

Ozarks Environmental and Water Resources Institute (OEWRI)
Missouri State University (MSU)

Hydrological Monitoring of the Big Barren Creek Watershed, Mark Twain National Forest, Southeast Missouri Water Year 2020

SUMMARY REPORT

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WATER YEAR 2020 SUMMARY

This report summarizes the 2020 Water Year (WY2020) discharge results for the 9 stations that were installed in the Big Barren Creek watershed in 2015 and 2016. The 2020 Water Year runs from October 1, 2019 to September 30, 2020. Big Barren Creek is a tributary of the Current River Basin (8-digit Hydrological Unit Code (HUC) #11010008) located in portions of Ripley, Oregon and Carter Counties in southeast Missouri (Figure 1). Gaging station locations were selected along both the main stem of Big Barren Creek and distributed along smaller tributaries throughout the watershed (Figure 2). Drainage areas for the tributary sites ranged from 1.59-7.82 km² and gage locations within the smaller tributary watersheds drain forest service lands that have either been entirely burned or unburned (Table 1). The drainage areas of the main stem sites have a mix of land uses from private lands to burned and unburned public forest, ranging in drainage area from 47.7-124.2 km². The majority of the streams within the Big Barren Creek watershed are ephemeral due to the underlying karst landscape where sinkholes, losing streams, and caves are common (Weary et al., 2014). The perennial site along Big Barren Creek is downstream of the Big Barren Creek Natural Area and appears to be associated with a series of northeast trending faults (Weary et al., 2014; Figure 2).

Stage data was recorded every 5-minutes using Hobo U20L-04 Water Level Loggers. The level loggers were installed inside a PVC pipe assembly and secured to 1-2 m staff gages that were installed at each site. An additional level logger was installed to measure barometric pressure used to compensate for barometric pressure changes. Raw data is downloaded periodically (≈ every 10 weeks) from the level loggers using the Hobo Waterproof Shuttle. Discharge rating curves were created at each site to estimate flows for each 5-minute stage reading over the monitoring period. Specific methods used to develop these rating curves can be seen in a separate report (Owen et al., 2020). For all 9 sites there were 10 days of missing data over the year during the lockdown period at the beginning of the COVID-19 pandemic. At SPC, there was 13 total days of missing data and 153 total days of missing data at LNA due to equipment malfunctions.

Rainfall

There was a total of 172.2 cm of rainfall in WY2020, which is 52.4 cm higher than the average annual rainfall for the area between 1956-2014 (Pavlowsky et al., 2016). Of that total, 58.7 cm (34.1%) fell in the winter from January to March which was the highest seasonal total for the period (Figure 3). The highest rainfall total recorded for the year occurred in the winter between January 9-11 (12.3 cm). The second highest seasonal rainfall total occurred in the Spring from April-June with 47.6 cm (27.7%) of the total annual rainfall. The lowest seasonal rainfall occurred in the summer from July-September with 24.1 cm (14.0%). While the total

annual rainfall was relatively high compared to the long-term average, no daily rainfall total exceeded 7.5 cm during WY2020 (Pavlowsky et al., 2016).

For WY2020, rainfall totals were recorded at three Onset HOBO rain gage data loggers (part# RG3-M) installed in the upper, middle, and lower portions of the watershed (Figure 2). Due to inconsistent records at the lower and middle stations, the upper station is reported here. The total rainfall collected at the gages located within the watershed recorded 26.3 cm ($\approx 17\%$ RPD) less rainfall than using the inverse distance weighted method from nearby gages (Pavlowsky et al., 2016).

Discharge and Runoff

The range in discharge values for WY2020 were calculated for both perennial and ephemeral gaging stations in the Big Barren Creek watershed and annual average discharges are comparable to nearby USGS gaging stations. The LNA site is the only gage in the perennial stream section of the watershed, but only a partial record was able to be recorded. For the ephemeral sites, average annual discharge ranged from $0.002 \text{ m}^3/\text{s}$ to $0.079 \text{ m}^3/\text{s}$. Annual peak discharge ranged from $2.98 \text{ m}^3/\text{s}$ at TH to $42.4 \text{ m}^3/\text{s}$ at LNA. Average annual discharge for the sites from this study were plotted by drainage area and compared to nearby USGS gaging stations. Ephemeral sites plot below the best-fit line of perennial USGS stations and perennial sites plot on or just below the USGS stations (Figure 4). Furthermore, the USGS station along a losing section of Logan Creek near Ellington plots along the best-fit line of the ephemeral sites in this study.

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Owen, M.R., S. Ahmed, and R.T. Pavlowsky (2020). Gaging Station Report for: Hydrological Monitoring of the Big Barren Creek Watershed, Mark Twain National Forest, Southeast Missouri, DRAFT REPORT. OEWRI EDR-20-00X. Completed for the U.S. Forest Service, November 24, 2020.

Pavlowsky, R.T., M.R. Owen, and R. A. Bradley (2016) *Historical Rainfall Analysis for the Big Barren Creek Watershed, Southeast Missouri (1955-2015)*. OEWRI EDR-16-001. Completed for the U.S. Forest Service, March 23, 2016.

Weary, D.J., R.W. Harrison, R.C. Orndorff, R.E. Weems, J.S. Schindler, J.E. Repetski, and H.A. Pierce (2014) Bedrock Geologic Map of the Spring Valley, West Plains, and Parts of the Piedmont and Poplar Bluff 30'x60' Quadrangles, Missouri, Including the Upper Current River and Eleven Point River Drainage Basins. U.S. Geological Survey Scientific Investigations Map 3280.

TABLES

Table 1. WY2020 gaging station locations in the Big Barren Creek watershed.

Site Name	Site ID	Northing (m) NAD83, UTM15N	Easting (m) NAD83, UTM15N	Elevation (m)	Drainage Area (km ²)	Stream Type	Burn History	Missing Days
Tram Hollow	TH	4,080,612.536	660,800.255	257.10	1.59	Ephemeral	Unburned	10
Upper Big Barren	UBB	4,082,297.631	660,727.701	253.46	2.51	Ephemeral	Burned	10
Upper Tributary	UT	4,081,698.540	660,910.259	247.92	4.19	Ephemeral	Unburned	10
Wolf Pond	WP	4,084,372.539	665,468.255	232.65	5.13	Ephemeral	Burned	10
Polecat Hollow	PH	4,082,395.533	664,472.252	224.51	6.19	Ephemeral	Burned	10
South Prong Cedar	SPC	4,078,550.511	666,420.219	209.96	7.28	Ephemeral	Burned	13
Fools Catch	FC	4,081,865.521	669,811.222	196.79	7.82	Ephemeral	Unburned	10
Middle Big Barren	MBB	4,081,306.806	667,938.252	191.57	47.8	Ephemeral	Mixed	10
Lower Natural Area	LNA	4,079,188.630	672,767.129	158.50	124.2	Perennial	Mixed	155

Table 2. WY2020 Big Barren Creek watershed gaging station data summary.

Site Name	Drainage Area (km ²)	Rainfall* Vol. (m ³)	Runoff Vol. (m ³)	Rainfall As Runoff (%)	Runoff Depth (cm)	Avg. Q (m ³ /s)	Max Q (m ³ /s)	10% Q** (m ³ /s)	50% Q** (m ³ /s)	90% Q** (m ³ /s)	Min Q (m ³ /s)
Tram Hollow	1.59	2,737,980	105,449	3.9	6.6	0.003	2.98	0.0	0.0	0.0	0.0
Upper Big Barren	2.51	4,322,220	194,025	4.5	7.7	0.006	4.73	0.01	0.0	0.0	0.0
Upper Tributary	4.19	7,215,180	61,571	0.9	1.5	0.002	3.23	0.0	0.0	0.0	0.0
Wolf Pond	5.13	8,833,860	69,471	0.8	1.4	0.002	3.46	0.0	0.0	0.0	0.0
Polecat Hollow	6.19	10,659,180	81,520	0.8	1.3	0.003	7.07	0.0	0.0	0.0	0.0
South Prong Cedar	7.28	12,536,160	2,504,144	20.0	34.4	0.079	5.64	0.18	0.02	0.0	0.0
Fools Catch	7.82	13,466,040	166,373	1.2	2.1	0.005	4.75	0.0	0.0	0.0	0.0
Middle Big Barren	47.8	82,311,600	966,930	1.2	2.0	0.031	18.0	0.04	0.01	0.0	0.0
Lower Natural Area***	124.2	213,872,400	54,797,244	25.6	44.1	1.73	42.4	5.44	0.59	0.27	0.009

*Total rainfall for WY2020 = 172.2 cm

** Exceedance value

*** Estimated from partial flow series.

Table 3. Water Year 2020 Records for Nearby USGS Gaging Stations.

Station Name	Start Year	Years of Record	Drainage Area km ²	WY 2020 Avg. Annual Q (m ³ /s)	Flow Exceedance (%)			
					90% (m ³ /s)	50% (m ³ /s)	10% (m ³ /s)	0% (Max) (m ³ /s)
EAST FORK BLACK RIVER NEAR LESTERVILLE, MO	2003	18	135.2	2.31	0.17	0.67	4.06	NA
CURRENT RIVER AT MONTAUK STATE PARK, MO	2007	14	152.3	4.88	2.92	4.30	7.56	100.3
E. FORK BLACK R. BELOW LOWER TAUM SAUK RESERVOIR	2008	13	226.1	3.96	0.30	1.41	8.52	NA
LOGAN CREEK AT ELLINGTON, MO*	1994	27	360.0	1.48	0.16	0.62	2.49	147.5
JACKS FORK NEAR MOUNTAIN VIEW, MO	2001	20	479.2	10.09	1.14	4.36	22.13	458.8
BIG CREEK AT SAM A. BAKER STATE PARK	2005	16	489.5	8.90	1.03	4.22	17.44	555.1
LITTLE BLACK RIVER BELOW FAIRDEALING, MO	2007	14	502.5	10.39	1.70	6.15	21.59	351.2
SOUTH FORK SPRING RIVER AT SADDLE, AR	2010	11	686.4	13.25	1.97	7.16	28.60	201.6
CURRENT RIVER ABOVE AKERS, MO	2001	20	764.1	21.26	8.54	15.18	41.72	354.0
JACKS FORK AT ALLEY SPRING, MO	1993	28	771.8	15.75	2.42	8.57	34.72	535.2
JACKS FORK AT EMINENCE, MO	1921	100	1,030.8	27.94	6.87	18.11	61.34	540.9
BLACK RIVER NEAR ANNAPOLIS, MO	1939	82	1,253.6	22.17	5.25	12.93	48.14	583.4
BLACK RIVER BELOW ANNAPOLIS, MO	2006	15	1,276.9	24.87	5.97	14.50	53.61	594.7
ST. FRANCIS RIVER NEAR SACO, MO	2005	16	1,719.8	28.94	2.27	12.01	61.45	1,506.6
ELEVEN POINT RIVER NEAR BARDLEY, MO	1921	100	2,053.9	41.26	17.05	33.98	74.93	388.0
SPRING RIVER AT TOWN BRANCH BRIDGE AT HARDY, AR	2001	20	2,188.6	47.66	14.72	36.39	91.53	424.8
ST. FRANCIS RIVER NEAR PATTERSON, MO	1921	100	2,476.0	41.06	4.99	19.31	84.73	1,348.0
BLACK RIVER AT LEEPER, MO	2008	13	2,556.3	43.90	14.57	28.60	99.97	276.7
BLACK RIVER ABOVE WILLIAMSVILLE, MO	2008	13	2,608.1	51.91	16.56	38.52	105.72	504.1
ELEVEN POINT RIVER NEAR RAVENDEN SPRINGS, AR	2000	21	2,926.7	59.33	24.91	46.87	110.96	359.7
SPRING RIVER AT IMBODEN, AR	2005	16	3,056.2	63.69	18.50	46.73	126.00	688.2
BLACK RIVER AT POPLAR BLUFF, MO	1939	82	3,224.6	61.00	20.68	44.75	116.40	376.7
ST. FRANCIS RIVER AT WAPPAPELLO, MO	1940	81	3,395.5	59.93	8.52	42.20	137.30	258.6
CURRENT RIVER AT VAN BUREN, MO	1912	109	4,317.5	98.98	37.58	70.52	178.44	931.7
BLACK RIVER NEAR CORNING, AR	1938	82	4,532.5	83.54	22.06	73.63	162.36	396.5
CURRENT RIVER AT DONIPHAN, MO	1918	103	5,278.4	137.10	58.34	106.06	239.16	1,186.6

* Losing section of Logan Creek, ephemeral

FIGURES

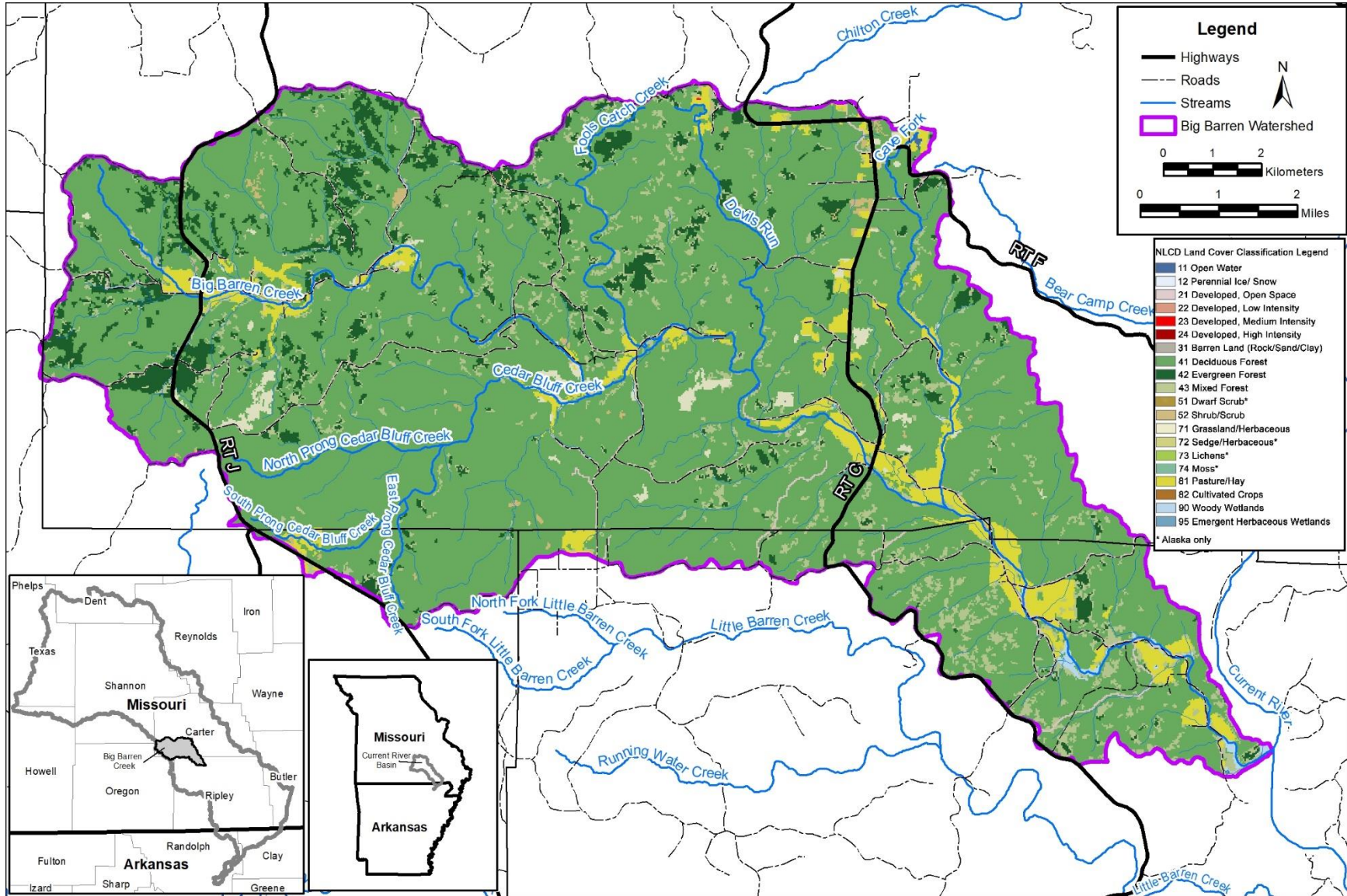


Figure 1. Location and land use of the Big Barren Creek watershed.

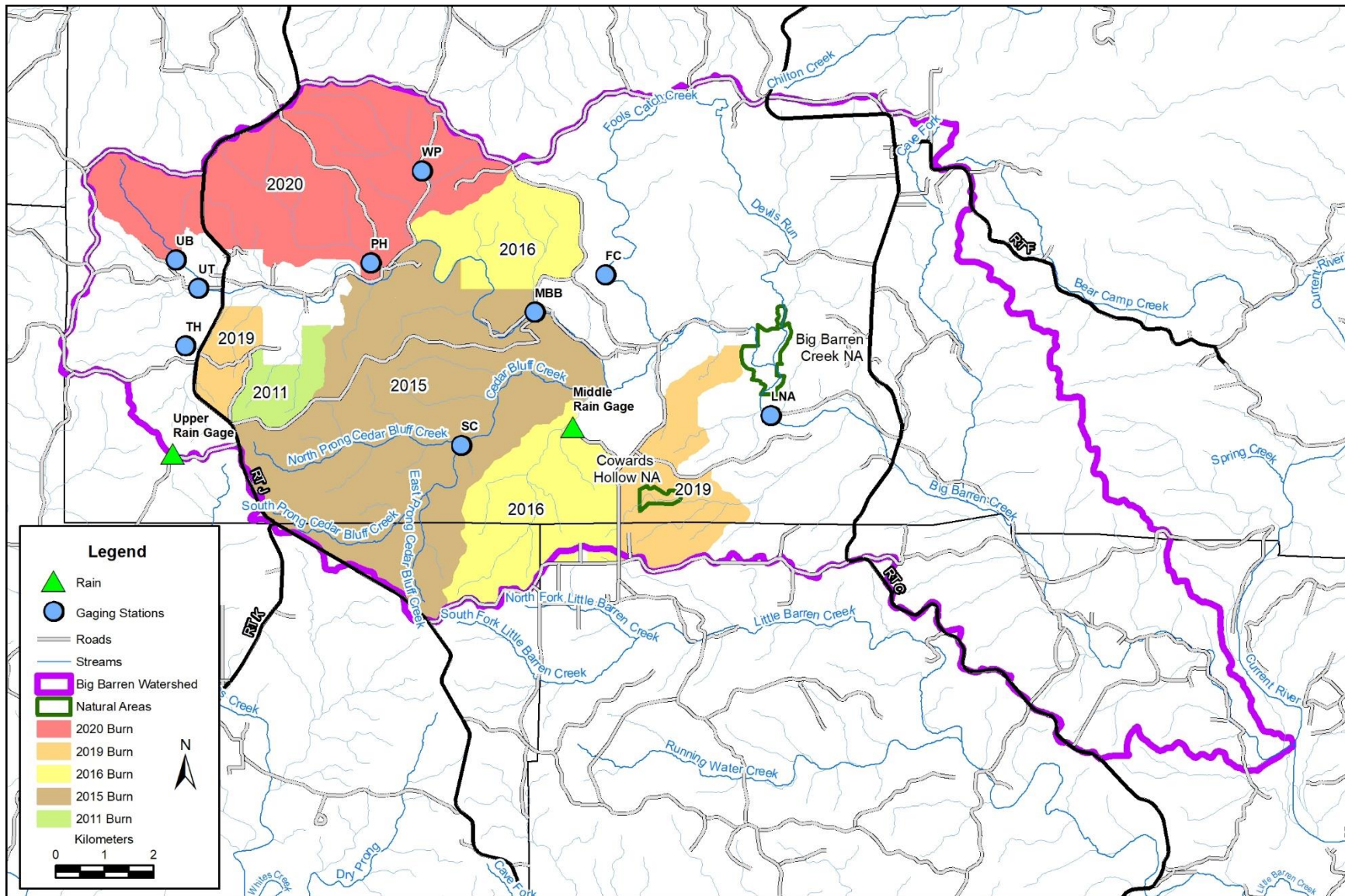


Figure 2. Hydrologic monitoring stations (WY2020) with burn history.

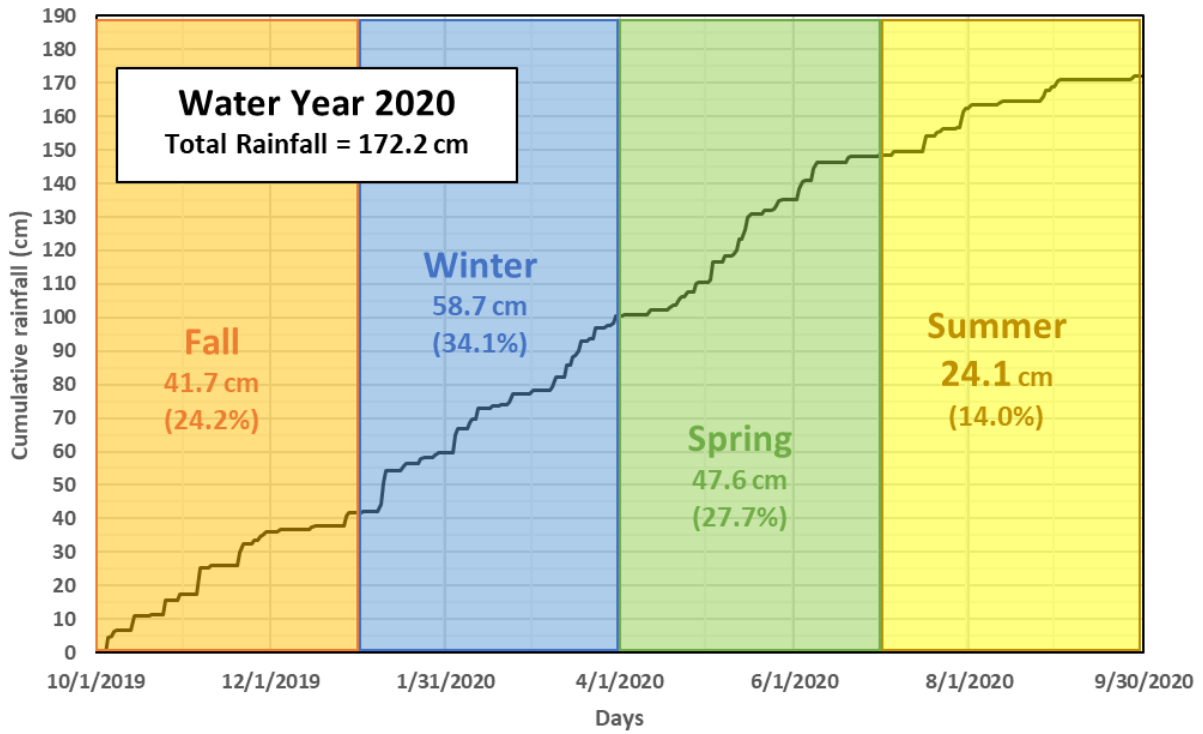


Figure 3. WY2020 cumulative rainfall by season.

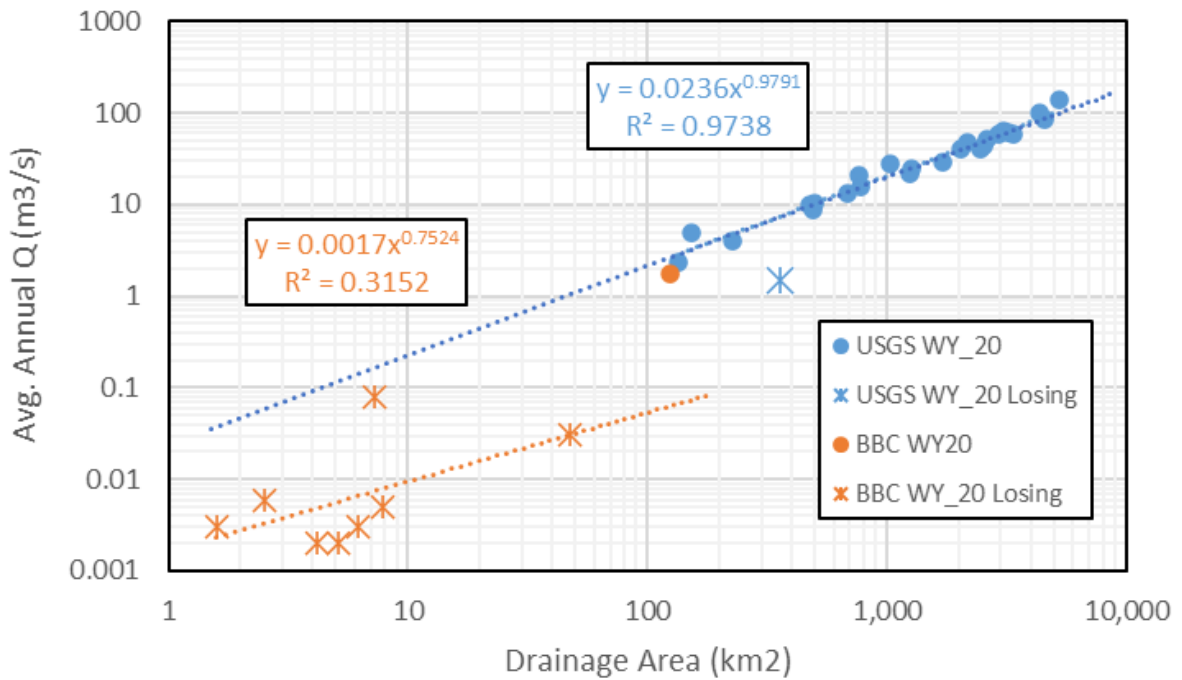


Figure 4. Average annual discharge for Big Barren Creek gages compared to nearby USGS gages (WY2020).

WY2020 GAGING STATION RESULTS

Tram Hollow (1.59 km²)

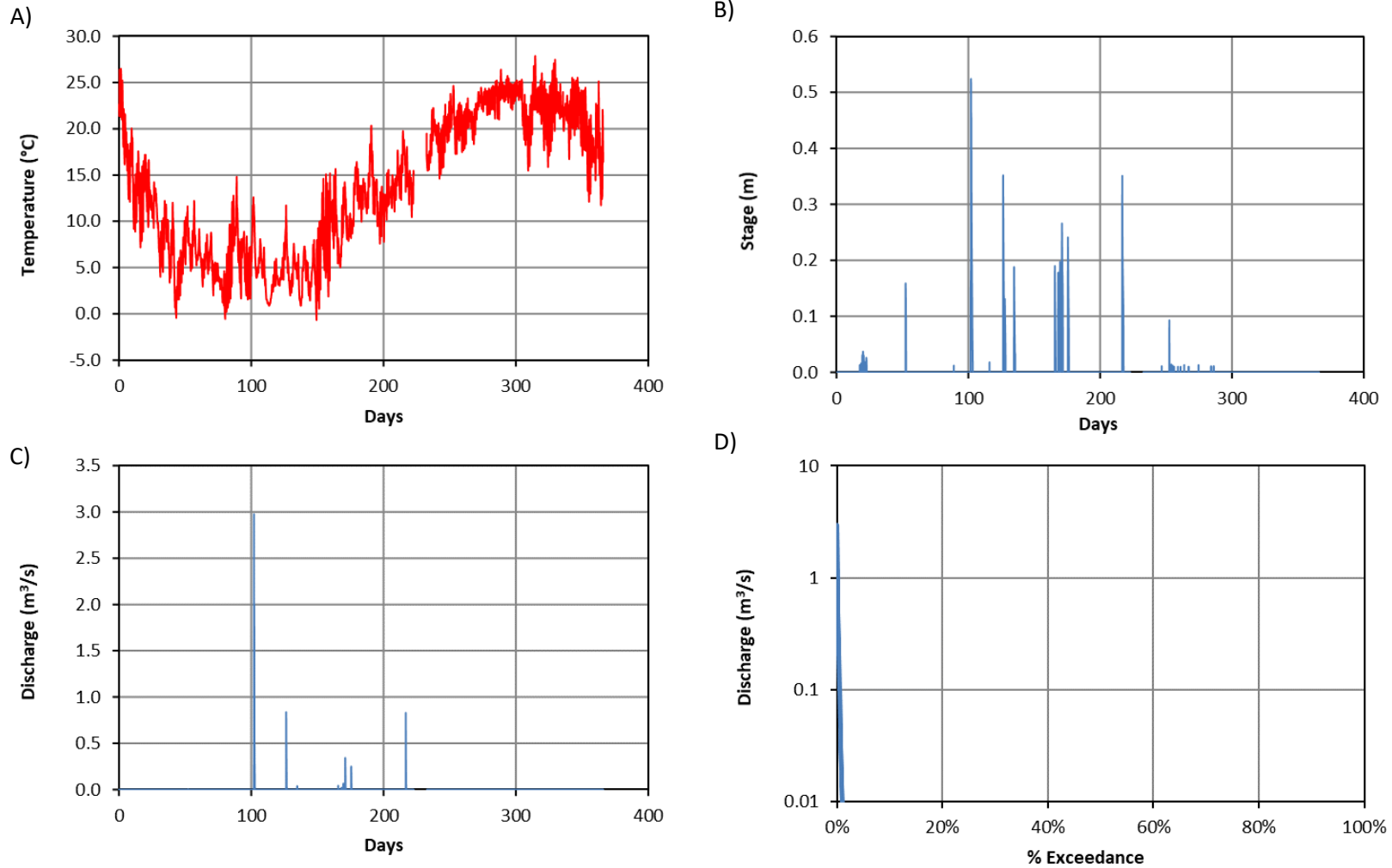


Figure 5. WY2020 A) temperature, B) stage, C) discharge, and D) flow duration curve collected from gaging station at Tram Hollow.

Table 4. Daily Mean Discharge (m³/s) for WY 2020 at Tram Hollow.

Day	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	Jul 2020	Aug 2020	Sep 2020
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.11	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.02	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.74	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.01	0.00	M	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.03	0.00	M	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.05	0.00	M	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00		0.00	0.00		0.00		0.00		0.00	0.00	
Total	0.00	0.00	0.00	0.75	0.17	0.14	0.00	0.13	0.00	0.00	0.00	0.00
Mean	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Max	0.00	0.00	0.00	0.74	0.17	0.05	0.00	0.11	0.00	0.00	0.00	0.00
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Upper Big Barren (2.51 km²)

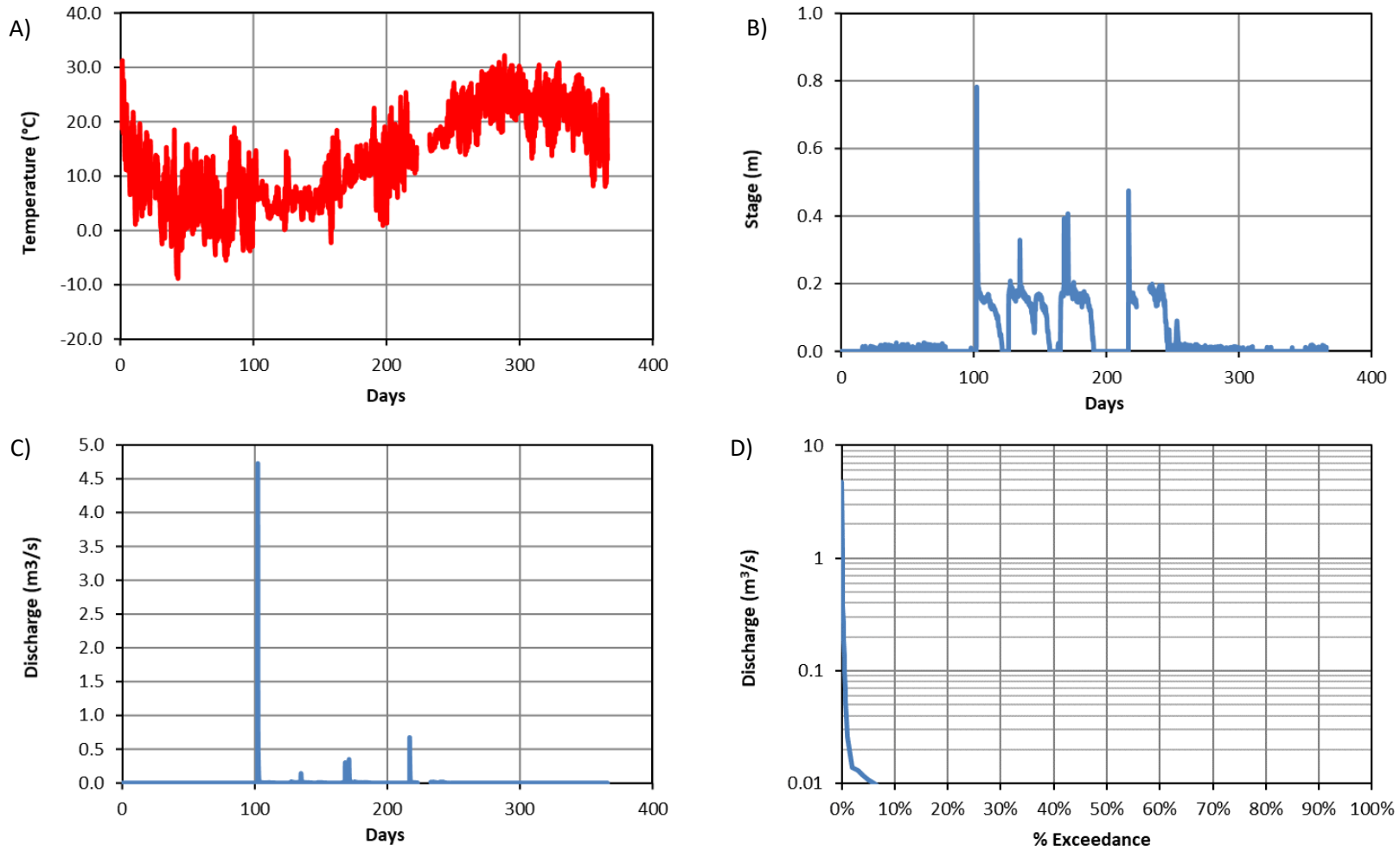


Figure 6. WY2020 A) temperature, B) stage, C) discharge, and D) flow duration curve collected from gaging station at Upper Big Barren.

Table 5. Daily Mean Discharge (m³/s) for WY 2020 at Upper Big Barren.

Day	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	Jul 2020	Aug 2020	Sep 2020
1	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.10	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.05	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.01	0.00	0.00	M	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	1.23	0.01	0.00	0.00	M	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.02	0.04	0.00	0.00	M	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.01	0.02	0.00	0.00	M	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.01	0.01	0.00	0.00	M	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.01	0.01	0.01	0.00	M	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.01	0.01	0.01	0.00	M	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.01	0.01	0.09	0.00	M	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.01	0.01	0.02	0.00	M	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.01	0.00	0.02	0.00	M	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.01	0.00	0.08	0.00	M	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00		0.00	0.00	0.01	0.00	0.00	0.00	0.00
31	0.00		0.00	0.00		0.01		0.01		0.00	0.00	
Total	0.00	0.00	0.00	1.32	0.22	0.33	0.03	0.28	0.00	0.00	0.00	0.00
Mean	0.00	0.00	0.00	0.04	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00
Max	0.00	0.00	0.00	1.23	0.04	0.09	0.01	0.10	0.00	0.00	0.00	0.00
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Upper Tributary (4.19 km²)

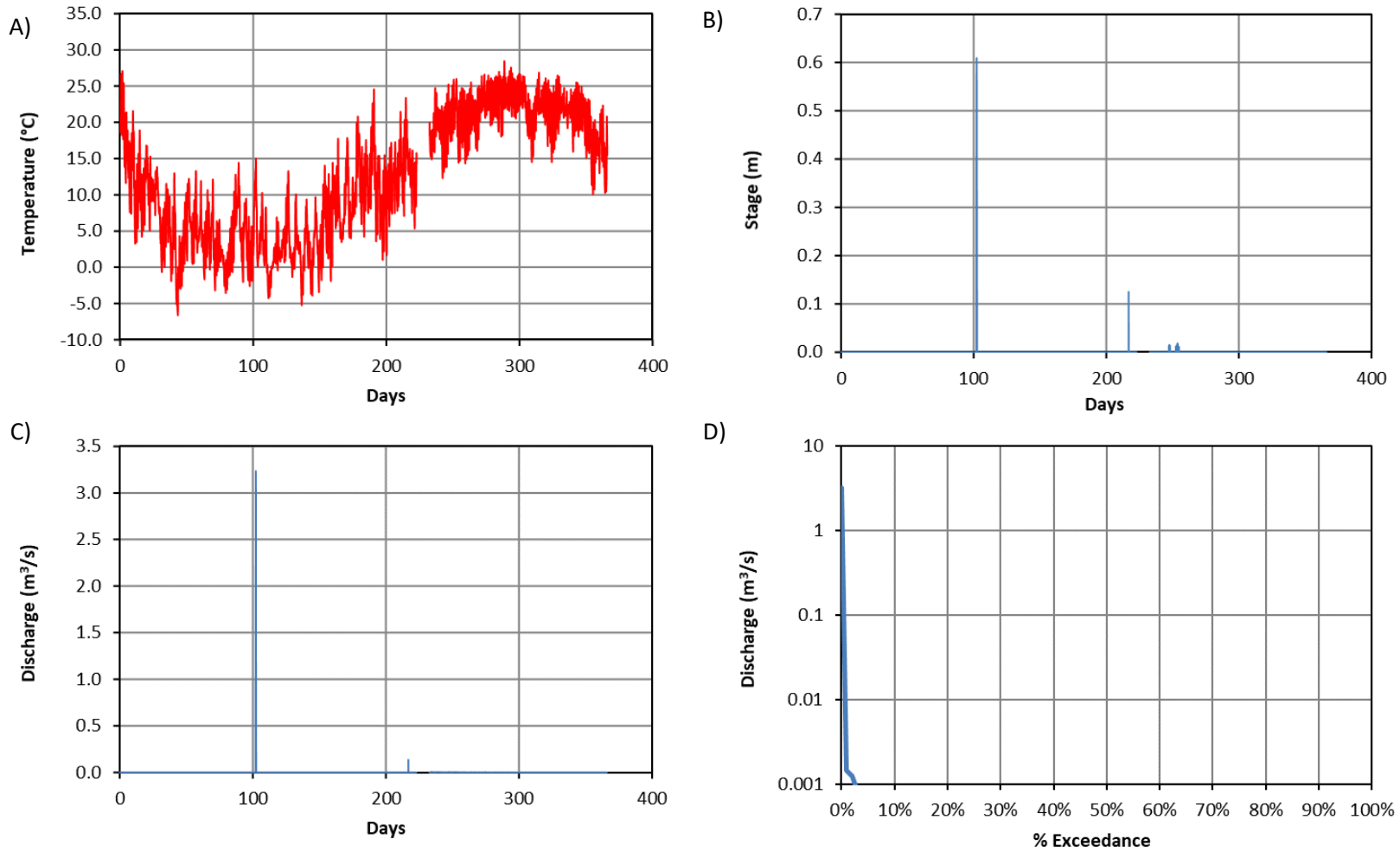


Figure 7. WY2020 A) temperature, B) stage, C) discharge, and D) flow duration curve collected from gaging station at the Upper Tributary.

Table 6. Daily Mean Discharge (m³/s) for WY 2020 at Upper Tributary.

Day	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	Jul 2020	Aug 2020	Sep 2020
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.68	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00		0.00	0.00		0.00		0.00		0.00	0.00	
Total	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00
Mean	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Wolf Pond (5.13 km²)

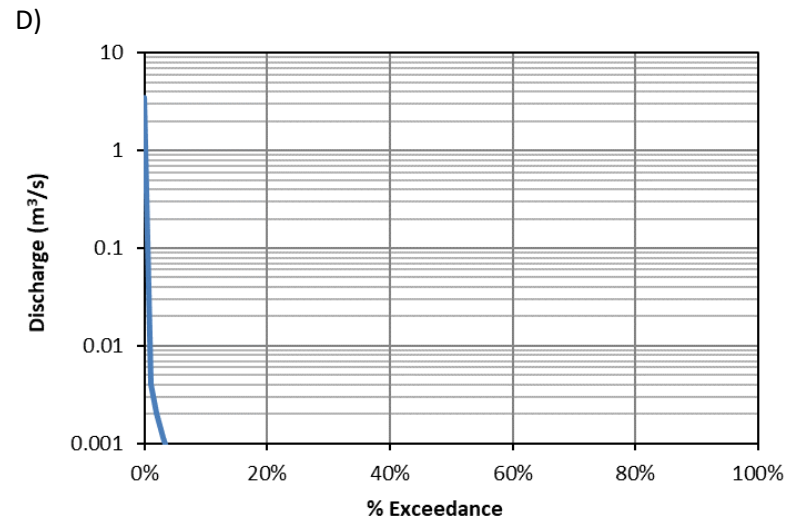
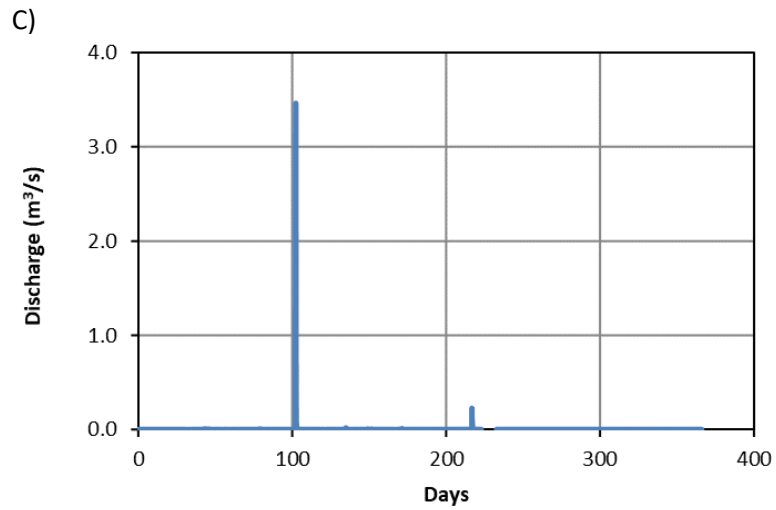
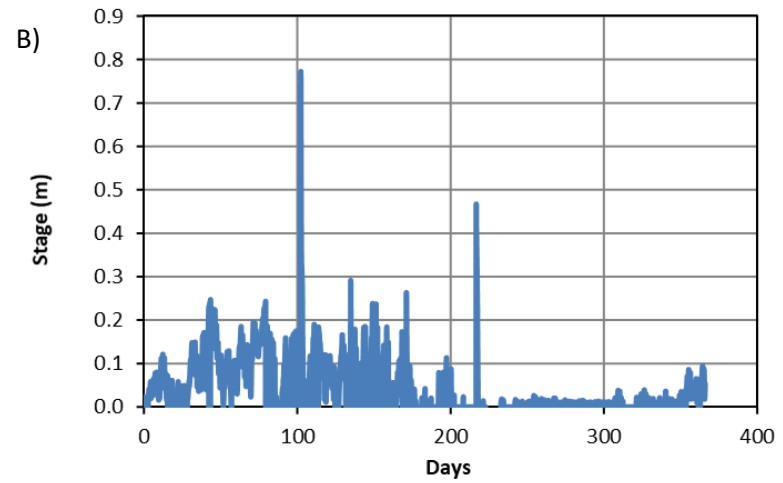
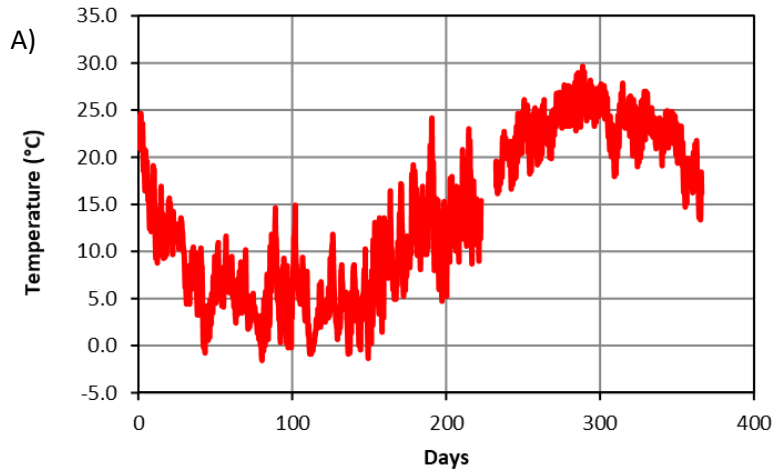


Figure 8. WY2020 A) temperature, B) stage, C) discharge, and D) flow duration curve collected from gaging station at the Wolf Pond Tributary.

Table 7. Daily Mean Discharge (m³/s) for WY 2020 at Wolf Pond Tributary.

Day	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	Jul 2020	Aug 2020	Sep 2020
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.70	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00		0.00	0.00		0.00		0.00		0.00	0.00	
Total	0.00	0.01	0.01	0.71	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.00
Mean	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Polecat Hollow (6.19 km²)

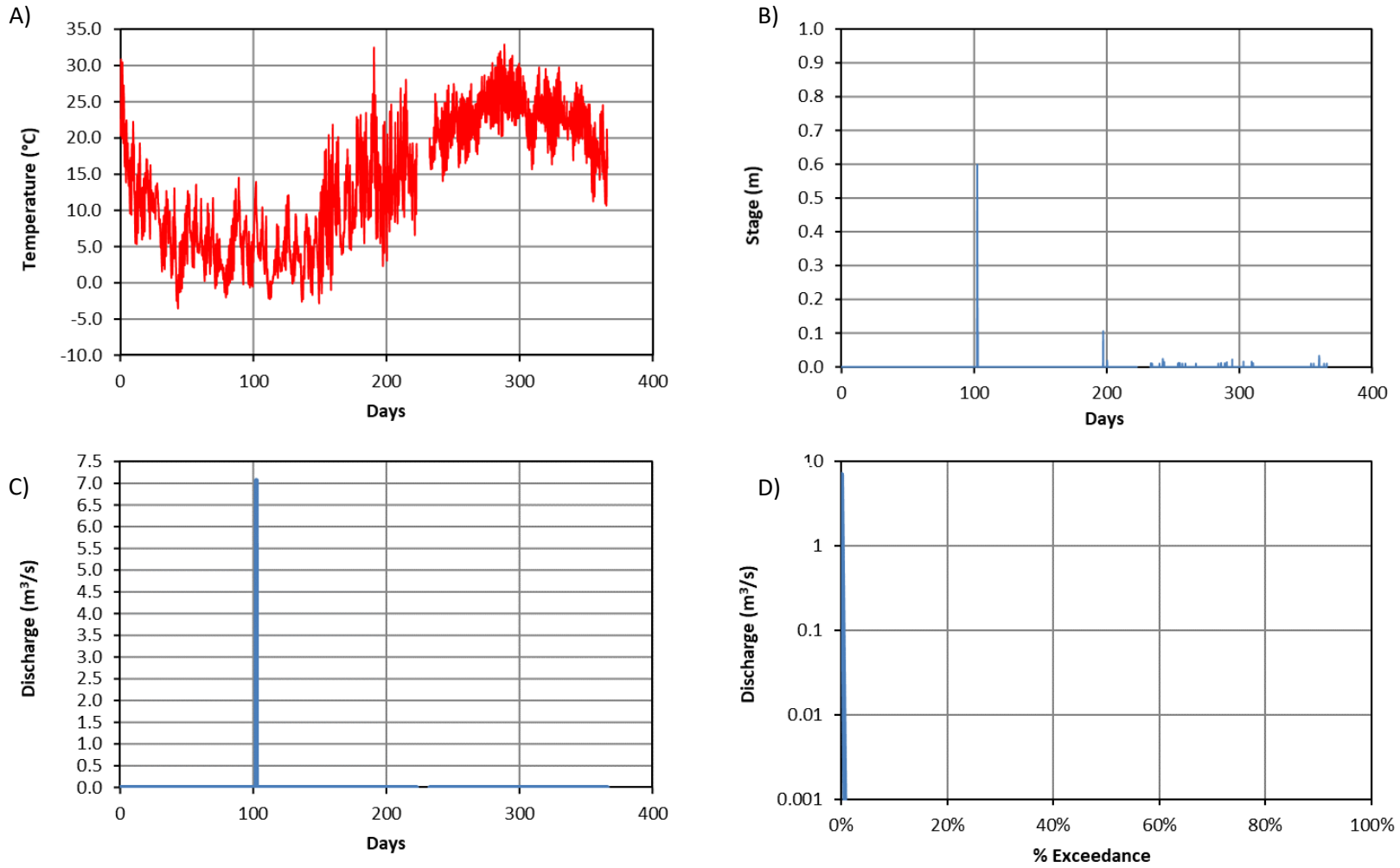


Figure 9. WY2020 A) temperature, B) stage, C) discharge, and D) flow duration curve collected from gaging station at Polecat Hollow.

Table 8. Daily Mean Discharge (m³/s) for WY 2020 at Polecat Hollow

Day	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	Jul 2020	Aug 2020	Sep 2020
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.92	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00		0.00	0.00		0.00		0.00		0.00	0.00	
Total	0.00	0.00	0.00	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mean	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Max	0.00	0.00	0.00	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

South Prong Cedar Bluff Creek (7.28 km²)

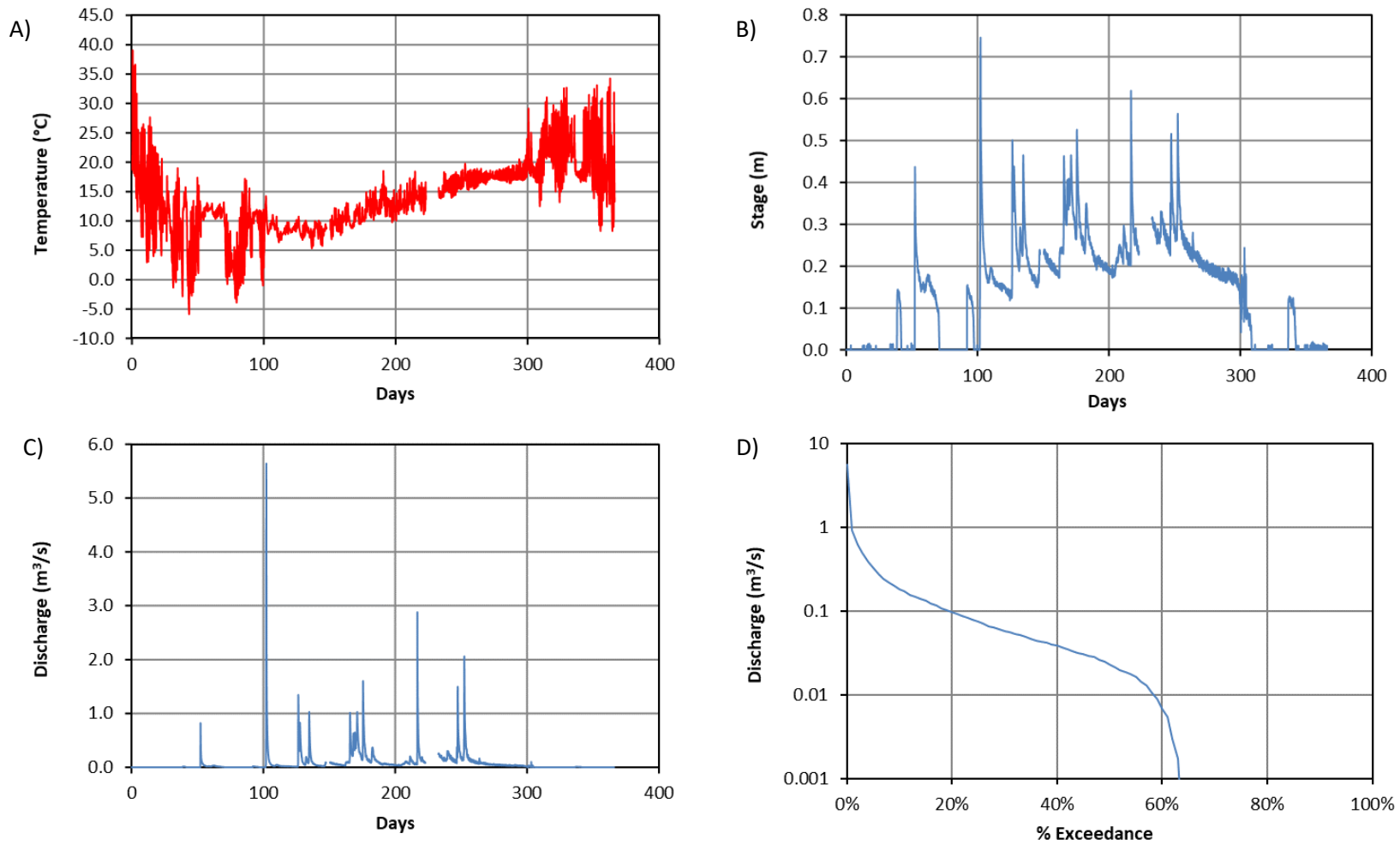


Figure 10. WY2020 A) temperature, B) stage, C) discharge, and D) flow duration curve collected from gaging station at South Prong Cedar Bluff Creek.

Table 9. Daily Mean Discharge (m³/s) for WY 2020 at South Prong Cedar Bluff Creek.

Day	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	Jul 2020	Aug 2020	Sep 2020
1	0.00	0.00	0.03	0.02	0.01	0.07	0.25	0.09	0.13	0.05	0.00	0.00
2	0.00	0.00	0.03	0.01	0.01	0.06	0.16	0.07	0.11	0.05	0.00	0.01
3	0.00	0.00	0.02	0.01	0.01	0.06	0.13	0.07	0.15	0.04	0.00	0.01
4	0.00	0.00	0.02	0.01	0.60	0.06	0.11	0.56	0.78	0.04	0.00	0.01
5	0.00	0.00	0.01	0.00	0.54	0.05	0.09	0.72	0.39	0.04	0.00	0.01
6	0.00	0.00	0.01	0.00	0.36	0.05	0.08	0.23	0.22	0.04	0.00	0.00
7	0.00	0.00	0.01	0.00	0.13	0.04	0.06	0.14	0.16	0.04	0.00	0.00
8	0.00	0.00	0.01	0.00	0.07	0.04	0.06	0.15	0.16	0.04	0.00	0.00
9	0.00	0.01	0.00	0.00	0.05	0.04	0.06	0.11	1.07	0.04	0.00	0.00
10	0.00	0.01	0.00	0.03	0.16	0.03	0.06	M	0.49	0.04	0.00	0.00
11	0.00	0.00	0.00	2.30	0.10	0.07	0.06	M	0.25	0.04	0.00	0.00
12	0.00	0.00	0.00	0.34	0.41	0.09	0.05	M	0.18	0.03	0.00	0.00
13	0.00	0.00	0.00	0.11	0.38	0.09	0.05	M	0.14	0.03	0.00	0.00
14	0.00	0.00	0.00	0.06	0.13	0.42	0.05	M	0.13	0.03	0.00	0.00
15	0.00	0.00	0.00	0.04	0.08	0.40	0.05	M	0.12	0.03	0.00	0.00
16	0.00	0.00	0.00	0.03	0.06	0.23	0.05	M	0.11	0.03	0.00	0.00
17	0.00	0.00	0.00	0.03	0.04	0.48	0.04	M	0.10	0.04	0.00	0.00
18	0.00	0.00	0.00	0.04	0.04	0.48	0.04	M	0.09	0.04	0.00	0.00
19	0.00	0.00	0.00	0.04	0.03	0.51	0.04	M	0.08	0.03	0.00	0.00
20	0.00	0.00	0.00	0.03	0.03	0.73	0.04	M	0.10	0.03	0.00	0.00
21	0.00	0.00	0.00	0.03	0.03	0.34	0.04	0.22	0.09	0.03	0.00	0.00
22	0.00	0.28	0.00	0.02	0.02	0.25	0.04	0.20	0.08	0.03	0.00	0.00
23	0.00	0.09	0.00	0.02	0.02	0.16	0.05	0.17	0.07	0.03	0.00	0.00
24	0.00	0.05	0.00	0.02	0.03	0.76	0.06	0.14	0.07	0.02	0.00	0.00
25	0.00	0.03	0.00	0.02	M	0.57	0.09	0.14	0.07	0.02	0.00	0.00
26	0.00	0.02	0.00	0.02	M	0.27	0.10	0.14	0.06	0.01	0.00	0.00
27	0.00	0.02	0.00	0.02	M	0.17	0.08	0.22	0.06	0.00	0.00	0.00
28	0.00	0.02	0.00	0.02	M	0.13	0.07	0.26	0.05	0.03	0.00	0.00
29	0.00	0.02	0.00	0.02	0.08	0.12	0.17	0.20	0.05	0.01	0.00	0.00
30	0.00	0.02	0.00	0.01		0.10	0.12	0.17	0.05	0.04	0.00	0.00
31	0.00		0.00	0.01		0.29		0.14		0.01	0.00	
Total	0.00	0.57	0.15	3.30	3.42	7.18	2.35	4.13	5.60	0.99	0.01	0.03
Mean	0.00	0.02	0.00	0.11	0.14	0.23	0.08	0.21	0.19	0.03	0.00	0.00
Max	0.00	0.28	0.03	2.30	0.60	0.76	0.25	0.72	1.07	0.05	0.00	0.01
Min	0.00	0.00	0.00	0.00	0.01	0.03	0.04	0.07	0.05	0.00	0.00	0.00

Fools Catch (7.82 km²)

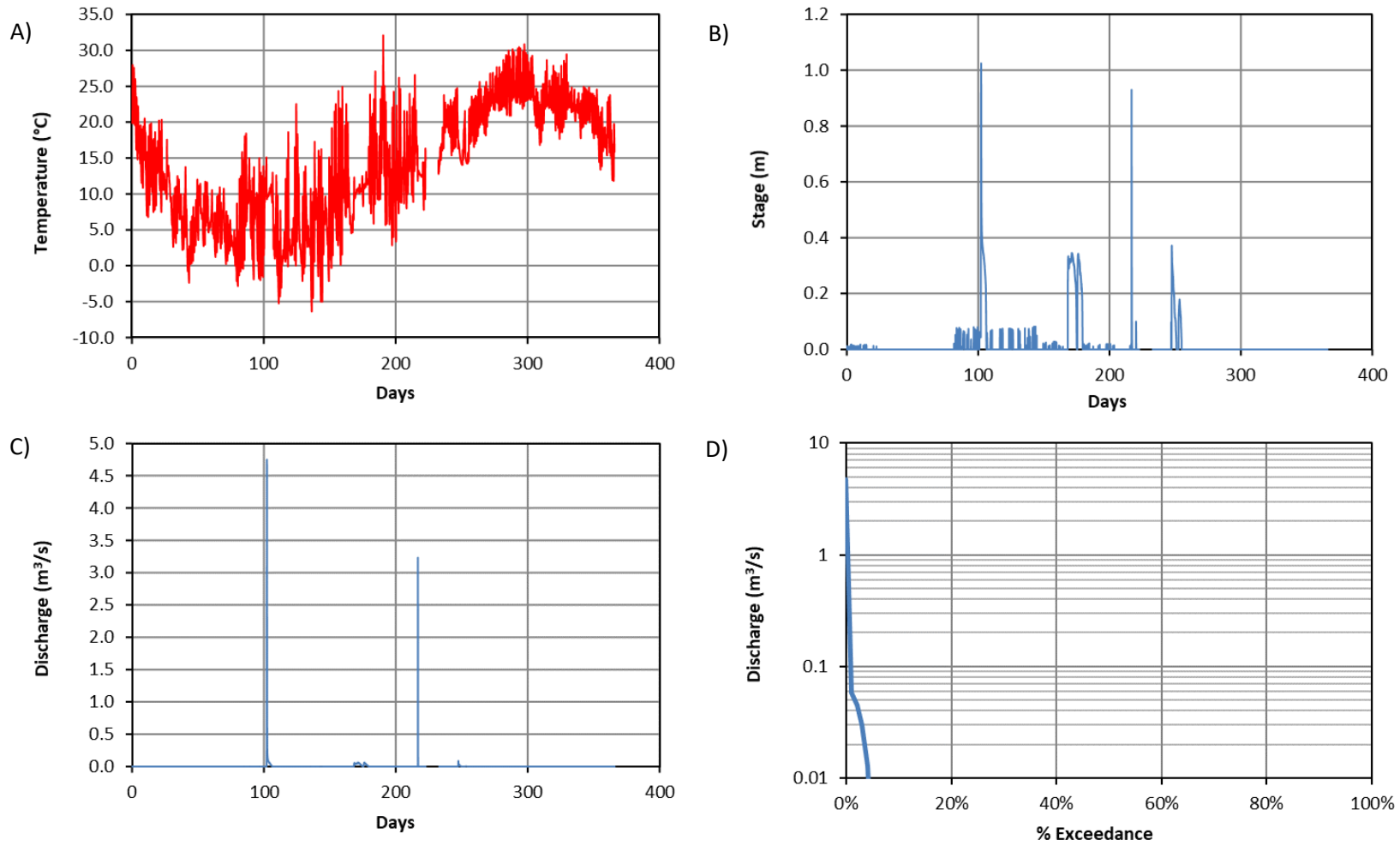


Figure 11. WY2020 A) temperature, B) stage, C) discharge, and D) flow duration curve collected from gaging station at Fools Catch.

Table 10. Daily Mean Discharge (m³/s) for WY 2020 at Fools Catch

Day	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	Jul 2020	Aug 2020	Sep 2020
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.03	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	1.13	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.08	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.05	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.02	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	M	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.03	0.00	M	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.04	0.00	M	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.05	0.00	M	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.06	0.00	M	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00		0.00	0.00		0.00		0.00		0.00	0.00	
Total	0.00	0.00	0.00	1.27	0.00	0.38	0.00	0.17	0.06	0.00	0.00	0.00
Mean	0.00	0.00	0.00	0.04	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
Max	0.00	0.00	0.00	1.13	0.00	0.06	0.00	0.17	0.03	0.00	0.00	0.00
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Middle Big Barren Creek (47.76 km²)

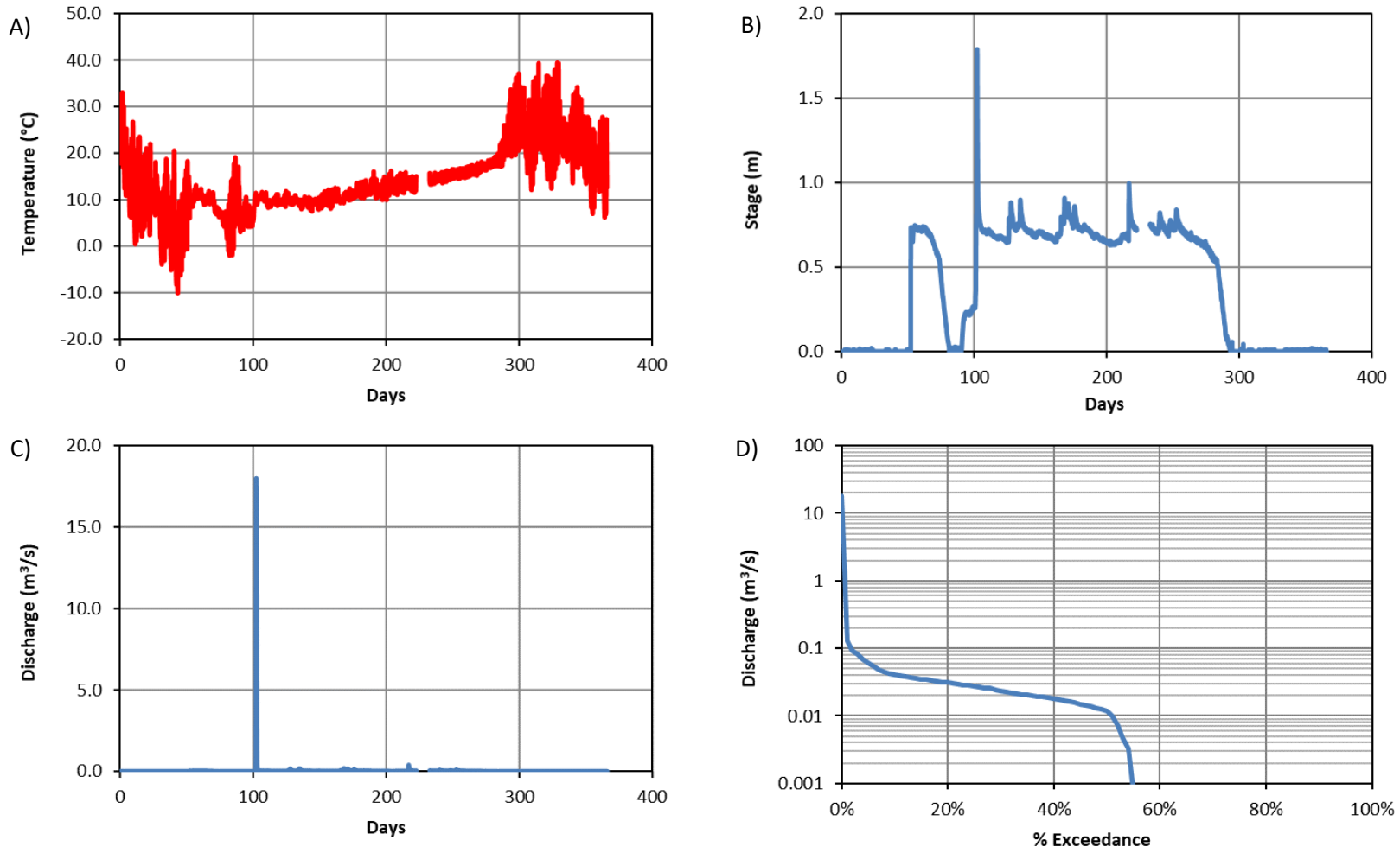


Figure 12. WY2020 A) temperature, B) stage, C) discharge, and D) flow duration curve collected from gaging station at Middle Big Barren.

Table 11. Daily Mean Discharge (m³/s) for WY 2020 at Middle Big Barren.

Day	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	Jul 2020	Aug 2020	Sep 2020
1	0.00	0.00	0.04	0.00	0.02	0.02	0.04	0.02	0.03	0.01	0.00	0.00
2	0.00	0.00	0.03	0.00	0.02	0.02	0.04	0.02	0.03	0.01	0.00	0.00
3	0.00	0.00	0.03	0.00	0.02	0.02	0.03	0.02	0.03	0.01	0.00	0.00
4	0.01	0.00	0.03	0.00	0.04	0.02	0.03	0.09	0.04	0.01	0.00	0.00
5	0.00	0.00	0.03	0.00	0.08	0.02	0.03	0.16	0.05	0.01	0.00	0.00
6	0.00	0.00	0.02	0.00	0.10	0.02	0.03	0.06	0.04	0.00	0.00	0.00
7	0.00	0.00	0.02	0.00	0.05	0.02	0.02	0.04	0.03	0.00	0.00	0.00
8	0.00	0.00	0.02	0.00	0.04	0.02	0.02	0.04	0.03	0.00	0.00	0.00
9	0.00	0.00	0.01	0.00	0.03	0.02	0.02	0.04	0.07	0.00	0.00	0.00
10	0.00	0.00	0.01	0.03	0.04	0.01	0.02	M	0.07	0.00	0.00	0.00
11	0.00	0.00	0.01	4.80	0.04	0.02	0.02	M	0.05	0.00	0.00	0.00
12	0.00	0.00	0.01	0.12	0.08	0.02	0.02	M	0.04	0.00	0.00	0.00
13	0.00	0.00	0.00	0.05	0.10	0.02	0.02	M	0.03	0.00	0.00	0.00
14	0.00	0.00	0.00	0.04	0.06	0.04	0.02	M	0.03	0.00	0.00	0.00
15	0.00	0.00	0.00	0.03	0.04	0.06	0.02	M	0.03	0.00	0.00	0.00
16	0.00	0.00	0.00	0.03	0.03	0.05	0.02	M	0.02	0.00	0.00	0.00
17	0.00	0.00	0.00	0.03	0.03	0.13	0.01	M	0.02	0.00	0.00	0.00
18	0.00	0.00	0.00	0.03	0.03	0.09	0.01	M	0.02	0.00	0.00	0.00
19	0.00	0.00	0.00	0.03	0.03	0.08	0.01	M	0.02	0.00	0.00	0.00
20	0.00	0.00	0.00	0.03	0.03	0.11	0.01	M	0.02	0.00	0.00	0.00
21	0.00	0.00	0.00	0.03	0.03	0.07	0.01	0.04	0.02	0.00	0.00	0.00
22	0.00	0.02	0.00	0.02	0.02	0.05	0.01	0.04	0.02	0.00	0.00	0.00
23	0.00	0.02	0.00	0.02	0.02	0.04	0.01	0.03	0.02	0.00	0.00	0.00
24	0.00	0.03	0.00	0.02	0.02	0.07	0.01	0.03	0.02	0.00	0.00	0.00
25	0.00	0.04	0.00	0.02	0.03	0.08	0.01	0.03	0.02	0.00	0.00	0.00
26	0.00	0.04	0.00	0.02	0.03	0.05	0.01	0.03	0.01	0.00	0.00	0.00
27	0.00	0.03	0.00	0.02	0.03	0.04	0.01	0.04	0.01	0.00	0.00	0.00
28	0.00	0.03	0.00	0.02	0.03	0.03	0.01	0.07	0.01	0.00	0.00	0.00
29	0.00	0.03	0.00	0.02	0.03	0.03	0.02	0.05	0.01	0.00	0.00	0.00
30	0.00	0.03	0.00	0.02		0.03	0.02	0.04	0.01	0.00	0.00	0.00
31	0.00		0.00	0.02		0.04		0.04		0.00	0.00	
Total	0.01	0.27	0.26	5.43	1.11	1.35	0.58	0.93	0.86	0.06	0.00	0.00
Mean	0.00	0.01	0.01	0.18	0.04	0.04	0.02	0.05	0.03	0.00	0.00	0.00
Max	0.01	0.04	0.04	4.80	0.10	0.13	0.04	0.16	0.07	0.01	0.00	0.00
Min	0.00	0.00	0.00	0.00	0.02	0.01	0.01	0.02	0.01	0.00	0.00	0.00

Lower Natural Area (124.2 km²)

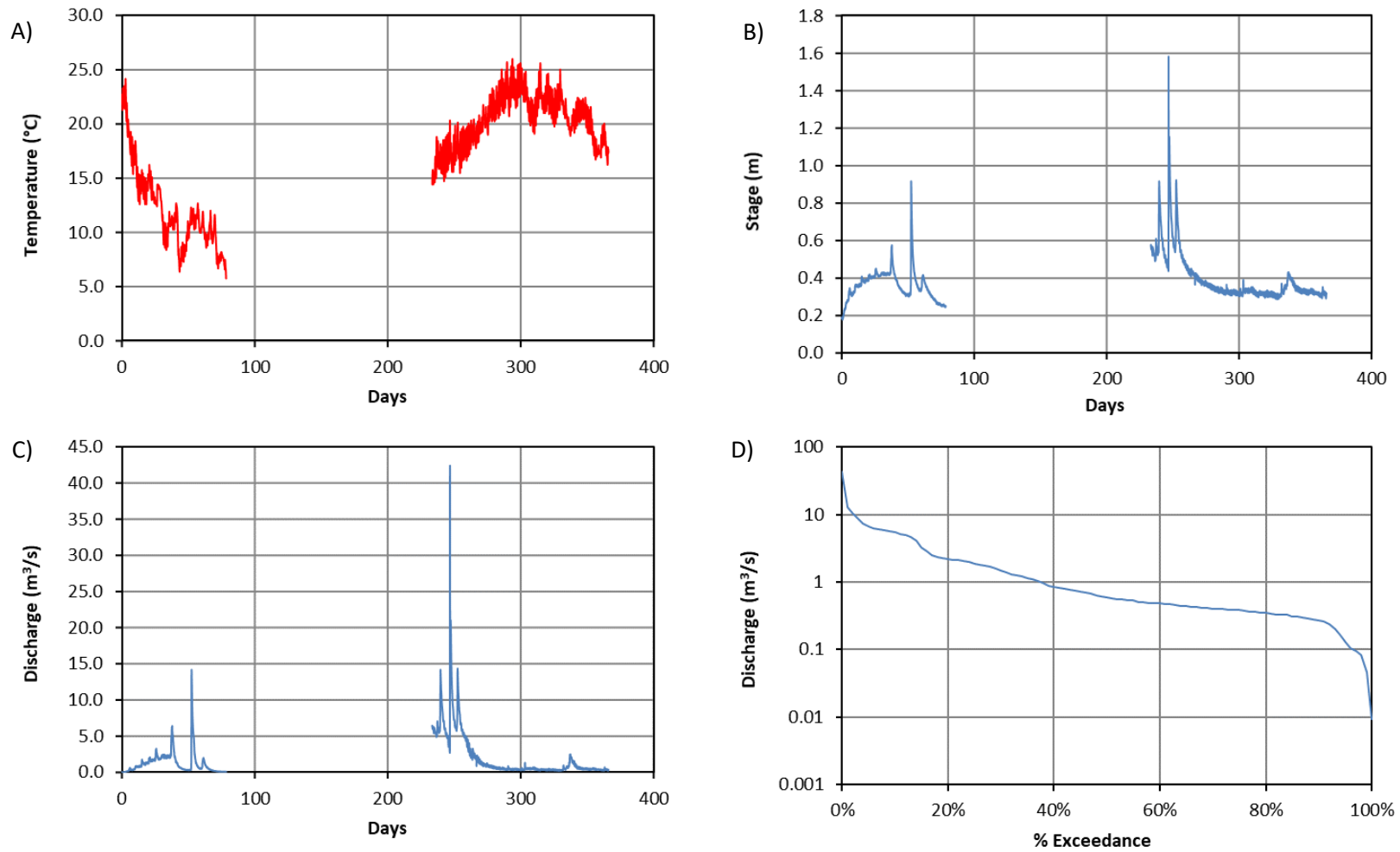


Figure 13. WY2020 A) temperature, B) stage, C) discharge, and D) flow duration curve collected from gaging station at Lower Natural Area.

Table 12. Daily Mean Discharge (m³/s) for WY 2020 at Lower Natural Area.

Day	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020	May 2020	Jun 2020	Jul 2020	Aug 2020	Sep 2020
1	0.01	2.25	1.75	M	M	M	M	M	5.08	1.04	0.53	1.23
2	0.03	2.18	1.14	M	M	M	M	M	4.44	0.91	0.50	2.19
3	0.06	2.15	0.79	M	M	M	M	M	9.04	0.83	0.50	1.70
4	0.12	2.21	0.59	M	M	M	M	M	16.40	0.78	0.50	1.38
5	0.16	2.17	0.44	M	M	M	M	M	10.82	0.73	0.53	1.16
6	0.37	2.30	0.36	M	M	M	M	M	7.94	0.70	0.50	0.91
7	0.41	5.37	0.29	M	M	M	M	M	6.60	0.64	0.44	0.67
8	0.32	4.48	0.23	M	M	M	M	M	6.02	0.58	0.39	0.62
9	0.37	2.51	0.19	M	M	M	M	M	11.01	0.56	0.34	0.58
10	0.44	1.63	0.16	M	M	M	M	M	9.62	0.55	0.32	0.53
11	0.77	1.24	0.13	M	M	M	M	M	7.29	0.51	0.39	0.49
12	0.77	0.85	0.11	M	M	M	M	M	6.16	0.48	0.39	0.46
13	0.76	0.67	0.11	M	M	M	M	M	5.51	0.51	0.37	0.47
14	0.82	0.57	0.10	M	M	M	M	M	5.10	0.47	0.35	0.48
15	0.93	0.47	0.09	M	M	M	M	M	4.79	0.41	0.32	0.45
16	1.44	0.41	0.09	M	M	M	M	M	4.28	0.41	0.35	0.41
17	1.18	0.36	0.08	M	M	M	M	M	3.64	0.53	0.36	0.41
18	1.16	0.31	M	M	M	M	M	M	3.09	0.46	0.34	0.44
19	1.27	0.32	M	M	M	M	M	M	2.57	0.39	0.34	0.48
20	1.30	0.30	M	M	M	M	M	M	2.44	0.39	0.34	0.45
21	1.76	0.33	M	M	M	M	M	M	2.54	0.42	0.33	0.41
22	1.75	8.56	M	M	M	M	M	5.96	2.25	0.44	0.31	0.39
23	1.66	6.15	M	M	M	M	M	5.69	1.92	0.42	0.28	0.38
24	1.68	3.31	M	M	M	M	M	5.17	1.85	0.38	0.27	0.36
25	1.75	1.55	M	M	M	M	M	6.13	1.58	0.37	0.27	0.34
26	2.56	0.97	M	M	M	M	M	5.72	1.44	0.35	0.28	0.31
27	2.40	0.69	M	M	M	M	M	9.95	1.24	0.34	0.31	0.30
28	1.89	0.53	M	M	M	M	M	10.24	1.08	0.40	0.63	0.45
29	1.84	0.50	M	M	M	M	M	7.72	1.08	0.34	0.44	0.37
30	2.00	1.05	M	M		M	M	6.43	0.95	0.68	0.69	0.32
31	2.28		M	M		M		5.60		0.49	0.76	
Total	34.27	56.38	6.65	M	M	M	M	68.61	147.79	16.52	12.69	19.14
Mean	1.11	1.88	0.39	M	M	M	M	6.86	4.93	0.53	0.41	0.64
Max	2.56	8.56	1.75	M	M	M	M	10.24	16.40	1.04	0.76	2.19
Min	0.01	0.30	0.08	M	M	M	M	5.17	0.95	0.34	0.27	0.30