



U.S. Geological Survey- Streamflow Measurement 2011

Aroscott Whiteman
Hydrologist
406-457-5911
whiteman@usgs.gov

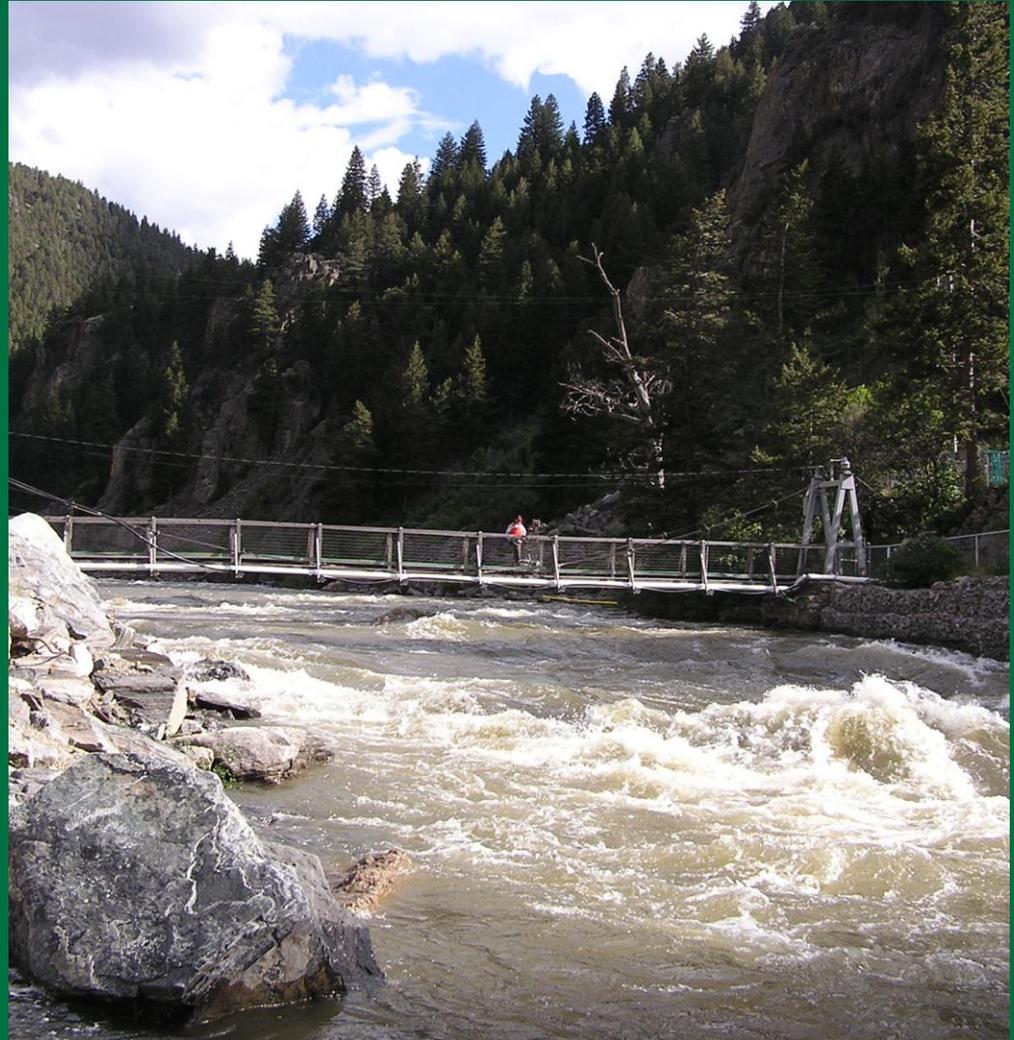
Overview

- Streamgaging Network
- 2011 Peak Streamflows
- Crest-Stage Gage Program



Surface-Water Stations

- 237 Gaging Stations
 - 164 Full Year Stations
 - 73 Seasonal Stations
- 97 Crest-Stage Gages

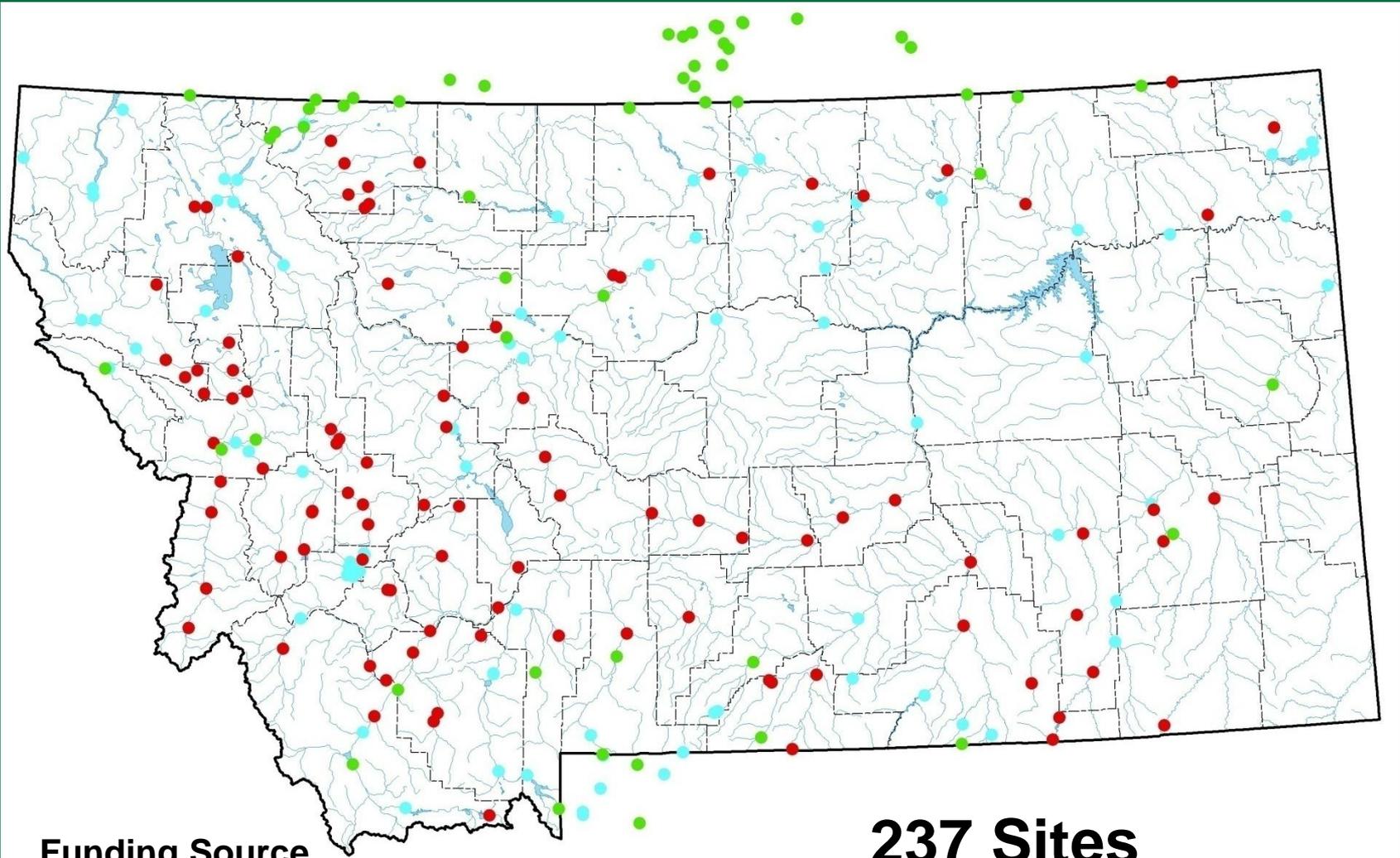


Cooperators with the USGS Streamgaging Network

- USGS National Streamflow Information Program
- 12 Other Federal Agencies
- 17 State, Local, and Tribal
- 2 Private



Active Streamgages



Funding Source

- USGS
- Other Federal Agencies
- State and Local Agencies

http://mt.water.usgs.gov

Real-time data

Historical data

Flood frequency

Recent studies

USGS
science for a changing world

Montana Water Science Center

home information/data projects publications droughtwatch contact eRAS internal

Water Resources of Montana

Tuesday, August 28, 2012 15:30ET

Welcome to the U.S. Geological Survey (USGS) Web site for the water resources of Montana. Here you'll find information on Montana lakes, rivers, and streams. The USGS operates the most extensive satellite network of stream-gaging stations in the State, many of which form the backbone of flood-warning systems.

The USGS provides current ("real-time") stream stage and [streamflow](#), [water-quality](#), and [groundwater levels](#) for over 200 sites in Montana. Sign up for our [WaterAlert service](#) if you'd like to receive e-mail or text messages when parameters measured continuously at USGS data-collection stations (streamflow for example) exceed levels you define.

Quick Link to Real-Time Data

Enter a USGS site number:

View site list: [SW](#) | [GW](#) | [WQ](#)

DATA CENTER

Real-time data

- Streamflow
- Groundwater
- Water quality
- Lake/Reservoir
- Monthly Conditions Report

Historical data

- Streamflow
- Groundwater
- Water quality
- Annual Data Reports
- Data Archive (IDA) for Montana
- Current & Discontinued Stations

WaterWatch

- Floods | Droughts
- Current conditions
- Montana Flood Frequency and Basin-Characteristic Data
- Groundwater

Groundwater networks

- Active Water Levels
- Climate response

MONTANA PROJECTS

- Williston and Powder River Basins GWA
- Tongue River Monitoring
- Clark Fork Monitoring
- Dial Metal Outlets

USGS Montana Highlights

Travel Times, Streamflow Velocities, and Dispersion Rates in the Missouri River Upstream from Canyon Ferry Lake, Montana

In 2010, the U.S. Geological Survey, in cooperation with the Montana Department of Environmental Quality, initiated a dye-tracer study to determine travel times, streamflow velocities, and longitudinal dispersion rates for the Missouri River upstream from Canyon Ferry Lake. For this study, rhodamine WT (RWT) dye was injected at two locations, Missouri River Headwaters State Park in early September and Broadwater-Missouri Dam (Broadwater Dam) in late August 2010. Dye concentrations were measured at three sites downstream from each dye-injection location. The study area was a 41.2-mile reach of the Missouri River from Trident, Montana, at the confluence of the Jefferson, Madison, and Gallatin Rivers (Missouri River Headwaters) at river mile 2,319.40 downstream to the U.S. Route 12 Bridge (Townsend Bridge), river mile 2,278.23, near Townsend, Montana.

Calculated velocities for the centroid of the dye plume ranged from 0.80 to 3.02 feet per second within the study reach from Missouri River Headwaters to Townsend Bridge, near Townsend. The mean velocity of the dye plume for the entire study reach, excluding the subreach between the

Current streamflow conditions

Low Normal High

Monthly Conditions Report

STREAMFLOWS MOSTLY BELOW NORMAL TO NORMAL AND RESERVOIR CONTENTS MOSTLY NORMAL FOR THE MONTH OF JULY IN MONTANA.

Monthly mean streamflows were below normal at three of eight long-term U.S. Geological Survey gaging stations in Montana, normal at three gaging stations, and above normal at two gaging stations for the month of July.

Monthly mean streamflow was below normal at:

- Rock Creek below Horse Creek, near international boundary
- Yellowstone River at Corwin Springs
- Yellowstone River at Billings

Streamflows were normal at:

- Blackfoot River near Bonner
- Clark Fork at St. Regis
- Marias River near Shelby

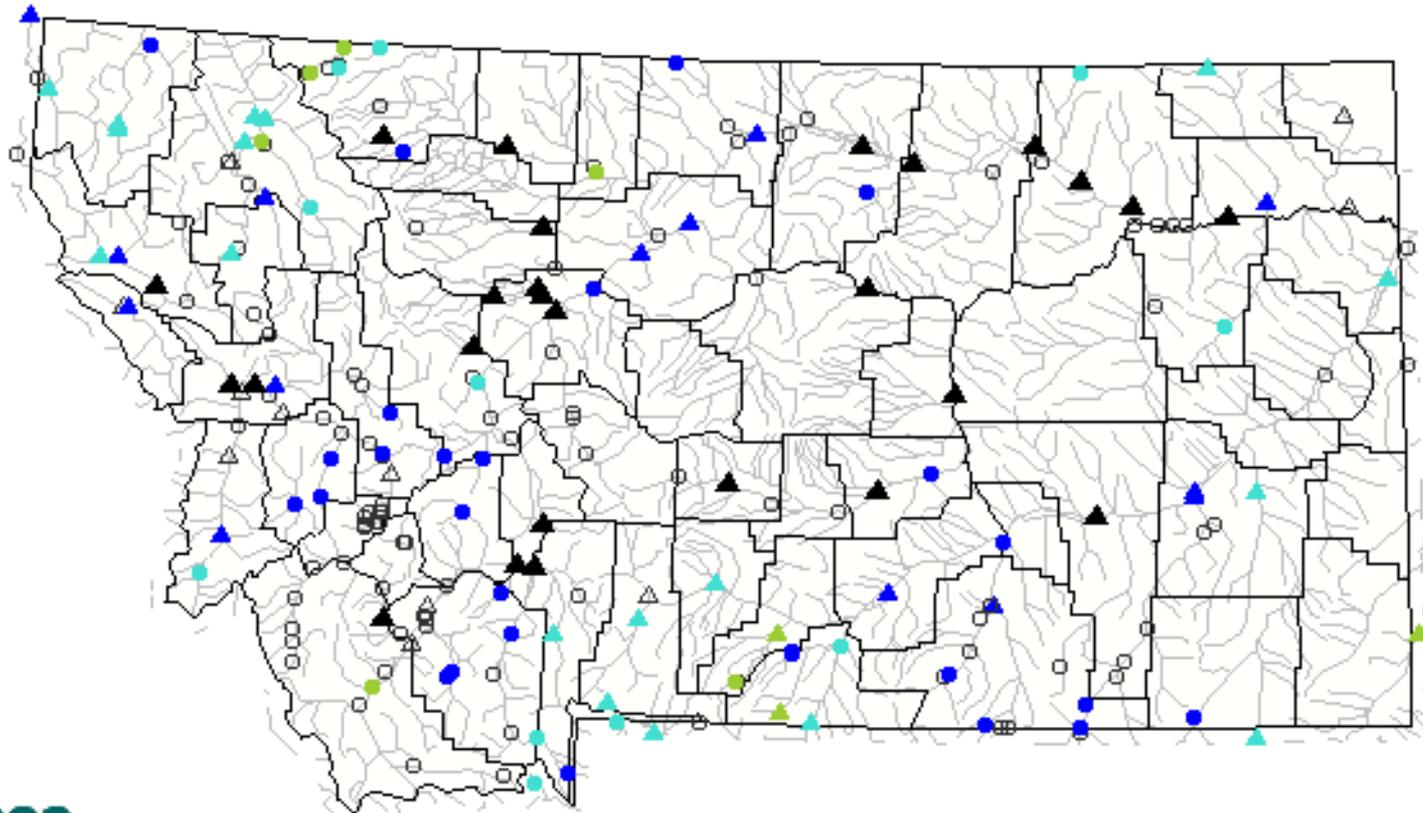
Streamflow was above normal at:

- Yaak River near Troy
- Middle Fork Flathead River near West Glacier



DAILY STREAMFLOW CONDITIONS

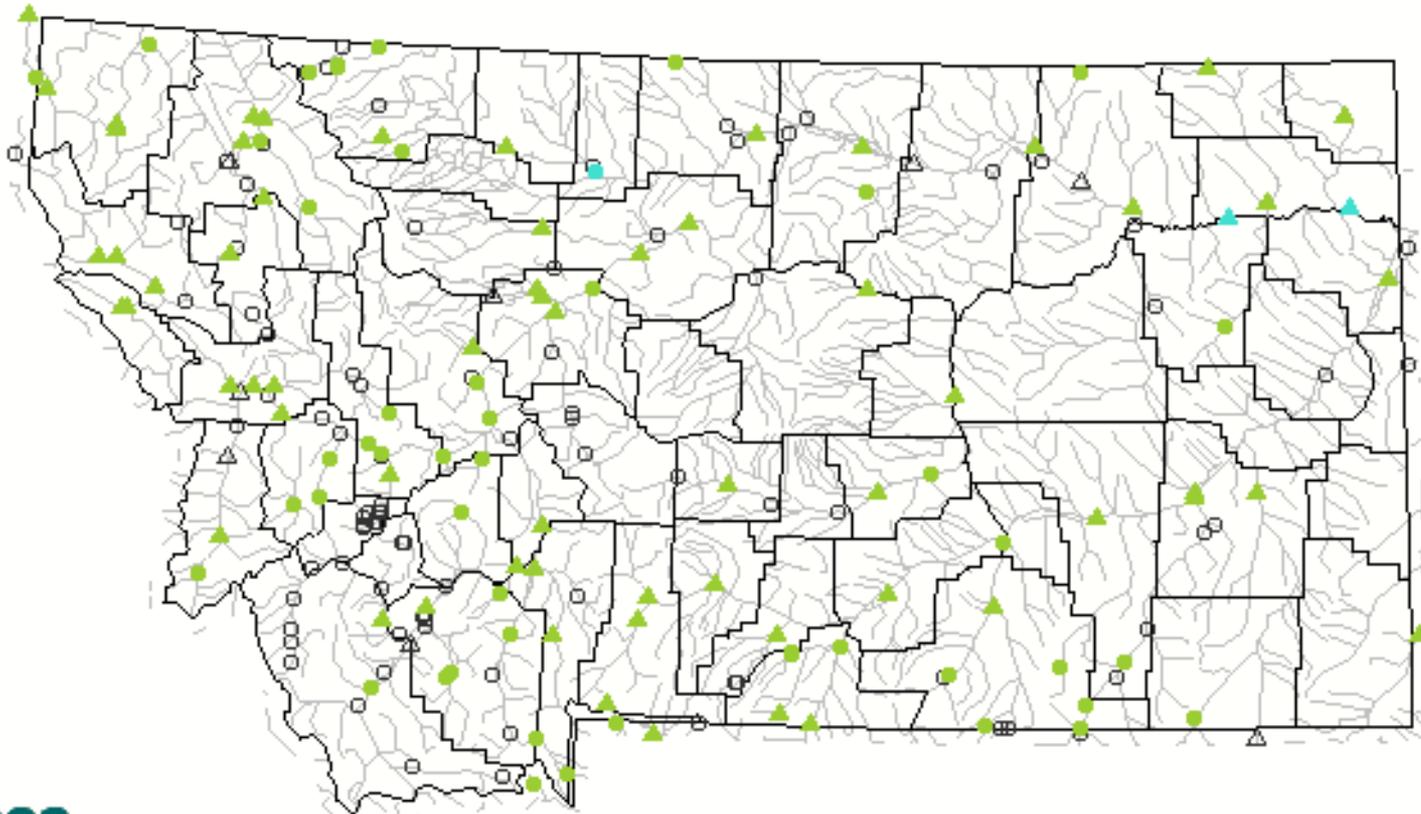
Friday, June 10, 2011 14:38ET



Explanation - Percentile classes				
				
<95	95-98	>= 99	River above flood stage	Not ranked
	Streamgage with flood stage			
	Streamgage without flood stage			

DAILY STREAMFLOW CONDITIONS

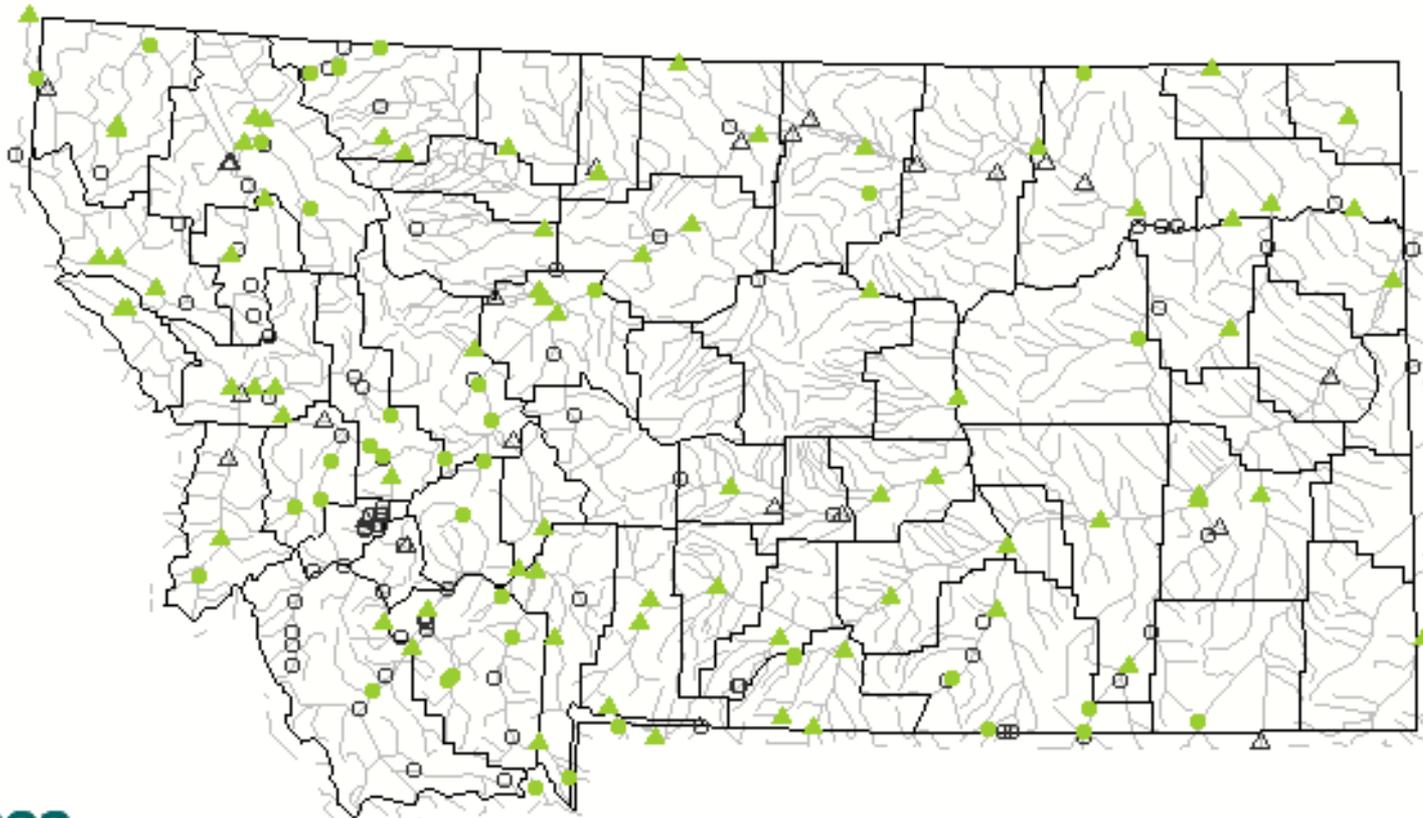
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Explanation - Percentile classes				
				
<95	95-98	>= 99	River above flood stage	Not ranked
	Streamgauge with flood stage			Streamgauge without flood stage

DAILY STREAMFLOW CONDITIONS

Tuesday, August 28, 2012 16:31ET



Explanation - Percentile classes				
				
<95	95-98	>= 99	River above flood stage	Not ranked
 Streamgage with flood stage		 Streamgage without flood stage		

2011 Peak Streamflows

- **Missouri River Basin**

71 of 95 stations exceeded 10% exceedance

- **Columbia River Basin**

23 of 44 stations exceeded 10% exceedance

- **In Montana**

94 of 139 stations exceeded 10% exceedance

Peak Streamflows Greater than 1% (100 year Flood)

- Musselshell River at Harlowton
- Musselshell River near Lavina
- Musselshell River near Roundup
- Musselshell River at Musselshell
- Milk River at Tampico
- Missouri River near Wolf Point
- Poplar River at International Boundary
- Missouri River near Culbertson
- Yellowstone River near Livingston
- Little Bighorn River near Hardin

Peak streamflows Greater than 1% (100 year Flood)

- **Rosebud Creek at Reservation Boundary, near Kirby**
- **Pumpkin Creek near Miles City**
- **Yellowstone River at Glendive**
- **Warm Springs Creek near Anaconda**
- **Warm Springs Creek at Warm Springs**
- **Boulder Creek at Maxville**
- **Blackfoot River above Nevada Creek, near Helmville**

Musselshell River near Roundup

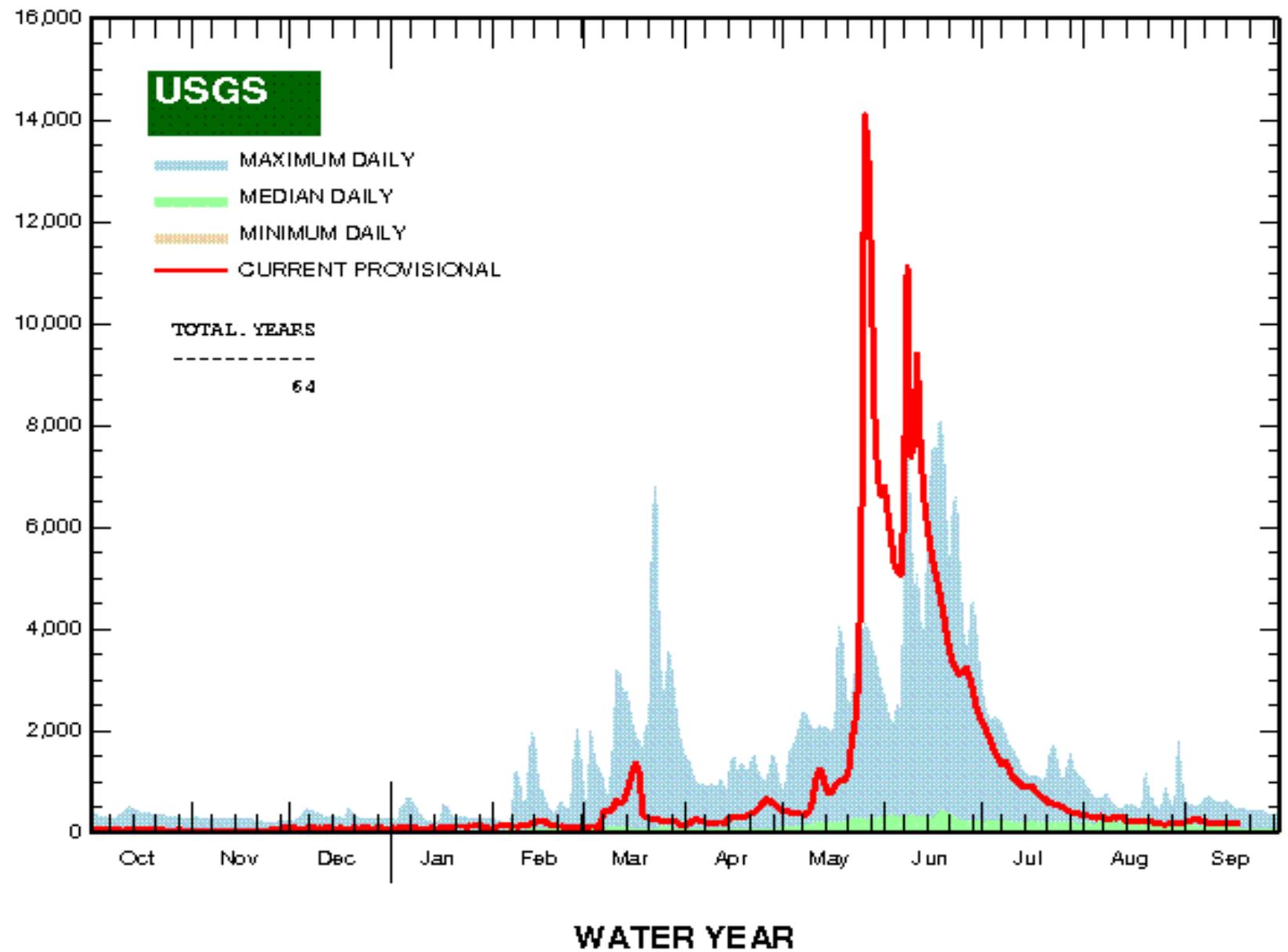


**Peak discharge 15,000 cfs on
May 26, 2011**



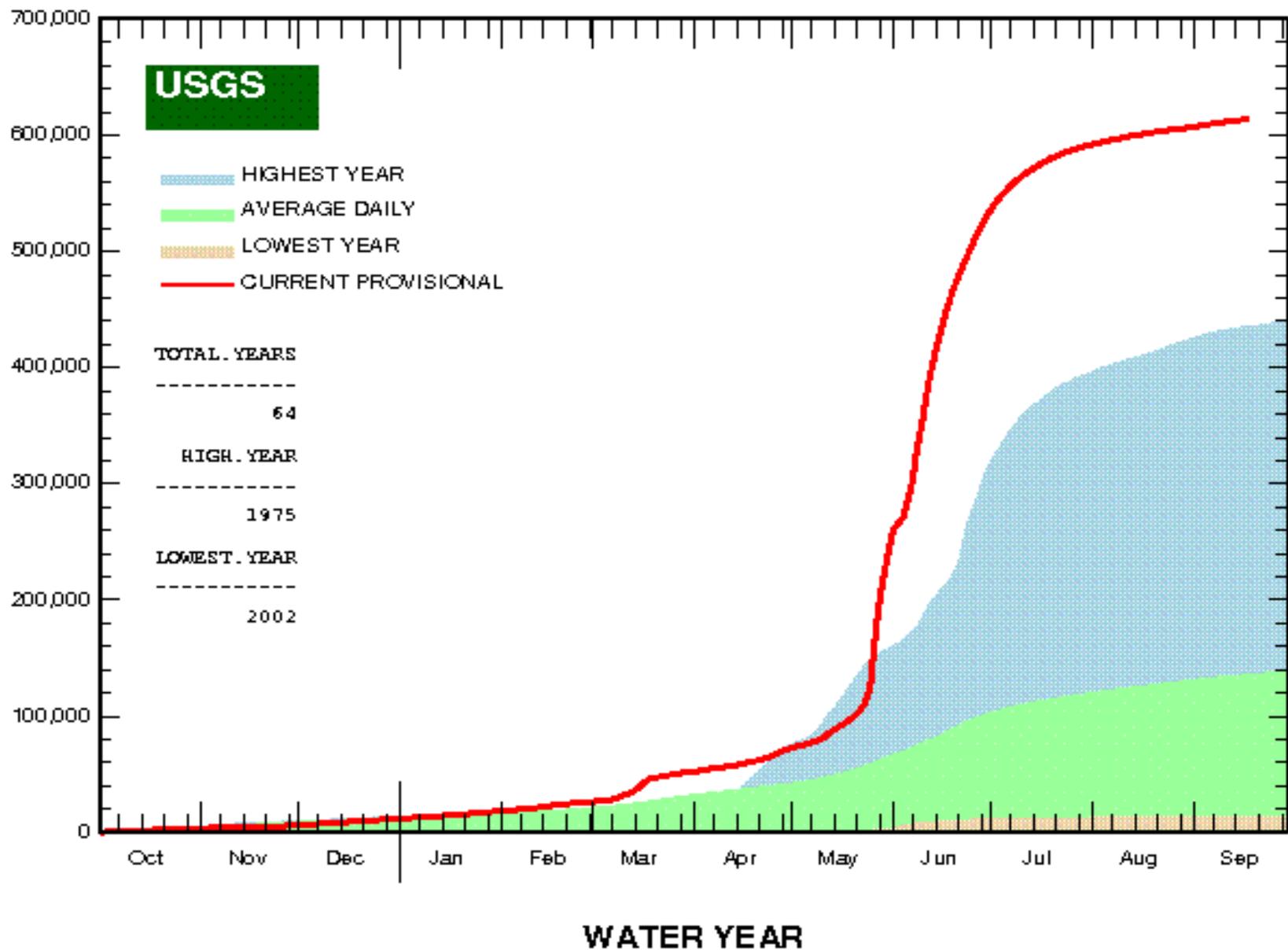
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Musselshell River near Roundup MT

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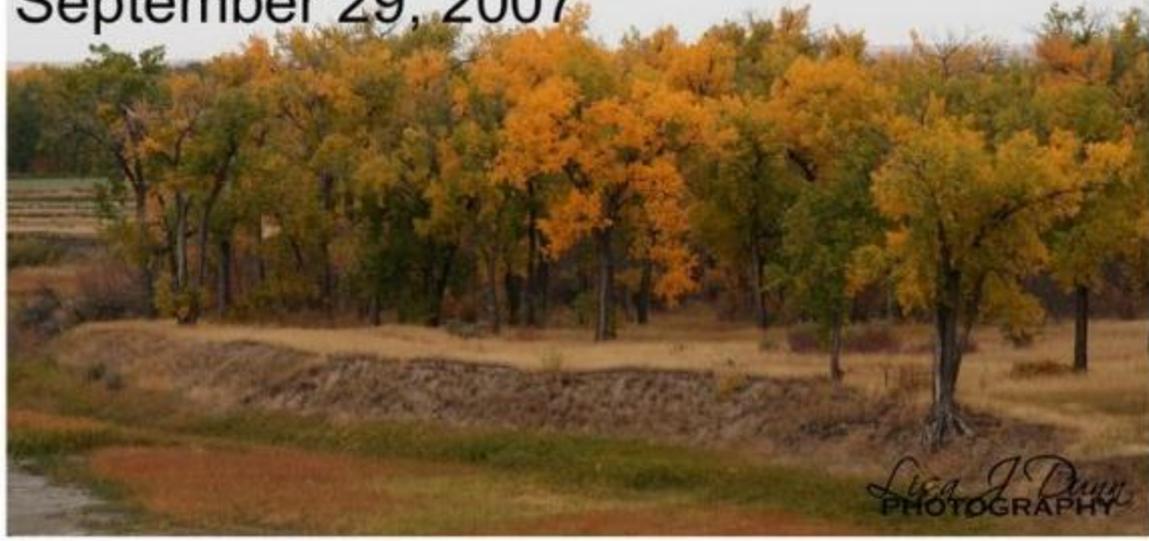


Musselshell River near Roundup MT

Missouri River near Wolf Point

- Record releases from Fort Peck Reservoir combined with the Milk River
- Approximate release from Fort Peck Dam was 60,000 cfs on June 10, 2011
- Peak
 - 93,200 cfs
 - June 14, 2011

September 29, 2007

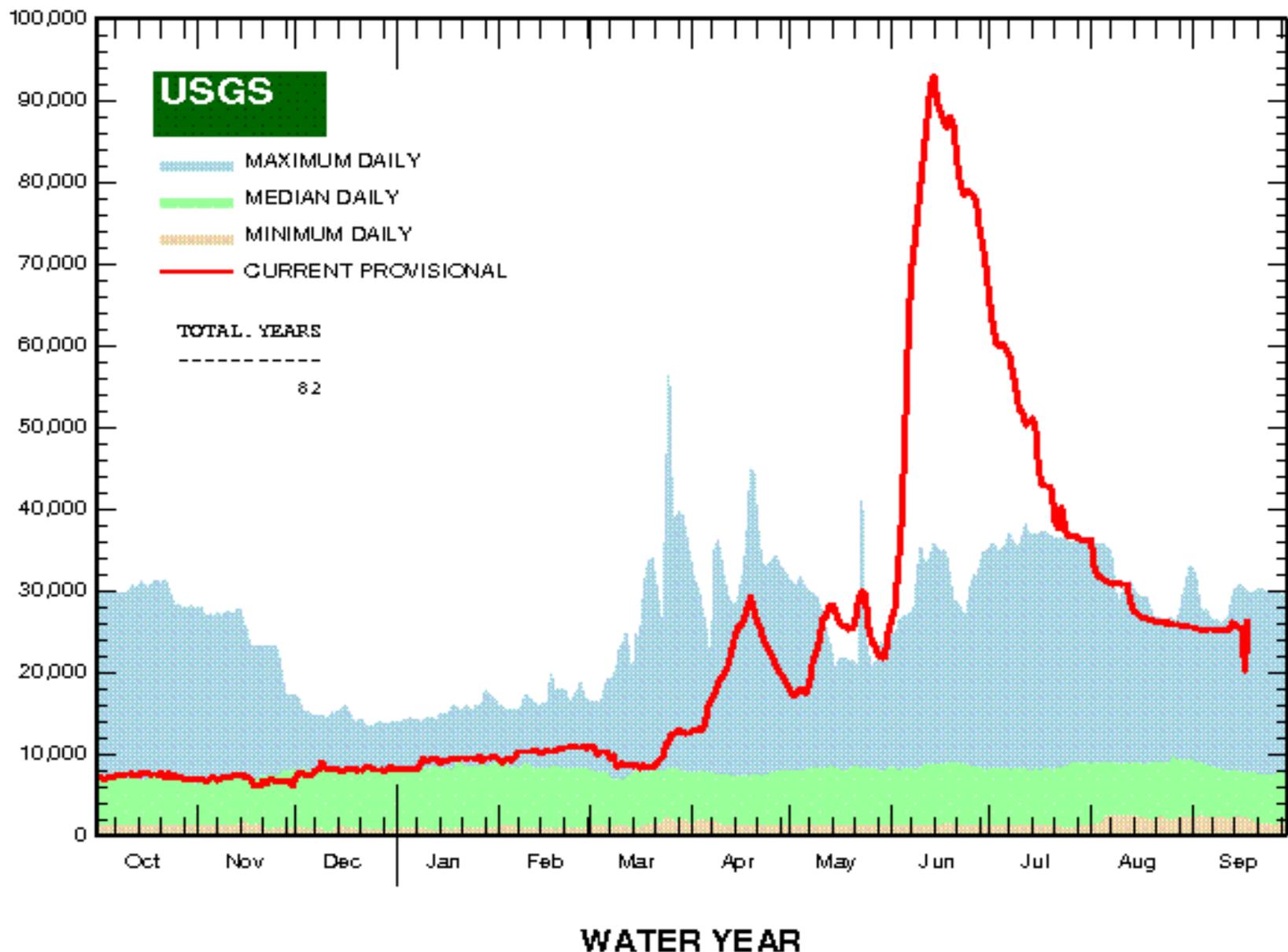


June 10, 2011



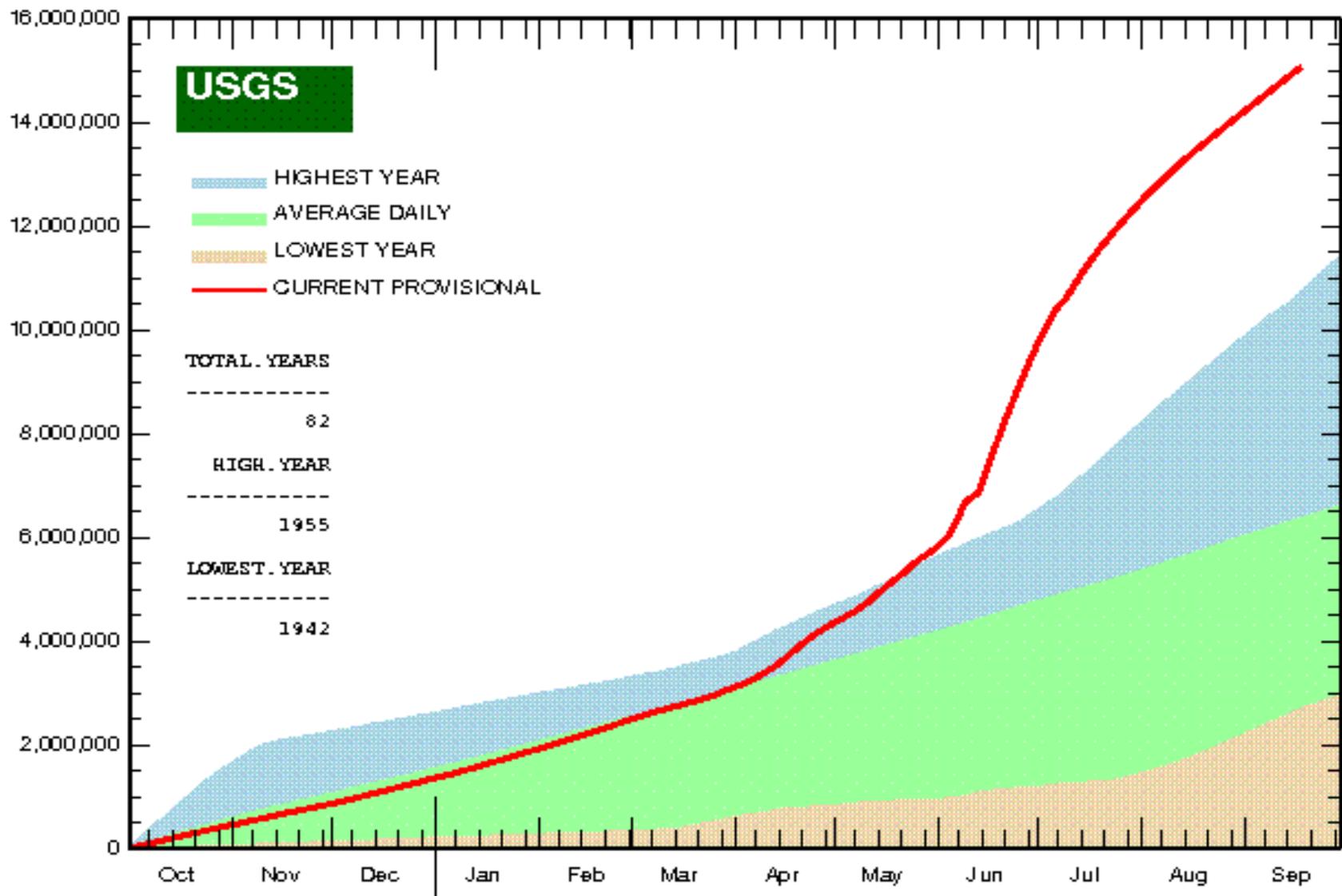
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Missouri River near Wolf Point MT

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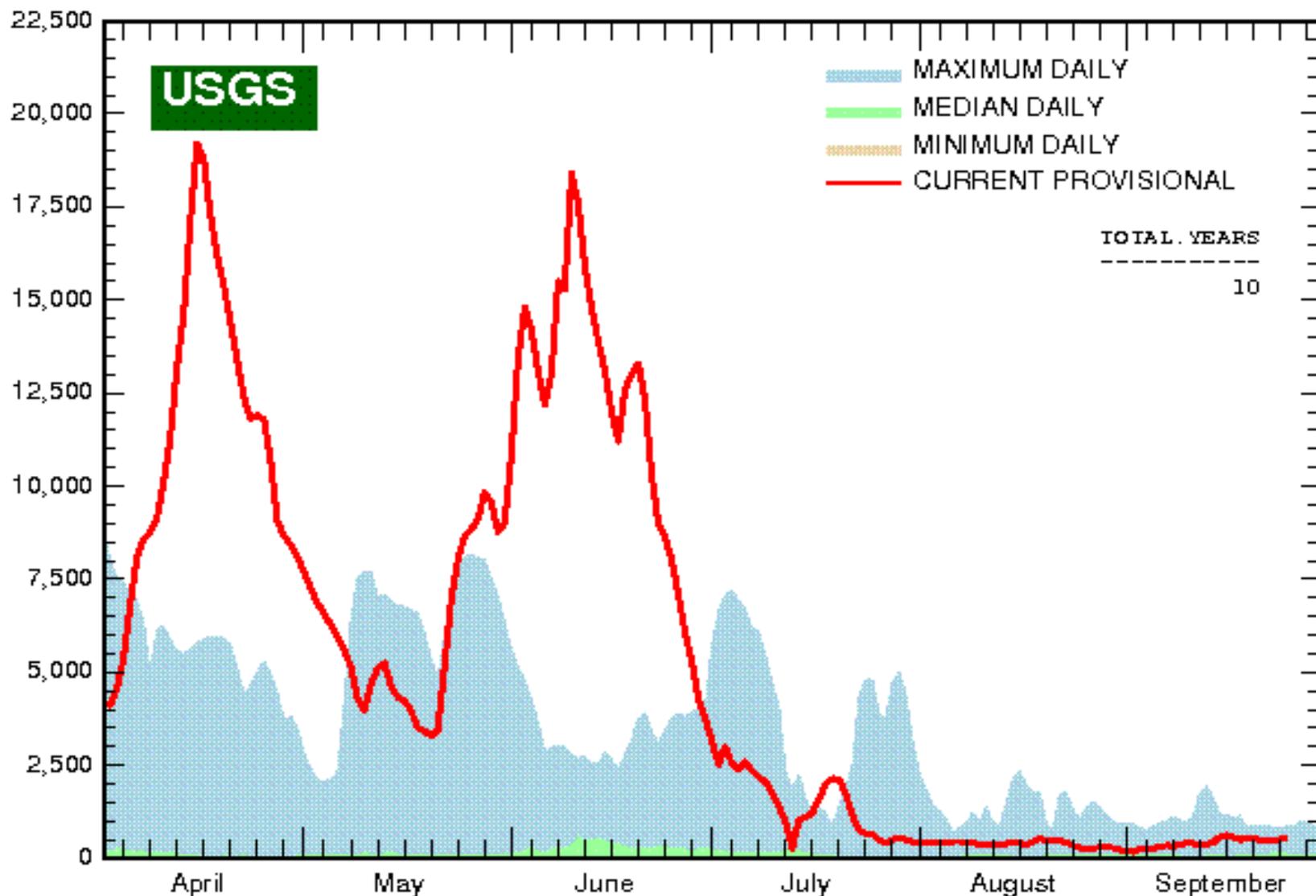
WATER YEAR

Missouri River near Wolf Point MT

Milk River near Tampico



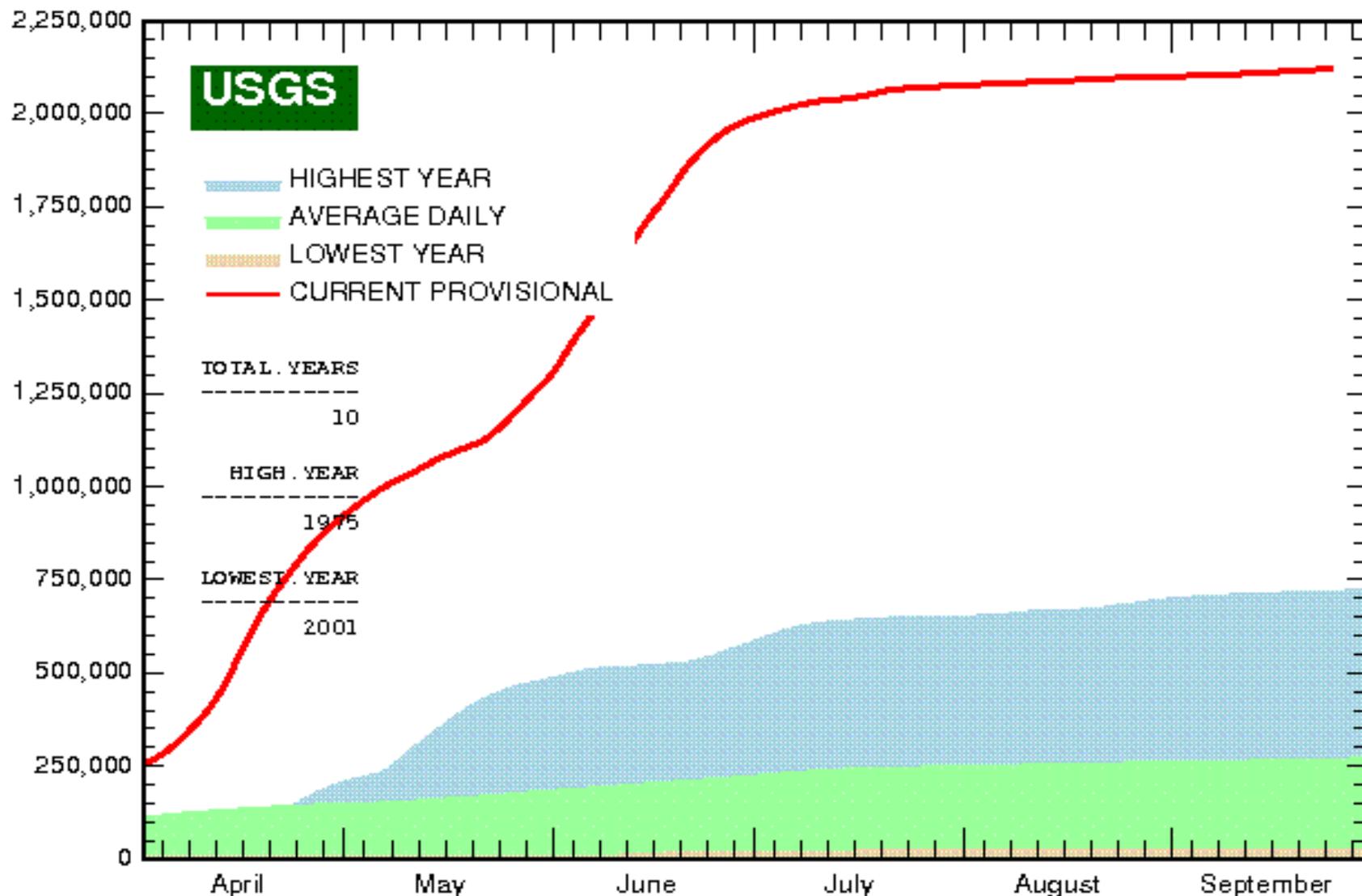
STREAMFLOW IN CFS



APRIL 1 TO SEPTEMBER 30

Milk River at Tampico MT

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APRIL 1 TO SEPTEMBER 30

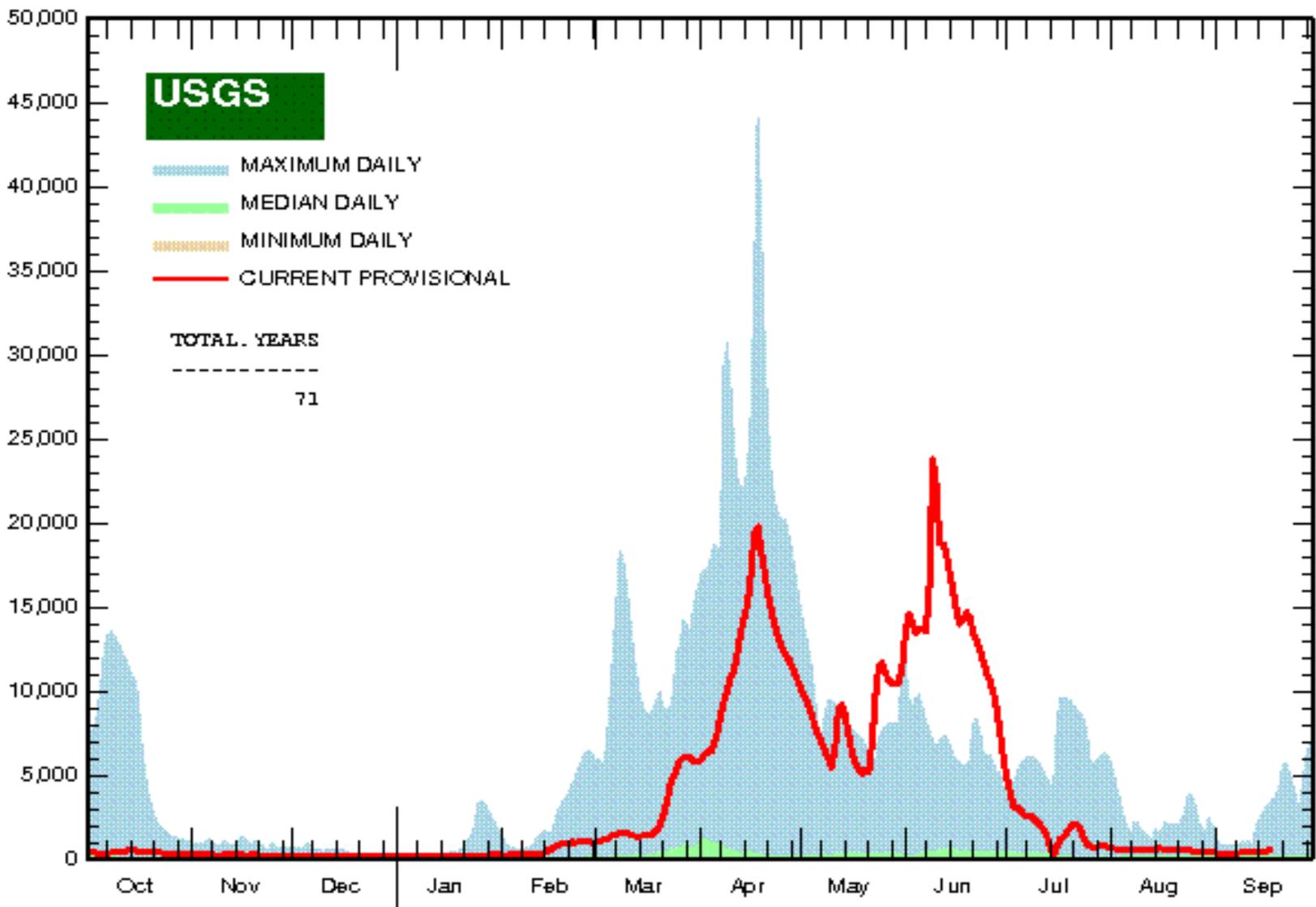
Milk River at Tampico MT

Milk River at Nashua



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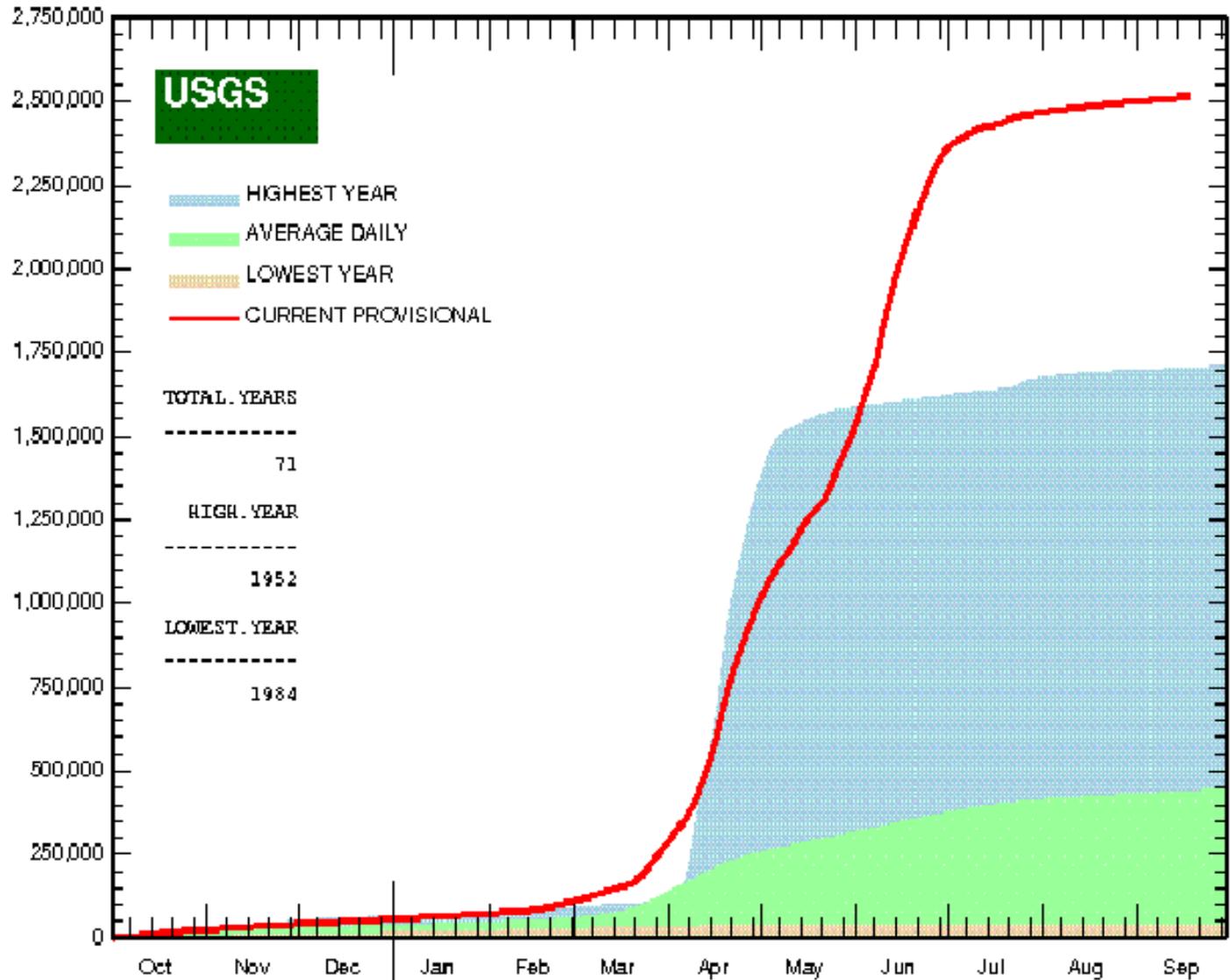
WATER YEAR

Milk River at Nashua MT

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Milk River at Nashua MT

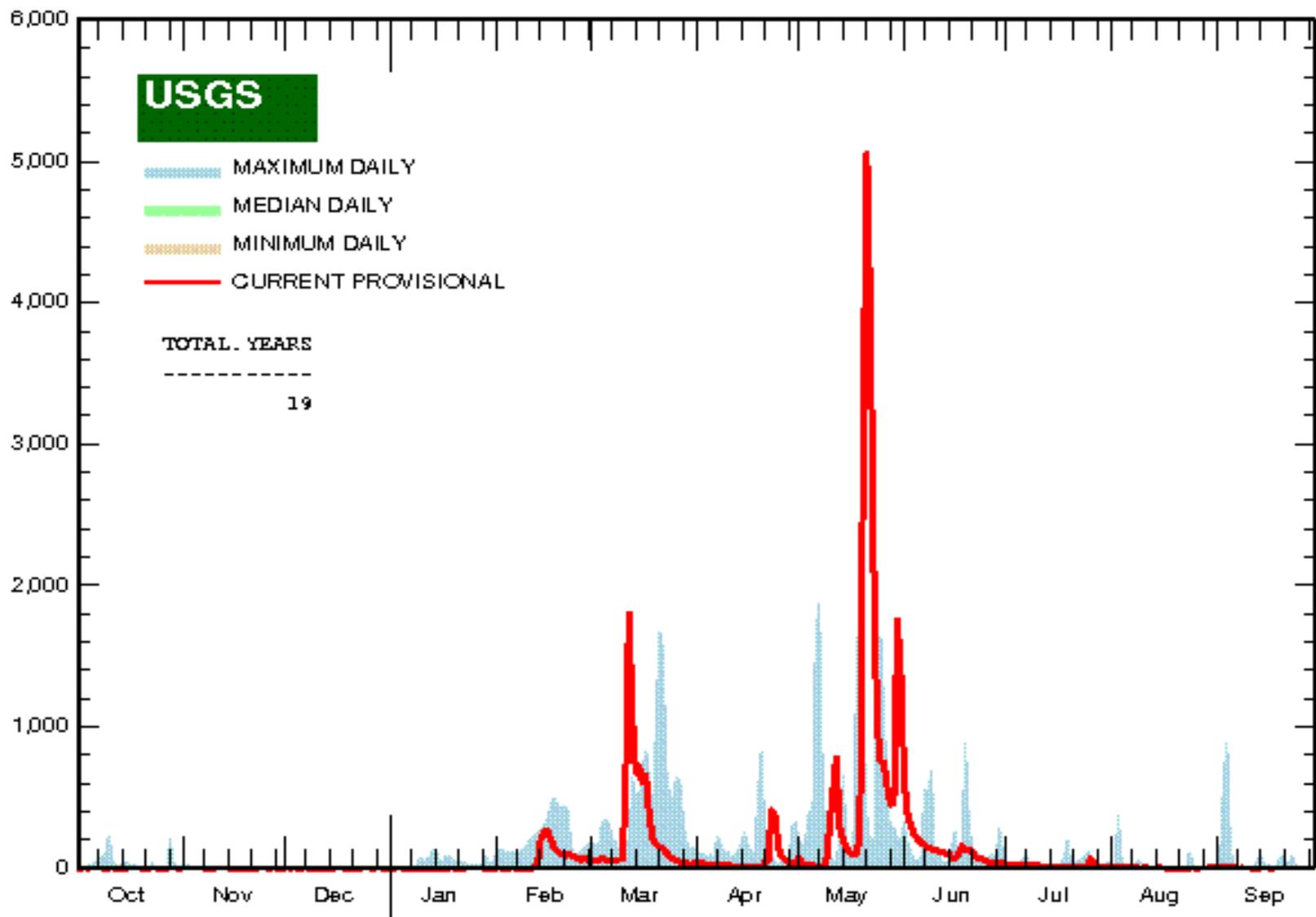
Pumpkin Creek near Miles City



Peak discharge 7,900 cfs on May 21, 2011

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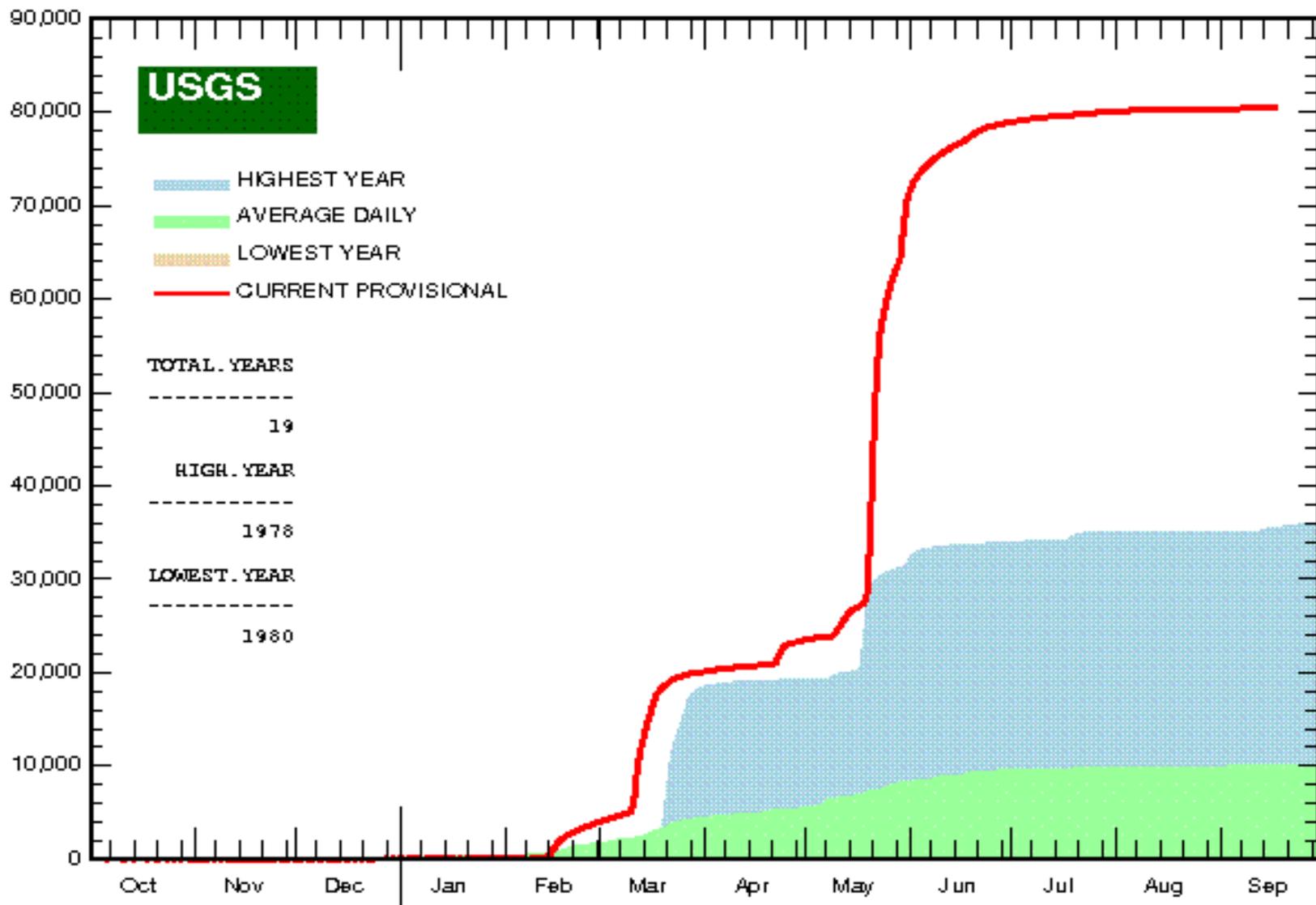
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WATER YEAR

Pumpkin Creek near Miles City MT

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WATER YEAR

Pumpkin Creek near Miles City MT



Little Bighorn River near Hardin

1978

**Gage height 11.20 ft
Discharge 22,600 cfs**

2011

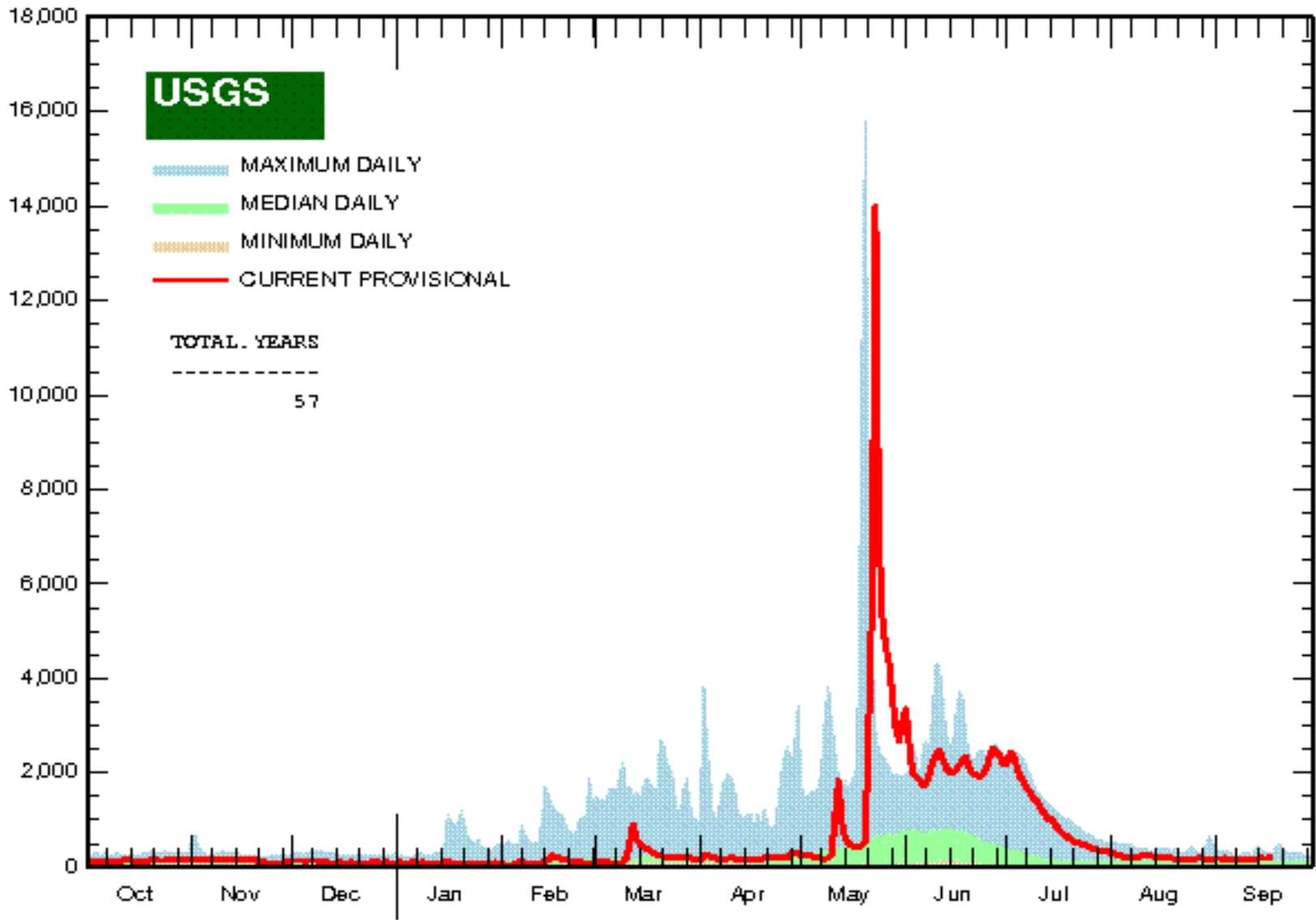
**Gage height 12.32 ft
Discharge ~18,600 cfs**



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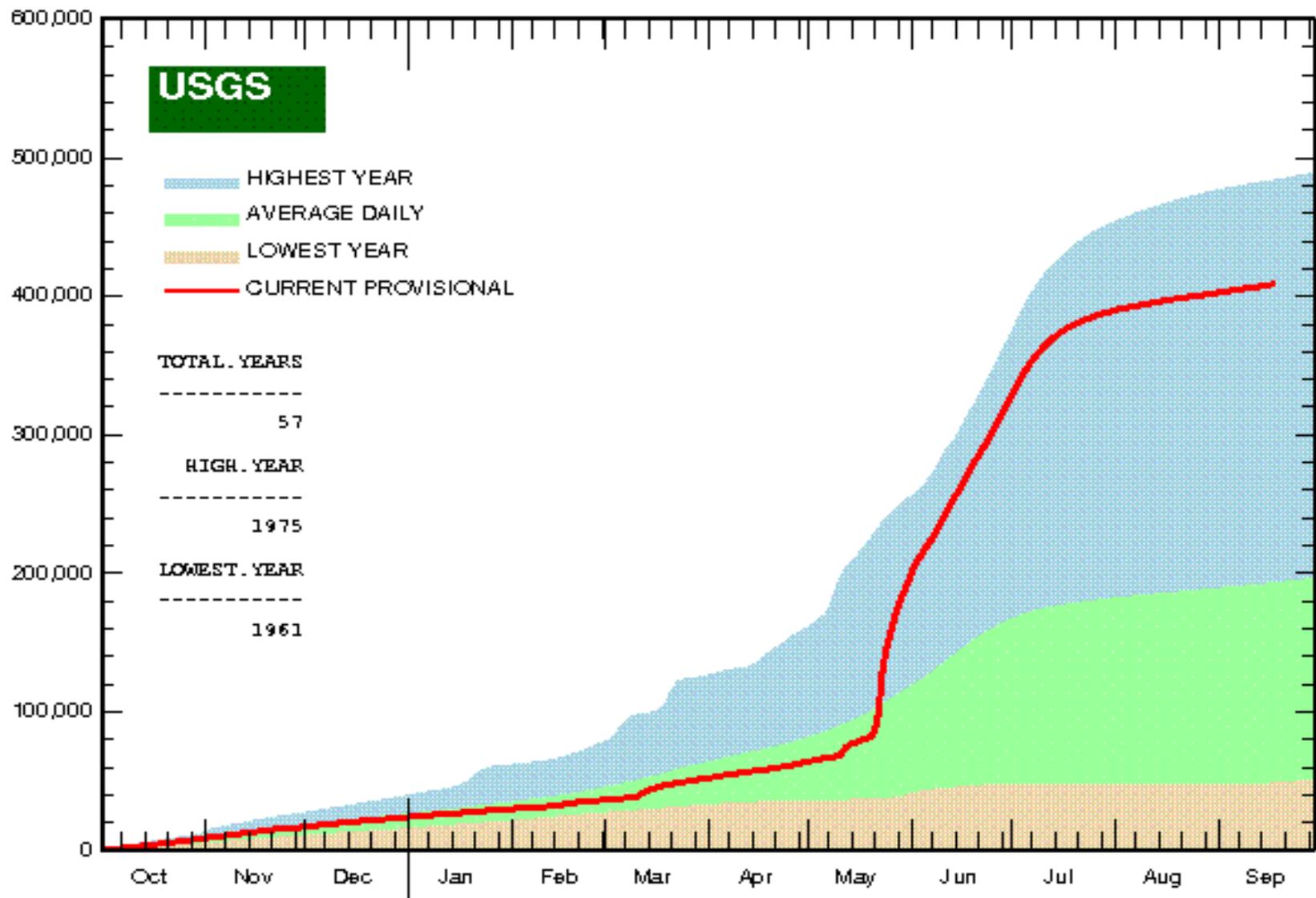
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WATER YEAR

Little Bighorn River near Hardin MT

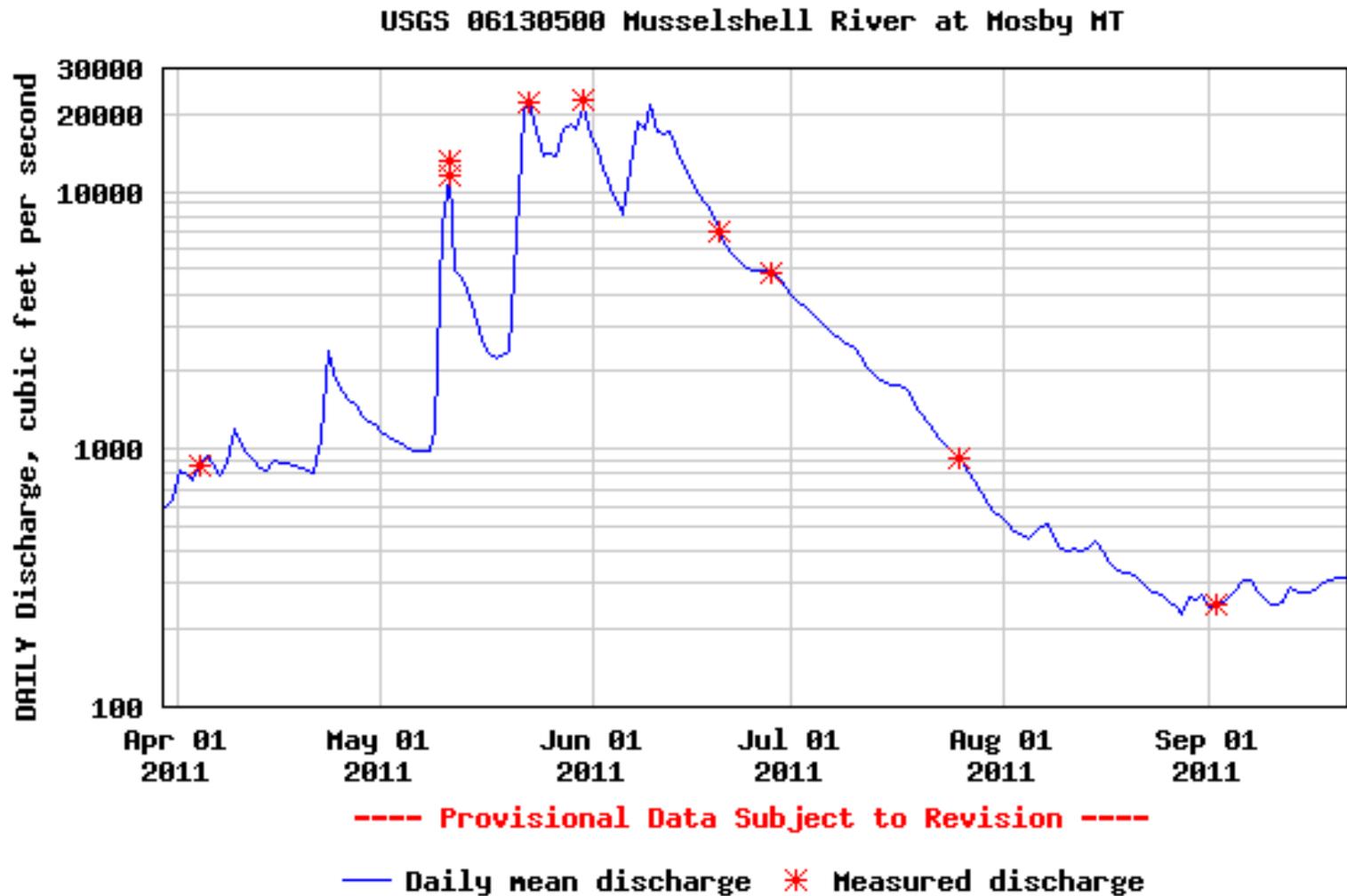
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WATER YEAR

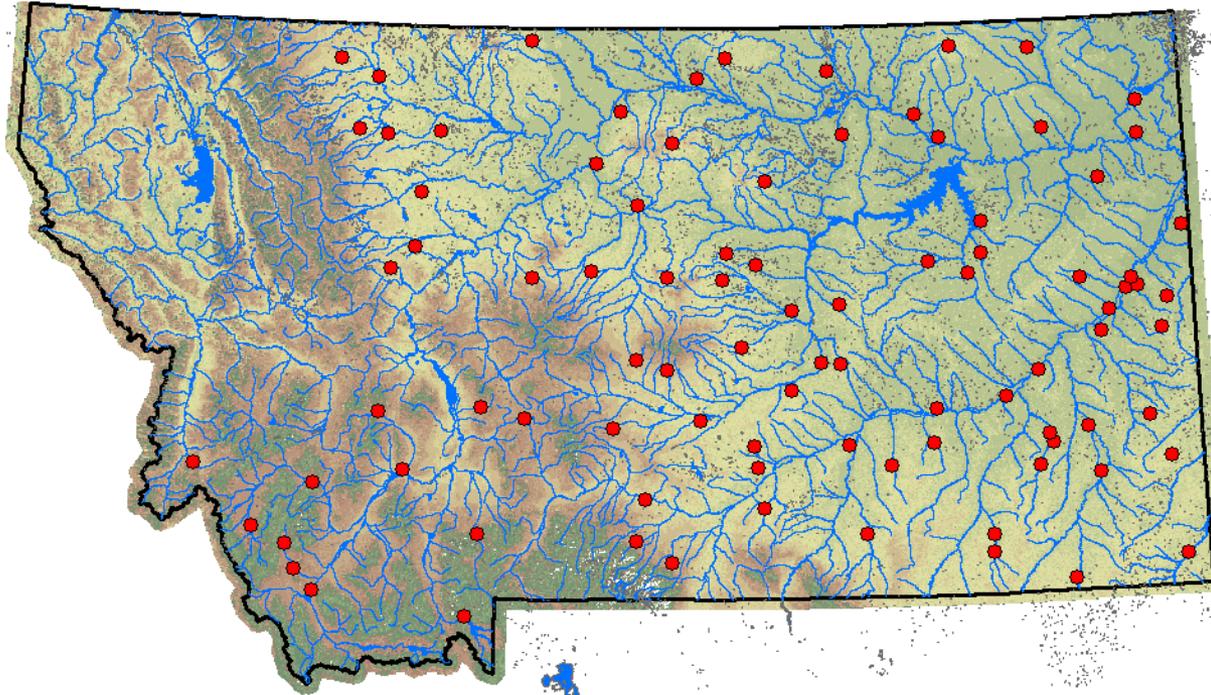
Little Bighorn River near Hardin MT

How to Define the Streamflow Hydrograph?

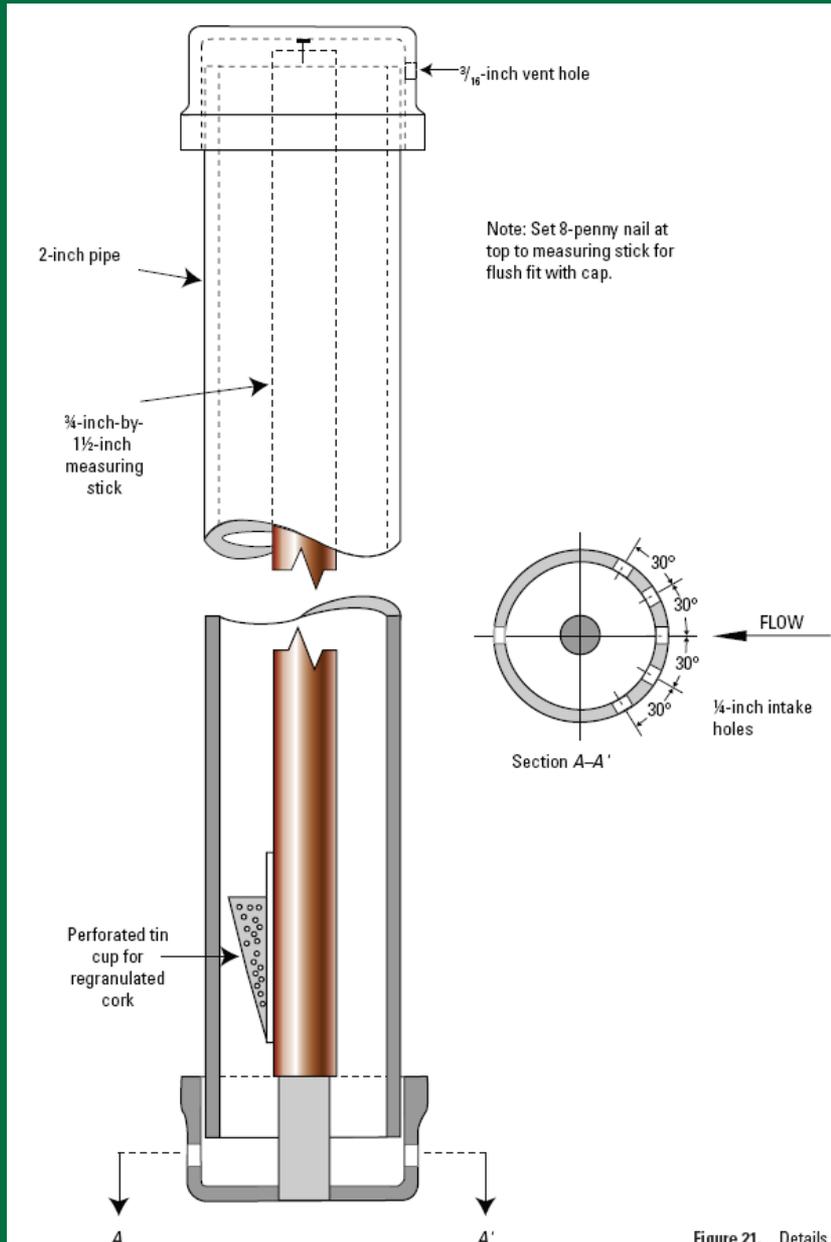


Crest-Stage Gage Network

96 Crest-Stage Gages



Crest-Stage Gage Instrumentation



Crest-Stage Gage Program Objectives

- Define hydrologic characteristics of smaller drainage basins (less than 100 square miles)
- Aid MT DOT in the evaluation and design of roadway infrastructure (i.e. culverts and bridges)
- Short flood duration hydrograph
 - Only peak stage recorded
 - Peak streamflow discharge computed
 - Developed rating based on structural geometry
 - Indirect measurement of peak streamflow discharge
 - Rating typically developed using indirect measurements

Indirect Measurement Analysis



Compute discharges after flood events

Indirect Measurement Analysis

- When peak exceeds recording instrument or unable to measure the peak streamflow
- Determine peak stage elevation
 - Based on established datum
- Survey associated characteristics
 - High-water profile at the peak
 - Channel and floodplain geometry
 - Bridge and/or culvert geometry
 - Road embankment and grade
- Process survey data

Indirect Measurement Analysis Cont.

- **Computation of peak discharge using established USGS protocols**
 - Slope-area computation
 - Slope conveyance
 - Culvert analysis
 - Width contraction (bridges)
 - Road overflow
 - Step-backwater analysis

Questions

USGS Home Page: <http://usgs.gov>

NwisWeb: <http://water.usgs.gov/mt/nwis>

Access to streamflow (realtime and historical), water-quality, and ground-water information.

Montana Water Science Center Home Page:

<http://mt.water.usgs.gov>

Montana Current Streamflow Conditions