EARTHQUAKE ACTIVITY IN THE YELLOWSTONE REGION

Preliminary Epicenters

January 1 – March 31, 2019

Prepared by the University of Utah Seismograph Stations and funded by
the U.S. Geological Survey (Cooperative Agreement No. G16AC00029)

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Foreword and Data Explanation

This report contains an epicenter map (Figure 1) and listings of earthquakes (Tables 1 and 2) detected and located in the Yellowstone region (lat. 44° 00′ – 45° 10′ N, long. 109° 45′ – 111° 30′ W). The computer program HYPOINVERSE-2000 (F. W. Klein, 2012, U.S. Geological Survey Open-File Report 02-171 revised) was used to process the earthquake data. This report also includes maps and a table of operating seismograph stations in the University of Utah's Yellowstone seismic network (Figure 2, Table 3).

The earthquake listing in Table 2 is estimated to be systematically complete above magnitude 1.5 within Yellowstone. *These data are preliminary—both the locations and magnitudes in this table are subject to revision.*

The following data are listed for each earthquake in Table 2:

- Date (yymmdd) and origin time in Coordinated Universal Time (UTC). To convert to local time, subtract seven hours for Mountain Standard Time (MST) and six hours for Mountain Daylight Time (MDT). During the report period, local time was MST through 02:00 (2:00 a.m.) on March 10 and MDT thereafter.

- Earthquake location coordinates in degrees and minutes of north latitude and west longitude, and depth in kilometers below sea level. Note that prior to October 1, 2012, the earthquake depths in these quarterly reports were computed relative to a datum of 2000 m above sea level.

- "*" indicates poor depth resolution: no recording stations within 10 km or twice the depth.

- MAG, the computed Richter local magnitude (M_L) for each earthquake. "W" indicates that peak amplitude measurements from Wood-Anderson records were used. Otherwise, the estimate is calculated from signal durations and is more correctly identified as coda magnitude (M_C). The notation "--" indicates that a reliable magnitude estimate could not be made.

- NO, the number of P and S readings used in the solution.

- GAP, the largest azimuthal separation in degrees between recording stations used in the solution.

- DMN, the epicentral distance in kilometers to the closest station.

- RMS, the weighted root-mean-square of the travel-time residuals in seconds:

$$RMS = \left(\frac{\sum_i (W_i R_i)^2}{\sum_i (W_i)^2} \right)^{\frac{1}{2}}$$

where: R_i is the observed minus the computed arrival time for the i-th P or S reading, and W_i is the relative weight given to the i-th P or S arrival time (0.0 for no weight through 1.0 for full weight).

EARTHQUAKE ACTIVITY IN THE YELLOWSTONE REGION
January 1 – March 31, 2019

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During the three-month period January 1 through March 31, 2019, the University of Utah Seismograph Stations (UUSS) located 292 earthquakes within the Yellowstone region (Figure 1). The total includes 3 earthquakes in the magnitude 3 range, and 19 earthquakes in the magnitude 2 range. The largest event to occur during this period was a magnitude 3.3 earthquake on March 4th. One earthquake was reported felt in the region during the report period (see Table 1, a cumulative tabulation of earthquakes that were felt in the Yellowstone region during 2019). Additional information on earthquakes within the Yellowstone region is available from the University of Utah Seismograph Stations.

Online Information

A complete copy of this report, including maps and the earthquake catalog, is available on the UUSS web site at *https://quake.utah.edu/earthquake-center/quarterly-seismicity-reports*.

Note: On October 1, 2012, UUSS began using the ANSS Quake Monitoring System (AQMS) software package for data acquisition and data processing. The primary effect on the data reported herein comes from computing the earthquake locations with a newer version of the computer program HYPOINVERSE-2000 (F. W. Klein, 2012, U.S. Geological Survey Open-File Report 02-171 revised) and a revised and expanded set of velocity models. As implemented at UUSS, this new version of the location program accounts for station elevation differences more accurately and reports focal depths relative to sea level instead of the 2000 m elevation datum used previously.

For earthquakes of magnitude 3 and larger in the Yellowstone region, the U. S. Geological Survey automatically posts a Community Internet Intensity Map (CIIM) on its "Did You Feel It?" web page at http://earthquake.usgs.gov/earthquakes/dyfi/. We encourage anyone who feels an earthquake to report their observations on this interactive web site; felt information is available by zip code on the CIIM site or can be obtained from UUSS directly.

Earthquakes of Magnitude 3.0 or Larger

M_L 3.0	January 23	03:05 MST	13.3 mi SE of Old Faithful, YNP
M_L 3.1	February 16	14:22 MST	8.7 mi W of Old Faithful, YNP
M_L 3.3	March 4	10:16 MST	20.4 mi E of Canyon, YNP

Notable Swarm Seismicity

During the report period, there were seven earthquake swarms in the Yellowstone region. For reporting purposes, we use the Mogi definition [Mogi, 1963] of a swarm and require each swarm to have ten or more earthquakes. Note that typically, around 50% of Yellowstone earthquakes occur as part of a seismic swarm [Farrell et al., 2009].

A. A swarm of 14 earthquakes ($0.1 \leq M \leq 1.3$) occurred about 7.8 mi NNE of West Yellowstone, MT from January 22nd – 24th.
B. A swarm of 10 earthquakes ($-0.2 \leq M \leq 1.6$) occurred about 7.5 mi ESE of West Yellowstone, MT from January 26th – 27th.
C. A swarm of 17 earthquakes ($0.1 \leq M \leq 1.7$) occurred about 6.4 mi N of West Yellowstone, MT on February 20th.
D. A swarm of 14 earthquakes ($0.3 \leq M \leq 1.4$) occurred about 10.6 mi SE of West Yellowstone, MT from February 22nd – 23rd.
E. A swarm of 10 earthquakes ($0.4 \leq M \leq 1.7$) occurred about 8.4 mi S of Lake, YNP from March 20th – 21st.
F. A swarm of 27 earthquakes ($0.1 \leq M \leq 1.9$) occurred about 5.3 mi WNW of Norris Geyser Basin, YNP on March 26th.
G. A swarm of 17 earthquakes ($0.1 \leq M \leq 2.0$) occurred about 8.0 mi W of Old Faithful, YNP on March 28th.

These swarms are labeled in Figure 1.

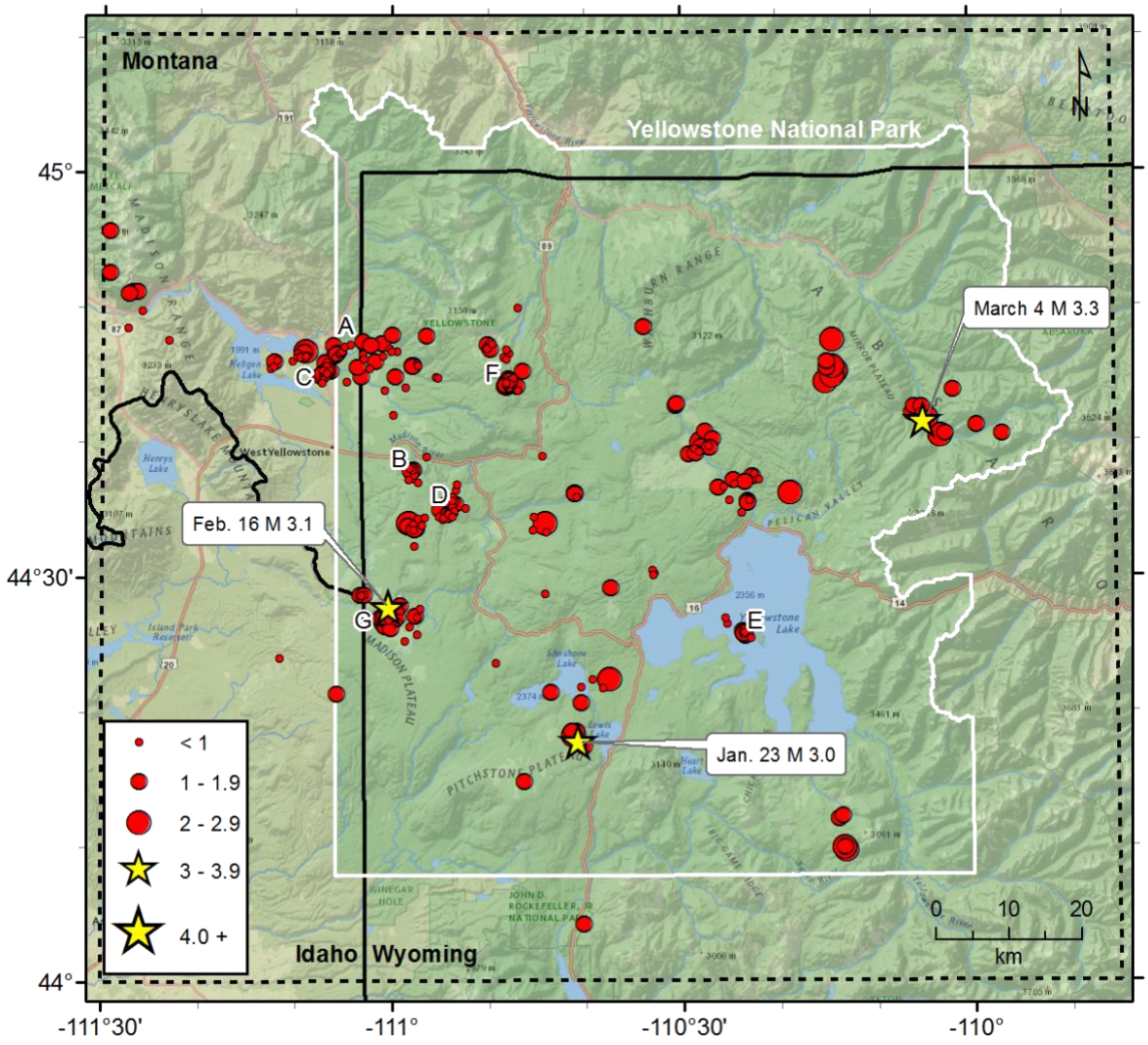

Figure 1. Epicenters of earthquakes located by the University of Utah Seismograph Stations, January 1, 2019, through March 31, 2019. Earthquake swarms (labeled A–G) are discussed in the text.

Table 1

EARTHQUAKES FELT IN THE YELLOWSTONE REGION
January 1, 2019 to March 31, 2019

Date	Time†	Felt Information‡	Latitude	Longitude	Magnitude§
February 16	14:22 MST 21:22 UTC	Yellowstone. Felt (III) at West Yellowstone, MT.	44º 27.90′	111º 00.43′	M_L 3.1

† Times are listed both as Local Time—Mountain Standard Time (MST) or Mountain Daylight Time (MDT)—and as Coordinated Universal Time (UTC).
? Indicates on-line reports that appear questionable given the distance from the source
‡ *CIIM* indicates the availability of a Community Internet Intensity Map (http://earthquake.usgs.gov/earthquakes/dyfi), compiled by the U.S. Geological Survey (USGS); *ShakeMap* indicates the availability of computer-generated maps of ground-shaking (*https://quake.utah.edu*), produced by the University of Utah Seismograph Stations (UUSS). Roman numerals correspond to the Modified Mercalli intensity scale. Unless otherwise indicated, felt information is from the USGS (1) CIIM reports and/or (2) PDE Monthly (or) Weekly Listing Files (http://earthquake.usgs.gov/data/pde.php).
§ Richter local magnitude (M_L) or coda magnitude (M_C) determined by UUSS. If labeled "NEIC," data are from the National Earthquake Information Center of the USGS.

Yellowstone Seismic Network
March 31, 2019

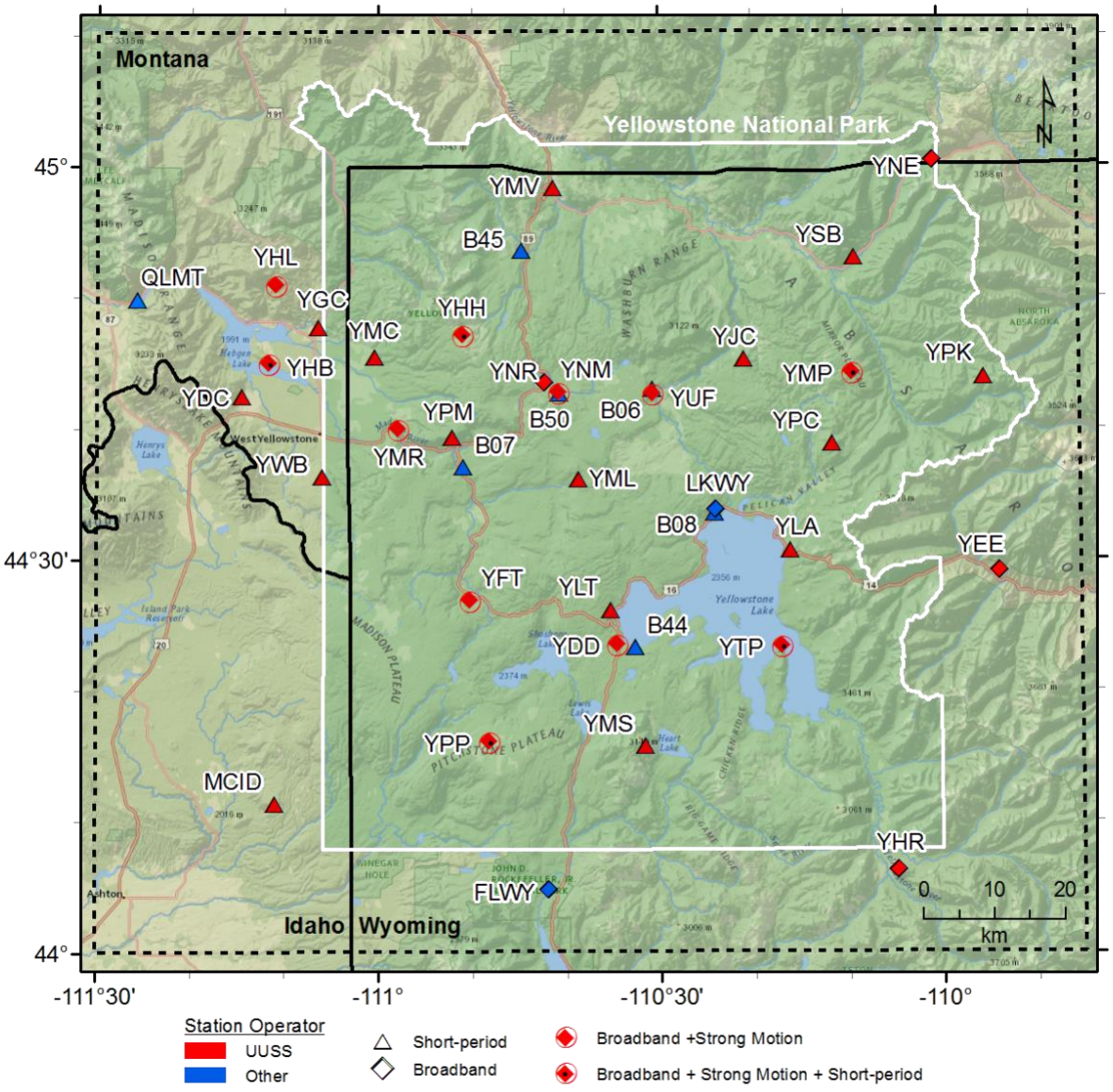

Figure 2. Seismograph stations of the Yellowstone Seismic Network as of March 31, 2019.

Table 2. Earthquakes in the Yellowstone Region: January 1–March 31, 2019

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
190101	22:27:27.34	44º44.57’	111º04.69’	12.9	0.1	10	194	6	0.16
190102	23:01:03.86	44º44.88’	111º03.26’	8.9	1.1W	19	93	4	0.13
190103	02:58:29.16	44º46.01’	111º01.74’	9.2	1.8W	23	109	2	0.16
190103	09:58:40.57	44º55.63’	111º29.35’	9.5*	1.2	19	101	26	0.13
190104	21:42:22.67	44º40.80’	110º27.62’	5.3	1.9W	25	89	5	0.19
190106	05:29:44.98	44º45.96’	110º14.87’	7.3	1.5	8	128	8	0.11
190106	05:35:11.48	44º45.21’	110º13.96’	8.7	2.4W	15	111	6	0.12
190106	05:36:52.81	44º45.57’	110º14.33’	7.7	2.0W	18	118	7	0.18
190106	05:38:10.89	44º44.91’	110º14.28’	8.2	2.3W	13	108	7	0.07
190106	05:38:42.46	44º45.16’	110º14.06’	8.8	2.8W	16	111	6	0.08
190106	05:39:06.73	44º44.46’	110º15.00’	2.1	2.6	8	106	7	0.19
190106	05:39:31.65	44º45.40’	110º14.43’	6.9	2.6	13	116	7	0.06
190106	05:39:45.73	44º47.52’	110º14.25’	6.4	2.8	8	234	9	0.15
190107	07:15:26.94	44º40.23’	110º26.84’	2.9	1.7W	13	118	7	0.16
190108	22:37:23.93	44º45.51’	111º12.66’	10.6	0.8	16	92	1	0.17
190109	22:26:50.29	44º04.35’	110º40.33’	6.1	1.3	15	133	2	0.17
190110	06:17:35.49	44º45.31’	110º46.53’	4.8	1.4W	16	93	7	0.19
190112	03:02:59.89	44º43.88’	110º47.02’	5.9	0.8W	13	141	8	0.17
190112	05:46:05.22	44º44.15’	110º47.12’	5.4	1.2W	20	96	7	0.15
190112	09:25:54.60	44º37.03’	110º23.45’	4.0	1.2	12	228	6	0.12
190112	18:39:46.25	44º49.74’	111º26.03’	11.8	0.7	16	150	0	0.11
190113	00:49:36.82	44º50.00’	110º46.92’	5.2	0.7	12	109	7	0.22
190113	07:39:49.85	44º36.23’	110º18.78’	6.4	2.4	21	49	9	0.11
190113	10:56:36.43	44º23.70’	110º49.34’	3.6	0.8	15	108	6	0.10
190114	13:58:01.71	44º45.55’	111º02.39’	8.1	0.8	19	125	3	0.16
190115	11:44:55.24	44º39.70’	110º27.98’	4.9	1.9W	19	113	7	0.21
190115	11:46:42.96	44º39.75’	110º27.19’	4.7	--	14	122	7	0.23
190115	11:46:51.54	44º39.18’	110º28.59’	2.4	1.5	10	171	7	0.16
190115	11:50:42.29	44º39.96’	110º27.85’	6.8	2.0W	21	78	6	0.19
190115	12:11:58.22	44º39.30’	110º28.14’	3.5	--	14	113	7	0.19
190115	12:12:00.82	44º39.11’	110º29.30’	2.9	1.6W	9	159	7	0.21
190115	16:52:11.15	44º22.49’	110º37.59’	6.0	2.4W	21	101	5	0.16
190116	01:00:03.66	44º44.13’	110º58.60’	6.1	0.3	11	104	4	0.08
190116	14:42:16.21	44º21.90’	110º38.22’	2.0	0.8	9	164	9	0.21
190117	07:26:10.30	44º34.04’	110º58.30’	13.2	2.0W	24	91	11	0.13
190117	12:58:38.19	44º47.25’	111º04.39’	8.3	-0.5	7	164	6	0.10
190117	13:28:28.56	44º34.41’	110º57.37’	12.9	0.2	12	206	10	0.14
190118	10:15:17.80	44º27.19’	110º57.69’	4.7	1.1W	20	115	10	0.18
190118	19:10:12.29	44º34.46’	110º56.68’	12.7	-0.1	12	142	9	0.12
190122	22:06:05.63	44º33.97’	110º57.82’	13.9	0.7	21	90	11	0.19
190122	22:24:29.47	44º47.14’	111º04.97’	9.9	0.1	10	159	2	0.14
190122	22:24:36.80	44º46.39’	111º05.91’	10.3	0.6	13	113	3	0.12
190122	22:53:17.10	44º46.64’	111º05.34’	10.0	0.4	15	119	3	0.13
190123	00:21:13.40	44º46.63’	111º05.46’	9.8	0.3	18	116	2	0.17
190123	02:04:03.88	44º46.63’	111º05.72’	10.5	1.2W	22	108	2	0.16

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190123	02:07:05.56	44º46.72’	111º05.11’	10.1	0.3	15	127	3	0.13
190123	06:25:00.64	44º46.68’	111º05.41’	10.0	0.8W	15	118	2	0.12
190123	09:59:38.90	44º18.35’	110º41.30’	10.8	2.0W	15	101	13	0.21
190123	10:02:45.48	44º18.45’	110º40.81’	4.7*	0.3	10	111	13	0.11
190123	10:02:53.29	44º18.65’	110º41.04’	4.8*	1.6	10	140	13	0.09
190123	10:05:57.52	44º17.92’	110º40.82’	9.4	3.0W	21	113	14	0.22
190123	10:10:02.87	44º18.66’	110º41.49’	6.6	1.1	12	108	13	0.10
190123	12:29:21.91	44º46.42’	111º05.99’	10.0	1.3W	17	75	3	0.12
190123	14:01:45.95	44º46.66’	111º05.54’	10.6	0.6W	12	114	2	0.15
190123	14:01:46.14	44º46.77’	111º05.25’	9.2	0.3	17	125	2	0.15
190123	22:15:03.93	44º46.55’	111º05.82’	10.0	1.0W	14	103	2	0.13
190124	03:24:52.52	44º46.77’	110º59.52’	5.2	0.3	15	118	3	0.13
190124	04:24:58.95	44º46.55’	111º03.03’	9.3	0.5	20	112	4	0.17
190124	07:33:25.19	44º17.48’	110º40.22’	7.8	1.2	19	106	14	0.21
190124	09:09:10.31	44º46.20’	111º02.94’	9.6	0.3	18	109	4	0.16
190124	13:21:13.50	44º45.60’	111º03.63’	7.8	1.1W	19	102	4	0.18
190126	00:33:36.84	44º27.73’	110º57.17’	9.0	0.7W	12	126	9	0.20
190126	11:56:57.06	44º47.49’	110º49.86’	3.7	0.9W	16	184	2	0.14
190126	14:52:15.25	44º38.15’	110º58.23’	8.6	0.1	13	150	4	0.11
190126	16:55:44.66	44º44.83’	110º47.43’	5.8	0.4	14	156	7	0.23
190126	21:30:46.01	44º46.39’	110º48.44’	2.5	0.5	16	85	4	0.11
190127	03:54:47.49	44º37.12’	110º57.33’	5.3	-0.2	10	152	6	0.13
190127	03:54:53.10	44º38.96’	110º56.47’	5.2	0.6	7	118	3	0.08
190127	03:58:12.41	44º38.01’	110º57.91’	8.1	0.2	14	147	4	0.16
190127	04:02:53.53	44º38.03’	110º57.83’	8.5	1.5W	23	92	4	0.14
190127	04:31:19.03	44º37.29’	110º58.32’	5.9	0.2	11	150	5	0.11
190127	04:59:59.78	44º37.38’	110º57.86’	6.0	0.3	9	148	5	0.10
190127	05:29:53.99	44º37.91’	110º58.14’	8.7	1.3W	13	126	4	0.14
190127	05:50:12.30	44º37.64’	110º57.76’	7.8	0.3	14	147	5	0.17
190127	10:04:43.74	44º37.94’	110º57.96’	9.2	1.6W	24	92	4	0.15
190128	10:06:46.98	44º46.34’	111º09.65’	6.7	0.9W	8	119	4	0.12
190129	05:28:19.06	44º33.54’	110º45.49’	2.8	0.9W	9	99	10	0.13
190129	13:35:59.52	44º48.00’	111º00.00’	9.6	1.1W	13	164	5	0.11
190129	14:03:25.23	44º41.19’	109º59.36’	10.8	1.2	7	218	14	0.05
190129	14:48:00.77	44º40.53’	109º56.75’	5.3*	1.1	6	228	18	0.04
190129	16:55:05.76	44º43.77’	110º01.77’	8.0	1.8	9	148	9	0.14
190130	22:21:05.67	44º33.72’	110º57.52’	12.9	1.5W	16	128	11	0.14
190131	03:37:56.94	44º44.88’	110º55.47’	9.7	0.6	16	101	7	0.13
190131	03:55:46.60	44º44.85’	110º55.28’	9.7	0.0	16	100	7	0.17
190201	05:49:44.28	44º46.37’	111º09.58’	5.0	0.3	9	119	4	0.14
190201	10:20:22.51	44º47.20’	111º06.09’	13.2	1.5W	19	65	1	0.12
190201	17:19:37.13	44º46.30’	111º09.07’	5.3	0.6	15	108	4	0.21
190201	17:20:58.55	44º46.53’	111º08.89’	4.9	0.8	14	107	4	0.15
190201	18:33:00.21	44º43.93’	111º00.83’	6.4	-0.3	9	108	3	0.15
190201	19:28:06.27	44º46.81’	111º09.00’	7.3	2.1W	17	113	4	0.17

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DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
190201	19:39:14.73	44º46.39’	111º09.85’	5.6	0.4	10	125	4	0.17
190201	21:35:09.39	44º30.54’	110º33.06’	4.6	0.4	14	71	9	0.13
190201	22:35:03.45	44º46.41’	111º08.95’	3.7	0.0	9	114	4	0.11
190201	22:54:36.06	44º46.50’	111º09.40’	5.4	0.9	12	117	4	0.19
190201	23:15:49.82	44º30.20’	110º32.98’	2.0	0.4	14	71	8	0.25
190201	23:16:08.97	44º30.38’	110º32.86’	5.3	0.7	11	96	8	0.11
190202	06:18:18.72	44º46.68’	111º09.22’	7.7	1.6W	17	77	4	0.16
190203	11:42:20.02	44º46.43’	111º00.96’	6.4	0.4	8	242	2	0.05
190204	18:28:32.33	44º36.66’	110º26.27’	5.2	1.5W	12	156	6	0.06
190205	19:49:58.83	44º33.58’	110º57.86’	11.9	0.5	11	92	11	0.12
190205	23:42:15.45	44º47.28’	110º50.14’	5.0	1.4W	17	106	1	0.15
190209	19:54:28.31	44º48.50’	111º27.45’	11.8	0.8	11	121	19	0.06
190211	15:35:22.41	44º39.55’	110º28.68’	3.1	0.8	15	108	7	0.14
190212	12:54:36.37	44º39.06’	110º44.43’	5.5	0.4	14	94	8	0.12
190214	13:03:33.22	44º51.05’	111º27.38’	9.5*	1.3	15	98	21	0.07
190216	15:30:29.74	44º36.02’	110º40.91’	7.3	0.6	11	138	3	0.16
190216	15:31:23.17	44º36.32’	110º41.09’	6.6	1.9W	11	127	3	0.11
190216	15:32:33.03	44º36.20’	110º41.14’	6.1	1.0	13	73	3	0.17
190216	21:22:50.83	44º27.90’	111º00.43’	8.2	3.1W	25	95	14	0.19
190216	21:28:05.79	44º27.98’	110º59.20’	3.1*	1.5	10	150	12	0.10
190217	04:43:16.73	44º45.47’	110º14.89’	5.9	1.5	12	119	8	0.10
190217	07:55:46.77	44º33.61’	110º57.50’	13.3	1.5W	21	103	11	0.10
190217	20:43:55.88	44º44.89’	110º59.69’	7.8	1.6W	18	86	2	0.12
190219	13:51:28.50	44º33.94’	110º56.98’	11.6	0.6	12	147	10	0.11
190220	00:14:20.38	44º37.48’	110º22.73’	3.8	1.5W	12	81	7	0.18
190220	00:15:14.61	44º36.90’	110º24.53’	4.8	0.4	8	120	6	0.14
190220	00:16:49.67	44º35.73’	110º25.10’	1.0	0.8	5	170	4	0.00
190220	00:17:27.14	44º37.66’	110º22.52’	4.4	0.2	8	211	8	0.14
190220	08:59:56.51	44º45.09’	111º07.33’	10.4	1.0W	14	107	6	0.11
190220	09:19:53.96	44º44.94’	111º06.84’	8.1	0.4	12	107	7	0.14
190220	11:55:49.32	44º45.21’	111º07.01’	9.6	1.2W	14	110	6	0.16
190220	11:58:16.85	44º44.92’	111º07.20’	8.7	0.6W	12	105	6	0.14
190220	12:02:20.08	44º45.72’	111º06.80’	9.6	0.5	13	120	7	0.13
190220	12:14:29.27	44º45.39’	111º06.78’	9.9	1.0W	16	114	7	0.18
190220	12:26:56.98	44º45.37’	111º07.21’	9.6	0.4	12	112	6	0.11
190220	12:29:22.42	44º45.27’	111º06.87’	9.5	1.1W	17	87	6	0.14
190220	12:31:05.27	44º45.18’	111º07.16’	9.9	1.5W	18	86	6	0.16
190220	12:32:39.79	44º45.19’	111º07.17’	9.3	0.8	16	109	6	0.15
190220	12:39:19.29	44º45.40’	111º06.97’	11.7	1.7W	21	69	4	0.15
190220	12:41:29.03	44º44.81’	111º07.15’	8.6	0.9W	13	104	6	0.14
190220	12:47:53.55	44º45.11’	111º07.06’	9.9	0.6	17	86	6	0.14
190220	12:52:14.95	44º44.77’	111º07.15’	8.7	0.5	14	103	6	0.13
190220	13:38:01.30	44º44.70’	111º07.20’	8.5	0.3	12	101	6	0.12
190220	20:30:12.56	44º45.16’	111º06.83’	10.4	0.1	14	141	7	0.18
190220	20:31:57.20	44º45.20’	111º07.11’	9.4	1.1	16	87	6	0.12

Table 2. Earthquakes in the Yellowstone Region: January 1–March 31, 2019

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
190221	12:23:40.30	44º51.16’	111º26.96’	10.2*	1.8W	19	188	21	0.13
190221	13:31:55.68	44º51.14’	111º26.49’	9.7*	1.5W	15	186	20	0.14
190222	01:07:03.05	44º34.43’	110º54.39’	7.9	0.6	11	127	7	0.09
190222	08:48:01.98	44º34.52’	110º54.71’	7.7	0.5	8	182	7	0.08
190222	10:43:32.54	44º34.54’	110º55.15’	8.6	0.7	10	172	7	0.09
190222	11:52:40.94	44º34.73’	110º54.29’	8.4	1.0	12	77	6	0.07
190222	11:56:44.23	44º34.61’	110º54.42’	7.4	0.9	10	125	7	0.09
190222	12:38:54.81	44º34.35’	110º54.76’	8.4	0.7	8	184	7	0.08
190222	12:39:06.92	44º34.95’	110º53.61’	7.3	0.4	8	168	5	0.12
190222	12:48:54.79	44º34.81’	110º54.31’	9.2	0.3	9	177	6	0.08
190222	13:34:17.97	44º35.02’	110º55.06’	9.2	1.3W	19	74	7	0.17
190222	17:22:48.78	44º34.82’	110º53.65’	8.5	0.6	14	113	6	0.17
190222	17:23:33.85	44º34.55’	110º53.82’	7.5	0.3	11	124	6	0.16
190222	18:42:34.09	44º34.80’	110º54.21’	8.5	0.3W	11	122	6	0.08
190222	19:18:34.26	44º34.90’	110º54.46’	8.9	0.9W	15	76	6	0.14
190223	04:20:12.23	44º44.97’	111º07.54’	10.4	1.5W	19	104	6	0.13
190223	08:01:18.50	44º33.60’	110º57.72’	13.1	1.4W	18	91	11	0.11
190223	19:24:58.99	44º29.28’	110º37.40’	5.4	1.6W	25	53	6	0.20
190225	23:46:58.19	44º28.74’	111º02.97’	11.4	1.0	12	167	17	0.15
190225	23:53:10.72	44º28.78’	111º02.91’	13.2	0.8	16	167	17	0.18
190226	00:27:51.59	44º28.69’	111º03.26’	9.3	0.8	13	148	15	0.20
190226	00:47:05.35	44º28.74’	111º03.31’	12.7	1.1W	13	169	18	0.17
190226	00:48:19.30	44º46.64’	110º47.89’	2.3	0.9	15	108	4	0.10
190226	01:03:32.58	44º28.55’	111º03.31’	13.6	0.9	15	169	18	0.20
190227	00:54:59.37	44º35.67’	110º23.16’	2.0*	1.9W	17	66	13	0.22
190227	05:34:58.26	44º45.29’	111º06.38’	10.4	1.4W	22	90	7	0.17
190227	11:32:29.09	44º45.36’	111º06.49’	9.3	0.3	16	116	7	0.19
190228	00:02:48.84	44º47.38’	111º01.12’	8.7	1.3W	19	123	4	0.12
190228	02:51:53.46	44º45.42’	111º06.84’	10.8	0.7	19	107	7	0.15
190228	09:27:28.42	44º42.07’	110º59.89’	10.5	0.8	17	101	4	0.15
190301	13:53:45.33	44º34.56’	110º45.36’	7.7	0.6	16	112	9	0.18
190302	03:47:42.49	44º45.15’	111º06.64’	9.7	0.4	16	111	7	0.17
190302	10:53:52.49	44º44.45’	111º07.26’	9.1	0.2	12	98	6	0.15
190302	12:20:22.85	44º40.44’	110º03.10’	13.3	2.1W	14	144	11	0.13
190304	02:37:51.28	44º33.86’	110º58.40’	14.1	1.5W	17	93	11	0.15
190304	17:16:43.81	44º41.59’	110º04.93’	6.0	3.3W	26	76	8	0.14
190304	17:22:13.21	44º42.58’	110º05.90’	7.8	1.6	9	81	6	0.10
190304	17:29:55.19	44º42.08’	110º06.07’	7.9	1.7	10	77	6	0.10
190304	23:17:12.17	44º41.70’	110º04.58’	4.9	2.1W	12	140	8	0.16
190304	23:21:05.90	44º42.14’	110º05.27’	7.3	0.9	10	137	7	0.12
190305	02:51:08.56	44º42.53’	110º05.04’	7.6	1.0	10	139	7	0.09
190305	03:53:37.86	44º46.90’	110º48.12’	4.6	0.6	19	95	4	0.17
190305	08:22:24.52	44º36.75’	110º25.65’	2.2	-0.7	8	186	6	0.05
190305	08:22:29.59	44º37.25’	110º22.00’	6.4	0.0	13	114	7	0.17
190305	17:56:02.21	44º47.58’	111º23.25’	11.9	0.8	14	87	5	0.14

Table 2. Earthquakes in the Yellowstone Region: January 1–March 31, 2019

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
190306	13:58:45.14	44º36.01’	110º53.77’	10.0	0.5	12	110	4	0.08
190306	14:39:05.28	44º35.78’	110º53.76’	9.8	0.2	10	163	5	0.08
190307	07:57:15.06	44º34.84’	110º23.78’	8.2	0.9	13	156	2	0.13
190307	13:01:37.61	44º36.54’	110º53.42’	8.9	0.3	8	228	4	0.06
190307	21:03:20.89	44º37.21’	110º24.69’	4.7	1.8W	12	172	6	0.19
190308	05:05:03.46	44º24.08’	111º11.65’	12.2	0.8	12	162	23	0.13
190308	11:36:31.53	44º26.58’	110º25.35’	3.6*	0.5	7	130	12	0.09
190309	01:16:18.94	44º21.55’	110º43.59’	-3.4*	1.6	7	262	13	0.09
190309	04:35:03.05	44º27.05’	110º25.51’	2.3*	0.5	10	115	12	0.11
190309	08:20:11.39	44º32.39’	110º57.77’	7.3	0.6	8	170	13	0.10
190311	09:31:53.64	44º13.53’	110º15.82’	8.9*	1.5	9	310	19	0.08
190311	11:32:50.75	44º13.10’	110º15.43’	9.0*	1.7	12	307	19	0.10
190311	23:37:30.02	44º47.19’	111º02.26’	7.8	1.1W	17	147	4	0.19
190312	00:35:31.11	44º35.29’	110º53.81’	10.6	0.6	11	115	5	0.13
190312	00:35:51.12	44º35.48’	110º53.55’	10.3	1.4W	17	113	5	0.16
190312	00:36:59.94	44º35.71’	110º54.03’	11.0	1.0W	16	113	5	0.16
190312	00:37:31.94	44º35.58’	110º54.15’	11.0	1.4W	14	115	5	0.14
190312	18:51:18.07	44º36.91’	110º53.30’	8.8	0.3	12	185	3	0.09
190313	13:13:30.32	44º34.05’	110º44.15’	7.9	2.8W	40	67	8	0.18
190313	13:29:59.24	44º33.42’	110º44.10’	4.8	0.8W	14	90	9	0.10
190313	16:49:02.05	44º09.81’	110º13.26’	3.5*	2.3W	19	172	26	0.12
190313	20:28:18.63	44º09.97’	110º13.39’	4.6*	2.0W	16	187	26	0.15
190314	00:16:20.38	44º35.21’	110º52.47’	9.4	0.8	10	154	4	0.13
190314	06:13:27.05	44º10.02’	110º13.40’	6.3*	1.4	15	187	25	0.20
190314	13:59:59.03	44º46.89’	110º49.83’	4.3	1.1W	17	92	2	0.14
190314	14:09:42.07	44º46.99’	110º50.11’	4.8	0.8W	13	94	1	0.15
190315	01:22:54.41	44º42.73’	110º30.63’	1.8	1.3W	10	160	0	0.18
190315	01:55:10.09	44º42.84’	110º30.48’	1.8	1.1W	13	188	0	0.15
190315	16:31:07.98	44º21.42’	111º05.80’	10.8*	1.5W	8	290	23	0.04
190316	08:59:52.98	44º47.33’	110º49.66’	4.4	0.5	9	215	2	0.10
190316	15:28:55.61	44º46.78’	111º00.10’	7.7	0.0	10	146	2	0.14
190316	15:33:38.11	44º47.01’	111º00.34’	9.4	0.2	12	148	3	0.08
190317	16:03:14.21	44º45.73’	110º57.96’	10.4	1.5W	16	99	3	0.14
190317	16:15:16.08	44º45.70’	110º57.34’	8.1	0.2	12	109	4	0.13
190317	16:15:47.30	44º45.88’	110º57.48’	8.6	0.3	12	133	4	0.10
190319	06:35:07.68	44º14.91’	110º46.40’	2.2*	1.1	12	192	23	0.19
190319	10:57:53.30	44º46.09’	111º10.34’	10.6	0.7W	15	89	3	0.15
190319	10:57:54.17	44º22.48’	110º39.33’	3.0	-0.3	6	222	7	0.11
190319	11:07:12.84	44º20.75’	110º40.55’	3.2*	1.4W	13	233	12	0.15
190319	11:36:11.05	44º21.93’	110º40.45’	3.3	0.4	12	223	8	0.12
190319	18:41:07.34	44º39.61’	110º27.09’	4.4	1.5W	16	121	8	0.19
190320	22:45:57.95	44º26.13’	110º23.68’	2.6	0.9	11	128	10	0.12
190320	22:50:48.05	44º25.83’	110º23.65’	3.3	0.9	11	134	10	0.10
190320	22:56:48.56	44º25.97’	110º23.72’	3.2	0.8	11	131	10	0.11
190320	22:57:28.51	44º25.93’	110º23.58’	2.3	0.4	9	132	10	0.08

Table 2. Earthquakes in the Yellowstone Region: January 1–March 31, 2019

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
190320	23:04:57.55	44º25.84’	110º23.67’	4.3	1.0	9	134	10	0.07
190320	23:12:15.25	44º25.51’	110º22.93’	9.2	0.8	8	139	9	0.13
190321	00:27:12.90	44º25.94’	110º23.83’	2.1	0.9	11	132	10	0.09
190321	01:52:39.65	44º25.91’	110º23.69’	3.0	1.4W	9	133	10	0.07
190321	03:01:49.43	44º25.66’	110º23.48’	7.5	1.0	11	86	9	0.13
190321	04:19:31.95	44º52.58’	111º29.40’	13.0	1.1	10	285	7	0.10
190321	09:16:34.96	44º26.01’	110º23.76’	3.8	1.7W	9	131	10	0.09
190321	17:10:21.11	44º47.88’	110º56.42’	6.7	1.2W	19	127	7	0.10
190322	02:46:42.26	44º40.55’	110º02.63’	10.5	1.7	11	147	11	0.17
190322	11:20:24.29	44º45.98’	111º12.25’	11.8	1.0W	15	88	2	0.13
190322	11:21:47.64	44º46.17’	111º11.92’	11.7	0.8W	14	84	2	0.15
190322	16:02:31.88	44º35.54’	110º23.19’	4.4	1.6W	22	86	3	0.22
190322	16:03:42.68	44º35.74’	110º23.04’	4.4	0.0	12	171	4	0.18
190325	05:50:47.81	44º28.86’	110º44.20’	3.2	0.8	7	136	9	0.15
190325	20:06:54.97	44º48.59’	110º33.90’	7.4	1.7W	19	119	11	0.19
190326	00:44:58.47	44º45.69’	110º57.90’	9.3	1.5W	16	109	3	0.15
190326	01:00:26.19	44º45.70’	110º57.82’	9.0	1.8W	22	109	3	0.18
190326	04:36:28.17	44º44.14’	110º48.00’	8.1	0.6W	10	137	7	0.13
190326	04:37:38.07	44º44.13’	110º47.86’	5.0	0.6W	13	138	7	0.19
190326	04:46:03.34	44º44.29’	110º48.15’	4.0	0.6	13	90	7	0.09
190326	04:53:29.75	44º44.39’	110º47.81’	7.4	0.2	11	144	7	0.16
190326	04:55:33.70	44º44.74’	110º47.99’	9.0	1.2W	14	95	6	0.14
190326	09:01:48.37	44º44.43’	110º48.09’	5.0	0.6W	12	91	7	0.11
190326	09:27:59.33	44º44.47’	110º48.20’	8.4	1.9W	21	78	6	0.16
190326	09:28:39.48	44º46.24’	110º48.18’	12.8	0.4	8	183	4	0.06
190326	09:28:55.90	44º44.46’	110º48.06’	5.5	1.3W	13	92	7	0.15
190326	09:30:23.43	44º44.22’	110º48.18’	2.3	0.9	15	89	7	0.13
190326	10:05:16.06	44º44.27’	110º47.80’	7.3	1.3W	19	86	7	0.19
190326	10:18:09.35	44º44.23’	110º48.27’	4.0	0.9W	14	83	7	0.14
190326	10:19:55.62	44º44.48’	110º48.09’	4.8	1.5W	17	89	7	0.15
190326	10:20:02.04	44º44.61’	110º47.65’	2.2	1.5	10	129	7	0.21
190326	19:16:44.14	44º44.57’	110º47.86’	3.4	1.0W	17	89	7	0.16
190326	19:17:25.08	44º44.45’	110º48.07’	2.0	0.7W	11	142	7	0.15
190326	19:21:35.03	44º44.46’	110º47.89’	4.2	1.5W	17	89	7	0.15
190326	19:21:57.89	44º44.43’	110º48.17’	2.4	0.1	7	140	7	0.07
190326	19:22:51.89	44º44.46’	110º48.07’	3.2	0.9W	11	90	7	0.10
190326	19:25:31.28	44º44.13’	110º48.13’	2.1	1.2W	14	88	7	0.14
190326	19:51:40.68	44º44.42’	110º47.95’	2.3	0.3	12	143	7	0.11
190326	19:57:10.28	44º44.21’	110º48.31’	6.2	1.8W	20	81	7	0.17
190326	19:58:13.39	44º44.65’	110º47.84’	6.8	0.9	11	148	6	0.11
190326	20:03:22.36	44º44.26’	110º48.18’	4.9	1.7W	18	82	7	0.18
190326	20:14:24.83	44º44.32’	110º48.04’	4.3	1.6W	18	83	7	0.15
190326	20:18:54.24	44º44.07’	110º48.01’	2.9	0.9W	9	135	7	0.11
190326	21:08:27.19	44º44.22’	110º48.21’	5.1	1.1W	15	83	7	0.15
190327	21:15:11.85	44º45.63’	111º12.37’	10.4	0.8	14	164	1	0.16

Table 2. Earthquakes in the Yellowstone Region: January 1–March 31, 2019

DATE	ORIGIN TIME	LATITUDE	LONGITUDE	DEPTH	MAG	NO	GAP	DMN	RMS
190327	22:07:55.48	44º46.66’	111º09.87’	8.8	0.9W	14	129	4	0.21
190328	11:21:11.14	44º25.81’	110º57.42’	15.0	0.8	9	139	10	0.31
190328	11:27:12.35	44º27.35’	111º00.45’	6.1*	0.6	15	131	14	0.28
190328	11:27:25.20	44º27.14’	110º59.48’	4.1*	1.5W	13	234	12	0.24
190328	11:32:21.98	44º26.28’	111º00.20’	8.3	1.3W	11	241	13	0.24
190328	11:33:28.80	44º27.23’	111º01.25’	3.5*	0.8W	10	240	15	0.30
190328	11:37:17.64	44º27.06’	111º01.29’	15.0	1.6W	18	136	15	0.14
190328	11:47:16.97	44º26.37’	110º58.23’	12.4	0.5W	12	130	11	0.21
190328	11:47:33.45	44º27.10’	110º57.43’	9.7	0.1	11	142	10	0.27
190328	11:51:29.61	44º27.09’	111º00.96’	5.0*	1.2W	11	228	14	0.27
190328	11:57:34.95	44º27.62’	110º59.18’	4.3*	0.3	11	123	12	0.24
190328	13:30:29.59	44º26.73’	110º59.38’	2.1*	0.6	9	125	12	0.18
190328	16:05:41.12	44º25.37’	110º58.76’	10.5	0.9W	9	261	12	0.22
190328	16:06:28.55	44º26.71’	110º59.59’	4.5*	0.9W	12	126	13	0.18
190328	16:06:47.55	44º26.88’	111º00.35’	5.0*	0.1	9	136	14	0.31
190328	16:08:18.11	44º26.40’	111º00.75’	3.9*	1.8W	17	131	14	0.22
190328	16:08:18.34	44º26.88’	110º59.77’	4.8*	1.8W	19	235	13	0.24
190328	16:12:34.49	44º26.84’	111º00.65’	8.4	2.0W	21	131	14	0.24
190330	03:44:43.38	44º45.91’	111º07.03’	10.7	1.1W	20	91	6	0.16
190330	07:46:36.01	44º44.59’	110º48.06’	6.1	0.9W	15	89	6	0.16
190330	19:54:25.19	44º47.47’	111º03.06’	7.7	1.2W	18	121	4	0.13
190331	01:46:29.33	44º46.02’	111º06.79’	10.1	0.8W	14	94	7	0.13

number of earthquakes = 292
* indicates poor depth control
W indicates Wood-Anderson data used for magnitude calculation

Table 3
UNIVERSITY OF UTAH YELLOWSTONE SEISMIC NETWORK
Operating Seismograph Stations
March 31, 2019

SEED Station	Location	SEED Channel	No. of Channels	Network Code	Latitude	Longitude	Elevation (meters)	Sensor	Digitizer	Telemetry	Sponsor
B206*	Canyon206bwy2008, Yellowstone, WY	EH[ZEN]	3	PB	44° 46.66′	110° 30.70′	2400	IESE-S2	Q330	Digital	PBO
B207*	Madisn207bwy2007, Yellowstone, WY	EH[ZEN]	3	PB	44° 37.14′	110° 50.91′	2182	IESE-S2	Q330	Digital	PBO
B208*	Lakejn208bwy2008, Yellowstone, WY	EH[ZEN]	3	PB	44° 33.61′	110° 24.09′	2406	IESE-S2	Q330	Digital	PBO
B944*	Grantt944bwy2008, Yellowstone, WY	EH[ZEN]	3	PB	44° 23.38′	110° 32.63′	2365	IESE-S2	Q330	Digital	PBO
B945*	Panthr944swy2008, Yellowstone, WY	EH[ZEN]	3	PB	44° 53.64′	110° 44.65′	2249	IESE-S2	Q330	Digital	PBO
B950*	Norris950bwy2013, Yellowstone, WY	EH[ZEN]	3	PB	44° 42.77′	110° 40.71′	2328	IESE-S2	Q330	Digital	PBO
FLWY*	Flagg Ranch, WY	BH[ZEN]	3	IW	44° 04.96′	110° 41.96′	2078	3ESP	RT-130	Digital	ANSS
IMW*	Indian Meadows, WY	BH[ZEN]	3	IW	43° 53.58′	110° 56.58′	2670	3ESP	RT-130	Digital	ANSS
LKWY*	Lake, WY	BH[ZEN]	3	US	44° 33.91′	110° 24.00′	2424	STS-2	Q330	Digital	USGS
LOHW*	National Elk Refuge, WY	BH[ZEN]	3	IW	43° 36.76′	110° 36.30′	2245	3ESP	RT-130	Digital	ANSS
MCID	Moose Creek, ID	EHZ	1	WY	44° 11.45′	111° 11.03′	2137	L4C	PSN	Analog	USGS
MOOW*	Moose Ponds, WY	BH[ZEN]	3	IW	43° 44.92′	110° 44.69′	2128	3ESP	RT-130	Digital	ANSS
QLMT*	Earthquake Lake, MT	EHZ	1	MB	44° 49.84′	111° 25.80′	2064	L4C	-	Analog	MBMT
REDW*	Red-Top Meadows, WY	BH[ZEN]	3	IW	43° 21.74′	110° 51.18′	2322	3ESP	RT-130	Digital	ANSS
SNOW*	Snow King Mountain, WY	BH[ZEN]	3	IW	43° 27.75′	110° 45.31′	2390	3ESP	RT-130	Digital	ANSS
TPAW*	Teton Pass, WY	BH[ZEN]	3	IW	43° 29.41′	110° 57.04′	2512	3ESP	RT-130	Digital	ANSS
TPMT*	Teepe Creek, MT	EHZ	1	MB	44° 43.79′	111° 39.94′	2518	L4C	-	Analog	MBMT
YDC	Denny Creek, MT	EHZ	1	WY	44° 42.51′	111° 14.60′	2025	L4C	PSN	Analog	USGS
YDD	Grant Junction, Yellowstone, WY	HH[ZEN]	3	WY	44° 24.00′	110° 34.80′	2400	STS-2	Q330	Digital	NSF
		EN[ZEN]	3					Episensor			
YEE	East Entrance (YNP), WY	HH[ZEN]	3	WY	44° 29.12′	109° 53.81′	2270	Compact	Taurus	Digital	USGS
YFT	Old Faithful (YNP), WY	HH[ZEN]	3	WY	44° 27.05′	110° 50.24′	2292	Compact	Centaur	Digital	USGS
		EN[ZEN]	3					Titan			
YGC	Grayling Creek, MT	EHZ	1	WY	44° 47.77′	111° 06.45′	2075	L4C	PSN	Analog	USGS
YHB	Horse Butte, MT	EHZ	1	WY	44° 45.07′	111° 11.71′	2157	L4C	PSN	Analog	USGS
		HH[ZEN]	3					Compact	ANSS-130	Digital	
		EN[ZEN]	3					Titan			
YHH	Holmes Hill (YNP), WY	EHZ	1	WY	44° 47.30′	110° 51.03′	2717	S13	PSN	Analog	USGS
		HH[ZEN]	3					Trillium 120	Q330	Digital	
		EN[ZEN]	3					Titan			

SEED Station	Location	SEED Channel	No. of Channels	Network Code	Latitude	Longitude	Elevation (meters)	Sensor	Digitizer	Telemetry	Sponsor
YHL	Hebgen Lake, MT	HH[ZEN]	3	WY	44° 51.05′	111° 10.98′	2691	Trillium 120	Q330	Digital	USGS
		EN[ZEN]	3					Titan			
YHR	Hawk's Rest, WY	HH[ZEN]	3	WY	44° 06.36′	110° 04.90′	2976	Trillium 120	Q330	Digital	USGS
YJC	Joseph′s Coat (YNP), WY	EH[ZEN]	3	WY	44° 45.33′	110° 20.95′	2684	S13	PSN	Analog	USGS
YLA	Lake Butte (YNP), WY	EHZ	1	WY	44° 30.76′	110° 16.12′	2580	L4C	PSN	Analog	USGS
YLT	Little Thumb Creek (YNP), WY	EHZ	1	WY	44° 26.25′	110° 35.28′	2439	L4C	PSN	Analog	USGS
YMC	Maple Creek (YNP), WY	EH[ZEN]	3	WY	44° 45.53′	111° 00.41′	2073	S13	PSN	Analog	USGS
YML	Mary Lake (YNP), WY	EH[ZEN]	3	WY	44° 36.20′	110° 38.63′	2653	S13	PSN	Analog	USGS
YMP	Mirror Plateau (YNP), WY	EHZ	1	WY	44° 44.38′	110° 09.40′	2774	S13	PSN	Analog	USGS
		HH[ZEN]	3					Trillium 120	Q330	Digital	
		EN[ZEN]	3					Titan			
YMR	Madison River (YNP), WY	HH[ZEN]	3	WY	44° 40.12′	110° 57.90′	2149	Trillium 120	Q330	Digital	USGS
		EN[ZEN]	3					Titan			
YMS	Mount Sheridan (YNP), WY	EHZ	1	WY	44° 15.84′	110° 31.67′	3106	L4C	PSN	Analog	USGS
YMV	Mammoth Vault (YNP), WY	EHZ	1	WY	44° 58.42′	110° 41.33′	1829	L4C	PSN	Analog	USGS
YNE	Northeast Entrance (YNP), WY	HH[ZEN]	3	WY	45° 00.46′	110° 00.48′	2343	Compact	ANSS-130	Digital	USGS
YNM	Norris Museum (YNP), WY	HH[ZEN]	3	WY	44° 43.59′	110° 42.22′	2311	Trillium 240	Q330	Digital	USGS
YNR	Norris Junction (YNP), WY	HH[ZEN]	3	WY	44° 42.93′	110° 40.75′	2336	Trillium 120	Q330	Digital	USGS
		EN[ZEN]	3					Titan			
YPC	Pelican Cone (YNP), WY	EHZ	1	WY	44° 38.88′	110° 11.55′	2932	L4C	PSN	Analog	USGS
YPK	Parker Peak (YNP), WY	EH[ZEN]	3	WY	44° 43.91′	109° 55.32′	2897	L4C	PSN	Analog	USGS
YPM	Purple Mountain (YNP), WY	EHZ	1	WY	44° 39.43′	110° 52.12′	2582	L4C	PSN	Analog	USGS
YPP	Pitchstone Plateau (YNP), WY	EHZ	1	WY	44° 16.26′	110° 48.27′	2707	S13	PSN	Analog	USGS
		HH[ZEN]	3					Trillium 120	Q330	Digital	
		EN[ZEN]	3					Titan			
YSB	Soda Butte (YNP), WY	EHZ	1	WY	44° 53.04′	110° 09.06′	2072	L4C	PSN	Analog	USGS
YTP	The Promontory (YNP), WY	EHZ	1	WY	44° 23.51′	110° 17.10′	2384	L4	PSN	Analog	USGS
		HH[ZEN]	3					Trillium 120	Q330	Digital	
		EN[ZEN]	3					Titan			
YUF	Upper Falls (YNP), WY	HH[ZEN]	3	WY	44° 42.76′	110° 30.71′	2394	40T	ANSS-130	Digital	USGS
		EN[ZEN]	3					Titan			
YWB	West Boundary (YNP), WY	EHZ	1	WY	44° 36.35′	111° 06.05′	2310	L4C	PSN	Analog	USGS

* Station operated by another agency and recorded as part of the Yellowstone Seismic Network
Network Statistics: 150 data channels from 46 stations were being recorded at the end of this report period

EXPLANATION OF TABLE

UURSN Code: Station code formerly used in routine processing. Owing to software limitations, the station code may not be the same code used by the original operator. For multi-component stations, the vertical, east-west, and north-south high gain (low gain) components are identified by an appended Z(V), E(L), and N(M), respectively, in UUSS phase files.

Location: General description of station location. YNP = Yellowstone National Park.

SEED Station: The SEED (Standard for the Exchange of Earthquake Data) station code used by the original operator.

SEED Channel: The SEED format uses three letters to name seismic channels. See <<http://www.iris.edu/manuals/SEEDManual_V2.4.pdf>> for information about the SEED channel naming convention. Relevant sections are reproduced below. In the SEED convention, each letter describes one aspect of the instrumentation and its digitization. The first letter specifies the general sampling rate and the response band of the instrument. Band codes used in this table include:

Band Code	Band Type	Sample Rate	Corner Period
E	Extremely short period	≥ 80 Hertz	< 10 seconds
H	High broadband	≥ 80 Hertz	≥ 10 seconds
B	Broadband	≥ 10 to < 80 Hertz	≥10 seconds
S	Short period	≥ 10 to < 80 Hertz	< 10 seconds

The second letter specifies the family to which the sensor belongs. Sensor families used in this table are:

Instrument Code	Description
H	High gain seismometer
L	Low gain seismometer
N	Accelerometer

The third letter specifies the physical configuration of the members of a multiple axis instrument package. Channel orientations used in this table are:

Z E N Traditional (Vertical, East-West, North-South)

Number of Channels: Total number of waveform channels recorded.

Network Code: The FDSN (Federation of Digital Seismographic Networks) registered network code. See <<http://www.iris.edu/dms/nodes/dmc/services/network_codes>> for information about registered seismograph network codes. Network codes referenced in this table:

Network Code	Network name; Network operator or responsible organization
IE	Idaho National Laboratory Seismic Network
IU	IRIS/USGS Network; USGS Albuquerque Seismological Laboratory
IW	Intermountain West Network, U.S. Geological Survey

MB	Montana Regional Seismic Network; Montana Bureau of Mines and Geology
PB	Plate Boundary Observatory
UU	University of Utah Regional Network; University of Utah
US	US National Network; USGS National Earthquake Information Center
WY	Yellowstone Wyoming Seismic Network; University of Utah

Latitude, Longitude: Sensor location in degrees and decimal minutes; North latitude, West longitude.

Elevation: Sensor altitude in meters above sea level.

Sensor	**Description**
L4, L4C	Mark Products L4 or L4C short-period seismometer
S13, 18300	Geotech S13 or 18300 short-period seismometer
Ranger	Kinemetrics Ranger short-period seismometer
40T	Guralp CMG-40T broadband seismometer
3T	Guralp CMG-3T broadband seismometer
3ESP	Guralp CMG-3ESP broadband seismometer
STS-2	Streckheisen STS-2 broadband seismometer
FBA23	Kinemetrics FBA-23 accelerometer
EpiSensor	Kinemetrics EpiSensor accelerometer
Applied Mems	Applied Mems accelerometer
PA-23	Geotech PA-23 accelerometer
Compact	Nanometrics Compact broadband seismometer
Trillium 120	Nanometrics Trillium 120 broadband seismometer
Trillium 240	Nanometrics Trillium 240 broadband seismometer
Titan	Nanometrics Titan accelerometer
Observer	Refraction Technology (REF TEK) Model 151 Observer broadband seismometer
IESE-S2	Institute of Earth Science and Engineering S-2 model borehole seismometer

Digitizer	**Description**
K2	Kinemetrics Altus Series K2 (19-bit resolution field digitizer)
Etna	Kinemetrics Altus Series Etna (18-bit resolution field digitizer)
72A-07	Refraction Technology (REF TEK) model 72A-07 (24-bit field digitizer)
72A-08	Refraction Technology (REF TEK) model 72A-08 (24-bit field digitizer)
ANSS-130	Refraction Technology (REF TEK) model 130-ANSS/02 (24-bit resolution field digitizer)
RT-130	Refraction Technology (REF TEK) model RT-130 (24-bit resolution field digitizer)
Q330	Quanterra, Inc Q330 digitizer (24-bit resolution field digitizer)
SMART-24	Geotech SMART-24 digitizer (24-bit resolution field digitizer)
PSN	PSN-ADC-SERIAL version III (16-bit resolution field digitizer)
Basalt	Kinemetrics Basalt (24-bit resolution field digitizer)
Taurus	Nanometrics Taurus (24-bit resolution field digitizer)
Centaur	Nanometrics Centaur (24-bit resolution field digitizer)

Telemetry	Description
Analog	Data transmission is analog along part of the transmission pathway
Digital	Data are converted to digital form at the station site
None	On-site recording system

Sponsor (or Operator for stations marked by * in preceding columns)

USGS	U.S. Geological Survey
Utah	State of Utah
ANSS	Advanced National Seismic System
INL	Idaho National Laboratory
MBMT	Montana Bureau of Mines and Geology
PBO	Plate Boundary Observatory
NSF	National Science Foundation

Network Changes During January 1–March 31, 2019

None