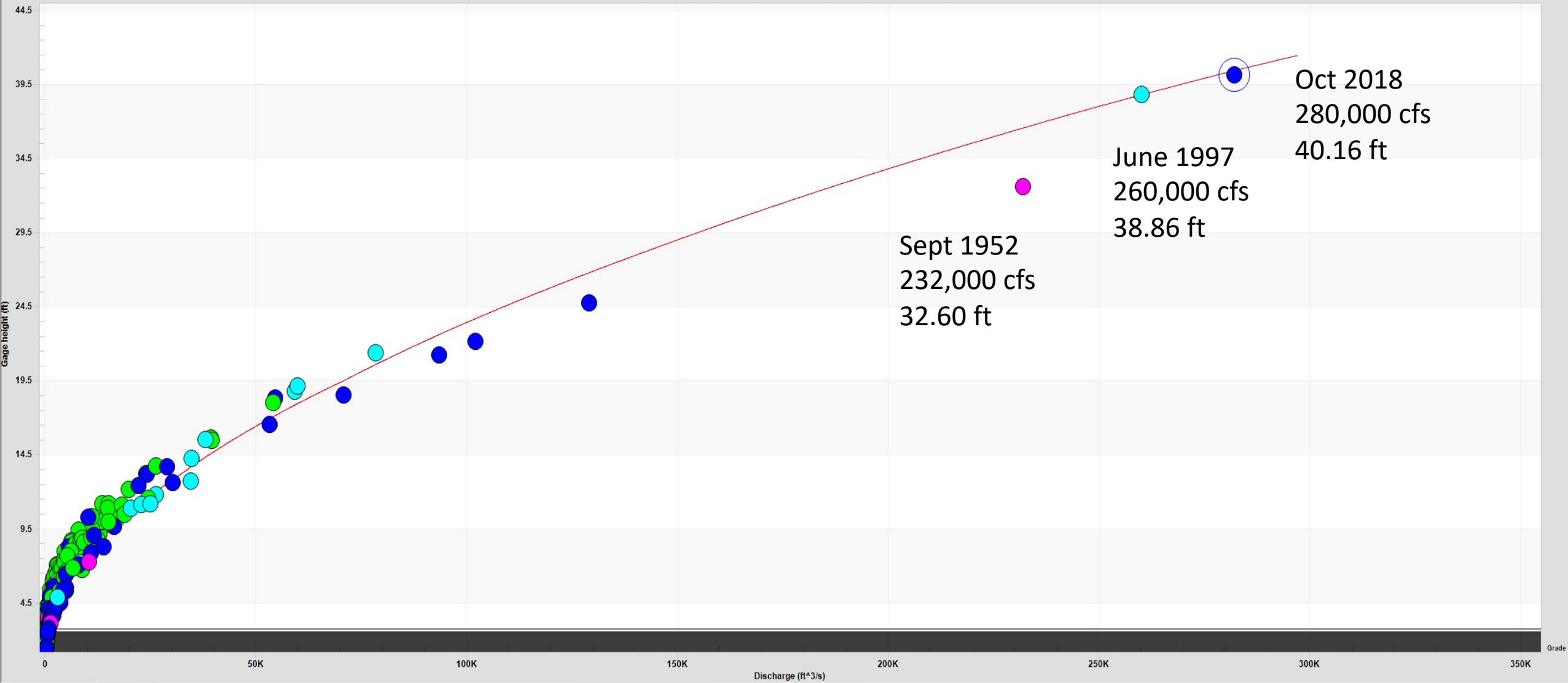
Additional measurements in November and December to redefine stage-discharge ratings after the flood



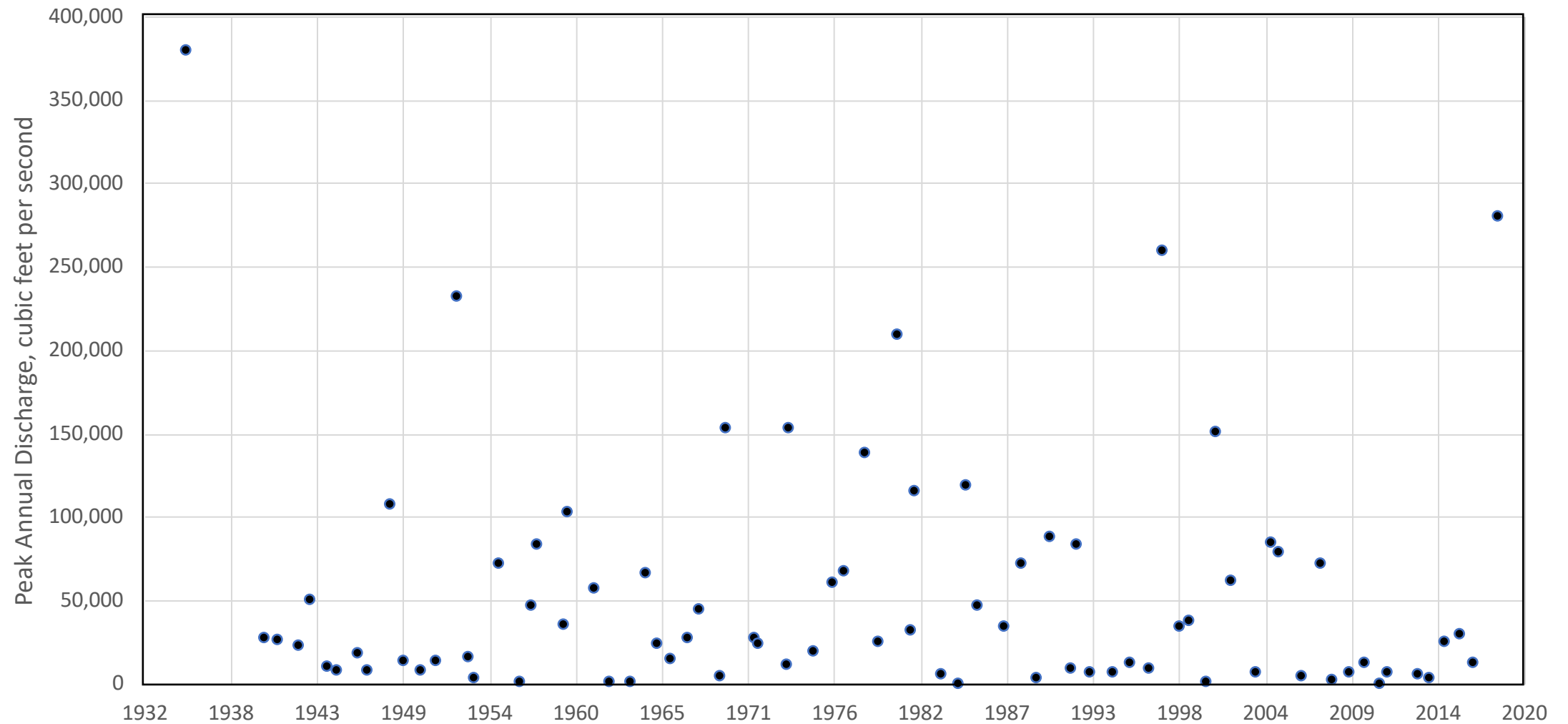




 **USGS**
science for a changing world



Stage-Discharge Rating
Llano River at Llano



Annual Peak Discharge, Llano River at Llano, Texas, 1935--2018

Texas Water Dashboard



Twitter Layers

Legend 5

USGS Streams: Status

Remove

All-Time Low for this Day	0 th percentile (minimum)
Much Below Normal	<10 th percentile
Below Normal	10 th - 24 th percentile
Normal	25 th - 75 th percentile
Above Normal	76 th - 90 th percentile
Much Above Normal	>90 th percentile
All-Time High for this Day	100 th percentile (maximum)
Not Flowing	0 cubic feet per second
Above NWS Flood Stage	See Comments
Not Ranked	See Comments

Comments: Marker color indicates the current streamflow condition. Categories are based on the percentile of existing streamflow record on this day-of-the-year. A streamgage is not ranked when there is less than 20 years of record or a current streamflow measurement is unavailable. Flood stages are maintained by the National Weather Service (NWS) and are not established for all USGS streamgages.

Data Source: USGS Water Data for the Nation

Click points to access real-time data, time-series graphs, and station information.

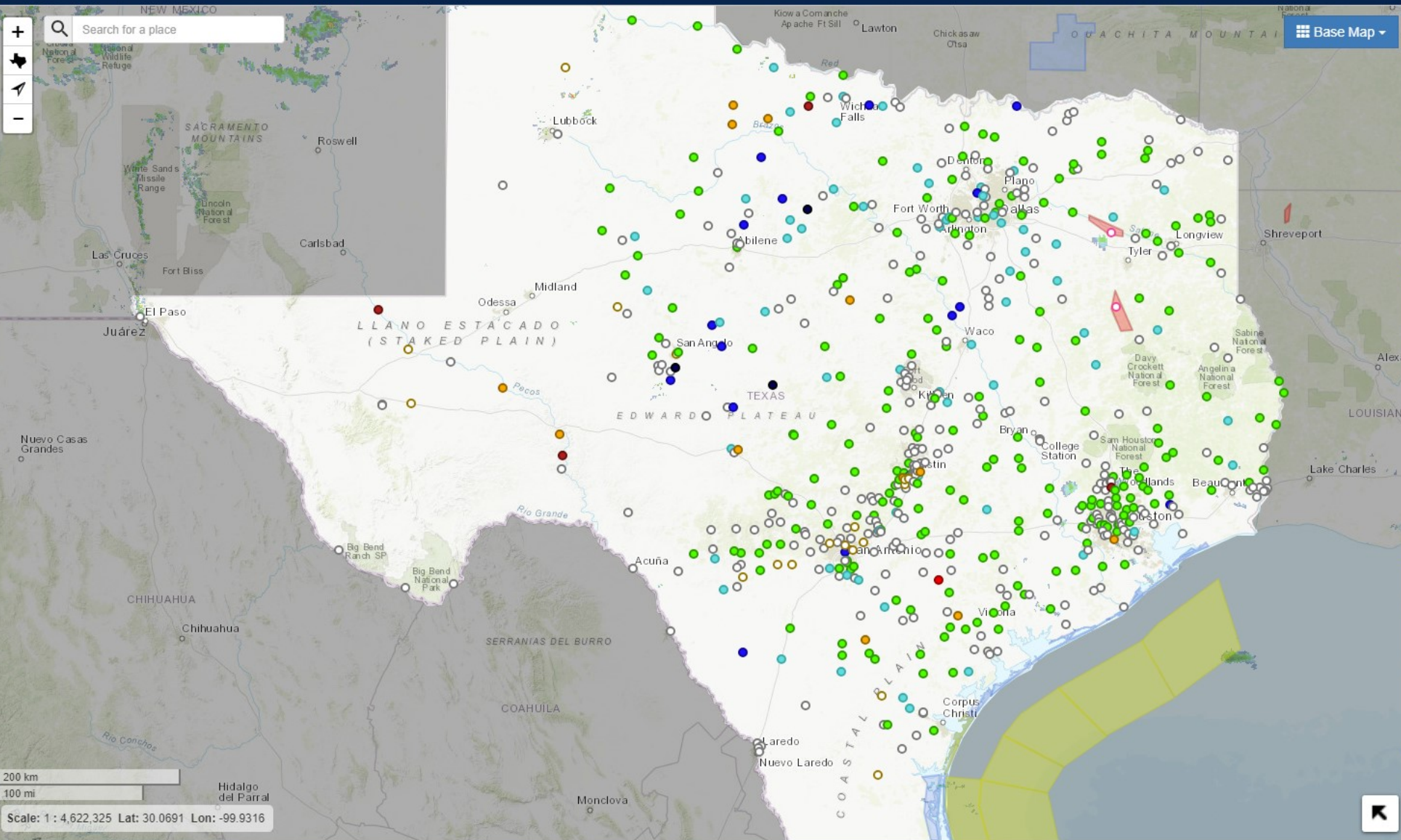
Watches, Warnings, and Advisories

Remove

Clear Map

River Report

About



Questions?

