

NWS FORM E-5 U.S. DEPARTMENT OF COMMERCE
NOAA, NATIONAL WEATHER SERVICE

HSA OFFICE:
North Webster, IN

REPORT FOR (MONTH & YEAR):

January 1999

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

DATE:

February 2, 1999

TO: NATIONAL WEATHER SERVICE
HYDROMETEOROLOGICAL INFO CENTER
1325 EAST-WEST HIGHWAY
SILVER SPRING MD 20910

SIGNATURE:
Michael Sabones, MIC

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 flooding occurred within this Hydrologic Service Area.



Precipitation

January was a month of contrasts across Northern Indiana, Northwest Ohio and Southern Michigan. There was plenty of precipitation as compared to other Januaries, but it was as rainy as it was snowy. The month started out cold and very snowy across most of the area. The first major snowstorm in many years blasted through the area on the 2nd and 3rd of the month. Snowfall totals ranged from 7 inches over Northwest Ohio to nearly 30 inches in La Porte County Indiana. Totals of over 20 inches were estimated to have fallen in Southern Michigan. The second significant precipitation event occurred on the 22nd and 23rd when over one inch of rain fell across the HSA. Temperatures warmed into the upper 40s F^o to near 50 F^o on the 22nd with even warmer temperatures on the 23rd when the mercury reached record levels at Ft. Wayne where 60 F^o was achieved. The snow pack, which contained between 2 and 3 inches of water, quickly melted causing flooding along nearly every major river system in our HSA. Many small creeks and streams flooded as well, as the rapidly melting snow combined with the rain to raise water levels everywhere.

Precipitation was, however, only about 0.5 inches above the normals for the HSA during January. At Fort Wayne 2.78 inches of precipitation fell, which included 18 inches of snow. At South Bend 3.06 inches fell, which included 37 inches of snow. Much of the snow that fell at South Bend was lake effect which contains less water than average.

Temperature

After a very cold start, temperatures finished out January, on average, slightly below normal across the HSA. Temperatures at Ft. Wayne were 0.7 F^o above normal, but South Bend averaged 0.6 F^o below normal. Temperatures were as much as 25 F^o below normal during the first half of the month. The second half of the month was just the opposite with temperatures as high as 25 F^o above normal.

Average high temperatures were in the lower 30s F° and average low temperatures were in the middle teens F° during January.

Weather

January began very cold with temperatures averaging around 13 F° below normal. Near the end of December, a long wave trough began to establish itself over the center of the country. This allowed for a parade of arctic air masses to come south out of Canada putting the area in the deep freeze. This trough was, however centered far enough to our west to allow for storm systems to move across the area from the southwest with enough moisture to allow for heavy snow. This occurred with a vengeance on the 2nd and 3rd of the month as a major winter storm socked the area with over 2 feet of snow in some locations. Many roads become impassable due to blowing and drifting of the heavy snowfall. People were told, in many areas to stay at home because the risk of getting stranded in the storm was too great.

Once the storm had passed , The upper level trough moved far enough east to allow storms to pass through the area from Northwest Canada. These systems gave the area almost daily snow falls, with some locations getting nearly 5 inches more in some of these events. With a fresh snow cover in place and clear skies, temperatures fell rapidly to record lows in some locations. Low temperature records were set or tied on the 5th and the 9th at both Fort Wayne and South Bend. The mercury fell to -16 F° at South Bend on the 5th and -14 F° at Fort Wayne. The South Bend record low was broken and Fort Wayne's record was tied. Both record low temperatures were eclipsed on the 9th when the temperature fell to -6 F° at South Bend and -9 F° at Fort Wayne.

The weather pattern changed on the 15th when the trough moved east and was replaced by "zonal" flow across the HSA. This allowed warmer Maritime Polar air into the area which began the snow melt process. After temperatures in the teens F° for highs and around zero F° for lows, temperatures in the upper 30s F° for highs and 20s F° for lows returned to the area. Snow depth totals were cut nearly in half by the 18th. However most of the melt remained in the snow pack. The ripening of the snow pack had begun. By the 18th a significant storm system began to take shape in the southern plains, but this one packed plenty of warm air and moisture so the form of precipitation with this system would be rain. The rain began on the morning of the 22nd with 1.0 to 1.5 inch totals common across the area. This caused a rapid snow melt and began to send small rivers and streams out of their banks by afternoon. The first flood warnings went out early that morning and by that evening all of the major rivers and streams in our area had flood warnings posted.

The rain abated on the evening of the 22nd and most rivers crested between the 23rd and the 26th of the month. The worst flooding event took place along the Tippecanoe and the Wabash Rivers. The Tippecanoe River crested at 14.8 feet on the 26th at Winamac . This

crest was the 4th highest on record there and qualifies as a major flood. The Wabash River crested at an estimated 15.5 feet on the 24th at Bluffton which is the 3rd highest ever. The Mississinewa River at Marion reached a crest of 15.4 feet on the 23rd. The crest along the Salamonie River reached 15.4 feet at Warren on the 23rd. Most of the flooding was moderate to major in some locales.

Significant flooding occurred in the Maumee River Valley also. Crests of over 20 feet occurred along the St. Marys and Maumee Rivers at Decatur (23.1 ft 1/25/99), Fort Wayne (21.0 ft 1/25/99), and New Haven (21.5 ft 1/25/99) respectively. Crests of 14 to 15 feet were recorded at Montpelier Ohio (E14.6 ft 1/25/99) and Newville Indiana (15.2 ft 1/26/99) respectively on the St. Joseph River. There was flooding along both the Auglaize and Tiffin Rivers in Northwest Ohio, with the worst occurring along the Tiffin River where a crest of 16.1 feet occurred at Stryker Ohio on the 25th. Water was high along the Auglaize with a crest of 17 feet recorded at Ft. Jennings Ohio on the 23rd and the Blanchard River crested over 24 feet at Ottawa Ohio on the 23rd as well.

Unfortunately, the flooding did not come without death. A young mother, Stacey R. Costner and her 9 year old son, John Mark Huston were swept off the road into Grassy Fork Creek in Grant County at 6:15 pm EST on Friday January 22nd and died. The location was about 50 miles northeast of Indianapolis. Their car was found on Sunday morning January 24th. There was property damage from flooding, as of this time, the extent is not known.

Temperatures were as much as 25 F^o above normal during the second half of the month. The record high temperature for the date at Fort Wayne fell on the 23rd when the mercury reached 60 F^o. January finished out on a relatively dry note with just a few hundredths of an inch of rainfall recorded at any one location and temperatures remaining above normal.

NWS FORM E-5 U.S. DEPARTMENT OF COMMERCE
NOAA, NATIONAL WEATHER SERVICE

HSA OFFICE:
North Webster, IN

REPORT FOR (MONTH & YEAR):

February 1999

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

DATE:

March 4, 1999

TO: NATIONAL WEATHER SERVICE
HYDROMETEOROLOGICAL INFO CENTER
1325 EAST-WEST HIGHWAY
SILVER SPRING MD 20910

SIGNATURE:
Michael Sabones, MIC

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Precipitation

Precipitation during February ranged from below normal over Northwest Indiana and Southwest Michigan to above normal over Northeast Indiana and Northwest Ohio. On average, nearly 2 inches of precipitation fell across the area in February. South Bend reported 1.58 inches of precipitation which was 0.32 inches below normal. There was 2.51 inches of precipitation at Fort Wayne which was 0.60 inches above normal. Snowfall amounts were spotty with 10.4 inches at South Bend, 8.4 inches at the Northern Indiana Weather Office and only 3.1 inches at Fort Wayne. Significant precipitation occurred, on average, every 5 days with longer stretches more common as the month ended. The highest precipitation totals occurred on the 27th and 28th over the Northeast Indiana and Northwest Ohio where between 1.0 and 2.5 inches of rain fell. There were several small snow events in the area in February. South Bend recorded a maximum one day total of 3.8 inches, Fort Wayne's greatest one day total was only 1.7 inches and the highest one day total at the Northern Indiana Weather Office was only 3.3 inches. All these occurred on the 24th.

Temperature

February, 1999 was a very warm month with temperatures, on average, 6.6 degrees above normal. Only 6 to 7 days had temperatures averaging about 3.5 degrees below normal, whereas 21-22 days averaged over 10.5 degrees above normal. Maximum temperature records fell at both Ft. Wayne and South Bend on the 11th. Temperatures soared into the 70s that day. Fort Wayne recorded 71 degrees and South Bend recorded 72 degrees on the 11th. February, 1999 was the 14th warmest on record at Ft. Wayne.

The average high temperature was 41.4 degrees and the average low temperature was 24.8 degrees. This put the average temperature at 33.1 degrees for our HSA in February.

Weather

February, 1999 was dominated by “zonal flow” in the middle and upper levels of the atmosphere. This allowed moderate maritime polar air masses to dominate our weather. There were a few occasions on which tropical and maritime polar air masses managed to influence our weather. Tropical air was definitely in control on the 11th when temperatures rocketed into the 70s. Less modified maritime polar air masses managed appearances on the 12th through the 14th and again on the 21st through the 24th.

With the zonal flow, a series of weak weather disturbances crossed the HSA during the month which produced most of the precipitation over the area. A relatively strong storm system pushed through the area on the 27th and 28th dropping nearly 2.5 inches of rain in some spots in Northwest Ohio. Rainfall totals were nearly 2 inches in some spots in Northeast Indiana. Totals were much lighter as one traveled west and north with totals between a tenth and a quarter of an inch over Northwest Indiana and Southwest Michigan. Thunder accompanied some of the rainfall and hail was reported just south of our HSA on the 27th. It was this rainfall that forced the St Marys and Tippecanoe Rivers over their banks on the last day of the month. The Tippecanoe River was above flood stage early in February as well. It was slow to recede from the flooding of late January.

Because of the snow melt flooding of late January, all area rivers were slow to recede finally achieving low flows in the week of the 21st. They remained there until the 27th and 28th when the heavy rain over Northwest Ohio and Northeast Indiana caused a quick rise of nearly 13 feet in one day on the St Marys. The Auglaize, Blanchard, Upper Wabash, Little, Eel, Mississinewa and Salamonie Rivers experienced rises of several feet as well in a single day. There were minor rises on other rivers to the north and west. The Tippecanoe River generally runs high. So a much smaller rise put it out of its banks on the 28th.

NWS FORM E-5

U.S. DEPARTMENT OF COMMERCE
NOAA, NATIONAL WEATHER SERVICE

HSA OFFICE:
North Webster, IN

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

DATE:

REPORT FOR (MONTH & YEAR):
March 1999

April 6, 1998

TO: NATIONAL WEATHER SERVICE (W/OH12X1)
HYDROMETEOROLOGICAL INFO CENTER
1325 EAST-WEST HIGHWAY, RM 7116
SILVER SPRING, MD 20910

SIGNATURE:
Michael Sabones, MIC
Greg Lamberty, Service Hydrologist

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Unlike February, March, 1999 quite a bit cooler than normal across Northern Indiana, Northwest Ohio and Southern Michigan. It was also a dry month. However it was on the snowy side with monthly totals ranging from just over 14 inches northwest to nearly 8 and a half inches northeast. With much of the precipitation during the month being snow, there was some minor snowmelt flooding along the St. Marys and Tiffin Rivers during the month.

Temperature: March, 1999 averaged about 4 degrees below the normal for the month. The average high temperature was in the middle 40s and the average low temperature reached the lower 20s, with the resulting average temperature being in the lower 30s.

March started out with temperatures slightly above normal, but it turned quickly colder by the 6th with the cold weather persisting until the 27th. The coldest weather occurred from the 6th through the 16th with temperatures as much as 23 degrees below normal. Temperatures sank below zero on the 7th at South Bend where -2 degrees F was recorded. That broke the record low temperature for the date. There was a brief respite from the cold weather on the 17th as temperatures sprang into the 60s. This melted the snow cover which caused some minor flooding along the St. Marys, Tiffin and the Tippecanoe Rivers. Temperatures then sank below normal until the 27th, but not as cold. They finally crept above normal on the 28th and remained there through the end of the month with the 70 degree F mark being pierced on the 30th and 31st.

Precipitation: March was unusually dry in 1999. March is usually a wet month considering the transition from winter to spring. Normal amounts of around 3 inches were underwhelmed by totals of only 1.2 inches across the area. All of the measurable precipitation fell in the first 11 days of March with the remaining 20 days producing at most a trace of precipitation on any one day. As stated before, only about 1.2 inches of precipitation fell across the area in March. This was about 1.8 inches below the normal of around 3 inches.

Three storm systems were responsible for the rain/snowfall over Northern Indiana's HSA in March. The first system, which moved through the area on the 2nd, produced only rain with amounts of 0.1 to 0.7 inches. This added slightly to the flooding which was occurring on the St. Marys and Tippecanoe Rivers as February ended. The next system hit the area on the 5th and the 6th with precipitation mainly snow totaling nearly 8 inches to the northwest and mostly rain southeast. Liquid amounts between 0.5 and 0.8 inches were found across the area. This system brought in cold air behind it which set the stage for the third and final storm system of the month which moved through the area on the 8th and 9th. It produced significant amounts of snow with totals of nearly 10 inches over some parts of the HSA, mainly south and east and totals of 5 inches north and west. Liquid amounts of between 0.4 and 0.8 inches were common.

Once these three storm systems passed through the area, no more measurable precipitation was recorded through the end of the month. Significant snow cover remained on the ground until the 17th when temperatures finally broke well above freezing. Snow, with water equivalents of nearly three quarters of an inch, melted rapidly as the snowpack ripened. This led to minor flooding along the St. Marys, and Tiffin Rivers with little damage. Crests of 15.43 ft occurred at Decatur on the St. Marys on the 18th and 11.6 ft was the crest height at Stryker on the Tiffin on the 20th. Luckily, no rain fell to enhance the flooding, the melting occurring under sunny to mostly sunny skies. Flooding, which began along the Tippecanoe River in late February ended by the 12th with that along the St. Marys ending by the 5th.

Weather: The airmass which most dominated the region's weather was Maritime Polar. A trough of cold air dominated the circulation over the eastern third of the nation during the first 3 weeks of March. This allowed cold air to plunge into the Great Lakes Region resulting in much below normal temperatures and a significant amount of snow for the first 9 days of the month. As this system became ingrained, it drove subsequent snow making systems south of the area. One of these systems produced snow totals of over a foot along the Ohio River. As these storm systems moved across the Tennessee Valley, cold Arctic air became the dominant feature of the weather over Northern Indiana's HSA. There was a slight break in the pattern allowing warm air into the region on the 17th which caused a rapid snow melt resulting in some minor flooding. Later in March, there was a more significant breakdown of this pattern which allowed the persistent ridge of warm air which dominated the Western U.S. to move over the Eastern U.S. Once this occurred, temperatures moderated with highs in the 70s to close out March.

NWS FORM E-5

U.S. DEPARTMENT OF COMMERCE
NOAA, NATIONAL WEATHER SERVICE

HSA OFFICE:
North Webster, IN

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

DATE:

REPORT FOR (MONTH & YEAR):
April 1999

May 4th, 1998

TO: NATIONAL WEATHER SERVICE (W/OH12X1)
HYDROMETEOROLOGICAL INFO CENTER
1325 EAST-WEST HIGHWAY, RM 7116
SILVER SPRING, MD 20910

SIGNATURE:
Michael Sabones, MIC
Greg Lamberty, Service Hydrologist

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April, 1999 was warm and quite wet across Northern Indiana, Northwest Ohio and Southern Michigan. It rained on 18 of the 30 days of the month with the heaviest rainfall totals occurring on the 15th and the 22nd and 23rd. Some areas received nearly 1.4 inches on the 15th and 2.6 inches on the 22nd and 23rd. With the heavy rain across the area, there was flooding on many rivers in our HSA. Flooding over most of the area was minor, but along the Tippecanoe River, radar estimates of between 2 and 3 inches of rain fell from the 21st through the morning of the 23rd this added to the rains which fell earlier in the month caused a major flood along the Tippecanoe, especially in the Winamac area. Crests of over 14 feet were recorded at Ora and 12.4 feet at Winamac.

Temperature: April, 1999 averaged about 2.2 °F above normal over the area. The average high temperature was in the lower 60s and the average low was around 40 °F with the average temperature in the lower 50s. The mercury reached the 70s in the first week of the month and some locations in Northwest Ohio had high temperatures reach the upper 70s in the forth week of April.

In more detail...

April started out with temperatures well above normal, some 12 °F to 20 °F degrees above normal. Temperatures reached highs in the 70s on the 3rd and again on the 7th and 8th. A cold front then swept through on the 9th dropping temperatures into the middle 50s. This was still slightly above normal. The cool streak continued through the 20th with temperatures averaging about 2.5 degrees below normal. Things began to warm after the 20th with temperatures averaging near normal. The temperature rose to 78 degrees at Fort Wayne on the 3rd which tied the record high for that date.

Precipitation: April was much wetter than normal. Unlike March, April had measurable rainfall on 18 of the 30 days. 6.37 inches fell at Fort Wayne, 2.99 inches above normal. April, 1999 was the 4th wettest April on record at Fort Wayne. 7.48 inches fell at South Bend, which was 3.66 inches above normal. This approached the South Bend record of

9.20 inches in an April which was set back in 1943. Looking at data from around the HSA, an average of 5.87 inches of rain fell in April, 1999. There was just a trace of snow reported at both Fort Wayne and South Bend in April.

The most significant rainfall events occurred on the 8th through the 10th, the 15th and 16th and 21st through the 23rd. The excessive precipitation was caused by a series of very strong storm systems which formed over the Central Plains and moved right over the area. The wettest of these occurred on the 21st through the 23rd when over two and a half inches of rain fell in some locations.

These rainfall events caused area rivers to rise. There was minor flooding along the Tiffin, St. Joseph (MI) and St. Joseph (OH), Maumee, Yellow, Tiffin and the Elkhart Rivers. There was a moderate flood along the Kankakee River and a Major flooding event along the Tippecanoe River.

All of the rivers were in low flow as the month began. The snow melt flooding of mid-March had concluded and the dry conditions of March served to drive the area rivers to low flow levels. With the first significant rains which occurred on the 8th through the 10th of the month, river levels began to rise. The most significant rises occurred in the Maumee River Basin, but rises were recorded along most other rivers in our HSA. The Tippecanoe, St. Joseph (OH) and Tiffin Rivers went into flood on the 10th, but the rest of the rivers remained below flood level. The next significant rains occurred on the 15th and 16th which added to the rise, but no additional flooding occurred. This rainfall, however, led to renewed flooding along the Tippecanoe River. Most other rivers in the HSA recorded rises but remained below flood levels.

It was the rain of April 22nd and 23rd which caused most of the flooding across the area. An average of 1.6 inches of rain HSA-wide fell across the area on both days. Some locations received over two and a half inches on both days. This resulted in flooding along the St. Joseph (MI), Elkhart, Kankakee, Yellow and Maumee Rivers and renewed flooding along the St. Joseph (OH) and Tiffin Rivers. Flooding continued along the Tippecanoe River in Northwest and North Central Indiana. With the additional rainfall, the Tippecanoe River level at Ora reached over 14 feet which qualified as a major flood. The flood along the Tippecanoe resulted in extensive lowland flooding along the river and the flooding of some residences in Monterey and Winamac. The central park in Winamac was severely flooded with the water approaching an estimated 5 feet deep in places and parks in Monterey were also flooded.

Weather: The weather in April was dominated by a modified Maritime Tropical Air mass for the first 8 days. From the 8th to the end of April, Continental Polar Air dominated the area. It was drawn down from a strong persistent high pressure system which dominated Southeast Canada.

Several strong storm systems traversed the area from the 9th through the 23rd which gave several bouts of rain, heavy at times. Significant hail storms pelted the northern tier of counties in Northern Indiana and extreme Northwest Ohio on the 10th. Hail the size of

golf balls pelted parts of Fulton, Pulaski, Noble, and Allen Counties in Indiana. Large hail also fell across La Porte County in Indiana. More significant hail falls occurred across parts of St. Joseph, Northern Kosciusko and Southern Elkhart Counties in Northern Indiana.

More severe weather occurred on the 22nd with the second to last in the series of storms which came out of the Central Plains. Most of the severe weather that occurred consisted of hail and strong winds. This system led to much urban and street flooding in Northern Huntington, Northern Wabash and Southern Allen Counties in Indiana as a line of thunderstorms stalled on the night of the 22nd over that area. Roanoke in Northeast Huntington County had extensive street and urban flooding with 3 homes reported flooded in downtown Roanoke. The final storm system occurred on the 27th and 28th of April. It brought rain to mainly the southern and western part of our HSA with some locations in that area receiving 1.5 inches of rain. This extra rain slowed the fall of the Tippecanoe, Kankakee and Yellow Rivers.

NWS FORM E-5

U.S. DEPARTMENT OF COMMERCE
NOAA, NATIONAL WEATHER SERVICE

HSA OFFICE:
North Webster, IN

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

DATE:

REPORT FOR (MONTH & YEAR):
June 1999

July 13, 1999

TO: NATIONAL WEATHER SERVICE (W/OH12X1)
HYDROMETEOROLOGICAL INFO CENTER
1325 EAST-WEST HIGHWAY, RM 7116
SILVER SPRING, MD 20910

SIGNATURE:
Michael Sabones, MIC
Greg Lamberty, Service Hydrologist

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June, 1999 was warmer than normal across all of Northern Indiana, Southwest Michigan and Northwest Ohio. Rainfall was spotty as it was in May, but on average it was dryer than normal across the entire HSA. Most of the rainfall was convective in nature with the heaviest amounts over Northwest Indiana, parts of Northeast Indiana and Northwest Ohio.

Temperature: June, 1999 averaged about 1.2 °F above normal over the HSA. The average high temperature was around 80 °F and the average low was around 60 °F with the average temperature being in the lower 70s. The mercury reached 90 °F by the 6th of the month which was the start of a very hot week across the HSA. High temperature records were broken in South Bend on 6th, 7th, 10th and 11th of the month. That hot week was followed by a cool snap with the low temperature record at South Bend being broken on the 18th of the month. The warmest day was 11th with high temperatures at South Bend reaching 95 °F and 92 °F was reached at Fort Wayne.

In more detail...

June started out with temperatures running around normal. By the 5th temperatures began a rapid warmup, as warm moist air moved into the area. High temperatures reached the upper 80s. By the 6th, highs were over 90 °F and that continued through the 11th which was the warmest day of the month across the HSA. Temperatures ran around 13 degrees above normal for that week. However the 11th was the last day in which the temperature went above 90 °F for June. A strong cold front moved through the region on the 13th which brought a significant cool snap into the area with high temperatures dropping into the low to middle 60s on the 15th and 16th. The cool snap lasted from the 14th through the 20th with temperatures averaging around 8.5 degrees below normal. Cool high pressure moved east allowing temperatures to recover with the upper 80s being reached by the 23rd. June finished with temperatures about 2 degrees above normal across the HSA from the 21st through the 30th. Record high temperatures of 94 °F were set on the 6th, 93 °F on the 7th, 94 °F on the 10th and 95 °F on the 11th at South Bend. A record low temperature

of 43 °F of was set at South Bend on the 18th.

Precipitation: As in May, spotty rain fell across the HSA in June, 1999, with most of the precipitation occurring in thunderstorms. Unlike May, rainfall was below normal across the HSA. Only 1.07 inches of rain fell at Fort Wayne which was 2.52 inches below normal. More rain fell at South Bend with 2.60 inches recorded there. That, however was still 1.51 inches below normal. The days with the most significant rainfall were the 12th and 13th of the month as a strong cold front passed through the area. The heaviest totals occurred over Northeast Indiana and Northwest Ohio with a total of 2.32 inches reported at North Manchester in Northeast Indiana. 2.00 inches was reported at Montpelier in Northwest Ohio. Many other stations reported over one inch totals. Rainfall was lighter over North Central and Northwest Indiana and Southwest Michigan.

A couple of weak cold fronts brought rain to the HSA on the 24th through the 29th of the month. Totals were less than an inch across the HSA with amounts between 0.40 and 0.90 inches the most common reported.

Rain was reported on only 11 days of June at both Fort Wayne and South Bend.

Area rivers and streams started off the month high in the Maumee and Upper Wabash River Basins, however low flow prevailed elsewhere across the HSA. Flows in the Maumee and Wabash River Basins subsided rapidly as June continued with low flow being reached by the 9th. There were minor rises on area rivers with the rains on the 11th through the 13th and slight rises on area rivers from rains of the 25th through the 28th of the month. There was no threat of any flooding from these rises in river levels. Dry soil conditions and rapid vegetation growth served to limit any runoff from rainfall. June finished with all rivers and streams in low flow. Palmer indices of Northern Indiana Weather's area showed some areas of the HSA to be in a moderate drought with Northwest Ohio in a severe drought. (Based on data through July 3rd)

Weather: The weather in June was dominated by two warm periods and one cool period. The month started out with temperatures near normal, but by the 5th a warm front moved north of the area ushering in a warm spell as Maritime Tropical air overspread the region. This pushed temperatures into the 90s, setting a series of high temperature records at South Bend. A change to colder weather began on the 12th as a strong cold front approached the area. Showers and thunderstorms occurred, in a scattered fashion, from the 9th through the 13th with severe weather on all five days. The damage done by these storms was from wind and hail. With the passage of the cold front the severe threat ended as well as the precipitation.

Cool Maritime Polar air from Canada then invaded the HSA which drove temperatures well below normal with a record low temperature set at South Bend on the 18th. This cool high pressure moved east and allowed Maritime Tropical air to return to the region resulting in warmer temperatures. A couple of weak cold fronts moved through the HSA, one on the 24th and the other on the 29th. They only lowered temperatures slightly for a

day with the warmer Maritime Tropical air making a quick return. With these fronts in the vicinity of the area, spotty showers and thunderstorms occurred across parts of the HSA. However this rain did little to break the prevailing dry pattern.

NWS FORM E-5

U.S. DEPARTMENT OF COMMERCE
NOAA, NATIONAL WEATHER SERVICE

HSA OFFICE:
North Webster, IN

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

DATE:

REPORT FOR (MONTH & YEAR):
July 1999

August 3, 1999

TO: NATIONAL WEATHER SERVICE (W/OH12X1)
HYDROMETEOROLOGICAL INFO CENTER
1325 EAST-WEST HIGHWAY, RM 7116
SILVER SPRING, MD 20910

SIGNATURE:
Michael Sabones, MIC
Greg Lamberty, Service Hydrologist

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July, 1999 was a very warm and dry one across all of Northern Indiana and Northwest Ohio, but there was a good deal more rainfall across Southern Michigan in July which put soil moisture near normal for this time of year there. Drought conditions prevailed across the rest of the HSA in July. Rainfall was very spotty across the area with no measurable rainfall at the South Bend Regional Airport from July 2nd through July 27th. At Fort Wayne, there were several small rain events, but none greater than 0.28 inches. Only 3 days produced measurable rainfall at South Bend with the bulk of the monthly total falling on the 1st where 2.10 inches fell. At Fort Wayne, only 7 days had measurable rainfall with 0.28 inches being the greatest total at the Fort Wayne International Airport. On the whole only 1.07 inches of rain fell officially at the Fort Wayne International Airport, the 7th driest July on record, 2.38 inches below normal. At South Bend, 2.40 inches fell in July, 1999, the 17th driest on record, 1.42 inches below normal.

Temperature: July, 1999 averaged about 4.7 °F above normal over the HSA. The average high temperature was in the upper 80s and the average low was in the middle 60s with the average temperature being in the upper 70s. Record high temperature readings were reached on July 30th at both Fort Wayne and South Bend when the temperature reached 100 °F and 102 °F respectively. The record high temperature record fell at Fort Wayne on July 31st as well when the mercury reached 98 °F. The record high temperature was tied at South Bend on July 23rd when the high temperature reached 96 °F. July was generally hot for the entire month. There was only one day when the high temperature was below 80 °F at Fort Wayne and two days when the high temperature stayed below 80 °F at South Bend. On the other hand, there were 14 days when the high temperature soared above 90 degrees at South Bend and 16 days where the high temperature rose above 90 °F in Fort Wayne. The temperature reached or exceeded the 100 °F mark at both locations on July 30th, both record highs.

Precipitation: Rainfall was sparse and widely scattered across the HSA with the exception of Southern Michigan where more significant rains fell as weak disturbances moved east along a stationary front located in Central Michigan during July. These disturbances interacted with the very warm and moist air, in place across the area which resulted in the needed rainfall. This is reflected in the long term Palmer Drought Severity Index which continued to show Southern Michigan with near normal soil moisture. However Northwest Ohio and Northern Indiana were trapped in drought conditions for the entire month. There was some relief over parts of Northwest Ohio as thunderstorms rumbled into the area on the 23rd of the month. Rainfall amounts ranged from 0.50 inches to over 2 inches in some locations. Storms also dropped over 1.5 inches of rain over part of Northwest Fort Wayne during the same time period. Other areas received some relief in scattered thunderstorms with heavy rain during the month. July started out wet over parts of the area as thunderstorms dropped totals over 2 inches over parts of Northwest Indiana on the 1st. South Bend recorded the highest total which was 2.10 inches. But, rainfall across the area averaged around 1.90 inches below normal across Northern Indiana and Northwest Ohio in July. The continuation of the dry weather from June produced a significant drought over Northern Indiana and Northwest Ohio in July. Late in the month the Palmer Drought Severity Index reached an average of -2.82 across North Central and Northeast Indiana with a -1.06 over Northwest Ohio. The reading over Northwest Ohio was taken after the heavy rains of July 23rd. Readings below -3.00 indicate severe drought. Since the Palmer Drought Severity Index is based on average rainfall amounts, some areas will be drier than the index indicates, thus some areas were in severe drought.

Weather: Maritime Tropical air masses dominated the weather over Northern Indiana, Northwest Ohio and Southern Michigan during July, 1999. Only a couple of short lived cool spells broke the summer heat which characterized the month. With a hot upper high pressure system entrenched across the HSA for most of the month, any disturbances which could bring rain to the area remained north of the region, with the exception of Southern Michigan where these disturbances brought some rain, otherwise the heat wave continued through to the end of the month.

With most of the area in drought, area rivers and streams remained in low flow across the HSA. Late in July, the Maumee, St. Joseph (OH), St. Joseph (MI), the Wabash and the Kankakee Rivers were hovering between the 50 and 80 percent exceedence levels with most of them near the 80 percent exceedence levels. This indicated that 80 percent of all measurements of the river levels were higher than these readings. This was as of July 27th. Readings have deteriorated on some of the rivers as July ended.

NWS FORM E-5

U.S. DEPARTMENT OF COMMERCE
NOAA, NATIONAL WEATHER SERVICE

HSA OFFICE:
North Webster, IN

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

DATE:

REPORT FOR (MONTH & YEAR):
August 1999

September 7th, 1998

TO: NATIONAL WEATHER SERVICE (W/OH12X1)
HYDROMETEOROLOGICAL INFO CENTER
1325 EAST-WEST HIGHWAY, RM 7116
SILVER SPRING, MD 20910

SIGNATURE:
Michael Sabones, MIC
Greg Lamberty, Service Hydrologist

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 flooding occurred within this Hydrologic Service Area.



August, 1999 was considerably wetter than July, with one report of above normal rainfall across the Northern Indiana HSA. More weather disturbances made their way across the area in August from the northwest. South Bend reported 4.12 inches of rain in August, 0.45 inches above the normal for the month. Fort Wayne had 3.10 inches of rain in August, 0.27 inches below normal. Temperatures average below normal across the region in August as well. The average high temperature in Fort Wayne was 80.9 °F and the average low was 58.1 °F which came out to 2.0 degrees below normal. At South Bend, the average high temperature was 79.9 °F and the average low temperature was 60.2 °F which came out to 0.9 °F below normal. The cooler temperatures were due to the increased cloudiness and the lessening influence of hot air masses from the Central Plains and the Gulf of Mexico.

Temperature: August, 1999 averaged about 1.4 °F below normal over the area. The average high temperature was in the upper 70s and the average low was in the upper 50s with the average temperature in the upper 60s. The maximum temperature never exceeded 90 °F during the whole month of August which was a marked contrast to July when the maximum temperature exceeded 90 °F on average 15 times. High temperatures never reaches 80 °F on an average of 13 times during August. The cooler temperatures helped to slow the drought a little during the month by reducing evaporation rates across the HSA.

No temperature records were set during the month.

Precipitation: August averaged near normal in precipitation. A little more than 3 inches of rain fell in August across the HSA. 3.10 inches fell at Fort Wayne, 0.27 inches below normal. 4.12 inches fell at South Bend, which was 0.45 inches above normal.

The most significant rainfall event occurred from the 23rd through the 26th. Lessor events took place from the 5th through the 8th and again from 18th through the 19th. Computer problems caused by a lightning strike limited data collection for the first event, but there was a report of 0.34 inches at Fort Wayne and 0.11 inches at South Bend on the 7th.

North Judson reported 0.67 inches on the 7th as well. Most reports were less than a half of an inch. More significant rain occurred on the 12th and 13th where some rain fall reports ranged from 1.00 to 1.47 inches. Most totals for this event were less than a third of an inch. The most widespread rainfall event though took place from the 23rd through the 26th of August when a low pressure system in the middle of the atmosphere caused three days of significant rainfall. The heaviest rains fell on the 24th with a report of 1.79 inches at South Bend. There were several other reports of rain over one inch in the thunderstorms across the HSA on the 24th. Most reports were less than a half of an inch even in this event. This shows the spotty nature of all the rainfall events which occurred in August. As a result, there were a few areas which did not see much relief from from drought which has plagued much of the HSA during the summer.

Drought conditions continued across Northern Indiana's HSA in August and spread into Southwest Lower Michigan where a moderate drought was reported. Moderate drought conditions continued over most of Northern Indiana and Northwest Ohio, However severe drought conditions were observed over North Central Indiana where it would take 7.11 inches of rain to end the drought. South Central and Southeast Michigan reported normal moisture conditions in August.

Weather: The weather in August, 1999 was quite a contrast to that which occurred in July. Temperatures were below normal and precipitation near normal across parts of the HSA. The strong high pressure ridge which dominated the area's weather in July, broke down in August, allowing the jet stream to move south from its position along the US/Canadian border. This allowed several storm systems and their associated cold fronts to invade the area resulting in more rainfall and cooler temperatures. The tropical air masses which dominated the area in July were pushed out of the area for most of August being replaced by Maritime Polar air masses which invaded the area following the cold frontal passages. The most significant storm system stalled over Northern Indiana's HSA from the 23rd to the 26th causing the most significant rainfall of the month.

With continued dry weather, all area rivers and streams remained in low flow across the Northern Indiana HSA with many locations having flows near or below the 80 percent exceedance levels.

NWS FORM E-5

U.S. DEPARTMENT OF COMMERCE
NOAA, NATIONAL WEATHER SERVICE

HSA OFFICE:
North Webster, IN

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

DATE:

REPORT FOR (MONTH & YEAR):
September 1999

October 4th, 1999

TO: NATIONAL WEATHER SERVICE (W/OH12X1)
HYDROMETEOROLOGICAL INFO CENTER
1325 EAST-WEST HIGHWAY, RM 7116
SILVER SPRING, MD 20910

SIGNATURE:
Michael Sabones, MIC
Greg Lamberty, Service Hydrologist

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General Overview: September for the IWX HSA was dry with near normal temperatures. Most of September had very little rainfall with totals less than a third of an inch through September 27th. However, a significant rain occurred on the 28th and 29th with many reports of rainfall between one and three inches reported. Temperatures were near normal for September with highs averaging in the upper 70s and lows in the upper 40s. As a result the average temperature in September was in the middle 60s.

With continued dry weather, much of Northern Indiana slipped into an extreme drought as measured by the Palmer Drought Severity Index. For North Central Indiana, into September 25th, the Palmer Index read a -4.44. 9.38 inches of rain was needed to bring soil moisture conditions back to near normal. Northeast Indiana had a Palmer Index reading of -4.08 which would require 8.38 inches of rain over the next few weeks to return soil moisture levels to near normal. Southern Michigan slipped into a moderate drought during September with Palmer index readings between -2.00 and -3.00. Northwest Ohio was in a severe drought with a Palmer index reading of -3.57. 6.87 inches of rain was required over the next few weeks to bring the soil moisture back to near normal in Northwest Ohio. The drought had its effect on area rivers. Levels well below normal were recorded in September across most of IWX's HSA.

There were beneficial rains on the 28th and 29th of the month, however. This brought some relief to drought stricken areas as the month closed.

Temperature: For Fort Wayne, the average high temperature was 79.2 °F and the average low was 49.5 °F. This gave an average temperature of 64.3 of which was 0.6 °F below normal. At South Bend, the average high was 78.1 °F and the average low was 51.7 °F. The average temperature was 64.9 °F which was 1.0 °F above normal.

Taking a more detailed look at the temperatures for the area. September started out quite warm with high temperatures reaching the upper 80s to the lower 90s from the 2nd through the 5th. Temperatures then cooled down into the upper 70s and lower 80s on the 6th before bouncing back into the middle to upper 80s on the 8th. By the 9th high temperatures fell

into the low to middle 70s. The roller coaster temperature ride continued as temperatures rebounded into the 80s and lower 90s on the 11 and 12th. Highs then cooled down into the lower to middle 70s for the next 6 days. This was an extended cool period, but temperatures again popped up into the 80s on the 19th before a more significant cool snap began on the 20th. High temperatures were pushed down into the 60s for the first time in the month on the 20th and 21st over some of the area. This cool snap continued through the 24th as temperatures rebounded into the 80s by 25th of the month where they stayed until a strong cold front passed through on the 29th dropping high temperatures into the middle to upper 60s. A record high temperature of 89 °F occurred at Fort Wayne on 28th just before the cold front passed through the area. Low temperatures fell below 40 °F on the 22nd of the month with the more significant cool snap.

Precipitation: September was a dry month across the IWX HSA with the first 26 days having little rainfall. Only 5 days of the first 26 reported measurable rainfall. Rainfall totals were generally less than a tenth of an inch on those days. Most of the rainfall occurred with passage of relatively dry cold fronts. However after an extended warm spell near the end of the month, enough moisture moved into the area for a significant rain to occur ahead of a slow moving cold front. Many reported rainfall totals between one and three inches occurred with this system. Up until the 27th, only 0.12 inches of rain was reported at South Bend and 0.13 inches at Fort Wayne. So most of the rainfall of September occurred on the last 4 days. At South Bend, 1.25 inches fell in September which was 2.37 inches below normal and at Fort Wayne, 1.03 inches fell during the month which was 1.64 inches below normal. Much of the rain that fell with the system that moved through the area on the 27th through the 29th occurred in showers and thunderstorms. Thus the heavy rainfall totals were somewhat spotty.

Weather: The weather across the IWX HSA continued to be dry. Temperatures averaged around normal. A series of nearly dry cold fronts passed through the region about every 3 to 5 days bringing in dry cool air. Northwest flow in the middle of the atmosphere dominated the atmospheric flow over the area during September with Continental Polar the dominant air mass. This served to keep any significant moisture out of the area.

There was a hint of a change in the weather pattern, though, as a slow moving cold front brought significant rains to the region near the end of the month. This was caused by a deep and slow moving trough which allowed enough Gulf of Mexico moisture to pool ahead of the associated cold front, causing the heavy rainfall.

With continued very dry weather, river levels continued to be well below normal. Many streams had gauging measurements near and below 80 percent exceedance levels during the month. There were some minor rises with the rains near the end of the month, but none were significant as most of the water went into recharging the soil moisture.

To increase public awareness of the drought, a public information statement was issued on September 10th highlighting it. It was issued as an update to the 3 that were issued during August. 3 were also issued in late July highlighting the developing drought in Northern Indiana and Northwest Ohio. In September, Indiana Governor Frank O'Bannon

asked the Federal Government to declare 67 Indiana counties a farm disaster area. This was highlighted in our September 10th public information statement.

NWS FORM E-5

U.S. DEPARTMENT OF COMMERCE
NOAA, NATIONAL WEATHER SERVICE

HSA OFFICE:
North Webster, IN

REPORT FOR (MONTH & YEAR):
October 1999

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

DATE:
November 6th, 1999

TO: NATIONAL WEATHER SERVICE (W/OH12X1)
HYDROMETEOROLOGICAL INFO CENTER
1325 EAST-WEST HIGHWAY, RM 7116
SILVER SPRING, MD 20910

SIGNATURE:
Michael Sabones, MIC
Greg Lamberty, Service Hydrologist

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).

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General Overview: October, 1999 was dry and slightly cooler than normal. This did little to alleviate the drought conditions across the HSA. Rainfall was pretty sporadic across the area in October with the most significant event occurring on the 3rd and 4th of the month with nearly a one inch average rainfall total across the HSA. Other, much less significant precipitation events, happened on 8th and 9th, 13th, 16th and 17th and the 22nd of the month. Temperatures averaged about 0.5 °F below the normal with highs in the lower 60s and lows in the lower 40s. That gave the area an average temperature in the lower 50s.

With the continued dry weather, drought still gripped much of IWX's HSA. Cooler weather, though, reduced evaporation rates along with the more dormant vegetation. As a result, the drought eased a little across the area with Northern Indiana in a severe drought which was less severe than the extreme drought conditions of last month. As measured by the Palmer Drought Severity Index, North Central Indiana as of October 30th had a reading of -3.81 with 8.24 inches of rain required to bring soil moisture conditions back to near normal. Northeast Indiana had a Palmer Index reading of -2.65, moderate drought, much better than the -4.08 recorded on September 25th. 4.41 inches of rain over the next few weeks would still be required to bring soil moisture levels to near normal in this area. Northwest Indiana, however continued in a severe drought with the Palmer Index reading of -3.26, requiring 7.64 inches of rainfall to recharge soil moisture. Southwest Michigan had a moderate drought with a Palmer Index reading of -2.11, requiring 3.71 inches of rain to return soil moisture levels to near normal. South Central Michigan had near normal conditions, but was still dry with a Palmer Index reading of -0.53.

As of October 30th, Northwest Ohio still had a moderate drought with a Palmer Drought Severity Index reading of -2.61 requiring 4.19 inches of rain to end the drought conditions.

With the growing season ended and some improvement in conditions noted, no Public Information Statements were written about the drought in October.

The rainfall on the 3rd and the 4th continued to relieve drought conditions. This continued the improvement started on the 28th and 29th of September. There was, however only one

significant precipitation event following the 4th. This prolonged the drought across much of the area. Higher rainfall totals were more prevalent across the eastern half of the HSA which were responsible for the greater improvement in conditions over Northeast Indiana and Northwest Ohio.

Temperature: At Fort Wayne, the average high temperature in October was 63.0 °F and the average low was 40.9 °F. This gave an average temperature of 52.0 °F which was 0.9 °F below normal. At South Bend, the average high temperature was 63.2 °F and the average low was 42.0 °F. The average temperature was 52.6 °F which is the normal for October in South Bend.

The following is a more detailed look at the temperatures for the area. October started out on the cool side with temperatures averaging about 6.5°F below normal. Temperatures were about 4.5 °F above normal from the 8th through the 16th. From the 17th through the 27th, temperatures averaged about 4.2 °F below normal. From the 28th to the end of the month, temperatures soared well above normal, about 14.9 °F above normal. Two high temperature records were broken at South Bend within the last 4 days of October. The records fell on the 28th and the 29th when the thermometer hit 79 °F both days.

Precipitation: October was again a dry month for the IWX HSA. Only 9 days had measurable rainfall. On average, 1.60 inches of precipitation fell across the area in October (average of coop weather observers and Fort Wayne and South Bend). At Fort Wayne, 2.32 inches of precipitation fell which was 0.17 inches below normal. At South Bend, only 1.37 inches of rain fell which was 1.71 inches below normal. Several frontal systems crossed the area during the month, but significant moisture did not return north to the area until the systems were half way across the HSA. Due to that, the more significant precipitation fell over Northeast Indiana and Northwest Ohio. This is reflected in the drought statistics such as the Palmer Drought Severity Index, mentioned above.

Snow: The first snowfall occurred at Fort Wayne on the 22nd of the month when a trace fell. There was no snowfall reported at South Bend in October.

Weather: The weather across the IWX HSA continued to be dry with the driest weather occurring over the northwest half of the HSA. This was reflected in the precipitation statistics with South Bend receiving only 1.37 inches of rain and Fort Wayne 2.32 inches. A cold front coupled with a low pressure system over the Central Plains brought a large area of rain to the HSA on the 3rd. This was the most significant rain maker of the month. On average, nearly a inch of rain fell across the HSA. The rainfall caused only minor rises on area rivers with much of the rain going to recharging the soil moisture. The front responsible for the rain, remained south of the area and it was a low pressure system moving along it from the Great Plains which caused the overrunning of warm moist air leading to the rainfall. Temperatures late in September reached the upper 80s and it was this tropical air mass which was forced over that cold front. Temperatures remained below normal as Continental Polar air masses dominated the region's weather into the 8th when a warm front moved north of the area bringing scattered light rain and a return to warmer weather. The Maritime Tropical air mass, which was greatly modified, returned to the HSA bring somewhat milder

temperatures. A weak cold front brought temperatures close to normal on the 13th with scattered light rain showers. This was the only day that thunder was reported in the HSA. Another weak cold front with a Continental Polar air mass passed through the area on the 16th bringing much cooler weather to the region, dropping high temperatures from the lower 70s to the mid 50s. Another cold front brought cooler temperatures and more Maritime Polar air to the area along with rain showers on the 22nd. This was the 2nd wettest event of the month in October. Temperatures remained cooler than normal into the 28th when a retreating high pressure allowed Continental Tropical air to rapidly move north into the area causing much above normal temperatures.

After the initial small rise on the 4th and 5th, area rivers returned to the low levels of last month with many rivers and streams near or below 80 percent exceedance levels. No hydrological products outside of the daily products were issued by this office in October.

NWS FORM E-5

U.S. DEPARTMENT OF COMMERCE
NOAA, NATIONAL WEATHER SERVICE

HSA OFFICE:
North Webster, IN

REPORT FOR (MONTH & YEAR):
December 1999

MONTHLY REPORT OF RIVER AND FLOOD CONDITIONS

DATE:

January 6th, 2000

TO: NATIONAL WEATHER SERVICE (W/OH12X1)
HYDROMETEOROLOGICAL INFO CENTER
1325 EAST-WEST HIGHWAY, RM 7116
SILVER SPRING, MD 20910

SIGNATURE:
Michael Sabones, MIC
Greg Lamberty, Service Hydrologist

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General Overview: December, 1999 for the IWX HSA continued the trend of the last couple of months by being drier and warmer than normal. There were more days of measurable precipitation across the HSA in December than in November. This was due to lake effect snows which occurred across the area, but primarily in areas close to Lake Michigan. The average precipitation total across the HSA was about 2.4 inches, which was about 1.3 inches more than the average total in November. That total was still over three quarters of an inch below the normals for December. Temperatures averaged about 2.9 °F above normal. Average high temperatures were in the upper 30s and the average low temperatures were in the middle 20s. The average temperature was in the lower 30s. About 4 inches of snow, on average, fell across the HSA with the greatest amounts near the southeast shore of Lake Michigan.

The drought, begun last summer, continued in December with North Central Indiana in extreme drought, which was the worst area in the HSA. Other areas in Northern Indiana were in severe drought as was Northwest Ohio. Southwest Lower Michigan was dry, but not in a significant drought situation. Below normal precipitation continued to keep most of IWX's HSA in drought. A Public Information Statement was issued on the 2nd of the month informing the public on the continuing drought situation in IWX's HSA.

Temperature: For Fort Wayne, the average high temperature was 38.6 °F and the average low was 24.2 °F. This gave an average temperature of 31.4 of which was 2.8 °F above normal. At South Bend, the average high was 39.0 °F and the average low was 24.7 °F. The average temperature was 31.9 °F which was 3.0 °F above normal.

Taking a more detailed look at temperatures for the area, December started out quite warm with above normal temperatures common through 15th of the month. High temperatures started out in the lower 40s, which was slightly below normal at Fort Wayne. From the 2nd through the 5th high temperatures rose through the 50s to reach 60 by the 4th and 5th at South Bend. The upper 50s were the highest temperatures reached at Fort Wayne for this time period. These temperatures were the warmest reached in December at both South Bend and Fort Wayne. High temperatures fell into the middle

30s by the 6th, still slightly above normal, before rising to the middle 50s on the 9th of December. Colder air then moved into the area on the 10th, dropping high temperatures into the upper 30s to around 40 by the 11th and 12th, still slightly above normal. High temperatures saw-sawed in the upper 30s and lower 40s through the 15th when decidedly colder air began moving into the region. High temperatures fell into the lower 30s and upper 20s by the 18th, before a slight rebound into the lower 40s by the 19th and 20th. Then much colder air moved into the area on the 21st, dropping high temperatures into the upper teens and the lower 20s across the area. The cold air remained in the area into Christmas Day with highs remaining in the 20s. Temperatures averaged about 11 degrees below normal from the 20th through the 25th. Minimum temperatures were in the single digits or very low teens from the 21st through the 25th with Christmas Day being the coldest. Low temperatures on Christmas were around 5 to 6 above zero °F. A warming trend began on the 28th with high temperatures rising into the 40s by month's end. Temperatures were 10 °F above normal on the last 3 days of December.

Precipitation: December was dry across IWX HSA, but not as dry as November. About 2.4 inches of precipitation fell across the IWX's HSA. That was more than three quarters of an inch below normal. The greatest precipitation amounts across the HSA occurred on the 4th and 5th where many reports of a half to over one inch of rain were received. This ended the warmest weather spell of the month. Another significant event occurred on the 14th and 15th of the month with rainfall amounts of between a third and one inch being reported.

At Fort Wayne, 1.95 inches of precipitation was reported, 0.94 inches below normal. At South Bend, 2.66 inches of precipitation was reported, 0.64 inches below normal for December. 2.64 inches of precipitation fell at the National Weather Service Office in Northern Indiana in December, 1999.

Snowfall was below normal for both Fort Wayne and South Bend this December. Only 1.9 inches of snow fell at Fort Wayne this December which tied the December of 1949 for the 10th least snowy December since records were kept there. In South Bend, only 6.9 inches of snow fell which was the 5th least snowy December since records were kept at South Bend. 3.6 inches of snow fell at the NWS office in Northern Indiana.

December capped a dry 1999. At Fort Wayne, 28.33 inches of precipitation was reported in 1999, 6.42 inches below normal. At South Bend, 30.65 inches of precipitation was reported in 1999, 8.49 inches below normal. South Bend had the eighth driest and the fifth warmest year on record in 1999.

Weather: December was marked by two significant storm systems. The first one occurred on the 4th and 5th of the month with one half to over one inch rainfall amounts being common. The second one moved across the area on the 14th and 15th dropping between a third of an inch and one inch of mostly rain across the area. Both systems ended extended periods of warmer weather with the first system ending the warmest period of the month.

Most snowfall this December was primarily lake induced, with South Bend receiving

significantly more snow than Fort Wayne. The storm systems on the 4th and 5th and 14th and 15th ended with light snowfall with little accumulation.

For Christmas Day, neither South Bend, the National Weather Service Office in Northern Indiana, or Fort Wayne reported any snow on the ground. There was snow on the ground, however, across Southwest Lower Michigan and Northwest Indiana, closest to Lake Michigan.

Maritime Polar air masses dominated the area on the first half of December and last three days of the month with Arctic air the dominant air mass for most of the last half of December. Most of the snowfall occurred as Arctic air flowing over the warmer waters of Lake Michigan picked up moisture and deposited it in the form of snow across IWX's HSA with the greatest amounts near the shores of Lake Michigan. The northwest to west winds were so strong, at some times, that lake effect snow reached Fort Wayne, nearly 150 miles from the shores of Lake Michigan.

River levels continued to be well below normal, which has been the trend since summer. As a result, no flood statements or warnings were issued by WFO IWX in December, 1999.