

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD



Division of Natural Resources & Conservation Planning Water Resources Branch

WATER MONITORING STATION ANALYSIS – CALENDAR YEARS 2013 to 2016

SITE NUMBER: 393937093090901

SITE NAME: Turkey Creek nr Sumner MO, Fulbright Rd

COOPERATION: Swan Lake National Wildlife Refuge

WATERSHED: 48.9 square miles

NOTES:

A timestamp offset was applied from 9/29/2015 onwards for this station to account for the fact that the Satlink datalogger records in Greenwich Mean Time (GMT). This offset was not applied until after the station analysis was completed, but minimal impact to the record is assumed.

EQUIPMENT:

Sutron Satlink in metal gage housing in communication with a transducer mounted on a fencepost in the streambed. Instruments are powered by two solar panels run to a battery inside the gage housing. Stage data are collected at 15 minute intervals, and water temperature data are collected at hourly intervals. Prior to 09/29/2015, data logger was a Sutron Monitor 1.

SITE CHARACTERISTICS:

The site is located approximately one mile north of where Turkey joins Elk Creek just upstream of Swan Lake National Wildlife Refuge and Silver Lake. The transducer is deployed throughout the year collecting water temperature and water level data. The bottom is mucky with a significant portion of clays and fine sediments. Water levels respond rapidly to rainfall, but low flows are typical where the control is often affected by Silver Lake water levels downstream.

GAGE RECORD:

U.S. Department of Interior

U.S. Fish and Wildlife Service

Last modified 12/12/2018- James Stack

O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\Turkey Creek nr Sumner\Station Analysis\2013_2016

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

The record from 2013 to 2016 has numerous gaps due to equipment malfunction at this site. Site visits were made by Region 3 Hydrologists or Refuge staff to download the data, take logger readings and record surface water levels. One stage reading per site visit was used for datum corrections(**Table 1**). Corrections were calculated and verified using a Microsoft Excel spread sheet (O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\JKS Excel worksheet for Swan Lake NWR) The data logger records stage at 15, 30, 45 and hourly minute markers. Staff tried to take WSL readings on recorded values, but if missed, the datum correction was applied to the nearest 15-minute marker. All stage readings were taken using RP4 or RP5. Reference elevations for these were determined after a 2013 RTK survey by Vince Capeder and then corrected in WISKI for data analysis. Additional observations were estimated and entered to account for the breaks in record caused by equipment failure. The datum of the gage is NAVD 88.

Date	Time	WSL	Comment
02/12/2013	02:00:00 PM	668.35	Manually edited.
3/11/2013	1:45:00 PM	678.36	Refuge staff; RP5= - 5.57 (ref elev=683.925); flood conditions. Flood measurment. Water almost to bottom of bridge. Tape w/ 10' offset.
3/12/2013	11:00:00 AM	672.78	Manually edited
3/21/2013	3:15:00 PM	668.04	Manually edited
4/11/2013	12:15:00 PM	675.41	Refuge staff; RP5= -8.52 (ref elev=683.925); flood conditions
4/25/2013	10:45:00 AM	668.99	Refuge staff; RP5= - 14.94 (ref elev 683.925); flood conditions. Data logger may have died around this time
6/5/2013	4:00:00 PM	668.73	Refuge staff; RP5 = -15.20 (ref elev 683.925); batteries dead
6/27/2013	7:00:00 PM	667.3	RP5 = -16.63, (Ref elev. = 667.925), Datalogger and transducer replaced, started recording at 16:15 cst.
11/18/2013	4:00:00 PM	666.87	RP5=-17.06 (ref elev=683.925), backwater conditions, hardly any flow. Lots of leafy debris.
3/19/2014	10:30:00 AM	667.17	RP5 = - 16.76 (ref elev 683.92, backwater from Silver Lake, channel clear of debris
4/15/2014	5:45:00 PM	668.54	RP4 = -13.420 (ref elev 681.957), this visit uses RP4 instead of RP5
8/12/2014	2:00:00 PM	667.13	RP5 = - 16.80 (ref elev 683.925); cleared debris from transducer
12/16/2014	12:45:00 PM	667.78	RP5 = -16.15 (ref elev 683.925), leaves and branches in channel. Possible backwater
4/14/2015	12:00:00 PM	671.6	RP5 = -12.33 (ref elev = 683.925), High flow condition
7/9/2015	7:45:00 AM	669.04	Manually edited
7/14/2015	3:00:00 PM	667.7	RP5 = -16.23, (Ref elev = 683.925), possible backwater conditions, datalogger dead
7/15/2015	12:30:00 PM	667.63	Ref. Used RP5 = 683.925 minus MD = 16.30

U.S. Department of Interior
U.S. Fish and Wildlife Service

Last modified 12/12/2018- James Stack O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\Turkey Creek nr Sumner\Station Analysis\2013_2016

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

9/29/2015	5:30:00 PM	666.84	RP5 = -17.09, (ref elev = 683.925), logger dead on arrival, new offset applied. Old offset =666.505, new offset = 666.51
9/29/2015	11:45:00 PM	666.83	Manually edited
9/30/2015	7:45:00 AM	666.83	RP5 = -17.10, (ref elev = 683.925), channel clear, no backwater
11/1/2015	3:00:00 PM	667.1	Manually edited
12/10/2015	12:00:00 PM	667.81	RP5 = -16.12, (ref elev = 683.925)
12/10/2015	8:00:00 PM	667.81	Manually edited
1/19/2016	2:45:00 AM	667.81	Manually edited
3/6/2016	1:45:00 AM	667.28	Manually edited
3/9/2016	8:30:00 PM	671.15	Manually edited
3/9/2016	9:30:00 PM	671.13	Manually edited
3/11/2016	8:45:00 PM	668.52	Manually edited
3/14/2016	7:45:00 PM	670.24	Manually edited
3/21/2016	10:15:00 PM	667.76	Manually edited
4/27/2016	11:00:00 AM	667.41	RP5 = -16.52 (ref elev = 683.925), transducer surrounded by debris. Datalogger dead on arrival. Possible backwater from Silver Lake
4/27/2016	5:00:00 PM	667.39	Manually edited
5/25/2016	11:00:00 PM	667.27	Manually edited
7/27/2016	7:15:00 PM	667.02	RP5= -16.91, Ref el = 683.925 ft, some woddy debris around xducer, datalogger dead on arrival. New solar panel and solar controller added on 7/28
7/28/2016	12:15:00 AM	667.03	Manually edited
9/19/2016	3:00:00 PM	667.71	RP5= -16.22 Ref el =683.925 ft. Stagnant water likely backwater effect caused by Silver Lake.
12/12/2016	3:15:00 PM	667.09	RP5 = - 16.84, (ref elev = 683.925) ice present, leaves on transducer cleared.
3/6/2017	12:00:00 PM	667.3	RP 5 = -16.63 (ref elev = 683.925) +/- 0.03 due to wind. Channel appears to be backwater affected.

TABLE 1: OBSERVATIONS ENTERED INTO WISKI (OBS.O)

STAGE STATION ANALYSIS – CALENDAR YEAR 2013 to 2016

U.S. Department of Interior
U.S. Fish and Wildlife Service

Last modified 12/12/2018- James Stack O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\Turkey Creek nr Sumner\Station Analysis\2013_2016

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

DATUM CORRECTIONS:

On 3/3/2011, RTK and auto level surveys were conducted by VC. Reference mark elevations were used from the RTK survey, but the RP elevations were calculated based on the auto level survey from 6/27/2012 by JG/VC. **Table 2** below shows reference elevation summaries for adjustments made after the surveys were complete. From 2013 to 2016, three surveys were completed. During the 2013 survey, the RM-1 reference mark was noted as missing and has not been found in subsequent surveys. Additionally, in the 2015 survey, RP-3 was noted as having been modified by pounding down for a new gage housing. RP-3 was replaced with RP-9, the North fence post at the gage housing.

REFERENCE ELEVATIONS AT GAGE:

Reference	Description
RM-1	Lag bolt in tree 10' downstream of gage near levee <i>*Note: this RM is missing*</i>
RM-2	Lag bolt in tree 25' downstream of bridge
RM-3	NW corner of bridge (Pt. 283 RTK)
RM-4	SE corner of bridge (Pt. 286 RTK)
RP-3	Streamward, most southerly fence post at gage house
RP-4	Chiseled square on bridge on concrete downstream side (Pt. 284 RTK and Pt. 268 RTK)
RP-5	Three saw marks on bridge rail, downstream side (Pt. 285 RTK and Pt. 267 RTK)
RP-6	Top of fence post anchor transducer, just downstream of bridge
RP-7	Chiseled square on bridge concrete upstream side opposite from RP-4 and RP-5 (Pt. 271 RTK)
RP-8	Top of fence post on gage, with solar panel
RP-9	North fence post at gage housing

U.S. Department of Interior
U.S. Fish and Wildlife Service

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

Date	Surveyors	WS	HWM	RM-2	RM-3	RM-4	RP-3	RP-4	RP-5	RP-6	RP-7	RP-8	RP-9	Close
6/27/2013	VC/JG		682.068	677.074*	681.909		684.810	681.957	683.925		681.933	685.240		-0.001
9/30/2015	VC/JDE	666.72				681.863	**	681.957	683.925	668.489		685.195	684.779	0.000
7/27/2016	DM/JS	667.017			681.884			681.957	683.925					-0.002

* Bank Slump
** Pounded down
for new housing

TABLE 2: SUMMARY OF AUTO LEVEL AND RTK SURVEYS FROM 2010 TO 2012

Site visits are summarized in the discharge measurement summary report field notesheet. Observations were reviewed and manually entered into Cmd.Obs.O time series in WISKI. Datum corrections were calculated by WISKI from the difference between Cmd.Obs.E and Cmd.V. Datum corrections are applied to the continuous data and shown in the time series Cmd.E. **Table 3** below shows the datum corrections for the data analysis period of record. **Figure 1** shows the differences between Cmd.E and Cmd.V.

All corrections were based off measure downs at either RP4 or RP5 with an emphasis on RP5. On 07/14/2012 RO staff changed the gage datum from assumed to MSL based on RTK data. After review, it was found that some 2013 measurements were based on an incorrect datum correction, so the correction for those measurements is larger than any of the others. See **Figure 1** below for a graph of the datum corrections.

Date	Time	Correction	Comment
3/11/2013	1:45:00 PM	---	Applied datum correction where datalogger died.
3/12/2013	11:00:00 AM	-0.31	Applied datum correction to where datalogger began recording.
3/21/2013	3:15:00 PM	-0.20	Applied datum correction where datalogger died.
4/11/2013	12:15:00 PM	---	Measure down taken while logger was dead
4/25/2013	10:45:00 AM	---	Measure down taken while logger was dead
6/5/2013	4:00:00 PM	---	Measure down taken while logger was dead
6/27/2013	7:00:00 PM	0.00	Datalogger and transducer replaced. New offset applied 666.57
11/18/2013	4:00:00 PM	0.00	
3/19/2014	10:30:00 AM	0.06	

U.S. Department of Interior
U.S. Fish and Wildlife Service

Last modified 12/12/2018- James Stack

O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\Turkey Creek nr Sumner\Station Analysis\2013_2016

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

4/15/2014	5:45:00 PM	0.00	
8/12/2014	2:00:00 PM	0.02	
12/16/2014	12:45:00 PM	0.04	
4/14/2015	12:00:00 PM	0.03	
7/9/2015	7:45:00 AM	0.02	Applied datum correction where datalogger died.
7/14/2015	3:00:00 PM	---	Measure down taken while logger was dead
7/15/2015	12:30:00 PM	---	Measure down taken while logger was dead
9/29/2015	5:30:00 PM	---	Measure down taken while logger was dead; New offset applied (old offset = 666.505, new offset = 666.51)
9/29/2015	11:45:00 PM	0.00	New offset applied (old offset = 666.505, new offset = 666.51)
9/30/2015	7:45:00 AM	0.00	
11/1/2015	3:00:00 PM	0.00	
12/10/2015	12:00:00 PM	---	Measure down taken while logger was dead
12/10/2015	8:00:00 PM	0.00	Applied datum correction to where datalogger began recording.
1/19/2016	2:45:00 AM	0.00	Applied datum correction where datalogger died.
3/6/2016	1:45:00 AM	0.00	Applied datum correction to where datalogger began recording.
3/9/2016	8:30:00 PM	0.00	Applied datum correction where datalogger died.
3/9/2016	9:30:00 PM	0.00	Applied datum correction to where datalogger began recording.
3/11/2016	8:45:00 PM	0.00	Applied datum correction where datalogger died.
3/14/2016	7:45:00 PM	0.00	Applied datum correction to where datalogger began recording.
3/21/2016	10:15:00 PM	0.00	Applied datum correction where datalogger died.
4/27/2016	11:00:00 AM	---	Measure down taken while logger was dead
4/27/2016	5:00:00 PM	0.02	Applied datum correction to where datalogger began recording.

U.S. Department of Interior
U.S. Fish and Wildlife Service

Last modified 12/12/2018- James Stack O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\Turkey Creek nr Sumner\Station Analysis\2013_2016

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

5/25/2016	11:00:00 PM	0.02	Applied datum correction where datalogger died.
7/27/2016	7:15:00 PM	---	Measure down taken while logger was dead
7/28/2016	12:15:00 AM	0.01	Applied datum correction to where datalogger began recording.
9/19/2016	3:00:00 PM	0.00	
12/12/2016	3:15:00 PM	0.03	

TABLE 3: DATUM CORRECTIONS COMPUTED (Cmd.Cor.O)

U.S. Department of Interior
U.S. Fish and Wildlife Service

Last modified 12/12/2018- James Stack O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\Turkey Creek nr Sumner\Station Analysis\2013_2016

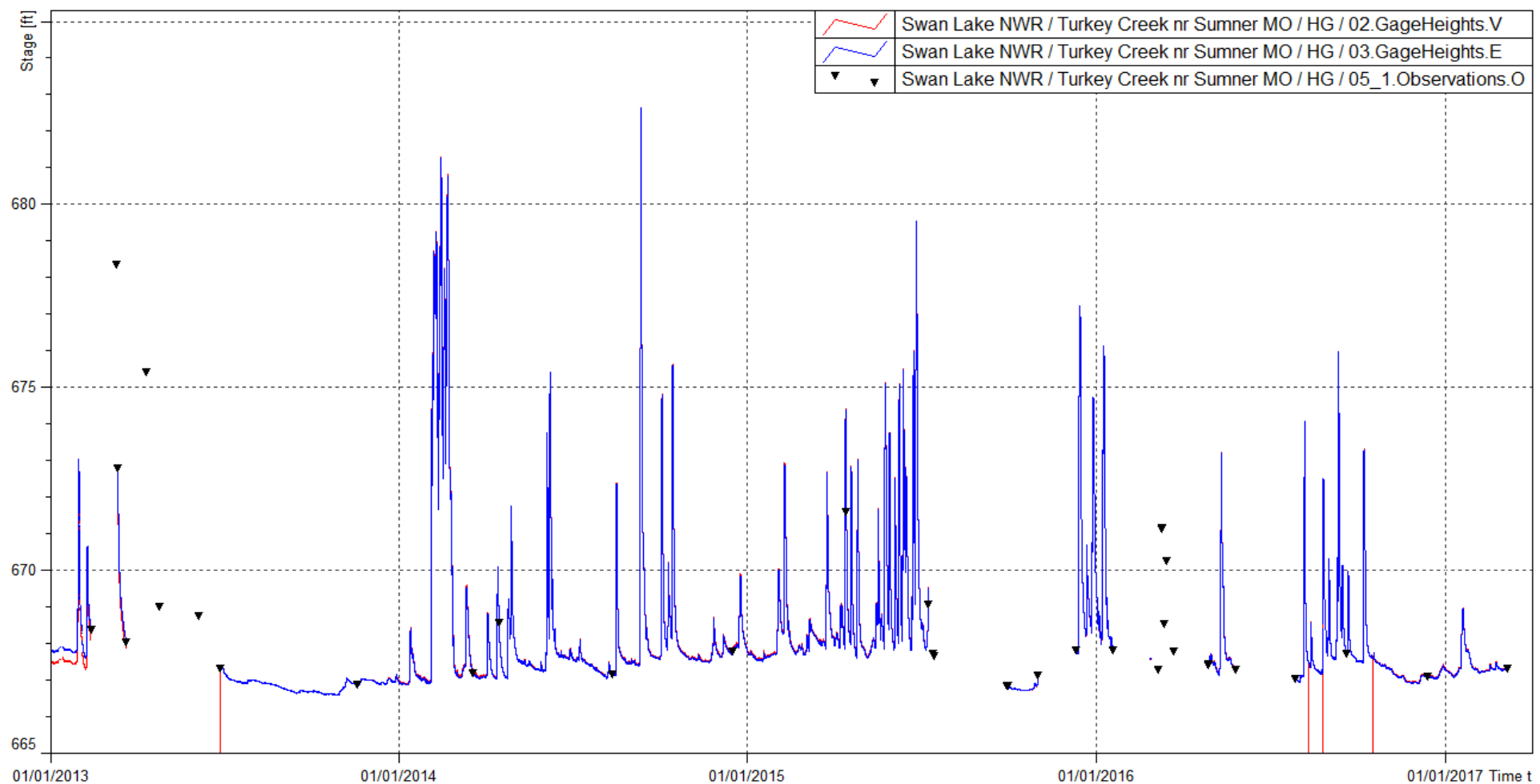


FIGURE 1: DATUM CORRECTIONS APPLIED FROM Cmd.V to Cmd.E

U.S. Department of Interior
U.S. Fish and Wildlife Service

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

CONTROL: The gage at Turkey Creek near Sumner is channel controlled at mid to high flows. For lows flows it is also controlled by the channel, but there are frequent period of backwater, suspected to be caused by Silver Lake.

RATING:

A previous rating for this site was created in 2013 using measurements from 2009 to 2013 (Rating 1, Version 1). For the current period of record (2013-2016), a new rating curve needed to be drawn due to there being more measurements (Rating 2, Version 2). This rating was developed using eight discharge measurements from 2013 to 2016 that were not taken during a period of backwater. It also used a high water measurement from 2009 to define the upper end of the curve. The rest of the upper end of the curve was kept the same as Rating 1, Version 1. Additional measurements are needed to define the upper end of the rating. This is a flashy stream making it difficult to obtain high flow measurements. The low end of the rating is oftentimes affected by backwater from Silver Lake. This site is frequently in subtle backwater conditions making it sometimes difficult to quantify low flow versus backwater affected discharges. As a result this rating curve is poorly defined at this time.

HG (ft)	Q (ft ³ /s)	Quality
666.60	0.04	160 (Poor)
667.80	0.30	160 (Poor)
667.00	1.16	160 (Poor)
667.30	3.66	160 (Poor)
667.60	6.74	160 (Poor)
667.90	10.77	160 (Poor)
668.20	16.05	160 (Poor)
668.50	21.60	160 (Poor)
669.00	37.21	160 (Poor)
669.50	56.85	160 (Poor)
670.00	81.58	160 (Poor)
670.50	111.21	160 (Poor)
671.00	145.95	160 (Poor)
672.00	223.62	160 (Poor)
674.00	365.93	160 (Poor)

**U.S. Department of Interior
U.S. Fish and Wildlife Service**

Water Monitoring Analysis 2013 to 2016
393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

678.00	716.31	160 (Poor)
681.50	1152.01	160 (Poor)

Table 3: RATING TABLE OF R2.V2

U.S. Department of Interior
U.S. Fish and Wildlife Service

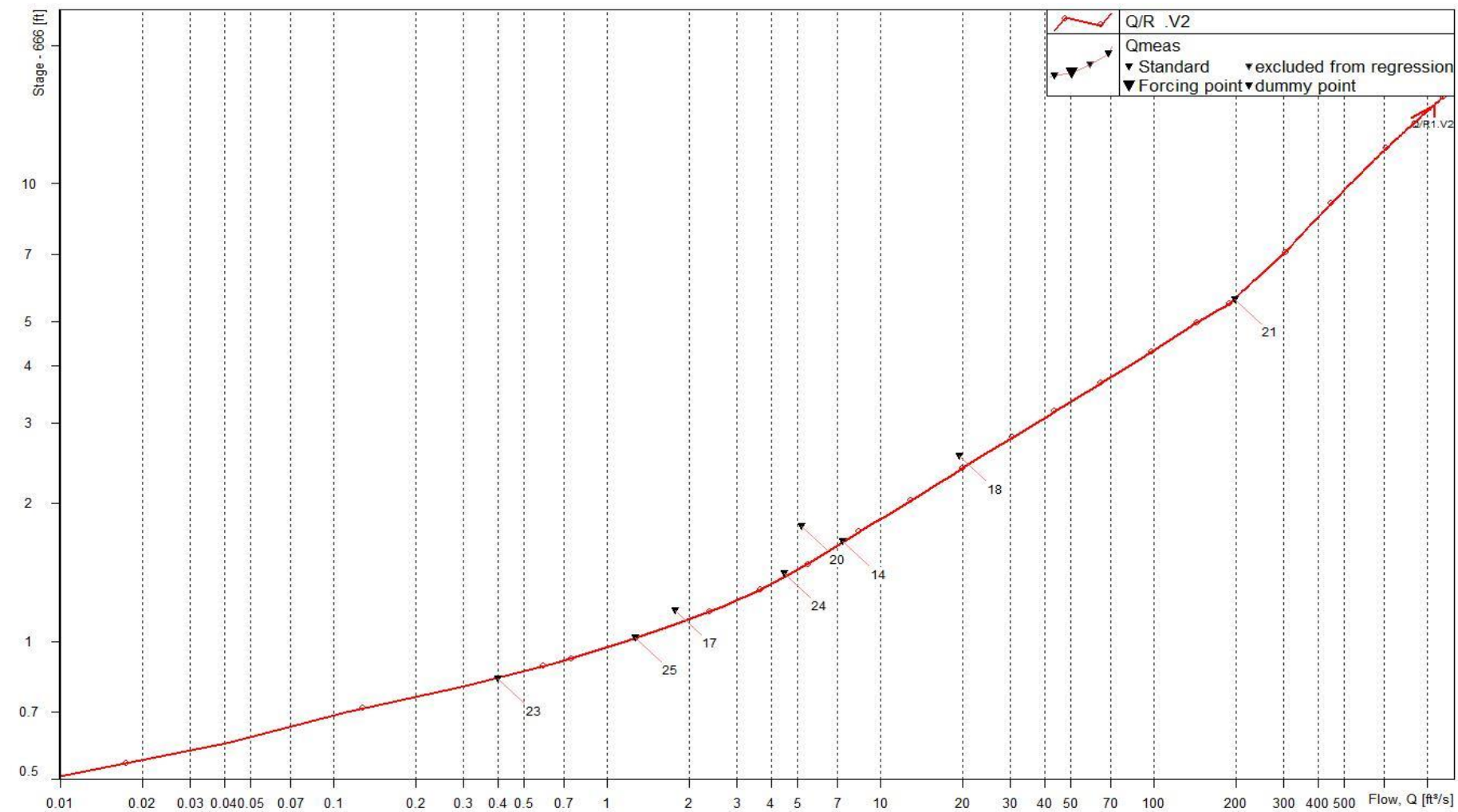


Figure 2: RATING 2, VERSION 2

U.S. Department of Interior
U.S. Fish and Wildlife Service

SHIFTS:

Three shifts were applied from 2013 to 2016. All three shifts were depositional and applied during the year 2014. All other measurements used for defining the rating curve were either directly on or extremely close to the curve, so did not need shifts. A -0.08 shift was applied to measurement 17 (3/29/2014), a -0.17 shift for measurement 18 (4/15/2014), and then a -0.33 shift was applied to measurement 20 (12/16/2014). The shifts for measurements 17 and 18 were needed because both measurements fell on the receding limb of small flood peaks. The receding limb of a flood peak is the time at which sediment scoured during the flood begins to be deposited in the stream channel. The shift for measurement 20 was much larger because it was during a time of prolonged low flow conditions, and the presence of leafy debris and sticks were noted in the channel during the measurement, causing a much lower discharge than would be expected for a given stage.

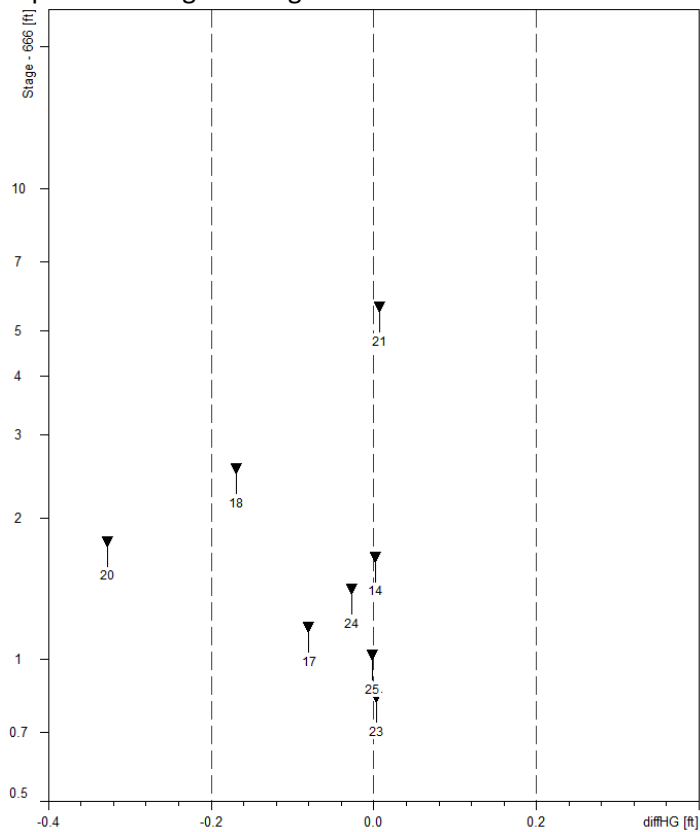


Figure 3: STAGE RELATED SHIFT DIAGRAM R2.V2. SHIFT WERE APPLIED FOR MEASUREMENTS 20, 18, and 17.

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

Date	Time	Quality	Low GH	Low Shift	Mid GH	Mid Shift	Max GH	Max Shift
01/26/2013	09:00:00 PM	160 (Poor),	666.50	-0.30	668.68	-0.30	679.90	0.00
01/30/2013	03:00:00 PM	160 (Poor),	666.50	0.00	667.65	0.00	679.90	0.00
02/21/2014	10:30:00 AM	160 (Poor),	666.50	0.00	667.17	0.00	679.90	0.00
03/01/2014	08:00:00 PM	160 (Poor),	666.50	-0.08	667.17	-0.08	679.90	0.00
04/02/2014	03:30:00 AM	160 (Poor),	666.50	-0.08	667.17	-0.08	679.90	0.00
04/15/2014	03:45:00 PM	160 (Poor),	666.50	-0.17	668.54	-0.17	679.90	0.00
06/03/2014	09:00:00 PM	160 (Poor),	666.50	-0.17	668.54	-0.17	679.90	0.00
06/08/2014	08:00:00 AM	160 (Poor),	666.50	0.00	668.54	0.00	679.90	0.00
09/10/2014	10:45:00 PM	160 (Poor),	666.50	0.00	667.78	0.00	679.90	0.00
09/20/2014	08:00:00 PM	160 (Poor),	666.50	-0.33	667.78	-0.33	679.90	0.00
01/31/2015	03:00:00 PM	160 (Poor),	666.50	-0.33	667.78	-0.33	679.90	0.00
02/08/2015	05:00:00 PM	160 (Poor),	666.50	0.00	667.78	0.00	679.90	0.00

Date	Time	Comments
1/26/2013	9:00:00 PM	-0.30 shift carried through to Jan. 2013. Zero discharge msmt collected on 7/12/12. Depositional shift also needed for 11/13/2012 msmt.
1/30/2013	3:00:00 PM	-0.30 shift carried through to Jan. 2013. Zero discharge msmt collected on 7/12/12. Depositional shift also needed for 11/13/2012 msmt.
2/21/2014	10:30:00 AM	Zero shift, start of -0.08 shift for 3/19 measurement.
3/1/2014	8:00:00 PM	Start of -0.08 shift applied to descending limb of hydrograph.

U.S. Department of Interior
U.S. Fish and Wildlife Service

Last modified 12/12/2018- James Stack O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\Turkey Creek nr Sumner\Station Analysis\2013_2016

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

4/2/2014	3:30:00 AM	-0.08 shift continues through descending limb before increase in stage on 4/3/2014
4/15/2014	3:45:00 PM	A greater, -0.17 shift applied after the descending limb of 4/14/2014 peak but before 4/15/2014 measurement.
6/3/2014	9:00:00 PM	-0.17 shift continued through 06/03/2014 to beginning of the rising limb of flood peak on that date.
6/8/2014	8:00:00 AM	Zero shift applied to peak of flood event on 6/7/2014, ending the depositional shift. This large flood peak would have likely scoured out the channel.
9/10/2014	10:45:00 PM	Zero shift, start of -0.33 shift needed for 12/16/14 measurement.
9/20/2014	8:00:00 PM	Start of -0.33 shift applied to descending limb of peak on 9/20/14.
1/31/2015	3:00:00 PM	-0.33 shift continues through 1/31/2015 before stage begins to rise on rising limb of flood peak.
2/8/2015	5:00:00 PM	Zero shift, end of -0.33 shift at peak of event.

Table 4: SHIFT TABLE

DISCHARGE COMPUTATIONS: Fourteen discharge measurements were taken from 2013 to 2016 (**Table 5**). These measurements are summarized in the discharge summary and can be viewed in WISKI under the Gaugings.O parameter. Daily flow values were computed based on Rating 2, Version 2, with shift corrections as discussed above. Ice in and ice out data was not taken into consideration at this time. Backwater measurements as determined by field notes and photos, were not used in the development of the R2 V2 rating curve. All discharges that were not estimated were rated as “Poor” due to the poor nature of the R2 V2 rating curve.

Due to the numerous periods of missing data, and the backwater affect sometimes observed from Silver Lake, portions of this record had to be estimated. Data was estimated by a visual comparison to computed discharge for Elk Creek, which had a more complete record. The two record were graphed on two separate axes so that their flood peaks matched up with one another. Then periods of missing data were estimated by entering values that matched Elk Creek’s hydrograph. The only difference was that Turkey Creek’s flood peaks were slightly lagged and were given a slower return to no flow than Elk Creek, due to the fact this gaging station is lower in the watershed and drains a larger area. Where, on-site discharge measurements were available, the estimates were made to correspond with these actual measured values. In periods where the hydrograph exhibited prolonged periods of low flow without much variation, this data was

**U.S. Department of Interior
U.S. Fish and Wildlife Service**

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

set at or close to zero and estimated as a time of backwater. Gaging data from Silver Lake and field notes were used to supplement this analysis of the presence of backflow

Number	Date	Time	Flow (cfs)	Quality	Stage (ft)	
14	03/21/2013	03:30:00 PM	7.32	80 (Fair)	667.65	
15	06/27/2013	06:30:00 PM	1.30	160 (Poor)	667.30	*
16	11/18/2013	04:45:00 PM	0.02	160 (Poor)	666.87	*
17	03/19/2014	09:45:00 AM	1.77	80 (Fair)	667.17	
18	04/15/2014	05:15:00 PM	19.56	80 (Fair)	668.53	
19	08/12/2014	03:15:00 PM	0.26	160 (Poor)	667.13	*
20	12/16/2014	01:45:00 PM	5.19	40 (Good)	667.78	
21	04/14/2015	12:30:00 PM	197.86	40 (Good)	671.60	
22	07/15/2015	10:00:00 AM	1.26	160 (Poor)	667.64	*
23	09/30/2015	09:15:00 AM	0.40	160 (Poor))	666.83	
24	04/27/2016	11:15:00 AM	4.45	80 (Fair)	667.41	
25	07/27/2016	08:00:00 PM	1.27	160 (Poor)	667.02	
26	09/19/2016	04:30:00 PM	3.56	160 (Poor)	667.71	*
27	12/12/2016	03:30:00 PM	0.39	160 (Poor)	667.09	*

* Indicates backwater
measurement (not used for rating)

Table 5: Discharge measurements taken during data analysis period.

U.S. Department of Interior
U.S. Fish and Wildlife Service

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

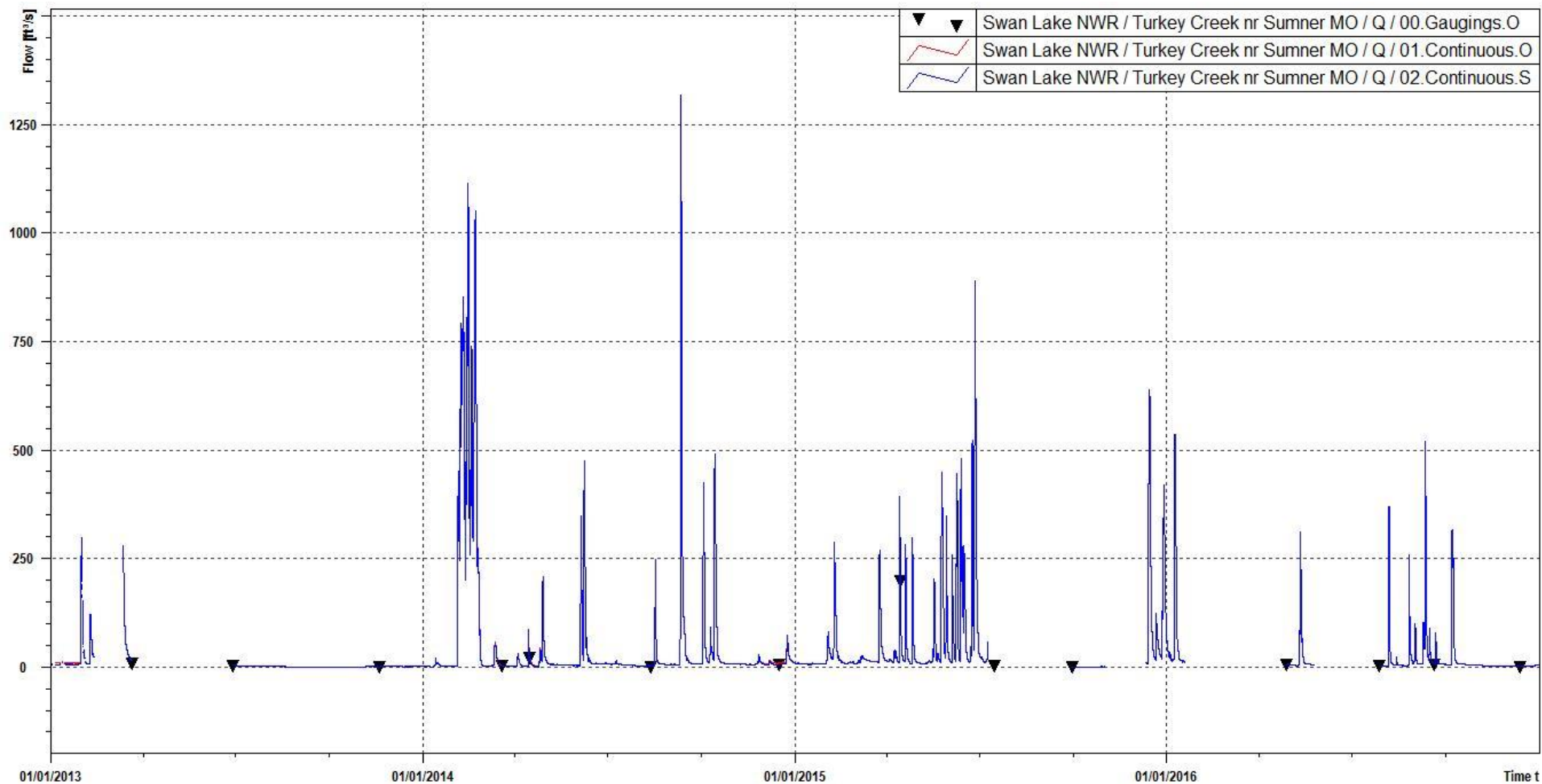


Figure 4 : COMPUTED DISCHARGE AT 15 MINUTE INTERVALS

U.S. Department of Interior
U.S. Fish and Wildlife Service

Last modified 12/12/2018- James Stack O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\Turkey Creek nr Sumner\Station Analysis\2013_2016

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

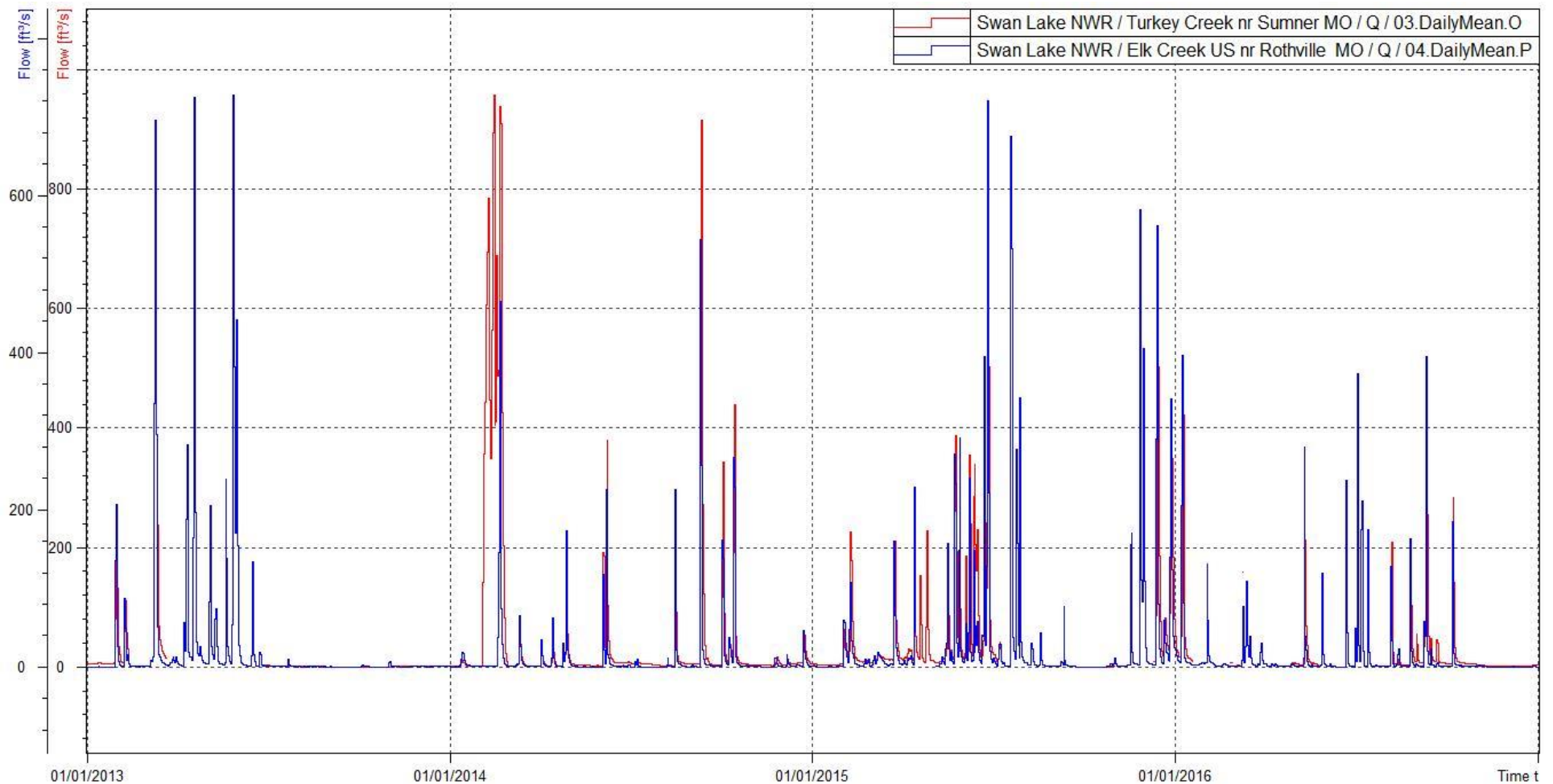


Figure 5: COMPARISON OF TURKEY CREEK (RED) AND ELK CREEK (BLUE) MEAN DAILY DISCHARGE. ELK CREEK WAS USED TO ESTIMAED MISSING DATA FOR TURKEY CREEK.

**U.S. Department of Interior
U.S. Fish and Wildlife Service**

Last modified 12/12/2018- James Stack O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\Turkey Creek nr Sumner\Station Analysis\2013_2016

Water Monitoring Analysis 2013 to 2016
393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

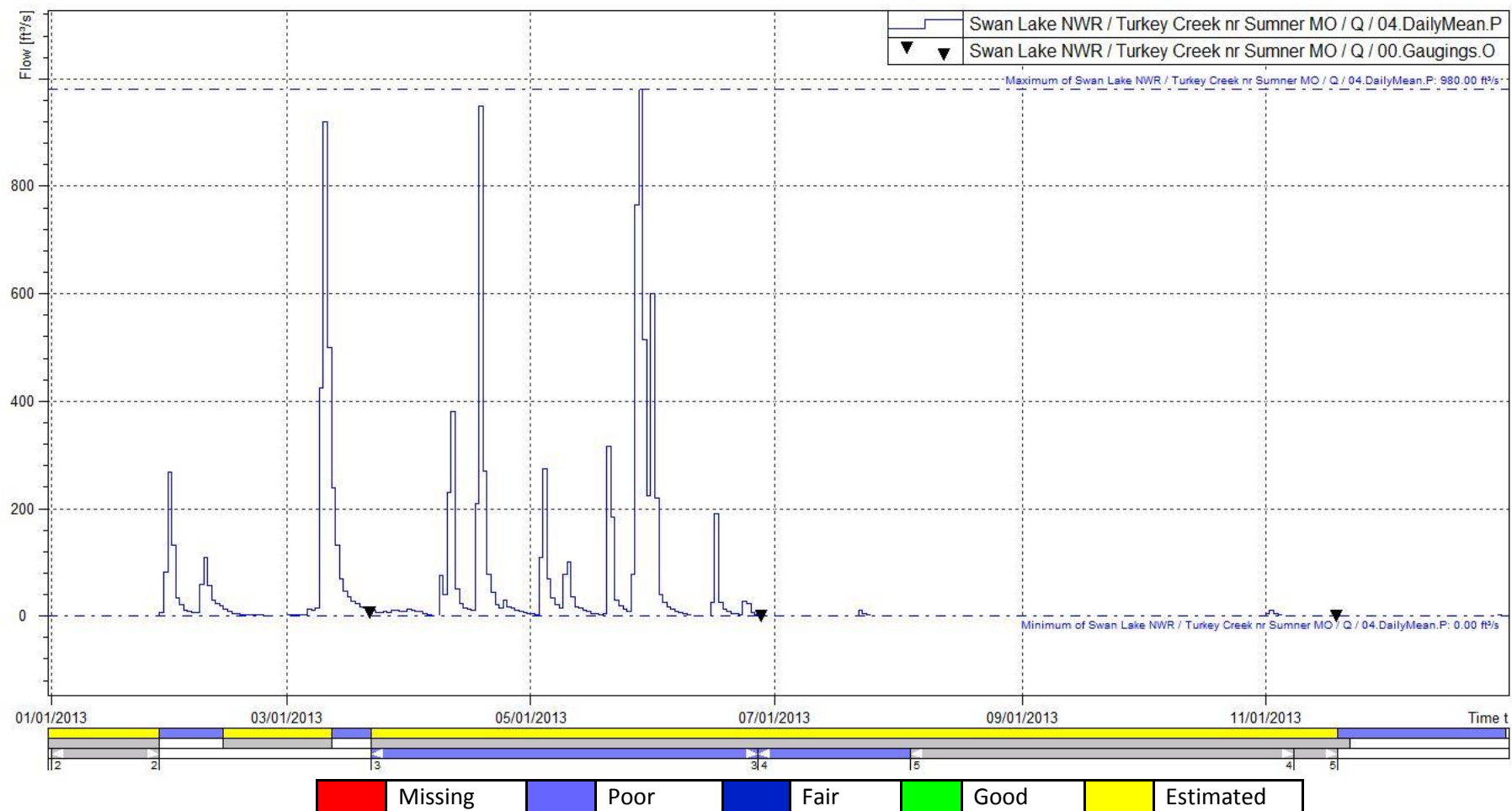


Figure 6A: MEAN DAILY COMPUTED DISCHARGE 2013 (DayMean.P).

U.S. Department of Interior
U.S. Fish and Wildlife Service

Water Monitoring Analysis 2013 to 2016
393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

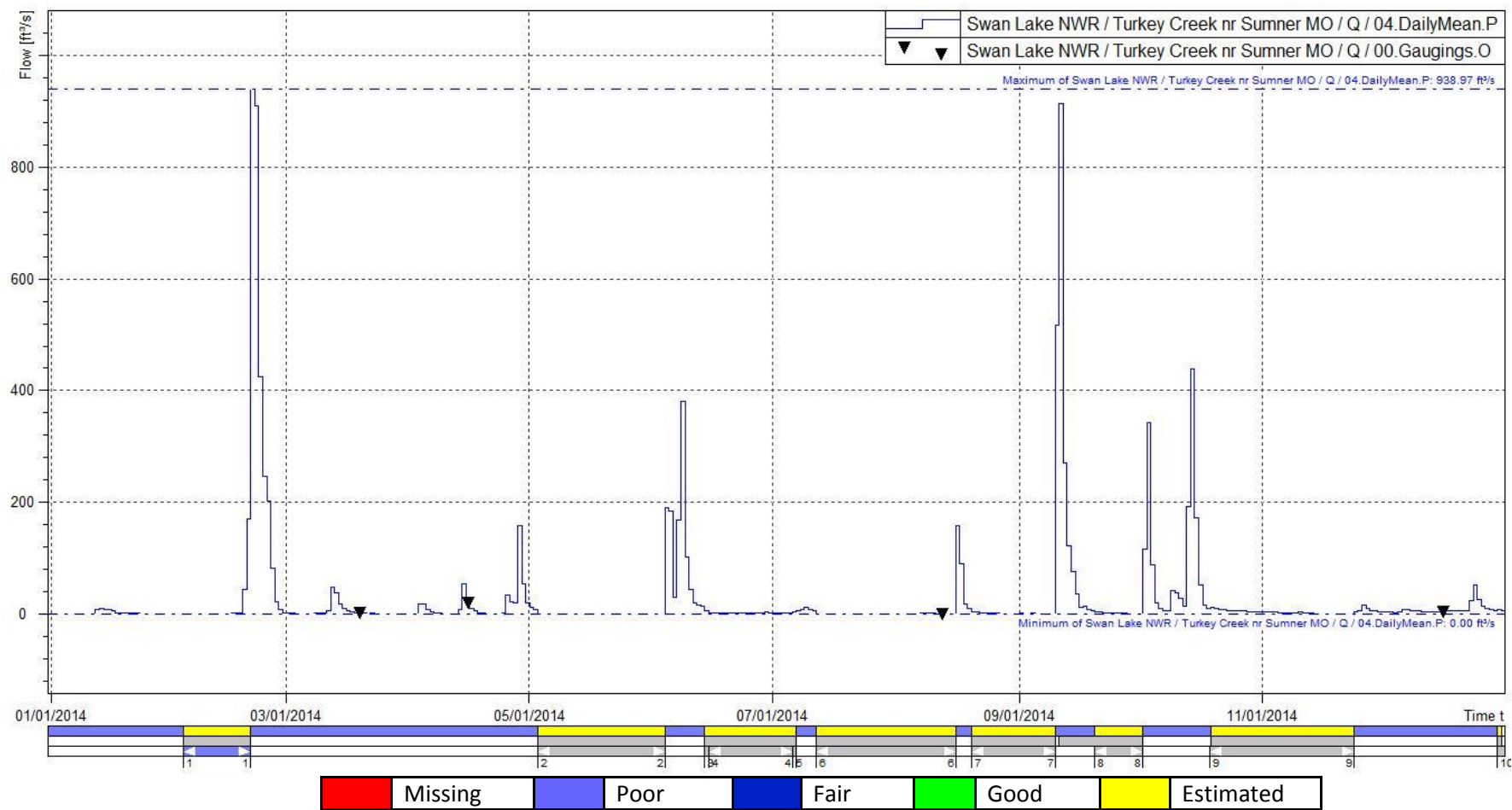


Figure 6B: MEAN DAILY COMPUTED DISCHARGE 2014 (DayMean.P).

U.S. Department of Interior
U.S. Fish and Wildlife Service

Water Monitoring Analysis 2013 to 2016
393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

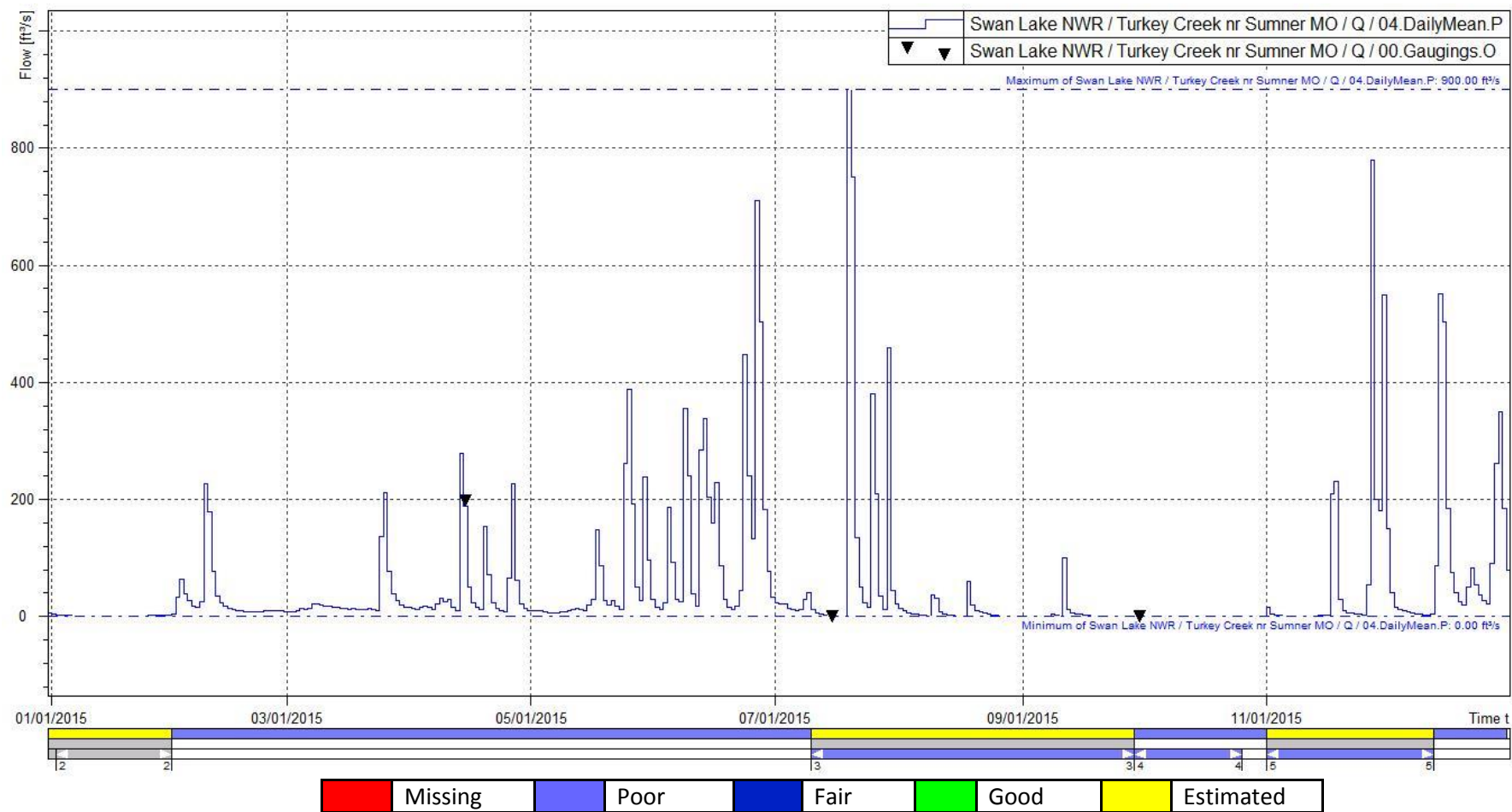


Figure 6C: MEAN DAILY COMPUTED DISCHARGE 2015 (note: maximum discharge is estimated) (DayMean.P).

U.S. Department of Interior
U.S. Fish and Wildlife Service

Water Monitoring Analysis 2013 to 2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

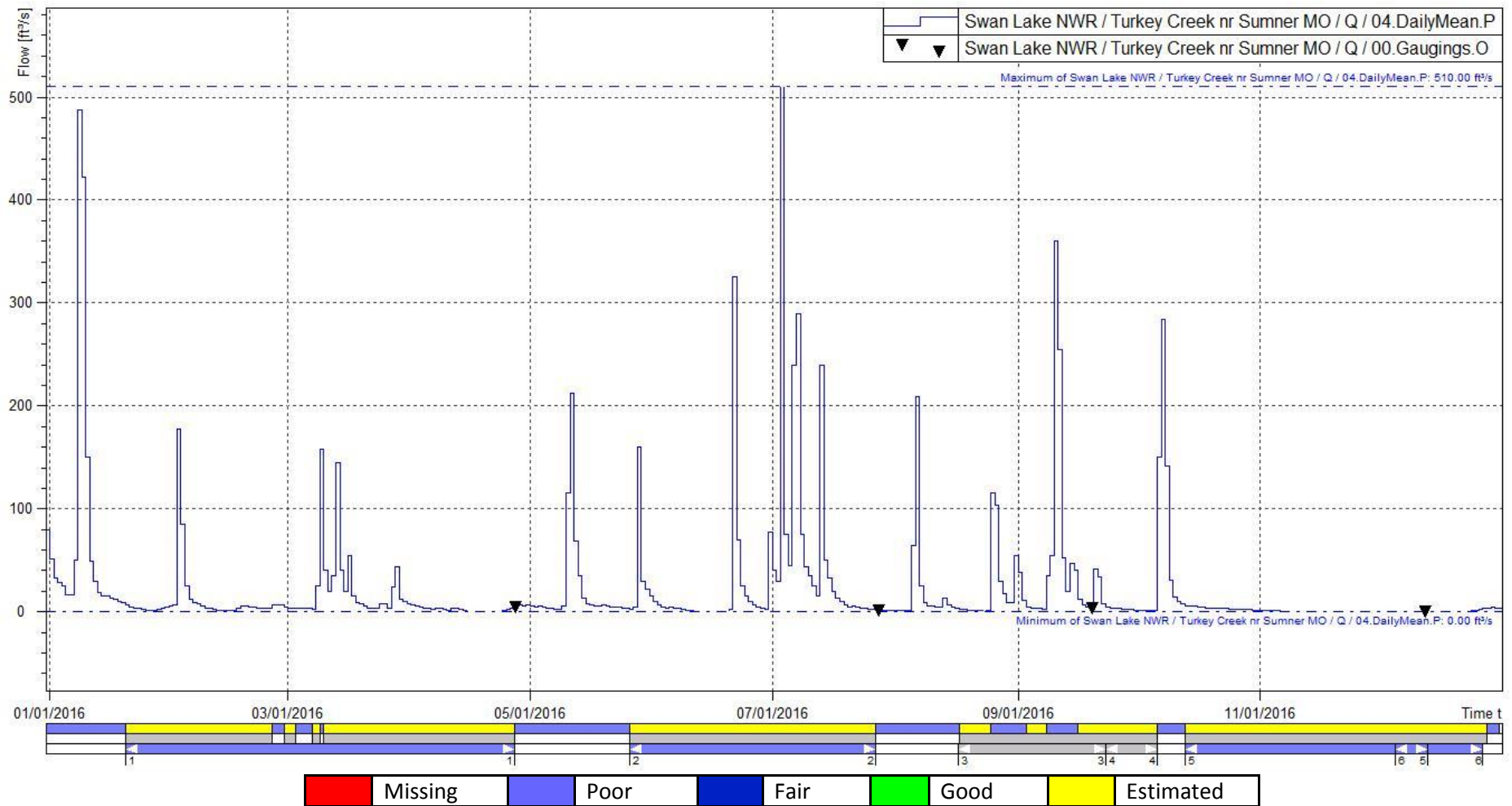


Figure 6D: MEAN DAILY COMPUTED DISCHARGE 2016 (note :maximum discharge is estimated) (DayMean.P).

U.S. Department of Interior
U.S. Fish and Wildlife Service

Last modified 12/12/2018- James Stack

O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\Turkey Creek nr Sumner\Station Analysis\2013_2016

Water Monitoring Analysis 2013 to 2016
393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

List of remarks

Time series info: 04.DailyMean.P

From: 1/ 1/2013 12:00:00 AM

To: 12/31/2016 11:59:59 PM

Update list

Configure visible remarks

List of entries

Quality codes

From	To	Text of remark	User
12/31/2012 12:00 AM	12/31/2016 11:59 PM	All data coded poor unless estimated.	JStack
01/01/2013 12:00 AM	01/28/2013 12:00 AM	Estimated zero flow due to backwater effect	JStack
03/22/2013 12:00 AM	06/27/2013 12:00 AM	Streamflow estimated due to missing data	JStack
06/27/2013 12:00 AM	11/08/2013 12:00 AM	Streamflow estimated as zero due to backwater	JStack
08/04/2013 12:00 AM	11/19/2013 12:00 AM	Streamflow estimated due to missing data, zero flow, and backwater effects. ...	JStack
02/03/2014 12:00 AM	02/20/2014 12:00 AM	Data estimated due to bad data logger readings.	JStack
05/03/2014 12:00 AM	06/04/2014 12:00 AM	Stream estimated as zero due to backwater	JStack
06/14/2014 12:00 AM	06/15/2014 12:00 AM	Estimated flow due to backwater effect	JStack
06/15/2014 12:00 AM	07/06/2014 12:00 AM	Estimated flow due to backwater effect	JStack
07/06/2014 12:00 AM	07/07/2014 12:00 AM	Estimated flow due to backwater effect	JStack
07/12/2014 12:00 AM	08/16/2014 12:00 AM	Estimated zero flow due to backwater effect	JStack
08/20/2014 12:00 AM	09/10/2014 12:00 AM	Estimated flow due to backwater effect	JStack
09/20/2014 12:00 AM	10/02/2014 12:00 AM	Estimated flow due to backwater effect	JStack
10/19/2014 12:00 AM	11/24/2014 12:00 AM	Estimated flow due to backwater effect	JStack
12/30/2014 12:00 AM	01/02/2015 12:00 AM	Estimated flow due to backwater effect	JStack
01/02/2015 12:00 AM	01/31/2015 12:00 AM	Estimated flow due to backwater effect	JStack
07/10/2015 12:00 AM	09/29/2015 12:00 AM	Streamflow estimated due to missing data	JStack
09/29/2015 12:00 AM	10/26/2015 12:00 AM	Streamflow estimated as zero due to suspected backwater	JStack
11/01/2015 12:00 AM	12/13/2015 12:00 AM	Streamflow estimated due to missing data.	JStack
01/20/2016 12:00 AM	04/27/2016 12:00 AM	Streamflow estimated due to missing data	JStack
05/26/2016 12:00 AM	07/27/2016 12:00 AM	Streamflow estimated due to missing data	JStack
08/17/2016 12:00 AM	09/23/2016 12:00 AM	Estimated streamflow due to suspected backwater	JStack
09/23/2016 12:00 AM	10/06/2016 12:00 AM	Streamflow estimated due to suspected backwater effect	JStack
10/13/2016 12:00 AM	12/13/2016 12:00 AM	Streamflow estimated due to suspected backwater effect	JStack
12/05/2016 01:00 AM	12/27/2016 01:00 AM	Estimated due to suspected backwater	JStack

OK

Cancel

Help

REMARKS:
Stage records coded POOR for the 2013 to 2016 record.

WORKED BY: J. STACK
REVIEWED BY: J. EASH, J. GRUETZMAN

U.S. Department of Interior
U.S. Fish and Wildlife Service

Last modified 12/12/2018- James Stack O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\Turkey Creek nr Sumner\Station Analysis\2013_2016

393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

RECORD:

The record is for this period of record is rated as FAIR.

REMARKS:

Data coded FAIR. Water temperature data from KPSI transducer not cross checked in field. JS

[illegible]

FIGURE 2: EDITS AND COMMENTS RELATED TO WATER TEMPERATURE

U.S. Department of Interior
U.S. Fish and Wildlife Service

Last modified 12/12/2018- James Stack **O:\NWRS_Hydrology\National Wildlife Refuges\Swan Lake\Records\Turkey Creek nr Sumner\Station Analysis\2013_2016**

Water Monitoring Analysis 2013 to 2016
393937093090901 TURKEY CREEK NR SUMNER MO, FULBRIGHT RD

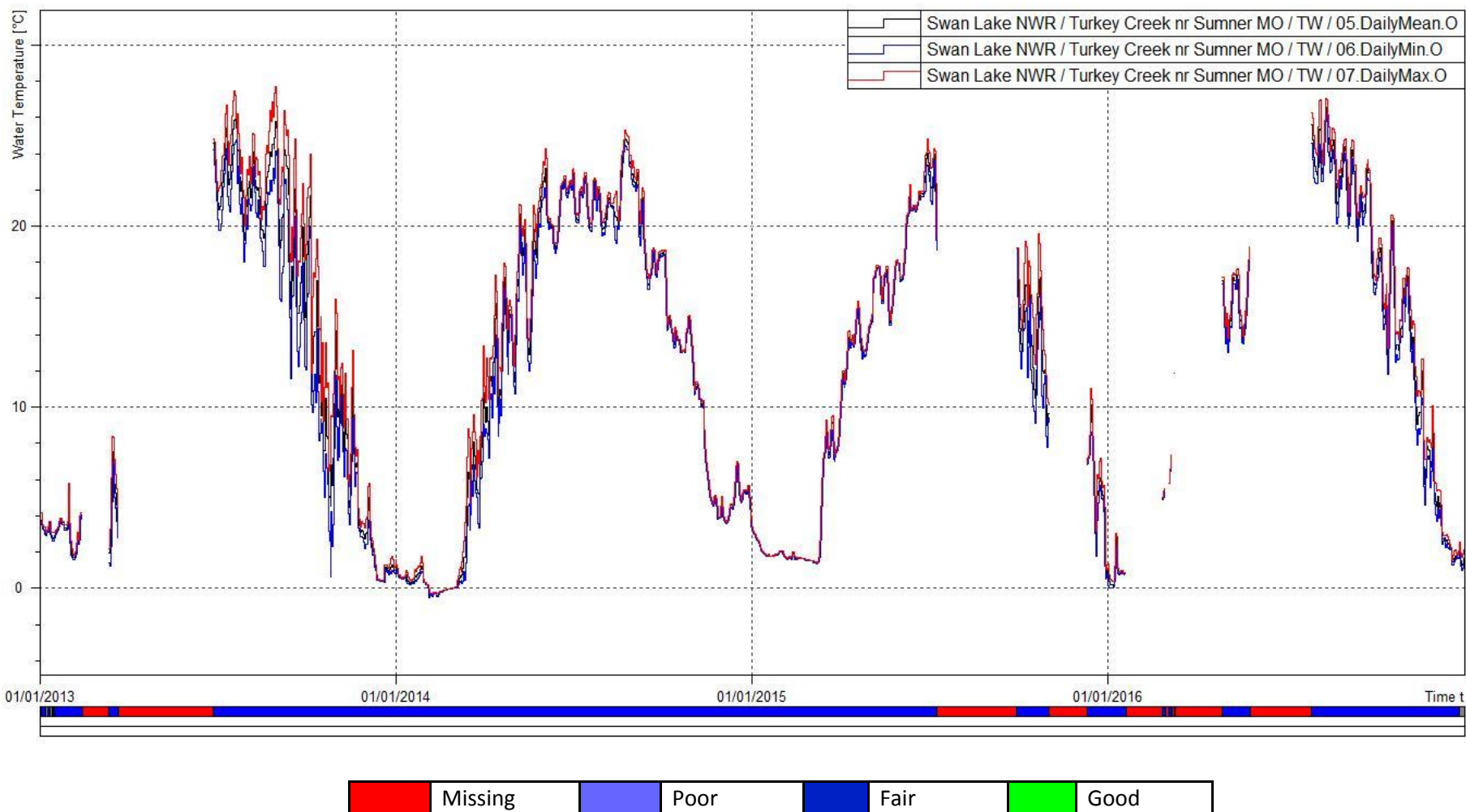


FIGURE 3: WATER TEMPERATURE DAILY VALUES – MAX, MEAN, MIN

U.S. Department of Interior
U.S. Fish and Wildlife Service