



November 20, 2019

via email  
Mr. Nelson Turcotte  
Black River L.P.

Dear Nelson,

I am writing on behalf of the Black Lake Association (BLA) to respond to a recent complaint filed with the Federal Energy Regulatory Commission (FERC) by the Black Lake Preservation Society (BLPS). BLPS' complaint alleges that Black River Hydro Limited Partnership (BRLP) has not complied with their license, and due to the lack of oversight and regulation, is responsible for "hundreds of thousands of dollars of damages to the public" on Black Lake.

BLA was founded in 1928 and has been actively involved for the past 92 years in maintaining the quality of the lake and surrounding watershed, providing recreational opportunities and communicating items of interest to its approximately 500 members. BLA has also been at the forefront in monitoring and studying Black Lake water levels during that time.

Black Lake property owners have dealt with high water levels in the spring for as long as there have been homes on Black Lake. This event has been the subject of numerous studies, reports, and papers over the years, some of which were written by BLA members. Many independent experts have collected and analyzed data on Black Lake water levels, including the Water Resources Branch of the United States Geological Survey, the Michigan Department of Conservation Engineering and Architecture Division, United Associates Inc. Architects Engineer Surveyors, the U.S. Army Corps of Engineers, the Water Management Division of the Michigan Department of Natural Resources, and H. S. Santeford, Ph.D. and G. R. Alger, Ph.D. Property damage due to high lake levels in the spring is NOT a new phenomenon on Black Lake. The conclusions have all been similar. Professors Santeford and Alger stated in 1986,



“It can be seen that operations of Alverno can have an effect on Black Lake levels. However, a reasonable operation at levels above 610.5 would not have a material effect on the maximum lake level provided drawdown of the power pond

is accomplished at the first sign of spring spillage at Keebler. Further, even with a low winter level for the lake it is the inability of the existing outflow river system to pass large flows at moderate lake elevations which has the most significant influence on resulting lake levels.”

In spite of the extensive record, BLPS, formed in 2016, claims that they are the only organization that understands the concerns of property owners and represents them in the process to improve lake level management practices. In addition to claiming hundreds of thousands of dollars of damages to properties on Black Lake in the last few years, their complaint makes a number of other assertions that we feel should be addressed.

We are fully aware of the high-water conditions during the spring thaw and the subsequent damage that sometimes occurs to the Black Lake shoreline. In fact, certain areas around Black Lake are more subject to flooding than others due to low elevations of approximately 614 feet above sea level. Several areas have been designated Special Flood Hazard Areas by the Federal Emergency Management Agency as indicated on the agency’s Flood Insurance Rate Maps. We are also aware that in prior years, some low-lying property owners attempted to reclaim shoreline by filling in their property with rock, sand, and topsoil. BLA does not condone this practice and we do not believe it to be a viable long-term solution to avoiding further property damage.

BLPS claims that significant property damage has been caused by noncompliance of BRLP by allowing lake levels to rise above 613.5 feet above sea level. It is interesting to note that data from 1960 to 1983 (the spill gate was wide open from approximately 1964 to 1982) shows that peak lake levels equaled or exceeded 613 feet above sea level in 16 out of 24 years (1960, 1962, 1963, 1965, 1967, 1971, 1972, 1974 – 1980, 1982, 1983). During these years when the hydro plant was not operational and the spill gate was open, it appears that there is a strong correlation of the lake levels as compared to cumulative precipitation levels during the winter period (defined as monthly precipitation in consecutive months when average temperatures were below 32 degrees). In years of below freezing temperatures and high precipitation, one would expect a fairly aggressive spring thaw when cumulative snow and ice levels thaw quickly. Yet even



when the spill gate was wide open for the entire winter the lake still rose to 613 and above during the spring thaw in 16 out of 23 years. Average peak lake level was 613.75 and average cumulative winter period precipitation was 11.1 inches during those years.

During the years when the peak lake level was below 613 feet above sea level (1961, 1964, 1966, 1968, 1969, 1970, 1973 and 1971) average peak lake level was 612.3 feet above sea level and average cumulative winter precipitation was only 7.5 inches.

It is interesting to note that we see the same strong correlation during the years 2008 to 2018 when the dam was operated by BRLP. The lake exceeded 613 feet above sea level in 8 of 11 years (2008, 2011-2014, 2016-2018). In those years the average peak lake level was 613.75 and average cumulative precipitation during the winter period was 12.0 inches. During the years when the peak lake level was below 613 feet above sea level (2010, 2015) average peak lake level was 612.3 feet above sea level and average winter precipitation was only 6.6 inches.

It appears to us that a cold (below freezing) winter with high cumulative precipitation during that period will trigger an aggressive spring runoff that results in a high peak spring lake level, regardless of winter lake levels. As has been discussed and concluded in the numerous reports mentioned above, this is because of the natural restriction in the Black River at Smith Rapids. We disagree with BLPS' assertion that high lake levels in the spring are the result of BRLP's "weak efforts to comply with their license."

We take issue with many other assertions in their letter. BLPS asserts that they have 500 members in a "private Facebook group". How many of these are Black Lake property owners versus family members of the aggrieved property owners? We doubt there are 500 members of BLPS. In fact, some of our BLA members have been denied membership to BLPS and access to their Facebook group. BLPS also asserts that "our group of property owners bears the entire burden of property damage" and are the only real stakeholders in the process. In support BLPS presents Appendix A with a summary of Spring 2016 property damage that names only 19 property owners. How many of those 19 properties are in the FEMA designated Special Flood Hazard Area? How many sustained damages to areas that had previously been filled with rock and sand? How many have flood insurance? How many have filed flood and/or homeowners insurance claims? There are in excess of 800 homesites on Black Lake, many owners with docks and boat hoists (most know not to put their docks in too early



in the spring!), and countless other sportsmen who use the lake during the summer for boating and fishing, and during the winter for snowmobiling, fishing, cross country skiing, etc. There are many other stakeholders in this process who rely on lake levels and are hurt by levels that are too high or too low, most of who are not members of the BLPS Facebook page.

BLPS asserts the lack of precise measurements and data that can be relied on, yet as discussed above, the record is full of data and analysis by qualified independent experts going back to the 1940's. BLPS provides no evidence for this assertion, yet claim that it is "inconceivable to us that the burden of proof is placed on the BLPS." In fact, there is little evidence presented for many of their assertions.

For example, BLPS protocol incorporates the claim that "the lower the lake level is at the start of the thaw determines the peak level that will be achieved during the thaw." This claim ignores reality. BLPS complaint Appendix C: Lake Levels without Hydro Plant Operations, provides lake levels for each month for the years 1960 through 1983. The spill-gate was wide open during those years. From a cursory review of the charts it appears that winter lake levels do not solely determine the peak lake levels achieved during the thaw. Again, this has been borne out in the numerous studies performed over the years.

BLPS claims that an agreed upon protocol has not been achieved for two reasons: questionable data and dysfunctional incentives.

BLPS claims they have no data regarding flow through the Smith Rapids or through the spill gate. This data was compiled in various reports including the 1947 Michigan Department of Conservation report and the 1986 Alverno Dam Survey Report. In fact, the 1986 report concludes as follows:

"also, keep in mind when looking at Figure One that the higher the lake level at the time of spring runoff the greater is the ability of the system to pass these increased inflows. If Black Lake is at 610.5 we can only let about 350 cfs out. On the other hand, if Black Lake is at 611.0 we can let out about twice that rate. Our report shows that there is little net advantage to having the lake at 610.5 vs. 611 before spring runoff and this is why. In effect at 610.5 you have more storage available but you will also have to store more water (all the lower flow inputs between 350 and 700 in the above example). Pages 17A thru 19A of our report show the



computer predictions for Black Lake level for the 1967 conditions if you were somehow able to get the lake down to 610.5 by the end of January 1967. The result indicates Black Lake would still have gone to elevation 614.43 instead of 614.5.

If one is able to bring Black Lake to around elevation 611 about the first of March and be prepared to lower Alverno Pond to around 1.5 feet lower than Black Lake when Keebler begins to spill you will be doing about the best you can to hold Black Lake levels down.”

BLPS asserts that the business of the hydro plant is based on dysfunctional incentives and represents a “win-lose” contract between the public and BRLP, that the dam is merely a cost to the property owners. This assertion ignores the benefit to the public that hydro power provides, that of a clean alternative energy source. BLA supports BRLP and the “green” energy it produces and does not support the “not on my lake” position of BLPS. They also assert that the recent more frequent destructive lake levels is a cost to the “public”. This assertion assumes that the operation of the dam is the only reason for the high lake levels and ignores the impact of winter weather and precipitation on lake levels. Our analysis above shows the correlation of high water to cumulative precipitation during the time the hydro plant was not in operation (1962 to 1980) and the period 2008 to 2018 presented by BLPS.

In fact, Black Lake is not the only body of water experiencing high lake levels in the last few years as a result of increased precipitation levels. A November 2019 article **5 things to know about high water’s impact on Lake Huron’s shoreline** by Heather Jordan in MLive.com states

“Heavy rain and abundant snow melt over the Great Lakes drainage basin for the past few years have caused near record-high lake levels, according to MLive Chief Meteorologist Mark Torregrossa, and it’s wreaking havoc on Michigan’s shoreline, including in eastern Michigan.”

“The Lake Michigan-Huron water level is 32 inches — or nearly 3 feet — higher than the long-term average, according to U.S. Army Corps of Engineers water level reports.”



“Dan Frank, owner of Tawas-based Shoreline Contracting, has been in the shore protection business since he was in high school and has worked for himself for 23 years. He said the last few years were unlike anything he had seen before.”

We believe that BLPS’ assertion that BRLP is responsible for the high spring thaw lake levels is misplaced.

The BLPS protocol is based on two presumptions. According to the complaint:

1. The goal of the licensing restriction should not be only to maintain a specific lake level through the winter and spring, but to drain as much water from the lake as is practical prior to and during the spring runoff.
2. The restriction should limit a variable that is controllable, and one that positively impacts the rate of drainage from the lake. That variable is the head pond level.

BLPS asserts that a lower head pond accelerates the rate of drainage.

BLA believes that these presumptions are incorrect and therefore the resulting BLPS protocol is flawed. As the 1986 Alverno Dam Survey concludes, the higher lake level during the spring runoff the greater is the ability of the system to pass the increased inflows out. The Survey also concludes that the Alverno pond should be kept at around 1.5 feet below the level of the lake when Kleeber begins to spill in order to achieve the maximum impact on lowering the lake levels.

We also note that BLPS attempted to back out of the mediation process before a mutual resolution was reached and despite numerous attempts by BRLP to address their issues.

We support the BRLP protocol on the following basis:

- Data and previous studies by independent experts have shown that Smith’s Rapids restricts the ability to lower Black Lake at low flow levels and low lake levels, and is a restriction to lowering lake levels at moderate to high flows regardless of pond level;



- The Court Order of 1965 Black Lake water level targets are very difficult if not impossible to achieve, especially the winter level of 610.5 feet above sea level (the license winter level of 610.2 is an error);
- During 1964 through 1982 the spill gate was fully open and in many years the lake did not achieve the 610.5 winter target level, and spring peaks above 613.5 occurred regularly;
- Spring peak lake levels are strongly correlated to “winter period” cumulative precipitation levels, and not to winter lake levels;
- The 1947 report by the Michigan Department of Conservation recommends that the spring pond level be kept at a level no higher than a 50% submergence level of the Smith’s Rapids in order to speed flows, lower the peak level, and reduce the duration of the peak;
- BLA sees value to the public of operating the hydro plant and wants to avoid an operating protocol that puts the existing plant in operational jeopardy of failure.

After long and careful consideration of the data and analysis presented, and the risks and benefits of the stakeholders, including but not limited to Black Lake and river property owners, recreationalists, fisherman, and Black River LP, we believe that the protocol, as proposed, is a good faith attempt to reduce the risk of high water level damage to lake property in the spring while protecting the fragile turbines at the dam from cavitation and potential failure resulting from operation of the head pond at low levels for long periods of time.

Based on the historical data presented, including the 18 years between 1964 to 1982, when the gate was left open at the dam, we believe that lake levels and property damage result from a variety of factors, many of which are beyond our control. In addition to the existence of Smith’s Rapids (a natural impediment discussed extensively), winter precipitation, snow and ice melt, strong wind storms (common in the area), ground water runoff, and the large size of the Black Lake watershed (much larger than that of Burt and Mullet Lakes) can all contribute to periodic high water events on Black Lake. As lake owners, we learn to minimize our risk of damage (e.g., put our docks in later in the spring, raise the height of our docks, use of rip /rap on shorelines, etc.). These are the realities of living on the water.



Because of the effort and time put forth during the mediation process that was ultimately cancelled, we also support a request by Black River LP to FERC for an extension of time for the submission of the License Amendment Application to April 30, 2020, to provide stakeholders a 60-day period to review the document.

On behalf of the BLA, I want to thank you for your guidance and patience in addressing the issue of high-water levels on Black Lake. You were very accommodating to all parties involved, and we appreciate your efforts.

Sincerely,

A handwritten signature in cursive script that reads "Brett Trepanier".

Brett Trepanier  
President, Black Lake Association

#### Attachments

Exhibit 1 – Relationship of Peak Spring Lake Levels to Cumulative Winter Period Precipitation 1960 to 1983 and 2008 to 2018

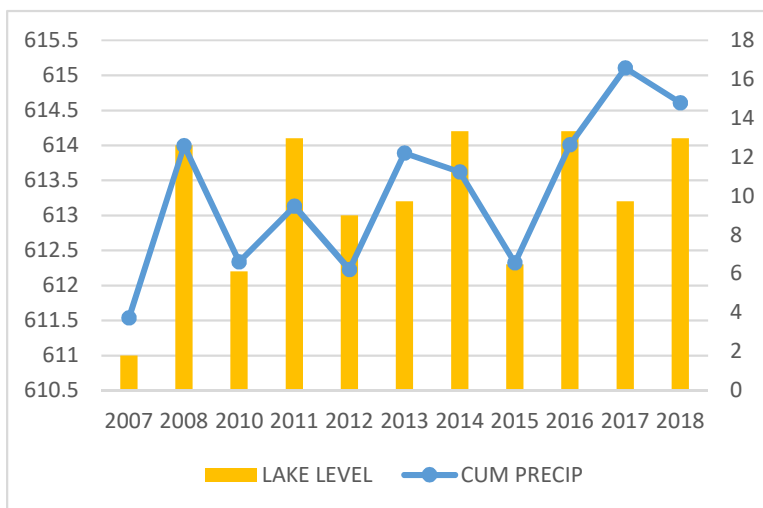
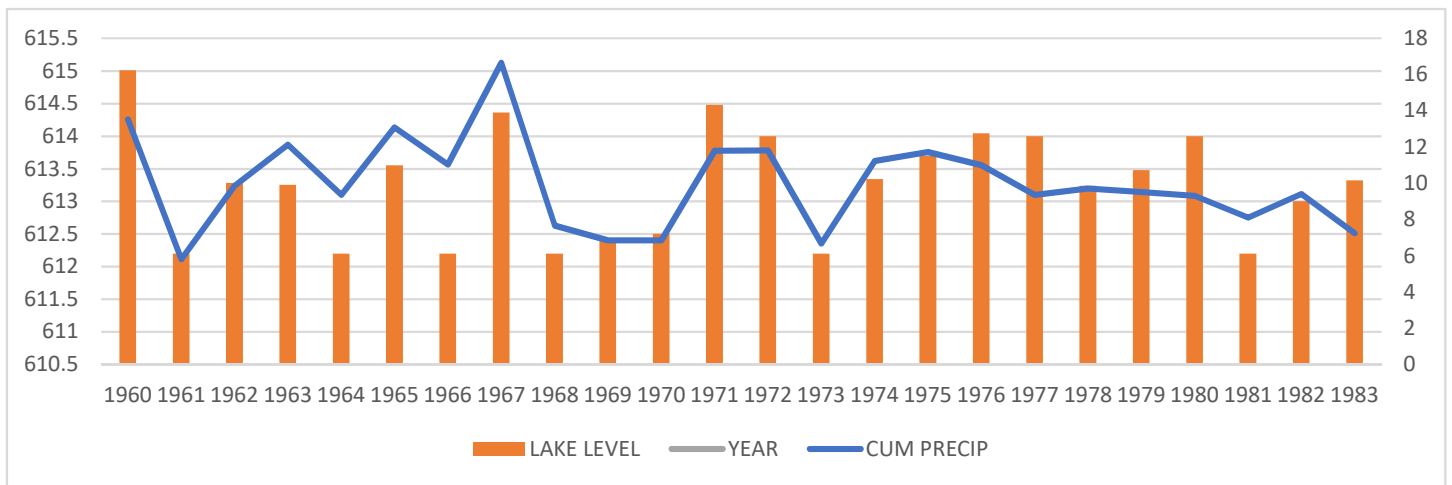
Exhibit 2 – Temperature and Precipitation Data for Onaway Michigan 1960 through 1983 and 2008 through 2018 (Source: National Oceanic & Atmospheric Administration Global Monthly Summaries for Station Onaway 4 N, MI USC00206184)





**Exhibit 1 – Relationship of Peak Spring Lake Levels to Cumulative Winter Period Precipitation 1960 to 1983 and 2008 to 2018**

Note: Peak spring lake levels found in BLPS Complaint Appendix C: Lake levels without hydro plant operations. Cumulative winter precipitation is from Exhibit 2.







**Exhibit 2 – Temperature and Precipitation Data for Onaway Michigan 1960 through 1983 and 2008 through 2018 (Source: National Oceanic & Atmospheric Administration Global Monthly Summaries for Station Onaway 4 N, MI USC00206184)**

NAME	DATE	PRCP	TAVG	AVG TEMP SEASON	CUM PRECIP	LAKE LEVEL	YEAR
ONAWAY 4 N, MI US	1959-01	1	14.7				
ONAWAY 4 N, MI US	1959-02	1.75	14.4				
ONAWAY 4 N, MI US	1959-03	1.89	26.6				
ONAWAY 4 N, MI US	1959-04	3.22	40.7				
ONAWAY 4 N, MI US	1959-05	3.74	57.7				
ONAWAY 4 N, MI US	1959-06	1.48	65.5				
ONAWAY 4 N, MI US	1959-07	1.54	68.9				
ONAWAY 4 N, MI US	1959-08	4.63	71.7				
ONAWAY 4 N, MI US	1959-09	5.01	61.4				
ONAWAY 4 N, MI US	1959-10	3.89	46				
ONAWAY 4 N, MI US	1959-11	3.16	29.4				
ONAWAY 4 N, MI US	1959-12	1.8	28.2				
ONAWAY 4 N, MI US	1960-01	1.97	21.5				
ONAWAY 4 N, MI US	1960-02	1.98	20.9				
ONAWAY 4 N, MI US	1960-03	0.89	19.7				
ONAWAY 4 N, MI US	1960-04	3.72	43	27.12	13.52	615.01	1960



ONAWAY 4 N, MI US	1960-05	5.08					
ONAWAY 4 N, MI US	1960-06	3.91					
ONAWAY 4 N, MI US	1960-07	2.5	65.4				
ONAWAY 4 N, MI US	1960-08	2.52	66.9				
ONAWAY 4 N, MI US	1960-09	3.26	60.3				
ONAWAY 4 N, MI US	1960-10	1.44	47.9				
ONAWAY 4 N, MI US	1960-11	3.67	38.6				
ONAWAY 4 N, MI US	1960-12	1.09	20.6				
ONAWAY 4 N, MI US	1961-01	0.29	14.5				
ONAWAY 4 N, MI US	1961-02	1.08	23.4				
ONAWAY 4 N, MI US	1961-03	1.56	31.5				
ONAWAY 4 N, MI US	1961-04	1.79	39.8	25.96	5.81	612.2	1961
ONAWAY 4 N, MI US	1961-05	1.52	51.1				
ONAWAY 4 N, MI US	1961-06	5.38	61.9				
ONAWAY 4 N, MI US	1961-07	3.53	67.4				
ONAWAY 4 N, MI US	1961-08	1.08	66.8				
ONAWAY 4 N, MI US	1961-09	9.36	63.7				
ONAWAY 4 N, MI US	1961-10	2.41	50.6				
ONAWAY 4 N, MI US	1961-11	2.33	35.2	Onaway avg temp data NA used Pellston data			
ONAWAY 4 N, MI US	1961-12	1.81	24.7				
ONAWAY 4 N, MI US	1962-01	1.76	17.1				



ONAWAY 4 N, MI US	1962-02	2.63	13.1				
ONAWAY 4 N, MI US	1962-03	1.22	29.2				
ONAWAY 4 N, MI US	1962-04	2.44	41.1	25.04	9.86	613.28	1962
ONAWAY 4 N, MI US	1962-05	5.09	58.6				
ONAWAY 4 N, MI US	1962-06	3.61	62.4				
ONAWAY 4 N, MI US	1962-07	0.97	65.3				
ONAWAY 4 N, MI US	1962-08	4.05	65.8				
ONAWAY 4 N, MI US	1962-09	2.57	55.7				
ONAWAY 4 N, MI US	1962-10	1.5	48.6				
ONAWAY 4 N, MI US	1962-11	0.81	35.3				
ONAWAY 4 N, MI US	1962-12	2.15	22.1				
ONAWAY 4 N, MI US	1963-01	0.93	11.3				
ONAWAY 4 N, MI US	1963-02	1.05	9.4				
ONAWAY 4 N, MI US	1963-03	2.23	28.2				
ONAWAY 4 N, MI US	1963-04	1.17	44	lake level peaked in April and May in 1963			
ONAWAY 4 N, MI US	1963-05	4.6	50.9	27.65	12.13	613.25	1963
ONAWAY 4 N, MI US	1963-06	2.87	64.7				
ONAWAY 4 N, MI US	1963-07	1.48	69.2				
ONAWAY 4 N, MI US	1963-08	4.35	62.7				
ONAWAY 4 N, MI US	1963-09	3.06	56.5				
ONAWAY 4 N, MI US	1963-10	0.53	56.6				



ONAWAY 4 N, MI US	1963-11	2.27	41.1				
ONAWAY 4 N, MI US	1963-12	1.23	20.8				
ONAWAY 4 N, MI US	1964-01	3.06	24.7				
ONAWAY 4 N, MI US	1964-02	0.24	22.2				
ONAWAY 4 N, MI US	1964-03	2.32	28.5				
ONAWAY 4 N, MI US	1964-04	2.52	42.5	27.74	9.37	612.2	1964
ONAWAY 4 N, MI US	1964-05	2.7	59.3				
ONAWAY 4 N, MI US	1964-06	0.08	62.4				
ONAWAY 4 N, MI US	1964-07	3.33	70				
ONAWAY 4 N, MI US	1964-08	2.94	63.8				
ONAWAY 4 N, MI US	1964-09	4.9	58.4				
ONAWAY 4 N, MI US	1964-10	1.87	48.1				
ONAWAY 4 N, MI US	1964-11	2.36	40.7				
ONAWAY 4 N, MI US	1964-12	1.9	21.9				
ONAWAY 4 N, MI US	1965-01	2.16	17.3				
ONAWAY 4 N, MI US	1965-02	3.71	18.1				
ONAWAY 4 N, MI US	1965-03	1.98	24				
ONAWAY 4 N, MI US	1965-04	3.33	38.2	23.9	13.08	613.55	1965
ONAWAY 4 N, MI US	1965-05	2.63	58.1				
ONAWAY 4 N, MI US	1965-06	1.41	62.8				
ONAWAY 4 N, MI US	1965-07	4.64	63.9				



ONAWAY 4 N, MI US	1965-08	4.91	64.4				
ONAWAY 4 N, MI US	1965-09	4.94	57.4				
ONAWAY 4 N, MI US	1965-10	1.97	47.8				
ONAWAY 4 N, MI US	1965-11	3.66	36.2				
ONAWAY 4 N, MI US	1965-12	1.65	29.8				
ONAWAY 4 N, MI US	1966-01	4.07	15.3				
ONAWAY 4 N, MI US	1966-02	1.7	23.2				
ONAWAY 4 N, MI US	1966-03	3.62	33.3	25.4	11.04	612.2	1966
ONAWAY 4 N, MI US	1966-04	2.96	40.9				
ONAWAY 4 N, MI US	1966-05	1.98	49.3				
ONAWAY 4 N, MI US	1966-06	0.93	66.2				
ONAWAY 4 N, MI US	1966-07	0.67	71.6				
ONAWAY 4 N, MI US	1966-08	2.76	67.1				
ONAWAY 4 N, MI US	1966-09	2.95	58.8				
ONAWAY 4 N, MI US	1966-10	3.13	48.6				
ONAWAY 4 N, MI US	1966-11	6.67	34.9				'30 inch snowfall on Nov 29 so included in winter precip
ONAWAY 4 N, MI US	1966-12	1.35	23.1				
ONAWAY 4 N, MI US	1967-01	2.49	22.9				
ONAWAY 4 N, MI US	1967-02	2.1	14.2				
ONAWAY 4 N, MI US	1967-03	1	27.3				
ONAWAY 4 N, MI US	1967-04	3.04	43.1	27.58	16.65	614.36	1967



ONAWAY 4 N, MI US	1967-05	1.59	49.6					
ONAWAY 4 N, MI US	1967-06	3.7	66.1					
ONAWAY 4 N, MI US	1967-07	3.13	67.5					
ONAWAY 4 N, MI US	1967-08	4.25	64.7					
ONAWAY 4 N, MI US	1967-09	2.91	59.3					
ONAWAY 4 N, MI US	1967-10	2.89	48.9					
ONAWAY 4 N, MI US	1967-12	2.47	23.5	Onaway avg temp data NA used Pellston data				
ONAWAY 4 N, MI US	1968-01	0.7	18					
ONAWAY 4 N, MI US	1968-02	2.01	13.6					
ONAWAY 4 N, MI US	1968-03	0.29	33.4					
ONAWAY 4 N, MI US	1968-04	2.19	47	27.1	7.66	612.2	1968	
ONAWAY 4 N, MI US	1968-05	2.27	53					
ONAWAY 4 N, MI US	1968-06	2.94	63.4					
ONAWAY 4 N, MI US	1968-07	2.39	68.7					
ONAWAY 4 N, MI US	1968-08	7.18	66.7	lake reached 613.14 in July with spillgate open				
ONAWAY 4 N, MI US	1968-09	5.69	62.9					
ONAWAY 4 N, MI US	1968-10	2.29	52.2					
ONAWAY 4 N, MI US	1968-11	3.27	36					
ONAWAY 4 N, MI US	1969-01	2.45	20.9					
ONAWAY 4 N, MI US	1969-02	0.39	20.2					
ONAWAY 4 N, MI US	1969-03	1.96	24.4					





ONAWAY 4 N, MI US	1969-04	2.06	43	27.125	6.86	612.4	1969
ONAWAY 4 N, MI US	1969-05	3.87	54.1				
ONAWAY 4 N, MI US	1969-06	6.31	58.9				
ONAWAY 4 N, MI US	1969-07	3.97	68.2				
ONAWAY 4 N, MI US	1969-08	1.92	70.1				
ONAWAY 4 N, MI US	1969-09	3.02	59.3				
ONAWAY 4 N, MI US	1969-10	6.52	47.2				
ONAWAY 4 N, MI US	1969-11	2.19	35				
ONAWAY 4 N, MI US	1969-12	0.97	24.1				
ONAWAY 4 N, MI US	1970-01	1.5	13.7				
ONAWAY 4 N, MI US	1970-02	0.35	16.5				
ONAWAY 4 N, MI US	1970-03	2.11	24.7				
ONAWAY 4 N, MI US	1970-04	1.93	43.4	24.48	6.86	612.5	1970
ONAWAY 4 N, MI US	1970-05	3.72	54.4				
ONAWAY 4 N, MI US	1970-06	1.54	64.1				
ONAWAY 4 N, MI US	1970-07	8.24	70.3				
ONAWAY 4 N, MI US	1970-08	1.01	67.2				
ONAWAY 4 N, MI US	1970-09	7.41	60				
ONAWAY 4 N, MI US	1970-10	2.9	51.7				
ONAWAY 4 N, MI US	1970-11	1.84	36.5				
ONAWAY 4 N, MI US	1970-12	3.5	21.1	Onaway data NA used Pellston			



ONAWAY 4 N, MI US	1971-01	1.98	14.2				
ONAWAY 4 N, MI US	1971-02	3.16	19.4				
ONAWAY 4 N, MI US	1971-03	2.18	25				
ONAWAY 4 N, MI US	1971-04	0.97	37	23.34	11.79	614.48	1971
ONAWAY 4 N, MI US	1971-05	3.92	52.6				
ONAWAY 4 N, MI US	1971-06	2.67	66.4				
ONAWAY 4 N, MI US	1971-07	4.56	65.4				
ONAWAY 4 N, MI US	1971-08	2.54	63.6				
ONAWAY 4 N, MI US	1971-09	2.69	62				
ONAWAY 4 N, MI US	1971-10	1.33	57.1				
ONAWAY 4 N, MI US	1971-11	3.68	36.7				
ONAWAY 4 N, MI US	1971-12	4.14	28.4				
ONAWAY 4 N, MI US	1972-01	0.89	19.5				
ONAWAY 4 N, MI US	1972-02	1.21	17.8				
ONAWAY 4 N, MI US	1972-03	2.71	23				
ONAWAY 4 N, MI US	1972-04	2.87	37.4	25.22	11.82	614	1972
ONAWAY 4 N, MI US	1972-05	3.26	56.2				
ONAWAY 4 N, MI US	1972-06	4.03	58.9				
ONAWAY 4 N, MI US	1972-07	5.09	67.4				
ONAWAY 4 N, MI US	1972-08	4.97	65.1				
ONAWAY 4 N, MI US	1972-09	3.29	57.9				



ONAWAY 4 N, MI US	1972-10	2.1	45				
ONAWAY 4 N, MI US	1972-11	1.51	35.3				
ONAWAY 4 N, MI US	1972-12	3.07	23.1				
ONAWAY 4 N, MI US	1973-01	1.57	23.1				
ONAWAY 4 N, MI US	1973-02	1	19.6				
ONAWAY 4 N, MI US	1973-03	1.04	38.2	26	6.68	612.2	1973
ONAWAY 4 N, MI US	1973-04	2.06	43.2				
ONAWAY 4 N, MI US	1973-05	3.15	51.6				
ONAWAY 4 N, MI US	1973-06	4.57	65.8				
ONAWAY 4 N, MI US	1973-07	4.82	68.7				
ONAWAY 4 N, MI US	1973-08	4.88	70.4				
ONAWAY 4 N, MI US	1973-09	1.96	60.3				
ONAWAY 4 N, MI US	1973-10	3.09	54.7				
ONAWAY 4 N, MI US	1973-11	1.69	37.2				
ONAWAY 4 N, MI US	1973-12	2.52	24.5				
ONAWAY 4 N, MI US	1974-01	2.78	20.9				
ONAWAY 4 N, MI US	1974-02	1.91	15.4				
ONAWAY 4 N, MI US	1974-03	0.73	27.9				
ONAWAY 4 N, MI US	1974-04	3.29	43.8	26.5	11.23	613.34	1974
ONAWAY 4 N, MI US	1974-05	1.76	51.7				
ONAWAY 4 N, MI US	1974-06	4.19	62.9				



ONAWAY 4 N, MI US	1974-07	4.46	69.3				
ONAWAY 4 N, MI US	1974-08	1.93	67.2				
ONAWAY 4 N, MI US	1974-09	4	55.3				
ONAWAY 4 N, MI US	1974-10	2.15	47.9				
ONAWAY 4 N, MI US	1974-11	2.53	38				
ONAWAY 4 N, MI US	1974-12	1.26	28.9				
ONAWAY 4 N, MI US	1975-01	2.64	22.9				
ONAWAY 4 N, MI US	1975-02	1.72	22.1				
ONAWAY 4 N, MI US	1975-03	3.55	26.8				
ONAWAY 4 N, MI US	1975-04	2.55	36.4	27.42	11.72	613.7	1975
ONAWAY 4 N, MI US	1975-05	5.69	60.8				
ONAWAY 4 N, MI US	1975-06	2.52	65.7				
ONAWAY 4 N, MI US	1975-07	4.95	70.1				
ONAWAY 4 N, MI US	1975-08	4.09	67.4				
ONAWAY 4 N, MI US	1975-09	1.92	56.6				
ONAWAY 4 N, MI US	1975-10	1.44					
ONAWAY 4 N, MI US	1975-11	3.31	42.3				
ONAWAY 4 N, MI US	1975-12	1.4	24.7				
ONAWAY 4 N, MI US	1976-01	1.2	16.9				
ONAWAY 4 N, MI US	1976-02	2.14	26.3				
ONAWAY 4 N, MI US	1976-03	4.93	31				



ONAWAY 4 N, MI US	1976-04	1.33	47.4	29.26	11	614.04	1976
ONAWAY 4 N, MI US	1976-05	2.73	51.2				
ONAWAY 4 N, MI US	1976-09	1.61	57.3				
ONAWAY 4 N, MI US	1976-10	1.87	44				
ONAWAY 4 N, MI US	1976-11	1.41	30.9				
ONAWAY 4 N, MI US	1976-12	1.17	15.2				
ONAWAY 4 N, MI US	1977-01	1.45	9.7				
ONAWAY 4 N, MI US	1977-02	2.28	20.8				
ONAWAY 4 N, MI US	1977-03	3.06	35.8	22.48	9.37	614	1977
ONAWAY 4 N, MI US	1977-04	1.69	46				
ONAWAY 4 N, MI US	1977-05	1	60.5				
ONAWAY 4 N, MI US	1977-06	1.44	61.4				
ONAWAY 4 N, MI US	1977-07	2.64	70.8				
ONAWAY 4 N, MI US	1977-08	6.78	63.1				
ONAWAY 4 N, MI US	1977-09	6.68	57.8				
ONAWAY 4 N, MI US	1977-10	1.31	47.6				
ONAWAY 4 N, MI US	1977-11	2.62	36.8				
ONAWAY 4 N, MI US	1977-12	2.98	21.6				
ONAWAY 4 N, MI US	1978-01	2.97	15.8				
ONAWAY 4 N, MI US	1978-02	0.53	14.2				
ONAWAY 4 N, MI US	1978-03	0.67	26.3				



ONAWAY 4 N, MI US	1978-04	2.57	38	23.18	9.72	613.24	1978
ONAWAY 4 N, MI US	1978-05	2.77	57.7				
ONAWAY 4 N, MI US	1978-06	2.39	63				
ONAWAY 4 N, MI US	1978-07	2.19	68.3				
ONAWAY 4 N, MI US	1978-08	1.78	68.1				
ONAWAY 4 N, MI US	1978-09	6.66					
ONAWAY 4 N, MI US	1978-10	1.39	47.8				
ONAWAY 4 N, MI US	1978-11	1.06	35				
				Onaway avg temp data NA used Pellston data			
				Onaway avg temp and precipitation data NA used Pellston data			
	1978-12	2.78	22.6				
ONAWAY 4 N, MI US	1979-01	1.96	14.3				
ONAWAY 4 N, MI US	1979-02	1.22	9.6				
ONAWAY 4 N, MI US	1979-03	3.56	32.5	19.75	9.52	613.48	1979
ONAWAY 4 N, MI US	1979-04	3.85	40.5				
ONAWAY 4 N, MI US	1979-05	3.43	53.6				
ONAWAY 4 N, MI US	1979-06	3.05	63.5				
ONAWAY 4 N, MI US	1979-07	3.42	68.7				
ONAWAY 4 N, MI US	1979-08	2.55	64.7				
ONAWAY 4 N, MI US	1979-09	0.29	61.7				
ONAWAY 4 N, MI US	1979-10	4.43	46.7				
ONAWAY 4 N, MI US	1979-11	2.47	37.4				
ONAWAY 4 N, MI US	1979-12	2.04	27.5				



ONAWAY 4 N, MI US	1980-01	1.48	19.4				
ONAWAY 4 N, MI US	1980-02	0.47	14.6				
ONAWAY 4 N, MI US	1980-03	0.67	26.1				
ONAWAY 4 N, MI US	1980-04	4.65	42.2	25.96	9.31	614	1980
ONAWAY 4 N, MI US	1980-05	1.3	57.3				
ONAWAY 4 N, MI US	1980-06	2.93	60.9				
ONAWAY 4 N, MI US	1980-07	1.21	69.1				
ONAWAY 4 N, MI US	1980-08	2.58	70.1				
ONAWAY 4 N, MI US	1980-09	3.19	58.3				
ONAWAY 4 N, MI US	1980-10	1.32	43.2				
ONAWAY 4 N, MI US	1980-11	1.33	34.6				
ONAWAY 4 N, MI US	1980-12	1.52	19.9				
ONAWAY 4 N, MI US	1981-01	0.38	15.3				
ONAWAY 4 N, MI US	1981-02	1.66	25.1				
ONAWAY 4 N, MI US	1981-03	0.67	32.7				
ONAWAY 4 N, MI US	1981-04	3.87	45.9	27.78	8.1	612.2	1981
ONAWAY 4 N, MI US	1981-05	0.91	53.6				
ONAWAY 4 N, MI US	1981-06	3.46	64.3				
ONAWAY 4 N, MI US	1981-07	0.7	69.7				
ONAWAY 4 N, MI US	1981-08	1.94					
ONAWAY 4 N, MI US	1981-09	2.71					



ONAWAY 4 N, MI US	1981-10	3.49	43.9				
ONAWAY 4 N, MI US	1981-11	1.08	38.2				
ONAWAY 4 N, MI US	1981-12	1.54	26.9				
ONAWAY 4 N, MI US	1982-01	2.65	12.7				
ONAWAY 4 N, MI US	1982-02	0.41	18				
ONAWAY 4 N, MI US	1982-03	1.85	27.6				
ONAWAY 4 N, MI US	1982-04	2.96	38	24.64	9.41	613	1982
ONAWAY 4 N, MI US	1982-05	1.79	59.5				
ONAWAY 4 N, MI US	1982-06	1.72	59.7				
ONAWAY 4 N, MI US	1982-07	1.79	71				
ONAWAY 4 N, MI US	1982-08	2.76	63				
ONAWAY 4 N, MI US	1982-09	5.45	58.7				
ONAWAY 4 N, MI US	1982-10	4.51	51.6				
ONAWAY 4 N, MI US	1982-11	2.86	37.2				
ONAWAY 4 N, MI US	1982-12	3.49	30.4				
ONAWAY 4 N, MI US	1983-01	1.39	21.3				
ONAWAY 4 N, MI US	1983-02	1.14	26.2				
ONAWAY 4 N, MI US	1983-04	1.23	38.2	29.025	7.25	613.32	1983
ONAWAY 4 N, MI US	2006-11	1.58	38.9				
ONAWAY 4 N, MI US	2006-12	2.29	31.8				
ONAWAY 4 N, MI US	2007-01	1.39	23.8				





ONAWAY 4 N, MI US	2007-02	0.56	15.2				
ONAWAY 4 N, MI US	2007-03	1.78	33.9	24.3	3.73	611	2007
ONAWAY 4 N, MI US	2007-04	2.65	40.4				
ONAWAY 4 N, MI US	2007-05	1.68	58.4				
ONAWAY 4 N, MI US	2007-06	4.41	67.8				
ONAWAY 4 N, MI US	2007-07	1.8	67.8				
ONAWAY 4 N, MI US	2007-08	1.99	69				
ONAWAY 4 N, MI US	2007-09	2.49	63.5				
ONAWAY 4 N, MI US	2007-10	3.87	54.7				
ONAWAY 4 N, MI US	2007-11	1.87	35.1				
ONAWAY 4 N, MI US	2007-12	2.2	25.1				
ONAWAY 4 N, MI US	2008-01	4.09	23.6				
ONAWAY 4 N, MI US	2008-02	1.87	18.9				
ONAWAY 4 N, MI US	2008-03	0.91	25.8				
ONAWAY 4 N, MI US	2008-04	3.51	46.1	27.9	12.58	614	2008
ONAWAY 4 N, MI US	2008-05	2.66	51.3				
ONAWAY 4 N, MI US	2008-06	4.34	64.6				
ONAWAY 4 N, MI US	2008-07	3.47	68.2				
ONAWAY 4 N, MI US	2008-08	1.46	66.5				
ONAWAY 4 N, MI US	2008-09	2.8	60.6				
ONAWAY 4 N, MI US	2008-10	1.19	47.1				



ONAWAY 4 N, MI US	2008-11	1.98	36.7				
ONAWAY 4 N, MI US	2008-12	4.43	20.6				
ONAWAY 4 N, MI US	2009-01	1.26	12.5				
ONAWAY 4 N, MI US	2009-02	2.2	22				
ONAWAY 4 N, MI US	2009-03	1.27	29.8				
ONAWAY 4 N, MI US	2009-04	1.99	41.7				
ONAWAY 4 N, MI US	2009-05	2	53.1				
ONAWAY 4 N, MI US	2009-06	2.83	61.6				
ONAWAY 4 N, MI US	2009-07	1.97	63.3				
ONAWAY 4 N, MI US	2009-08	7.35	65.2				
ONAWAY 4 N, MI US	2009-09	1.48	60				
ONAWAY 4 N, MI US	2009-10	5.16	44				
ONAWAY 4 N, MI US	2009-11	1.15	41.3				
ONAWAY 4 N, MI US	2009-12	2.94	23.3				
ONAWAY 4 N, MI US	2010-01	0.6	21.6				
ONAWAY 4 N, MI US	2010-02	0.67	22				
ONAWAY 4 N, MI US	2010-03	0.11	37.4				
ONAWAY 4 N, MI US	2010-04	2.29	49.9	30.84	6.61	612.2	2010
ONAWAY 4 N, MI US	2010-05	2.67	58.6				
ONAWAY 4 N, MI US	2010-06	6.41	62.6				
ONAWAY 4 N, MI US	2010-07	2.57	71				



ONAWAY 4 N, MI US	2010-08	3.78	70.2				
ONAWAY 4 N, MI US	2010-09	5.13	57.2				
ONAWAY 4 N, MI US	2010-10	1.47	48.8				
ONAWAY 4 N, MI US	2010-11	1.3	38.7				
ONAWAY 4 N, MI US	2010-12	1.06	23.2				
ONAWAY 4 N, MI US	2011-01	0.85	15.4				
ONAWAY 4 N, MI US	2011-02	0.26	22.5				
ONAWAY 4 N, MI US	2011-03	1.05	27.7				
ONAWAY 4 N, MI US	2011-04	6.25	40.9	25.94	9.47	614.1	2011
ONAWAY 4 N, MI US	2011-05	2.7	55.1				
ONAWAY 4 N, MI US	2011-06	7.46	62.9				
ONAWAY 4 N, MI US	2011-07	1.99	71.4				
ONAWAY 4 N, MI US	2011-08	2.72	68				
ONAWAY 4 N, MI US	2011-09	4.53	58.3				
ONAWAY 4 N, MI US	2011-10	4.45	50				
ONAWAY 4 N, MI US	2011-11	3.24	40				
ONAWAY 4 N, MI US	2011-12	0.88	29.6				
ONAWAY 4 N, MI US	2012-01	1.98	24.8				
ONAWAY 4 N, MI US	2012-02	0.83	28.7				
ONAWAY 4 N, MI US	2012-03	2.53	43.7	31.7	6.22	613	2012
ONAWAY 4 N, MI US	2012-04	2.5	43.1				



ONAWAY 4 N, MI US	2012-05	1.71	59.5				
ONAWAY 4 N, MI US	2012-06	3.98	66.5				
ONAWAY 4 N, MI US	2012-07	3.18	71.3				
ONAWAY 4 N, MI US	2012-08	2.6	68.8				
ONAWAY 4 N, MI US	2012-09	2.35	55.1				
ONAWAY 4 N, MI US	2012-10	5.95	47.7				
ONAWAY 4 N, MI US	2012-11	1	36.3				
ONAWAY 4 N, MI US	2012-12	2.49	28.5				
ONAWAY 4 N, MI US	2013-01	2.79	23				
ONAWAY 4 N, MI US	2013-02	1.84	20.3				
ONAWAY 4 N, MI US	2013-03	2.19	27.1				
ONAWAY 4 N, MI US	2013-04	2.9	38.9	27.56	12.21	613.2	2013
ONAWAY 4 N, MI US	2013-05	3.95	55				
ONAWAY 4 N, MI US	2013-06	1.05	62.5				
ONAWAY 4 N, MI US	2013-07	2.34	68.6				
ONAWAY 4 N, MI US	2013-08	1.35	66.5				
ONAWAY 4 N, MI US	2013-09	2.06	59				
ONAWAY 4 N, MI US	2013-10	4.51	48.2				
ONAWAY 4 N, MI US	2013-11	4.49	33.7				
ONAWAY 4 N, MI US	2013-12	2.79	16.6				
ONAWAY 4 N, MI US	2014-01	2.29	11.4				



ONAWAY 4 N, MI US	2014-02	1.13	11.6				
ONAWAY 4 N, MI US	2014-03	0.87	20.2				
ONAWAY 4 N, MI US	2014-04	4.16	39.1	19.78	11.24	614.2	2014
ONAWAY 4 N, MI US	2014-05	2.81	53.5				
ONAWAY 4 N, MI US	2014-06	2.03	64.6				
ONAWAY 4 N, MI US	2014-07	2.81	64.3				
ONAWAY 4 N, MI US	2014-08	6.85	64.3				
ONAWAY 4 N, MI US	2014-09	5.5	59.4				
ONAWAY 4 N, MI US	2014-10	4.55	47				
ONAWAY 4 N, MI US	2014-11	3.82	30				
ONAWAY 4 N, MI US	2014-12	1.67	27.7				
ONAWAY 4 N, MI US	2015-01	1.1	15.2				
ONAWAY 4 N, MI US	2015-02	0.69	6.7				
ONAWAY 4 N, MI US	2015-03	1.19	27.4				
ONAWAY 4 N, MI US	2015-04	1.91	41.1	23.62	6.56	612.3	2015
ONAWAY 4 N, MI US	2015-05	4.73	57.8				
ONAWAY 4 N, MI US	2015-06	1.88	60.5				
ONAWAY 4 N, MI US	2015-07	2.1	68				
ONAWAY 4 N, MI US	2015-08	2.22	66.9				
ONAWAY 4 N, MI US	2015-09	5.52	64.9				
ONAWAY 4 N, MI US	2015-10	1.78	47.6				



ONAWAY 4 N, MI US	2015-11	3.3	41				
ONAWAY 4 N, MI US	2015-12	4.43	35.5				
ONAWAY 4 N, MI US	2016-01	2.1	21.6				
ONAWAY 4 N, MI US	2016-02	1.85	23.4				
ONAWAY 4 N, MI US	2016-03	5.83	34.5				
ONAWAY 4 N, MI US	2016-04	2.85	37.4	29.225	12.63	614.2	2016
ONAWAY 4 N, MI US	2016-05	3.72	55.3				
ONAWAY 4 N, MI US	2016-06	1.83	63.2				
ONAWAY 4 N, MI US	2016-07	2.52	69.4				
ONAWAY 4 N, MI US	2016-08	4.49	70.1				
ONAWAY 4 N, MI US	2016-09	2.78	62.5				
ONAWAY 4 N, MI US	2016-10	3.52	50.7				
ONAWAY 4 N, MI US	2016-11	1.41	43.1				
ONAWAY 4 N, MI US	2016-12	2.89	26.5				
ONAWAY 4 N, MI US	2017-01	2.76	24.6				
ONAWAY 4 N, MI US	2017-02	2.61	27.4				
ONAWAY 4 N, MI US	2017-03	3.67	27.9				
ONAWAY 4 N, MI US	2017-04	4.65	46.2	30.52	16.58	613.2	2017
ONAWAY 4 N, MI US	2017-05	3.16	52.1				
ONAWAY 4 N, MI US	2017-06	3.37	63.6				
ONAWAY 4 N, MI US	2017-07	2.04	67.1				



ONAWAY 4 N, MI US	2017-08	3.85	65				
ONAWAY 4 N, MI US	2017-09	2.79	62.4				
ONAWAY 4 N, MI US	2017-10	6.04	52.5				
ONAWAY 4 N, MI US	2017-11	3.22	34.2				
ONAWAY 4 N, MI US	2017-12	2.07	20				
ONAWAY 4 N, MI US	2018-01	1.53	20				
ONAWAY 4 N, MI US	2018-02	1.62	21.8				
ONAWAY 4 N, MI US	2018-03	1.45	27.2				
ONAWAY 4 N, MI US	2018-04	4.61	33.8				
ONAWAY 4 N, MI US	2018-05	3.5	58.8	30.26666667	14.78	614.1	2018
ONAWAY 4 N, MI US	2018-06	0.82	63.3				
ONAWAY 4 N, MI US	2018-07	0.75	71.1				
ONAWAY 4 N, MI US	2018-08	1.85	70.1				
ONAWAY 4 N, MI US	2018-09	2.81	62.3				
ONAWAY 4 N, MI US	2018-10	6.53	45.3				
ONAWAY 4 N, MI US	2018-11	2.54	30.4				
ONAWAY 4 N, MI US	2018-12	1.89	28.3				
ONAWAY 4 N, MI US	2019-01	2.99	14				
ONAWAY 4 N, MI US	2019-02	3	18.7				
ONAWAY 4 N, MI US	2019-03	1.16	27.1				
ONAWAY 4 N, MI US	2019-04	2.75					



ONAWAY 4 N, MI US	2019-05	5.27	50.1
ONAWAY 4 N, MI US	2019-06	3.52	60.3
ONAWAY 4 N, MI US	2019-07	2.75	69
ONAWAY 4 N, MI US	2019-08	0.74	64.6
ONAWAY 4 N, MI US	2019-09	4.88	60.6