

Red Willow Creek above Hugh Butler Lake, Nebraska 06837300

LOCATION

Latitude and Longitude

40.40136, -100.7803

Road Log

The gage is reached by driving 5 miles west of McCook on Highway 6 & 34 (approximately 5.3 miles west from intersection of highways 6 & 83), then turn north on county road (#379) for 9.25 miles, turn west on county road (#726) for 1.75 miles, and then back north on county road (#377) for 3.90 miles. The gage house is on the northwest side of the wooden bridge.

On the left bank 15 ft. upstream from County road bridge, 7.0 miles upstream from Red Willow Dam, 12 miles Northeast of Culbertson NE., and 16 miles Northwest of McCook NE

Equipment Details

Recording Gage

A Sutron OTT RLS non-contact radar level sensor is the primary sensor and is attached to the upstream side of the county road bridge approximately over the middle of the channel. This radar is connected to the Satlink logger/transmitter. The equipment is powered by a 12 volt, wet-cell battery with a solar panel charging system

A Sutron Constant Flow Bubbler (CFB) connected to a Sutron Satlink Logger/Transmitter is a secondary sensor. The orifice is located approximately 75 ft. upstream of the county road bridge. The tubing is encased in a 1¼-in black PVC pipe at the top of the bank, 1¼-in galvanized pipe near the creek's edge and terminates with a muffler.

Equipment is housed in a 24" x 30" 72" stainless steel cabinet style gage house on the left bank 15 ft. upstream from county road.

External Gage

A wire-weight, cantilever style, gage is routed along the bridge deck on the upstream side of the county road bridge.

Datum of gage is 2,588.711 ft. National Geodetic Vertical Datum of 1929 and 2589.803 ft. North American Vertical Datum(NAVD88)(5/28/2014).

Bench Mark and Reference Marks

R.M. No. 1 - Destroyed.

RMs 2 - 4. Abandoned, at previous site, approximately 1000 ft upstream. [See previous Station Description, 2/9/95.]

R.M. #5 - Established Sept. 23, 1992, (at bridge site). Brass tablet in concrete post 3 ft. west of southwest corner of gage house. Elevation, 18.84 ft. gage datum; (levels 06/27/2022).

R.M. #6 - Established Sept. 23, 1992, (at bridge site). Brass tablet in concrete post 4 ft. east of southeast corner of gage house. Elevation, 18.96 ft. gage datum; (levels 06/27/2022).

R.M. #7 - Established Sept. 18, 1998, (at bridge site). Brass tablet in concrete post 6 ft. north of gage house. Elevation, 18.92 ft. gage datum; (Origin of levels 06/27/2022).

Hydrology

Drainage Area

600 mi², approximately, of which about 200 mi² contribute directly to surface runoff.

Channel and Control

The streambed is composed of sand and gravel. The banks are trapezoidal in shape with scattered tree and brush growth. The channel is fairly straight for about ½ mile above gage and makes a bend to the left about 200 ft. below the gage. Flow is steady and slow at low stages but swift and turbulent at medium and high stages.

The low stage control is a rock riffle 75 ft. below the gage. The channel and banks are the control for medium and high stages. However, a three strand, barbed wire fence located 30 ft. below the gage will act as the control and cause backwater during medium and high stages as debris begins to accumulate on the fence until the wire breaks from increasing stress due to the debris or if the fence is manually removed.

Discharge Measurements

Low and medium stage measurements are made by wading in the vicinity of the gage. Maximum wading stage is about 5.00 ft. gage datum. High stage measurements are made from county road bridge. (Note: bridge does not have guardrails)

Floods

Maximum discharge during the period of record occurred June 16, 1972; discharge 4,020 cfs, gage height 13.27 ft. gage datum (2,594.80 ft.). Highest known flood occurred June 1, 1935, stage and discharge not determined.

Extremes for Period of Record

Peak discharge 4,020 cubic feet per second June 16, 1972, gage height 13.27 feet (at different datum); minimum daily discharge 2.5 cubic feet per second August 1 & 4, 2005 and July 20, 2006.

Point of Zero Flow

Variable; 2.19 feet gage datum 8/4/2014, 2.00 feet gage datum 9/7/2016.

Winter Flow

Stage-discharge relation will be affected by ice during periods of extremely cold weather.

Regulation and Diversions

Several small pump diversions for irrigation.

Accuracy

Measuring conditions are good. Records of stage are FAIR. Open water records are good; record fair to poor during periods of backwater from ice.

Establishment and History

Original gage was a vertical staff gage reading from 6.76 to 10.14 ft. installed on Sept. 29, 1960, at site 1000 ft. above present site. Datum of gage was 1.40 ft. lower reading than present datum (2587.40 ft.).

On Oct. 12, 1960, a new vertical staff gage reading from 0.00 to 3.34 ft. was installed at same site with inferred datum (2594.80 ft.).

A recording gage with Stevens A-35 water-stage recorder was put in operation on May 6, 1963.

The outside gage, a standard wire-weight attached to the upstream guardrail of footbridge, was destroyed on Feb. 23, 1985.

New staff gages were install on Mar. 21, 1985.

On Sept. 23, 1992 the gage was moved 1000 ft. downstream to county road bridge. New gage datum is 2,588.80 ft. National Geodetic Vertical Datum of 1929, and 6.00 ft. lower than the previous site (2594.80 ft.)

On Sept. 30, 1994 the U.S.G.S. discontinued their role in the operation of this station.

On Oct. 1, 1994 the State of Nebraska Dept. of Water Resources took over the operation of this station.

The digital recorder was removed on Oct. 7, 1994 and returned to the U.S.G.S.

On April 14, 2008 the Sutron 8200A was replaced with a Sutron Satlink Logger.

On March 23, 2010 the Stevens A-35 water-stage recorder (with quartz clock), shaft encoder, and the balance beam manometer (model G2) were removed and replaced with a Sutron Accububble Self-Contained Bubbler System connected to a SatLink Data Logger/Transmitter.

On April 23, 2013 the Sutron Accububble Self-Contained Bubbler System (ABS) was replaced with a Sutron Constant Flow Bubbler (CFB).

March 10, 2016 the standard 5 X 5 corps shelter was replaced with a stainless steel shelter.

On November 19, 2020 a Sutron OTT RLS non-contact radar was installed as a secondary sensor.

October 12, 2021 the Sutron Constant Flow Bubbler was disconnected and the Sutron non-contact radar then became the primary sensor.

No other stations have been operated on this stream above Hugh Butler Lake.

Revision History

Original description prepared 7-31-61 by C.R. Liggett

Revised 7-15-63 by V.F. Pearce

Revised 5-16-67 by C.R. Liggett

Revised 6-08-77 by C.R. Liggett

Revised 4-23-86 by N.R. Harmon

Revised 2-09-95 by B.D. Edgerton

Revised 01-21-00 by R. Oaklund

Revised 12-03-04 by D. Gunderson

Revised 02-26-07 by D. Gunderson

Revised 02-29-08 by D. Gunderson

Revised 02-05-09 by D. Gunderson

Revised 02-24-11 by D. Gunderson

Revised 04-23-13 by D. Gunderson

Revised 04-16-15 by D. Gunderson

Revised 12-12-16 by D. Gunderson

Revised 01-25-18 by D. Gunderson

Revised 11-01-2021 by D. Gunderson

Revised 11-21-2022 by D. Gunderson