

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

TO: NATIONAL WEATHER SERVICE (W/OS31)
HYDROMETEOROLOGICAL INFO CENTER
1325 EAST-WEST HIGHWAY, RM 13468
SILVER SPRING, MD 20910

DATE:

June 4, 2013

SIGNATURE:

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When no flooding occurs, include miscellaneous river conditions, such as significant rises, record low stages, ice conditions, snow cover, droughts, and hydrologic products issued (WSOM E-41).

An X inside this box indicates that no significant flooding occurred within this Hydrologic Service Area.

Summary

Record flooding occurred during the month of April in our Hydrologic Service Area (HSA). Record crests occurred on the Lower portions of the Grand River at Ionia, Lowell, Ada, Comstock Park, and Grand Rapids, Michigan. In our HSA, 23 out of 35 river forecast points exceeded flood stage. Of the 23 river forecast points that exceeded flood stage, 5 set records, 4 resulted in moderate flooding, and 14 resulted in minor flooding. Areal flood warnings were issued for Allegan, Barry, Ionia, Kent, Montcalm, Ottawa, Van Buren, Clinton, and Gratiot Counties. Due to the severe flooding, Michigan's Governor Rick Snyder declared a state of disaster for 19 counties and two cities. The two cities declared in the disaster, Grand Rapids and Ionia, are located within our HSA and 9 of the 19 counties are within our HSA. The counties included in the disaster declaration that are in our HSA include Barry, Gratiot, Ionia, Kent, Mecosta, Muskegon, Newaygo, Osceola and Ottawa. In our HSA, hundreds of homes were flooded, over 300 roads closed, and preliminary flood damage estimates were in excess of 32 million dollars. On a more positive note, no lives were lost during this record flooding.

Decision support services included the Warning Coordination Meteorologist staffing the State Emergency Operations Center (SEOC) from April 17th through April 21st, and providing daily briefings to the SEOC and support staff to Michigan's Governor Rick Snyder on severe weather, flooding, and potential impacts. Daily webinars and information packets on weather and flooding were provided to Media and Emergency Management several days before, and during the height of, the record flood event.

Flood Conditions

Monday, April 8th

At 4:58 AM EDT the hazardous weather outlook mentioned the potential for heavy rainfall, in excess of 3 inches, to move into the area Wednesday into Thursday and cause significant rises on local rivers. The area forecast discussion also mentioned the potential for significant rises on local rivers this week.

Tuesday, April 9th

At 3:30 AM EDT the hydrology section of the area forecast discussion mentioned the potential for significant rises and flooding on local rivers by the end of the week.

At 1:00 PM EDT a webinar was conducted by our office for local media and emergency management on the severe weather and flood threat for our HSA. The Weather Prediction Center's Quantitative Precipitation Forecasts were showing three to four inches of rainfall over our entire HSA by early Friday morning.

Wednesday, April 10th

At 3:30 AM EDT a flood watch was issued effective through Thursday evening for 15 counties located within the southern two-thirds of our HSA. Heavy rain was forecast to move into the area over already saturated ground which could lead to flooding across the watch area.

At 9:55 AM EDT the flood watch was updated and highlighted the increased risk for flooding through Thursday.

At 11:35 AM EDT river flood warnings were issued for the following rivers:

- Grand River at Comstock Park, Michigan (None observed/Minor forecasted)*
- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Red Cedar River at East Lansing, Michigan (None observed/Minor forecasted)
- Looking Glass River near Eagle, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (None observed/Minor forecasted)
- Rogue River below Rockford, Michigan (None observed/Minor forecasted)
- White River above Whitehall, Michigan (None observed/Minor forecasted)
- Muskegon River near Croton, Michigan (None observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (None observed/Minor forecasted)

At 1:30 PM EDT a webinar was conducted by our office for local media and emergency management updating the severe weather and flood threat for our HSA.

At 3:28 PM EDT the flood watch was updated to highlight the potential for heavy rain this evening into Thursday.

At 11:59 PM EDT a river flood warning was issued for:

- Portage River near Vicksburg, Michigan (None observed/Minor forecasted)

* The format in the parentheses throughout this report is as follows: (River flood category observed/River flood category forecasted or fall below flood stage forecast) at product issuance time. A "none observed" flood category indicates the river was below flood stage at the time of issuance.

Thursday, April 11th

At 12:19 AM EDT river flood warnings had been cancelled and downgraded to river flood advisories for:

- Red Cedar River at East Lansing, Michigan
- Rogue River below Rockford, Michigan

River flood forecasts were updated and warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (None observed/Minor forecasted)
- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Looking Glass River near Eagle, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (None observed/Minor forecasted)
- Portage River near Vicksburg, Michigan (None observed/Minor forecasted)
- White River above Whitehall, Michigan (None observed/Minor forecasted)
- Muskegon River near Croton, Michigan (None observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (None observed/Minor forecasted)

At 3:23 AM EDT the flood watch was updated to highlight the potential for flooding due to the additional rainfall forecast for Thursday.

At 11:00 AM EDT a webinar was conducted by our office for local media and emergency management updating the severe weather and flood threat for our HSA.

At 11:17 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (None observed/Minor forecasted)
- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Looking Glass River near Eagle, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (None observed/Minor forecasted)
- Portage River near Vicksburg, Michigan (None observed/Minor forecasted)
- White River above Whitehall, Michigan (None observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)

At 11:35 AM EDT the flood watch was updated to highlight the flood potential and mentioned that 2 to 3 inches of rainfall had already fallen with the possibility of an additional inch of rainfall by Thursday evening.

At 3:40 PM EDT the flood watch was updated to highlight the flood potential due to the saturated ground and heavy rainfall.

At 4:45 PM EDT river flood warnings were issued for the following rivers:

- Pere Marquette River near Scottville, Michigan (None observed/Minor forecasted)
- Pine River at Alma, Michigan (None observed/Minor forecasted)

At 5:22 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (None observed/Minor forecasted)
- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Looking Glass River near Eagle, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (None observed/Minor forecasted)
- White River above Whitehall, Michigan (None observed/Minor forecasted)

- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)
- Pere Marquette River near Scottville, Michigan (None observed/Minor forecasted)
- Pine River at Alma, Michigan (None observed/Minor forecasted)

River flood warning was cancelled for the following river:

- Portage River near Vicksburg, Michigan

At 8:43 PM EDT the flood watch was cancelled for the 15 counties located within the southern two-thirds of our HSA and replaced by an areal flood advisory for all counties within our HSA.

At 10:52 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (None observed/Minor forecasted)
- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- White River above Whitehall, Michigan (None observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor flooding forecasted)
- Pere Marquette River near Scottville, Michigan (None observed/Minor forecasted)
- Pine River at Alma, Michigan (Minor observed/Minor forecasted)

River flood warning was cancelled for the following river:

- Looking Glass River near Eagle, Michigan

Friday, April 12th

At 5:42 AM EDT the river flood warning was upgraded from Minor to Moderate flooding for the following river:

- Pine River at Alma, Michigan (Minor observed/Moderate forecasted)

At 5:51 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (None observed/Minor forecasted)
- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- White River above Whitehall, Michigan (None observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)
- Pere Marquette River near Scottville, Michigan (None observed/Minor forecasted)

At 10:21 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (None observed/Minor forecasted)
- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)

- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)
- Pere Marquette River near Scottville, Michigan (None observed/Minor forecasted)
- Pine River at Alma, Michigan (Minor observed/Moderate forecasted)

A river flood warning was cancelled and downgraded to a river flood advisory for the following river:

- White River above Whitehall, Michigan

At 4:10 PM EDT river flood warnings were issued for the following rivers:

- Grand River at Ionia, Michigan (None observed/Minor forecasted)
- Grand River at Lowell, Michigan (None observed/Minor forecasted)
- Rogue River below Rockford, Michigan (None observed/Minor forecasted)

At 4:50 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (None observed/Minor forecasted)
- Grand River at Lowell, Michigan (None observed/Minor forecasted)
- Grand River at Comstock Park, Michigan (None observed/Minor forecasted)
- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Rogue River below Rockford, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)
- Pere Marquette River near Scottville, Michigan (None observed/Minor forecasted)
- Pine River at Alma, Michigan (Minor observed/Moderate forecasted)

At 10:52 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (None observed/Minor forecasted)
- Grand River at Lowell, Michigan (None observed/Minor forecasted)
- Grand River at Comstock Park, Michigan (None observed/Minor forecasted)
- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Rogue River below Rockford, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)
- Pere Marquette River near Scottville, Michigan (None observed/Minor forecasted)
- Pine River at Alma, Michigan (Minor observed/Minor forecasted)

Saturday, April 13th

At 11:20 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Minor observed/Minor forecasted)
- Grand River at Lowell, Michigan (None observed/Minor forecasted)
- Grand River at Comstock Park, Michigan (Minor observed/Minor forecasted)

- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)
- Pere Marquette River near Scottville, Michigan (Minor observed/Minor forecasted)
- Pine River at Alma, Michigan (Minor observed/Minor forecasted)

A river flood warning was cancelled and downgraded to a river flood advisory for the following river:

- Rogue River below Rockford, Michigan

At 10:03 PM EDT a river flood warning was upgraded from Minor to Moderate severity for:

- Grand River at Comstock Park, Michigan (Minor observed/Moderate forecasted)

At 10:09 PM EDT a river flood warning was issued for the following river:

- Thornapple River above Hastings, Michigan (Minor observed/Minor forecasted)

At 10:17 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Minor observed/Minor forecasted)
- Grand River at Lowell, Michigan (Minor observed/Minor forecasted)
- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)

At 10:34 PM EDT river flood warnings were cancelled and downgraded to river flood advisories for the following rivers:

- Pere Marquette River near Scottville, Michigan
- Pine River at Alma, Michigan

Sunday, April 14th

At 10:46 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Minor observed/Minor forecasted)
- Grand River at Lowell, Michigan (Minor observed/Minor forecasted)
- Grand River at Comstock Park, Michigan (Moderate observed/Moderate forecasted)
- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Thornapple River above Hastings, Michigan (Minor observed/Minor forecasted)

River flood warning was cancelled and downgraded to a river flood advisory for the following river:

- Chippewa River below Mt. Pleasant, Michigan.

At 9:53 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Minor observed/Minor forecasted)
- Grand River at Lowell, Michigan (Minor observed/Minor forecasted)
- Grand River at Comstock Park, Michigan (Moderate observed/Moderate forecasted)
- Grand River at Robinson Township, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Thornapple River above Hastings, Michigan (Minor observed/Minor forecasted)

Monday, April 15th

At 5:46 AM EDT a river flood warning was cancelled and downgraded to a river flood advisory for the following river:

- Grand River at Ionia, Michigan

At 11:23 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Lowell, Michigan (Minor observed/Minor forecasted)
- Grand River at Comstock Park, Michigan (Moderate observed/Moderate forecasted)
- Grand River at Robinson Township, Michigan (Minor observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Thornapple River above Hastings, Michigan (Minor observed/Minor forecasted)

At 10:20 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (Moderate observed/Moderate forecasted)
- Grand River at Robinson Township, Michigan (Minor observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)

River flood warnings were cancelled and downgraded to river flood advisories for the following rivers:

- Grand River at Lowell, Michigan
- Thornapple River above Hastings, Michigan

Tuesday, April 16th

At 11:41 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (Moderate observed/Moderate forecasted)
- Grand River at Robinson Township, Michigan (Minor observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)

At 2:00 PM EDT a webinar was conducted by our office for local media and emergency management on the severe weather threat and flood threat for our HSA. The Weather Prediction Center's Quantitative Precipitation Forecasts were showing two to five inches

of additional rainfall over our entire HSA by early Friday morning. The webinar highlighted the potential for moderate to major flooding of our larger rivers and widespread areal flooding and road washouts.

At 3:18 PM EDT an areal flood watch was issued effective through Friday morning for all counties in our HSA. Streams and rivers are already near bankfull and the forecast called for heavy rainfall over saturated ground Wednesday evening into Friday.

At 9:28 PM EDT the areal flood watch was updated to highlight the increasing flood threat and the potential for several rounds of heavy rainfall over saturated ground with streams already near bankfull.

At 10:44 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (Moderate observed/Moderate forecasted)
- Grand River at Robinson Township, Michigan (Minor observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)

Wednesday, April 17th

At 3:30 AM EDT the areal flood watch was updated to highlight the possibility for flooding late this week.

At 11:03 AM EDT the areal flood watch continued.

At 12:27 PM EDT a river flood warning was issued for:

- Chippewa River below Mt. Pleasant, Michigan (None observed/Minor forecasted)

At 12:38 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (Moderate observed/Moderate forecasted)
- Grand River at Robinson Township, Michigan (Minor observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (None observed/Minor forecasted)

At 1:00 PM EDT a webinar was conducted by our office for local media and emergency management updating the severe weather threat and flood threat for our HSA.

At 4:05 PM EDT the areal flood watch was updated to highlight the possibility of flooding tonight into Friday. Updated forecast called for an excess of 3 inches of rainfall along a stalled frontal system over the watch area.

At 9:00 PM EDT the areal flood watch was updated to highlight the flood potential due to saturated ground, multiple rounds of heavy rainfall, and streams already at bankfull.

At 9:38 PM EDT river flood warnings (based on 48 hours of quantitative precipitation forecast (QPF) instead of the usual 24 hours of QPF) were issued for the following rivers:

- Grand River at Ionia, Michigan (None observed/Moderate forecasted)
- Grand River at Lowell, Michigan (None observed/Moderate forecasted)
- Grand River at Ada, Michigan (None observed/Record forecasted)
- Grand River at Grand Rapids, Michigan (None observed/Record forecasted)
- Grand River at Robinson Twp., Michigan (Minor observed/Moderate forecasted)

- Red Cedar River at East Lansing, Michigan (None observed/Minor forecasted)
- Looking Glass River near Eagle, Michigan (None observed/Minor forecasted)
- Flat River near Smyrna, Michigan (None observed/Record forecasted)
- Thornapple River above Hastings, Michigan (None observed/Moderate forecasted)
- Thornapple River near Caledonia, Michigan (None observed/Moderate forecasted)
- Rogue River below Rockford, Michigan (None observed/Moderate forecasted)
- Kalamazoo River near New Richmond, Michigan (None observed/Minor forecasted)
- Portage River near Vicksburg, Michigan (None observed/Minor forecasted)
- Pere Marquette River near Scottville, Michigan (None observed/Moderate forecasted)
- White River above Whitehall, Michigan (None observed/Minor forecasted)
- Muskegon River at Ewart, Michigan (None observed/Moderate forecasted)
- Little Muskegon River above Morley, Michigan (None observed/Minor forecasted)
- Pine River at Alma, Michigan (Minor observed/Moderate forecasted)

River flood warnings were upgraded from Minor to Moderate flooding for:

- Muskegon River near Croton, Michigan (Minor observed/Moderate forecasted)
- Chippewa River below Mt. Pleasant, Michigan (None observed/Moderate forecasted)

River flood warnings were upgraded from Moderate to Record flooding for:

- Grand River at Comstock Park, Michigan (Moderate observed/Record forecasted)

Thursday, April 18th

At 3:31 AM EDT the areal flood watch was updated to highlight the possibility for flooding today into Friday.

At 5:11 AM EDT an areal flood warning was issued for Allegan, Barry, Ionia, Kent, Montcalm, Ottawa, and Van Buren counties until 5:00 PM EDT Thursday.

Thunderstorms producing very heavy rain over saturated ground were moving across the warned area.

At 5:38 AM EDT an areal flood warning was issued for Clinton and Gratiot counties until 5:30 PM EDT Thursday. Slow moving thunderstorms producing very heavy rainfall were moving across the warned area.

At 7:25 AM EDT the areal flood warning continues for Allegan, Barry, Ionia, Kent, Montcalm, Ottawa, and Van Buren counties. Thunderstorms with very heavy rainfall were moving over the warned area. Numerous road closures due to water over the road had been reported and a bridge collapsed at 48th Street on the Thornapple River.

At 7:27 AM EDT the river flood warning (based on 48 hours of quantitative precipitation forecast (QPF) instead of the usual 24 hours of QPF) was upgraded from a minor to moderate flood severity for the following river:

- Looking Glass River near Eagle, Michigan (Minor observed/Moderate forecasted)

At 9:22 AM EDT river forecasts (based on 48 hours of quantitative precipitation forecast (QPF) instead of the usual 24 hours of QPF) were updated and flood warnings continue for the following rivers:

- Grand River at Ionia, Michigan (None observed/Moderate forecasted)

- Grand River at Lowell, Michigan (None observed/Moderate forecasted)
- Grand River at Ada, Michigan (None observed/Record forecasted)
- Grand River at Comstock Park, Michigan (Moderate observed/Record forecasted)
- Grand River at Grand Rapids, Michigan (Minor observed/Record forecasted)
- Grand River at Robinson Twp., Michigan (Minor observed/Moderate forecasted)
- Red Cedar River at East Lansing, Michigan (None observed/Minor forecasted)
- Looking Glass River near Eagle, Michigan (Minor observed/Moderate forecasted)
- Flat River near Smyrna, Michigan (None observed/Record forecasted)
- Thornapple River above Hastings, Michigan (None observed/Moderate forecasted)
- Thornapple River near Caledonia, Michigan (None observed/Moderate forecasted)
- Rogue River below Rockford, Michigan (Minor observed/Moderate forecasted)
- Kalamazoo River near New Richmond, Michigan (None observed/Minor forecasted)
- Portage River near Vicksburg, Michigan (None observed/Minor forecasted)
- Pere Marquette River near Scottville, Michigan (None observed/Moderate forecasted)
- White River above Whitehall, Michigan (None observed/Minor forecasted)
- Muskegon River at Evart, Michigan (None observed/Moderate forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Moderate forecasted)
- Little Muskegon River above Morley, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Pine River at Alma, Michigan (Minor observed/Moderate forecasted)
- Chippewa River below Mt. Pleasant, Michigan (None observed/Moderate forecasted)

At 10:58 AM EDT the areal flood watch was updated to highlight the possibility for flooding and mentioned widespread rainfall amounts of around 3 inches with some areas exceeding 6 inches by Friday morning.

At 12:38 PM EDT a river flood warning was issued for:

- Grand River at Jackson, Michigan (None observed/Minor forecasted)

River flood warnings were upgraded from Moderate to Record severity for:

- Grand River at Robinson Twp., Michigan (Moderate observed/Record forecasted)
- Looking Glass River near Eagle, Michigan (Minor observed/Record forecasted)
- Rogue River below Rockford, Michigan (Minor observed/Record forecasted)

River flood warnings were upgraded from Minor to Moderate severity for:

- Maple River at Maple Rapids, Michigan (Minor observed/Moderate forecasted)

River flood warnings were upgraded from Moderate to Major severity for:

- Grand River at Ionia, Michigan (None observed/Major forecasted)
- Grand River at Lowell, Michigan (None observed/Major forecasted)
- Thornapple River near Caledonia, Michigan (None observed/Major forecasted)

At 12:53 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Jackson, Michigan (None observed/Minor forecasted)
- Grand River at Ionia, Michigan (None observed/Major forecasted)

- Grand River at Lowell, Michigan (None observed/Major forecasted)
- Grand River at Ada, Michigan (None observed/Record forecasted)
- Grand River at Comstock Park, Michigan (Moderate observed/Record forecasted)
- Grand River at Grand Rapids, Michigan (Minor observed/Record forecasted)
- Grand River at Robinson Twp., Michigan (Moderate observed/Record forecasted)
- Red Cedar River at East Lansing, Michigan (None observed/Minor forecasted)
- Looking Glass River near Eagle, Michigan (Minor observed/Record forecasted)
- Flat River near Smyrna, Michigan (None observed/Record forecasted)
- Thornapple River above Hastings, Michigan (None observed/Moderate forecasted)
- Thornapple River near Caledonia, Michigan (None observed/Major forecasted)
- Rogue River below Rockford, Michigan (Minor observed/Record forecasted)
- Kalamazoo River near New Richmond, Michigan (None observed/Minor forecasted)
- Portage River near Vicksburg, Michigan (None observed/Minor forecasted)
- Pere Marquette River near Scottville, Michigan (None observed/Minor forecasted)
- White River above Whitehall, Michigan (None observed/Minor forecasted)
- Muskegon River at Evart, Michigan (None observed/Moderate forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Moderate forecasted)
- Little Muskegon River above Morley, Michigan (None observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Moderate forecasted)
- Pine River at Alma, Michigan (Minor observed/Moderate forecasted)
- Chippewa River below Mt. Pleasant, Michigan (None observed/Moderate forecasted)

At 1:00 PM EDT a webinar was conducted by our office for local media and emergency management updating the severe weather threat and flood threat for our HSA.

At 2:00 PM EDT the areal flood warning continued for Gratiot and Clinton counties. Numerous road closures due to water over the road were reported.

At 2:08 PM EDT the areal flood warning continued for Allegan, Barry, Ionia, Kent, Montcalm, Ottawa, and Van Buren counties. Widespread flooding was reported.

At 3:12 PM EDT the flood watch was cancelled for all of our counties, except for Calhoun, Ingham, Jackson, Kalamazoo, and Van Buren Counties which remained in a flood watch.

At 3:21 PM EDT an areal flood warning was extended for Allegan, Barry, Ionia, Kent, Montcalm, Ottawa, and Van Buren counties until 5:00 PM EDT Friday. Local law enforcement officials reported flooding and road wash outs across the warned area. Significant flooding was occurring along Buck and Plaster Creek in Grand Rapids Metropolitan area. Evacuations were occurring in Grandville, Michigan, at a nursing home located next to Buck Creek.

At 3:24 PM EDT an areal flood warning was extended for Clinton and Gratiot counties until 5:30 PM EDT Friday. Local law enforcement officials reported widespread flooding across the warned area.

At 9:00 PM EDT the areal flood watch continued for Calhoun, Ingham, Jackson, Kalamazoo, and Van Buren Counties until Friday morning.

At 9:26 PM EDT river forecasts were updated and flood warnings continued for the

following rivers:

- Grand River at Jackson, Michigan (None observed/Minor forecasted)
- Grand River at Ionia, Michigan (Minor observed/Major forecasted)
- Grand River at Lowell, Michigan (Minor observed/Major forecasted)
- Grand River at Ada, Michigan (None observed/Record forecasted)
- Grand River at Comstock Park, Michigan (Moderate observed/Record forecasted)
- Grand River at Grand Rapids, Michigan (Minor observed/Record forecasted)
- Grand River at Robinson Township, Michigan (Moderate observed/Record forecasted)
- Red Cedar River at East Lansing, Michigan (None observed/Minor forecasted)
- Looking Glass River near Eagle, Michigan (Minor observed/Minor forecasted)
- Flat River near Smyrna, Michigan (None observed/Minor forecasted)
- Thornapple River above Hastings, Michigan (Minor observed/Minor forecasted)
- Thornapple River near Caledonia, Michigan (Minor observed/Moderate forecasted)
- Rogue River below Rockford, Michigan (Minor observed/Moderate forecasted)
- Kalamazoo River near New Richmond, Michigan (None observed/Minor forecasted)
- Portage River near Vicksburg, Michigan (None observed/Minor forecasted)
- Pere Marquette River near Scottville, Michigan (None observed/Minor forecasted)
- White River above Whitehall, Michigan (None observed/Minor forecasted)
- Muskegon River at Ewart, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Moderate forecasted)
- Maple River at Maple Rapids, Michigan (Moderate observed/Moderate forecasted)
- Pine River at Alma, Michigan (Moderate observed/Moderate forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Moderate forecasted)

River flood warning was cancelled and downgraded to an advisory for the following river:

- Little Muskegon River above Morley, Michigan

At 9:38 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Kalamazoo River near New Richmond, Michigan (Minor observed/Minor forecasted)
- Portage River near Vicksburg, Michigan (None observed/Minor forecasted)

At 10:06 PM EDT the areal flood warning continued for Allegan, Barry, Ionia, Kent, Montcalm, Ottawa, and Van Buren counties until 5:00 PM EDT Friday. Local law enforcement officials reported numerous road closures, washouts, and flooded roads.

At 10:29 PM EDT the areal flood warning was cancelled for Clinton County.

Friday, April 19th

At 3:12 AM EDT the areal flood watch continued for Calhoun, Ingham, Jackson, Kalamazoo, and Van Buren Counties until Friday at 8:00 AM EDT. A final round of rainfall, with additional amounts of up to an inch, was forecast to move through the watch area this morning.

At 6:47 AM EDT the areal flood watch was cancelled.

At 7:03 AM EDT the areal flood warning continued for Allegan, Barry, Ionia, Kent,

Montcalm, Ottawa, and Van Buren counties until 5:00 PM EDT Friday. Local law enforcement officials will still reporting numerous road closures, washouts, and flooded roads.

At 7:10 AM EDT areal flood warning continued for Gratiot County until 5:30 PM EDT Friday. Local law enforcement officials reported over 20 roads flooded and closed.

At 9:26 AM EDT a river flood warning was issued for the following river:

- Sycamore Creek near Holt, Michigan (Minor observed/Minor forecasted)

At 10:16 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Kalamazoo River near New Richmond, Michigan (Minor observed/Minor forecasted)
- Portage River near Vicksburg, Michigan (None observed/Minor forecasted)

At 11:19 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)
- Pine River at Alma, Michigan (Minor observed/Minor forecasted)

At 12:11 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Moderate observed/Major forecasted)
- Grand River at Lowell, Michigan (Minor observed/Major forecasted)
- Grand River at Ada, Michigan (Minor observed/Record forecasted)
- Grand River at Comstock Park, Michigan (Major observed/Record forecasted)
- Grand River at Grand Rapids, Michigan (Record observed/Record forecasted)
- Grand River at Robinson Township, Michigan (Moderate observed/Major forecasted)
- Sycamore Creek near Holt, Michigan (Minor observed/Minor forecasted)
- Red Cedar River at East Lansing, Michigan (None observed/Minor forecasted)
- Looking Glass River near Eagle, Michigan (Minor observed/Minor forecasted)
- Flat River near Smyrna, Michigan (None observed/Minor forecasted)
- Thornapple River above Hastings, Michigan (Minor observed/Minor forecasted)
- Thornapple River near Caledonia, Michigan (Minor observed/Moderate forecasted)
- Rogue River below Rockford, Michigan (Minor observed/Moderate forecasted)
- Kalamazoo River near New Richmond, Michigan (Minor observed/Minor forecasted)
- Portage River near Vicksburg, Michigan (None observed/Minor forecasted)
- Pere Marquette River near Scottville, Michigan (None observed/Minor forecasted)
- White River above Whitehall, Michigan (None observed/Minor forecasted)
- Muskegon River at Evart, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Moderate observed/Moderate forecasted)
- Maple River at Maple Rapids, Michigan (Moderate observed/Moderate forecasted)
- Pine River at Alma, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)

River flood warning was cancelled and downgraded to an advisory for the following river:

- Grand River at Jackson, Michigan

At 1:00 PM EDT a webinar was conducted by our office for local media and emergency management updating the major river flood threat for our HSA.

At 1:41 PM EDT river flood warning continued with an updated forecast (lowered crest) for:

- Grand River at Comstock Park, Michigan (Major observed/Major forecasted)

At 2:59 PM EDT river flood warning continued with an updated forecast (new observations) for:

- Kalamazoo River near New Richmond, Michigan (Minor observed/Minor forecasted)

At 3:01 PM EDT the areal flood warning was cancelled for Montcalm and Van Buren Counties.

At 3:06 PM EDT the areal flood warning was extended for Allegan, Barry, Ionia, Kent, and Ottawa counties until 5:00 PM EDT Saturday. Emergency management reported widespread flooding across the warned area with many road closures due to water over roads.

At 3:08 PM EDT an areal flood warning was extended for Gratiot County until 5:30 PM EDT Saturday. Emergency management reported numerous road closures due to flooded roads.

At 9:36 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Moderate observed/Major forecasted)
- Grand River at Lowell, Michigan (Minor observed/Major forecasted)
- Grand River at Ada, Michigan (Minor observed/Record forecasted)
- Grand River at Comstock Park, Michigan (Major observed/Major forecasted)
- Grand River at Grand Rapids, Michigan (Record observed/Record forecasted)
- Grand River at Robinson Township, Michigan (Moderate observed/Major forecasted)
- Red Cedar River at East Lansing, Michigan (Minor observed/Minor forecasted)
- Looking Glass River near Eagle, Michigan (Minor observed/Minor forecasted)
- Flat River near Smyrna, Michigan (None observed/Minor forecasted)
- Thornapple River above Hastings, Michigan (Minor observed/Minor forecasted)
- Thornapple River near Caledonia, Michigan (Minor observed/Minor forecasted)
- Rogue River below Rockford, Michigan (Minor observed/Minor forecasted)
- Kalamazoo River near New Richmond, Michigan (Minor observed/Minor forecasted)
- Portage River near Vicksburg, Michigan (None observed/Minor forecasted)
- Pere Marquette River near Scottville, Michigan (None observed/Minor forecasted)
- Muskegon River at Evart, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Moderate observed/Moderate forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Pine River at Alma, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)

River flood warnings were cancelled and downgraded to advisories for the following rivers:

- Sycamore Creek near Holt, Michigan

- White River above Whitehall, Michigan

At 9:57 PM EDT the areal flood warning continued for Allegan, Barry, Ionia, Kent, and Ottawa counties until 5:00 PM EDT Saturday. Widespread flooding continues across the warned area with numerous roads still closed due to water over roads.

At 9:59 PM EDT the areal flood warning continued for Gratiot County until 5:30 PM EDT Saturday. Numerous roads will still closed due to flooding.

At 10:00 PM EDT an updated briefing packet was provided by our office for local media and emergency management on the major river flood threat and impacts for our HSA.

Saturday, April 20th

At 5:05 AM EDT the river flood warning was cancelled and downgraded to an advisory for the following river:

- Pere Marquette River near Scottville, Michigan

At 6:00 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Moderate observed/Major forecasted)
- Grand River at Ada, Michigan (Record observed/Record forecasted)
- Red Cedar River at East Lansing, Michigan (Minor observed/Minor forecasted)
- Looking Glass River near Eagle, Michigan (Minor observed/Minor forecasted)
- Flat River near Smyrna, Michigan (None observed/Minor forecasted)
- Thornapple River near Caledonia, Michigan (Minor observed/Minor forecasted)
- Rogue River below Rockford, Michigan (Minor observed/Minor forecasted)
- Kalamazoo River near New Richmond, Michigan (Minor observed/Minor forecasted)
- Muskegon River at Evart, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Moderate forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)

At 10:24 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Pine River at Alma, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)

At 11:19 AM EDT a river flood warning was issued for:

- Sycamore Creek near Holt, Michigan (Minor observed/Minor forecasted)

River flood warning was upgraded from Major to Record severity for:

- Grand River at Comstock Park, Michigan (Major observed/Record forecasted)

At 12:05 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Moderate observed/Moderate forecasted)
- Grand River at Lowell, Michigan (Moderate observed/Record forecasted)
- Grand River at Ada, Michigan (Record observed/Record forecasted)
- Grand River at Comstock Park, Michigan (Major observed/Record forecasted)
- Grand River at Grand Rapids, Michigan (Record observed/Record forecasted)
- Grand River at Robinson Township, Michigan (Moderate observed/Major forecasted)
- Red Cedar River at East Lansing, Michigan (Minor observed/Minor forecasted)
- Sycamore Creek near Holt, Michigan (Minor observed/Minor forecasted)

- Thornapple River above Hastings, Michigan (Minor observed/Minor forecasted)
- Thornapple River near Caledonia, Michigan (Minor observed/Minor forecasted)
- Rogue River below Rockford, Michigan (Minor observed/Minor forecasted)
- Kalamazoo River near New Richmond, Michigan (Minor observed/Minor forecasted)
- Muskegon River at Evart, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Pine River at Alma, Michigan (Minor observed/Minor forecasted)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)

River flood warnings were cancelled and downgraded to advisories for the following rivers:

- Looking Glass River near Eagle, Michigan
- Flat River near Smyrna, Michigan

At 12:15 PM EDT river forecast was updated and the flood warning continued for the following river:

- Portage River near Vicksburg, Michigan (Minor observed/Minor forecasted)

At 2:35 PM EDT an areal flood warning was extended for Gratiot County until 5:30 PM EDT Sunday. Emergency management reported numerous roads still closed due to flooding.

At 2:37 PM EDT an areal flood warning was extended for Allegan, Barry, Ionia, Kent, and Ottawa counties until 5:00 PM EDT Sunday. Emergency management reported numerous roads still closed due to flooding.

At 9:08 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Moderate observed/Moderate forecasted)
- Grand River at Lowell, Michigan (Moderate observed/Record forecasted)
- Grand River at Ada, Michigan (Record observed/Record forecasted)
- Grand River at Comstock Park, Michigan (Major observed/Record forecasted)
- Grand River at Grand Rapids, Michigan (Record observed/Record forecasted)
- Grand River at Robinson Township, Michigan (Moderate observed/Major forecasted)
- Red Cedar River at East Lansing, Michigan (Minor observed/Minor forecasted)
- Thornapple River above Hastings, Michigan (Minor observed/Minor forecasted)
- Thornapple River near Caledonia, Michigan (Minor observed/Minor forecasted)
- Rogue River below Rockford, Michigan (Minor observed/Minor forecasted)
- Kalamazoo River near New Richmond, Michigan (Minor observed/Minor forecasted)
- Muskegon River at Evart, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Pine River at Alma, Michigan (Minor observed/fall below flood stage Sunday)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)

River flood warnings were cancelled for the following rivers:

- Portage River near Vicksburg, Michigan
- Sycamore Creek near Holt, Michigan

At 10:00 PM EDT an updated briefing packet was provided by our office for local media

and emergency management on the major river flood threat and impacts for our HSA.
At 10:24 PM EDT river flood warning was cancelled and downgraded to a flood advisory for:

- Sycamore Creek near Holt, Michigan

Sunday, April 21st

At 11:23 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Moderate observed/Moderate forecasted)
- Grand River at Lowell, Michigan (Record observed/Record forecasted)
- Grand River at Ada, Michigan (Record observed/Record forecasted)
- Grand River at Comstock Park, Michigan (Major observed/Record forecasted)
- Grand River at Grand Rapids, Michigan (Record observed/Record forecasted)
- Grand River at Robinson Township, Michigan (Moderate observed/Moderate forecasted)
- Red Cedar River at East Lansing, Michigan (Minor observed/Minor forecasted)
- Thornapple River above Hastings, Michigan (Minor observed/Minor forecasted)
- Thornapple River near Caledonia, Michigan (Minor observed/Minor forecasted)
- Kalamazoo River near New Richmond, Michigan (Minor observed/Minor forecasted)
- Muskegon River at Evart, Michigan (Minor observed/Minor forecasted)
- Muskegon River near Croton, Michigan (Minor observed/Minor forecasted)
- Maple River at Maple Rapids, Michigan (Minor observed/Minor forecasted)
- Pine River at Alma, Michigan (Minor observed/fall below flood stage Sunday)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/Minor forecasted)

River flood warning was cancelled and downgraded to an advisory for the following river:

- Rogue River below Rockford, Michigan

At 3:25 PM EDT the areal flood warning was cancelled for Allegan, Barry, Ionia, Kent, and Ottawa counties.

At 3:55 PM EDT the areal flood warning was cancelled for Gratiot County.

At 4:00 PM EDT an updated briefing packet was provided by our office for local media and emergency management on the major river flood threat and impacts for our HSA.

At 9:19 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Moderate observed/fall below flood stage Tuesday)
- Grand River at Lowell, Michigan (Moderate observed/fall below flood stage Thursday)
- Grand River at Ada, Michigan (Record observed/fall below flood stage Wednesday)
- Grand River at Comstock Park, Michigan (Record observed/Record forecasted)
- Grand River at Grand Rapids, Michigan (Record observed/Record forecasted)
- Grand River at Robinson Township, Michigan (Moderate observed/Moderate forecasted)
- Red Cedar River at East Lansing, Michigan (Minor observed/fall below flood stage Monday)
- Thornapple River above Hastings, Michigan (Minor observed/fall below flood

stage Tuesday)

- Thornapple River near Caledonia, Michigan (Minor observed/fall below flood stage Tuesday)
- Muskegon River at Ewart, Michigan (Minor observed/fall below flood stage Monday)
- Muskegon River near Croton, Michigan (Minor observed/fall below flood stage Tuesday)
- Maple River at Maple Rapids, Michigan (Minor observed/fall below flood stage Wednesday)
- Pine River at Alma, Michigan (Minor observed/fall below flood stage Monday)
- Chippewa River below Mt. Pleasant, Michigan (Minor observed/fall below flood stage Monday)

River flood warning was cancelled and downgraded to an advisory for the following river:

- Kalamazoo River near New Richmond, Michigan

At 10:00 PM EDT an updated briefing packet was provided by our office for local media and emergency management on the river flooding and impacts for our HSA.

Monday, April 22nd

At 5:28 AM EDT River flood warning was cancelled and downgraded to an advisory for the following river:

- Chippewa River below Mt. Pleasant, Michigan

At 11:00 AM EDT an updated briefing packet was provided by our office for local media and emergency management on the river flooding and impacts for our HSA.

At 11:01 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Minor observed/fall below flood stage Tuesday)
- Grand River at Lowell, Michigan (Moderate observed/fall below flood stage Thursday)
- Grand River at Ada, Michigan (Record observed/fall below flood stage Wednesday)
- Grand River at Comstock Park, Michigan (Major observed/fall below flood stage Saturday)
- Grand River at Grand Rapids, Michigan (Record observed/fall below flood stage Thursday)
- Grand River at Robinson Township, Michigan (Moderate observed/Moderate forecasted)
- Red Cedar River at East Lansing, Michigan (Minor observed/fall below flood stage Monday)
- Thornapple River above Hastings, Michigan (Minor observed/fall below flood stage Tuesday)
- Thornapple River near Caledonia, Michigan (Minor observed/fall below flood stage Tuesday)
- Muskegon River at Ewart, Michigan (Minor observed/fall below flood stage Monday)
- Muskegon River near Croton, Michigan (Minor observed/fall below flood stage Tuesday)
- Maple River at Maple Rapids, Michigan (Minor observed/fall below flood stage Wednesday)

- Pine River at Alma, Michigan (Minor observed/fall below flood stage Monday)
At 12:13 PM EDT river flood warning cancelled for the following river:

- Pine River at Alma, Michigan

At 9:10 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Ionia, Michigan (Minor observed/fall below flood stage Tuesday)
- Grand River at Lowell, Michigan (Moderate observed/fall below flood stage Thursday)
- Grand River at Ada, Michigan (Minor observed/fall below flood stage Wednesday)
- Grand River at Comstock Park, Michigan (Major observed/fall below flood stage Saturday)
- Grand River at Grand Rapids, Michigan (Moderate observed/fall below flood stage Thursday)
- Grand River at Robinson Township, Michigan (Moderate observed/Moderate forecasted)
- Thornapple River above Hastings, Michigan (Minor observed/fall below flood stage Tuesday)
- Thornapple River near Caledonia, Michigan (Minor observed/fall below flood stage Tuesday)
- Muskegon River near Croton, Michigan (Minor observed/fall below flood stage Tuesday)
- Maple River at Maple Rapids, Michigan (Minor observed/fall below flood stage Thursday)

River flood warnings were cancelled and downgraded to advisories for the following rivers:

- Red Cedar River at East Lansing, Michigan
- Muskegon River at Ewart, Michigan

At 10:00 PM EDT an updated briefing packet was provided by our office for local media and emergency management on the river flooding and impacts for our HSA.

Tuesday, April 23rd

At 10:00 AM EDT an updated briefing packet was provided by our office for local media and emergency management summarizing the river flooding and impacts for our HSA.

At 10:04 AM EDT a river flood warning was issued for the following river:

- Grand River at Jackson, Michigan (None observed/Minor forecast)

At 10:15 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Jackson, Michigan (None observed/Minor forecasted)
- Grand River at Ionia, Michigan (Minor observed/fall below flood stage Tuesday)
- Grand River at Lowell, Michigan (Minor observed/fall below flood stage Thursday)
- Grand River at Ada, Michigan (Minor observed/fall below flood stage Wednesday)
- Grand River at Comstock Park, Michigan (Major observed/fall below flood stage Monday)
- Grand River at Grand Rapids, Michigan (Minor observed/fall below flood stage Thursday)
- Grand River at Robinson Township, Michigan (Moderate observed/fall below

flood stage Sunday)

- Thornapple River above Hastings, Michigan (Minor observed/fall below flood stage Tuesday)
- Muskegon River near Croton, Michigan (Minor observed/fall below flood stage Friday)
- Maple River at Maple Rapids, Michigan (Minor observed/fall below flood stage Saturday)

River flood warning was cancelled and downgraded to an advisory for the following river:

- Thornapple River near Caledonia, Michigan

At 12:42 PM EDT a river flood warning was cancelled and downgraded to an advisory for the following river:

- Muskegon River near Croton, Michigan

At 2:27 PM EDT a river flood warning was cancelled and downgraded to an advisory for the following river:

- Thornapple River above Hastings, Michigan

At 9:08 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Jackson, Michigan (None observed/Minor forecasted)
- Grand River at Ionia, Michigan (Minor observed/fall below flood stage Tuesday)
- Grand River at Lowell, Michigan (Minor observed/fall below flood stage Thursday)
- Grand River at Ada, Michigan (Minor observed/fall below flood stage Wednesday)
- Grand River at Comstock Park, Michigan (Major observed/fall below flood stage Monday)
- Grand River at Grand Rapids, Michigan (Minor observed/fall below flood stage Thursday)
- Grand River at Robinson Township, Michigan (Moderate observed/fall below flood stage Sunday)
- Maple River at Maple Rapids, Michigan (Minor observed/fall below flood stage Saturday)

Wednesday, April 24th

At 12:31 AM EDT a river flood warning was cancelled and downgraded to an advisory for the following river:

- Grand River at Ionia, Michigan

At 6:03 AM EDT a river flood warning was cancelled and downgraded to an advisory for the following river:

- Grand River at Jackson, Michigan

At 10:33 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Lowell, Michigan (Minor observed/fall below flood stage Thursday)
- Grand River at Ada, Michigan (Minor observed/fall below flood stage Wednesday)
- Grand River at Comstock Park, Michigan (Major observed/fall below flood stage Monday)
- Grand River at Grand Rapids, Michigan (Minor observed/fall below flood stage Thursday)

- Grand River at Robinson Township, Michigan (Moderate observed/fall below flood stage Saturday)
- Maple River at Maple Rapids, Michigan (Minor observed/fall below flood stage Sunday)

At 9:06 PM EDT a river flood warning was issued for the following river:

- St. Joseph River at Burlington, Michigan (Minor observed/Minor forecast)

At 9:23 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Lowell, Michigan (Minor observed/fall below flood stage Thursday)
- Grand River at Comstock Park, Michigan (Moderate observed/fall below flood stage Monday)
- Grand River at Grand Rapids, Michigan (Minor observed/fall below flood stage Thursday)
- Grand River at Robinson Township, Michigan (Moderate observed/fall below flood stage Sunday)
- Maple River at Maple Rapids, Michigan (Minor observed/fall below flood stage Sunday)
- St. Joseph River at Burlington, Michigan (Minor observed/fall below flood stage Thursday)

A river flood warning was cancelled and downgraded to an advisory for the following river:

- Grand River at Ada, Michigan

Thursday, April 25th

At 10:57 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (Moderate observed/fall below flood stage Monday)
- Grand River at Grand Rapids, Michigan (Minor observed/fall below flood stage Thursday)
- Grand River at Robinson Township, Michigan (Moderate observed/fall below flood stage Sunday)
- Maple River at Maple Rapids, Michigan (Minor observed/fall below flood stage Sunday)
- St. Joseph River at Burlington, Michigan (Minor observed/fall below flood stage Thursday)

At 11:36 AM EDT a river flood warning was cancelled and downgraded to an advisory for the following river:

- Grand River at Lowell, Michigan

At 9:16 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (Moderate observed/fall below flood stage Monday)
- Grand River at Robinson Township, Michigan (Moderate observed/fall below flood stage Sunday)
- Maple River at Maple Rapids, Michigan (Minor observed/fall below flood stage Sunday)

River flood warnings were cancelled and downgraded to advisories for the following

rivers:

- Grand River at Grand Rapids, Michigan
- St. Joseph River at Burlington, Michigan

Friday, April 26th

At 10:13 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (Moderate observed/fall below flood stage Monday)
- Grand River at Robinson Township, Michigan (Moderate observed/fall below flood stage Monday)
- Maple River at Maple Rapids, Michigan (Minor observed/fall below flood stage Sunday)

At 9:13 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (Moderate observed/fall below flood stage Tuesday)
- Grand River at Robinson Township, Michigan (Minor observed/fall below flood stage Sunday)
- Maple River at Maple Rapids, Michigan (Minor observed/fall below flood stage Sunday)

Saturday, April 27th

At 12:24 PM river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (Minor observed/fall below flood stage Tuesday)
- Grand River at Robinson Township, Michigan (Minor observed/fall below flood stage Sunday)

A river flood warning was cancelled and downgraded to an advisory for the following river:

- Maple River at Maple Rapids, Michigan

At 9:46 PM river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (Minor observed/fall below flood stage Tuesday)
- Grand River at Robinson Township, Michigan (Minor observed/fall below flood stage Monday)

Sunday, April 28th

At 10:09 AM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (Minor observed/fall below flood stage Tuesday)
- Grand River at Robinson Township, Michigan (Minor observed/fall below flood stage Monday)

At 9:42 PM EDT river forecasts were updated and flood warnings continued for the following rivers:

- Grand River at Comstock Park, Michigan (Minor observed/fall below flood stage

Monday)

- Grand River at Robinson Township, Michigan (Minor observed/fall below flood stage Monday)

Monday, April 29th

At 10:29 AM EDT a river forecast was updated and the flood warning continued for the following river:

- Grand River at Comstock Park, Michigan (Minor observed/fall below flood stage Tuesday)

At 10:39 AM EDT a river flood warning was cancelled and downgraded to an advisory for the following river:

- Grand River at Robinson Township, Michigan

At 9:24 PM EDT a river forecast was updated and the flood warning continued for the following river:

- Grand River at Comstock Park, Michigan (Minor observed/fall below flood stage Tuesday)

Tuesday, April 30th

At 8:53 AM EDT a river flood warning was cancelled and downgraded to an advisory for the following river:

- Grand River at Comstock Park, Michigan

The following rivers exceeded bankfull during the month of April 2013:

- Pere Marquette River near Scottville, Michigan (17 days above bankfull)
- White River near Whitehall, Michigan (8 days above bankfull)
- Muskegon River at Evart, Michigan (19 days above bankfull)
- Muskegon River near Croton, Michigan (19 days above bankfull)
- Maple River at Maple Rapids, Michigan (21 days above bankfull)
- Pine River at Alma, Michigan (10 days above bankfull)
- Chippewa River below Mt. Pleasant, Michigan (17 days above bankfull)
- Grand River at Jackson, Michigan (4 days above bankfull)
- Red Cedar River near Williamston, Michigan (5 days above bankfull)
- Red Cedar River at East Lansing, Michigan (11 days above bankfull)
- Sycamore Creek near Holt, Michigan (16 days above bankfull)
- Looking Glass River near Eagle, Michigan (20 days above bankfull)
- Grand River at Lansing, Michigan (4 days above bankfull)
- Grand River at Ionia, Michigan (21 days above bankfull)
- Flat River near Smyrna, Michigan (18 days above bankfull)
- Grand River at Lowell, Michigan (20 days above bankfull)
- Grand River at Ada, Michigan (15 days above bankfull)
- Grand River at Comstock Park, Michigan (19 days above bankfull)
- Grand River at Grand Rapids, Michigan (19 days above bankfull)
- Grand River at Robinson Township, Michigan (15 days above bankfull)
- Thornapple River above Hastings, Michigan (18 days above bankfull)
- Thornapple River near Caledonia, Michigan (15 days above bankfull)
- Rogue River below Rockford, Michigan (9 days above bankfull)

- Kalamazoo River at Marshall, Michigan (5 days above bankfull)
- Kalamazoo River at Comstock, Michigan (6 days above bankfull)
- Kalamazoo River near New Richmond, Michigan (14 days above bankfull)
- Portage Creek near Vicksburg, Michigan (2 days above bankfull)
- St. Joseph River near Burlington, Michigan (9 days above bankfull)

Flood Categories used in this report

Minor flooding = A general term indicating minimal or no property damage but possibly some public inconvenience.

Moderate flooding = The inundation of secondary roads; transfer to higher elevation necessary to save property -- some evacuation may be required.

Major flooding = A general term including extensive inundation and property damage. (Usually characterized by the evacuation of people and livestock and the closure of both primary and secondary roads.)

Record flooding = Forecast or observed flooding exceeded highest crest (stage) on record.

Flood Stage Report

Record stages were set at 5 River Forecast Points in our Hydrologic Service Area.

- The Grand River at Ionia, Michigan, set a new crest stage record of 24.69 feet; the old record was 24.30 feet set back in 1948. This also set a flow/discharge record at 25,100 cubic feet per second (cfs).
- The Grand River at Lowell, Michigan, set a new crest stage record of 19.02 feet; the old record was 19.00 feet set back in 1948. Flow/discharge measurements are not taken at this site.
- The Grand River at Ada, Michigan, set a new crest stage record of 22.94 feet; the old record was 21.60 feet set back in 1986. Flow/discharge measurements are not taken at this site.
- The Grand River at Grand Rapids, Michigan, set a new crest stage record of 21.85 feet; the old record was 19.64 feet set back in 1985. However, this was only the fifth highest flow/discharge at 35,100 cfs.
- The Grand River at Comstock Park, Michigan, set a new crest stage record of 17.80 feet; the old record was 17.75 feet set back in 1948. Flow/discharge measurements are not taken at this site.

See attached Flood Stage Report (NWS Form E-3) for more details.

River Conditions

River levels across the HSA were significantly above normal at the end of the month. The end of the month percentage of normal flow for selected rivers is listed below:

<u>Location</u>	<u>River</u>	<u>% of Normal</u>
Scottville	Pere Marquette	163
Whitehall	White	153
Evert	Muskegon	162
Mt. Pleasant	Chippewa	200
Lansing	Grand	208
Grand Rapids	Grand	318
East Lansing	Red Cedar	286
Hastings	Thornapple	242
Battle Creek	Battle Creek	211
Battle Creek	Kalamazoo	177

General Hydrologic Information

April 2013 was cooler and wetter than normal in Southwest Lower Michigan, and will be remembered for extensive flooding across the area. Back to back weeks of very heavy rainfall during the middle of the month resulted in April 2013 being one of the wettest months on record for significant portions of Southwest Lower Michigan. Many locations received over eight inches of rain for the month (Figure 1).

April precipitation totals at Grand Rapids, Lansing, and Muskegon, Michigan, were 11.10, 7.87, and 7.43 inches, respectively. Precipitation totals for the month at these three sites were 7.75 inches above normal at Grand Rapids, 4.84 inches above normal at Lansing, and 4.52 inches above normal at Muskegon, Michigan (Figure 2). This was the wettest April on record for Grand Rapids with 11.10 inches of precipitation; the previous record of 8.29 inches was reached in 1909. This was also the wettest April on record for Lansing with 7.87 inches of precipitation; the previous record of 6.49 inches was reached in 2009. Yearly precipitation totals were 9.50 inches above normal for Grand Rapids, 5.84 inches above normal for Lansing, and 9.10 inches above normal for Muskegon, Michigan.

Snowfall was below normal for the month of April at Grand Rapids, Lansing, and Muskegon, Michigan with 0.7 of an inch (1.1 inches below normal), 0.5 of an inch (1.4 inches below normal), and Trace (2.3 inches below normal), respectively.

At the end of April, frost depths across the HSA were at zero.

Temperatures for the month of April were below normal at Grand Rapids, Lansing, and Muskegon, Michigan, with average monthly departures of -3.4, -3.2 and -2.9 degrees Fahrenheit, respectively.

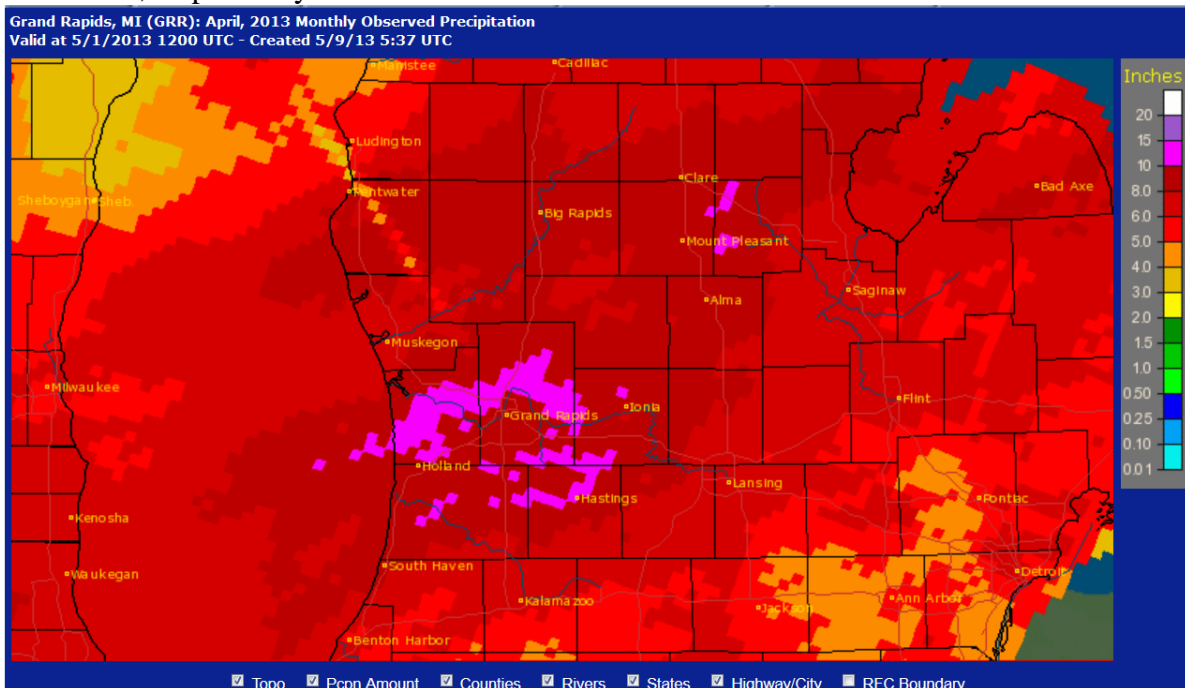


Figure 1. April Monthly Precipitation Totals

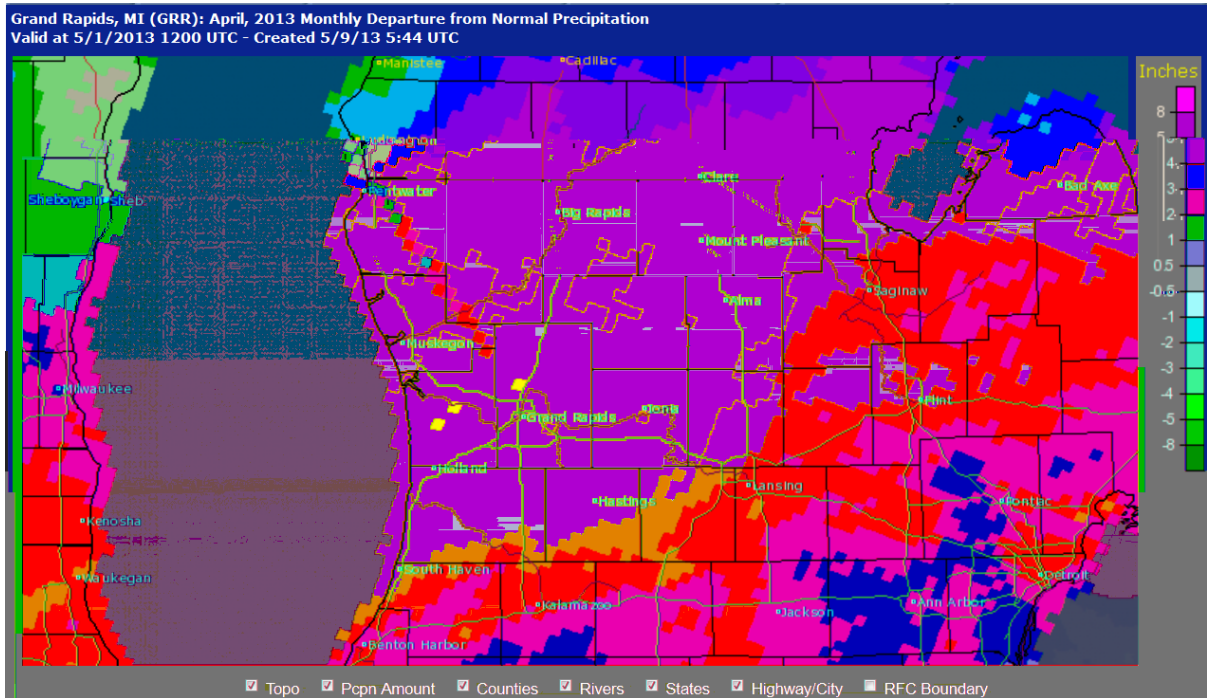


Figure 2. April Monthly Departure from Normal Precipitation Totals

Hydrologic Products issued this month:

- 19 Areal Flood Watches (ARBFFAGRR)
- 8 Areal Flood Warnings (ARBFLWGRR)
- 12 Areal Flood Statements (ARBFLSGRR)
- 15 River Flood Warnings (ARBFLWGRR)
- 65 River Flood Statements (ARBFLSGRR)
- 77 River Flood Advisories (ARBFLSGRR)
- 22 Hydrologic Statements (ARBRVSGRR)
- 1 Hydrologic Outlook (ARBESFGRR)
- 30 Hydrologic Summaries (ARBRVAGRR)
- 30 Daily River and Lake Summaries (ARBRVDGRR)