

**CHAPTER THREE
SECTION 3.6
HAZARD PROFILE-FLOODING**

AFFECTED JURISDICTIONS

COMMUNITIES

Unincorporated Pottawatomie County

Town of Bethel Acres

Town of Earlsboro

City of Shawnee

City of Tecumseh

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FLOODING

A flood is defined as an overflow or inundation coming from a river or other body of water that causes or threatens damage. Floods are usually a result of heavy, slowly moving thunderstorms or rains extending over a long period. Floods can also occur through dam failure or over-topping. Flash flooding is a short-term water inundation usually



resulting from storm water drainage or low water crossings on roadways.



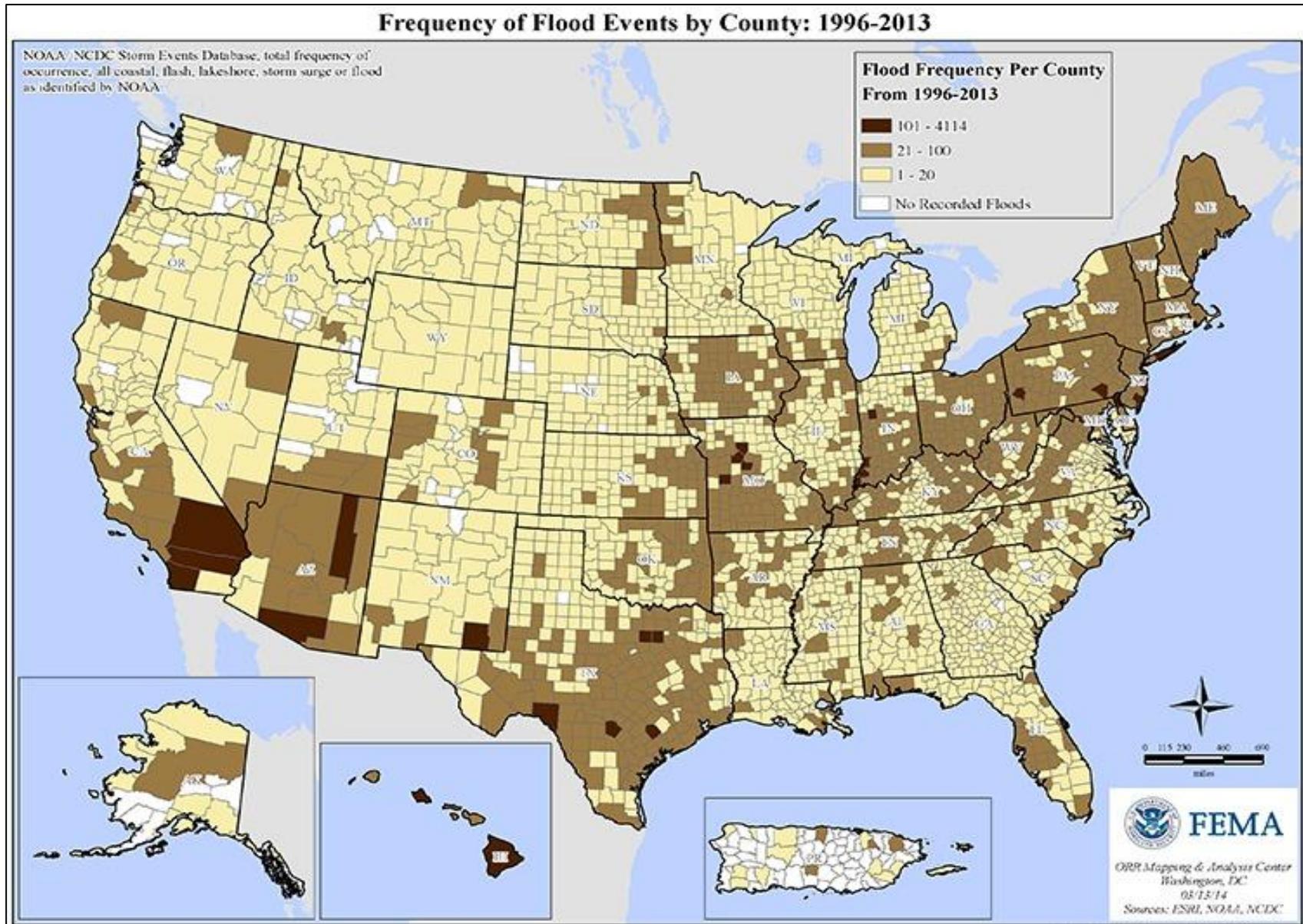
Fortunately, FEMA has mapped most of the known floodplains in the United States and administers the National Flood Insurance Program (NFIP). When the NFIP completes a flood study, the information and maps are assembled into a Flood Insurance Study (FIS). The FIS is a compilation and

presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community; it also includes causes of flooding. The FIS report and associated maps delineate Special Flood Hazard Areas (SFHAs), designate flood risk zones, and establish base flood elevations (BFEs) based on the flood that has a 1%

chance of occurring annually or the 100-year flood.

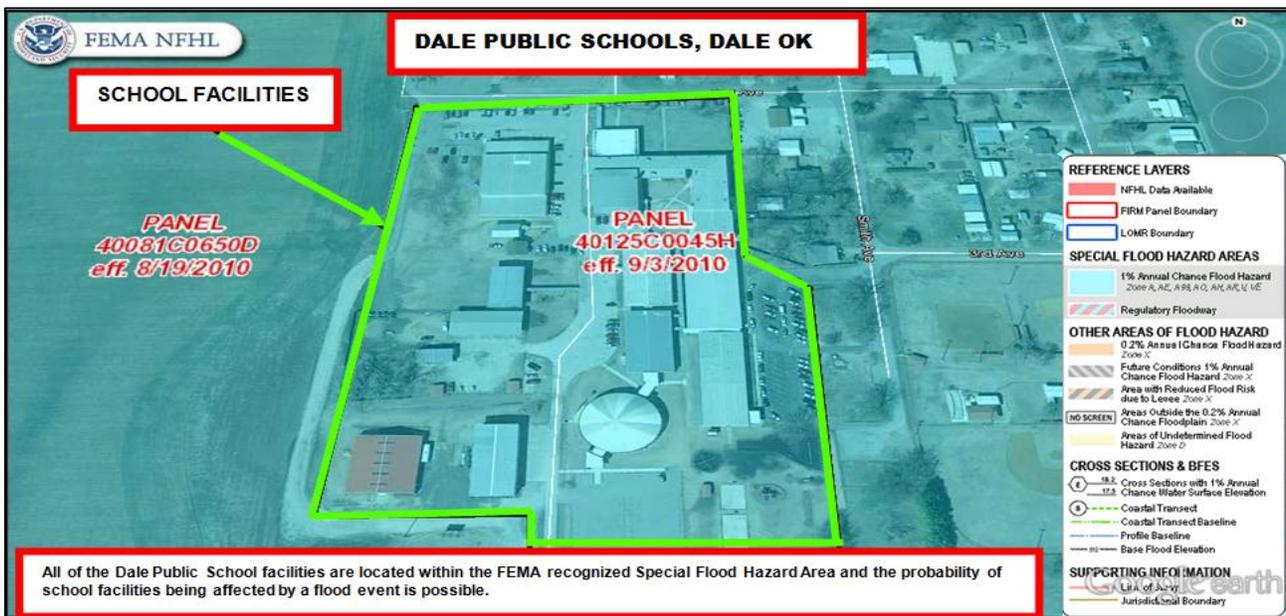
Riverine flooding occurs when excessive rainfall from areas upstream of the problem area exerts pressure on the rivers or drainage channels. Riverine flooding is usually a gradual process, which in many cases has a warning time from several hours to several days. River water surface elevations exceed the natural banks of the channel and overwhelm the areas within or beyond the floodplain. Riverine flooding has the tendency to remain in flood stage longer than other types of flood hazards. In many cases, riverine flooding may cause greater flood loss due to the length of time, the velocity, depth of the water, and the debris associated with the fast moving water, inundates the structures.

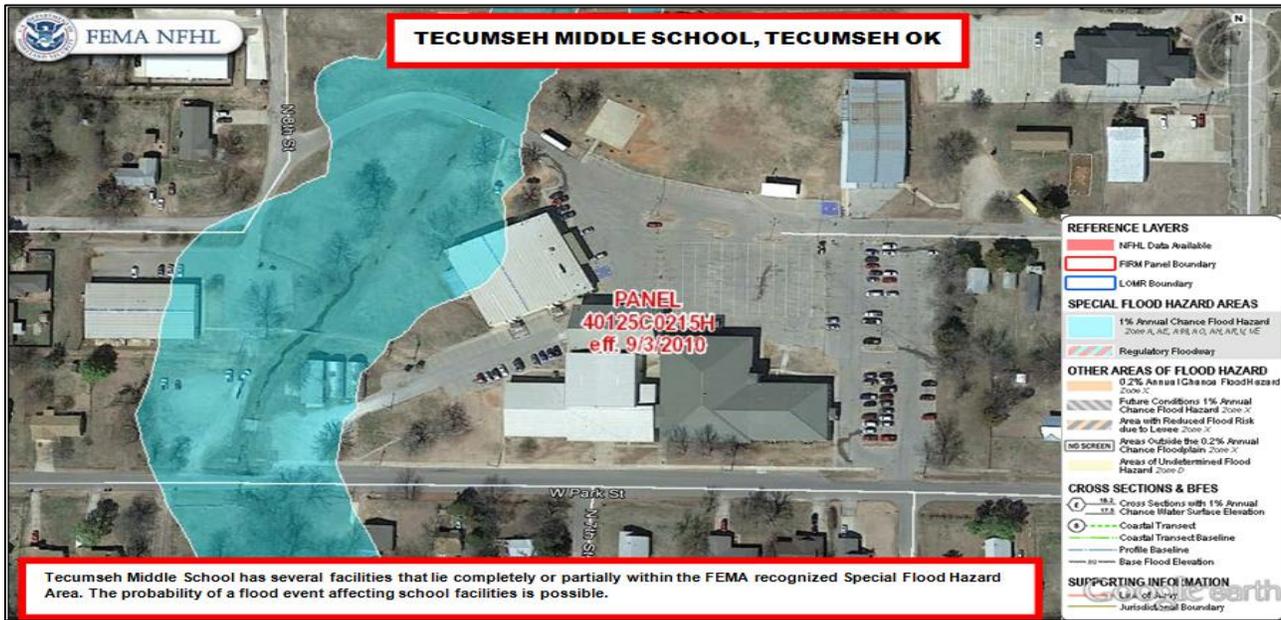




LOCATION

Various areas throughout Pottawatomie County are susceptible to occasional minor street flooding and ponding primarily due to flash flooding; however, the communities of **Bethel Acres; Earlsboro; Shawnee and Tecumseh** have been affected by flooding in the past, some causing damages. As shown on the following maps, Tecumseh Public Schools and Dale Public Schools have facilities that are located within the FEMA recognized Special Flood Hazard Area and have a possible risk of flooding. With the exception of Tecumseh High School, impacted by flash flooding in 2007, according to the Pottawatomie County Emergency Manager, no schools in either district have been impacted by flooding in the past. No other jurisdictions or public school districts in Pottawatomie County are affected by flooding. Flash flooding from thunderstorms occurs predominately in the spring and summer. Maps showing the location of all school campuses in relation to FEMA’s Special Flood Hazard Areas are provided in **Appendix B-Section B.7.**





EXTENT

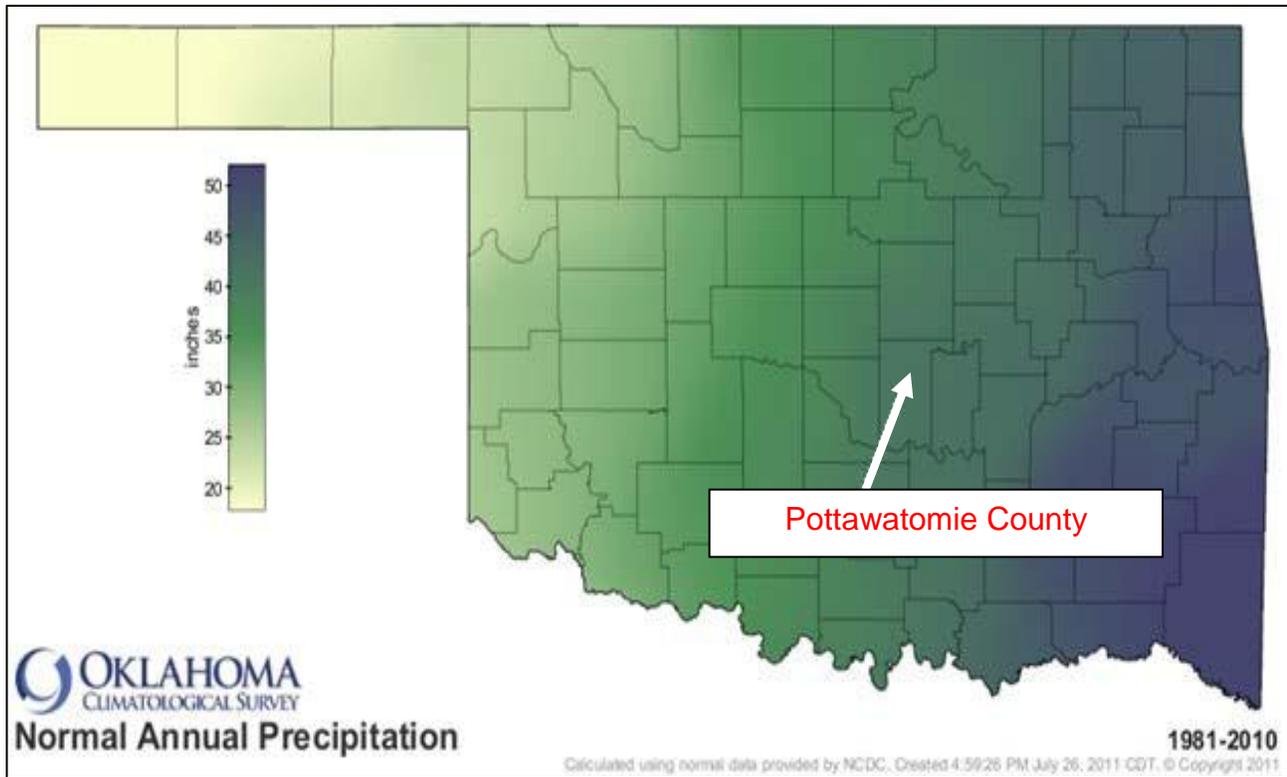
The geographical characteristics of Pottawatomie County are generally flat, level ground, conducive to flash flooding when rainfall is too heavy for the drainage system to handle the flow of runoff throughout the communities in the county. City, county, and school officials consider rainfall of 1-inch per hour a minor severity, and anything over three inches per hour a major event that can cause significant flooding problems from inadequate drainage. This example table shows the different flood zone designations as commonly recognized by the NFIP and used to differentiate between varying special flood hazard areas.

PREVIOUS OCCURRENCES

Some communities in Pottawatomie County have a history of flooding, primarily flash flooding. The very flat terrain of the county adds to the flash flooding potential. A number of areas in the unincorporated county have had flood problems over past years.

While unnecessary to list all areas in this plan a few of the more predominant areas in the county are: locations with flooding due to drainage problems are at Coleman and Ruggles Road, Hardesty Road and Brangus Road, Bethel Road and New Hope Road, 344 Road south of State Highway 39, Other areas will require major projects to correct the roadway flooding problems such as bridging the low water crossing on Dripping Springs Road between 346 and 347 Roads and at Chambers Road between 337th and 338th roads. These and other Pottawatomie County areas are described in Chapter Four. Various communities in the county also have flooding due primarily to inadequate drainage. Shawnee for example has drainage problems at Broadway and 7th Streets, MacArthur and Runway Tunnel, Wallace Highland, 10th Main and McKinley. In Tecumseh Broadway at US Highway 177 occasionally experiences flash flooding due to heavy rains and Edd Drive in the 200-300 blocks also experience flash flooding at times. McCloud also experiences flash floods on Oklahoma between 6th and 7th Streets and Broadway at 10th flash floods when Wynnewood Creek becomes full. In the town of Earlsboro Garwood and Main floods as does Main and Highway 9A. Bethel Acres west of Shawnee occasionally experiences flash flooding along Hardesty at Bethel Road and Gaddy and Stevens and Patterson.





PRECIPITATION

Average Annual: 40.19 inches
Days With Precipitation: 75
Wettest Year: 62.27 inches in 1908
Driest Year: 18.40 inches in 1956
Greatest Daily Rainfall: 10.62 inches
(Shawnee, October 20, 1983)

Pottawatomie County is no stranger to flooding as areas of the county have witnessed record flooding in different years. The most significant flood occurred in April 1928 and devastated downtown Shawnee, destroying most of the buildings and leaving many families homeless. More recently, presidential disaster declarations in 1990 and 1993 floods caused over \$1.5 million in property damage. Other parts of Pottawatomie County have experienced flooding as well. The Macomb area was damaged by flooding on the Little River in 1960 and 1961 but has only experienced minor street flooding since then. No school districts other than Tecumseh HS in 2007 have been affected by flash flooding or

flooding other than occasional problems on bus routes causing busses to detour from part of their route. Flooded roads occasionally cause problems accessing some communities in Pottawatomie County but the only communities affected frequently are Bethel Acres; Earlsboro; Shawnee and Tecumseh.

Table 3-18 EXPLANATION OF FLOOD ZONES Sources: Adapted from Floodplain Management Requirements: A Study Guide and Desk Reference for Local Officials (FEMA 480, 2005).			
100-Year Floodplain	Zone A (The 100-year or base floodplain) Zone V (constant 100-year floodplain)	A	Unnumbered A Zone. The 100-year floodplain mapped by approximate methods (RFEs are not determined).
		A1-30 (Old FIRM format) Or AE (New FIRM format)	The 100-year floodplain where RFEs are provided.
		AO	The 100-year floodplain with sheet flow, ponding, or shallow flooding. 100-year flood depths (feet above ground) are provided.
		AH	Shallow flooding 100-year floodplain (RFEs are provided).
		A99	Area to be protected from 100-year flood by levees or federal flood protection systems under construction. RFEs not determined.
		AR	The floodplain that results from the decertification of a previously accredited flood protection system that is in the process of being restored to provide a 100-year or greater level of flood protection
		V	The coastal area subject to a velocity hazard (wave action) where RFEs ARE NOT determined on the FIRM.
		VE	The coastal areas subject to velocity hazard (wave action) ARE provided on the FIRM.

Table 3-18

EXPLANATION OF FLOOD ZONES
Sources: Adapted from Floodplain Management
Requirements: A Study Guide and Desk Reference for
Local Officials (FEMA 480, 2005).

Area Outside of 100-Year Floodplain	Zone B and Zone X (shaded)	Areas of moderate flood hazard, usually the area between the limits of the 100-year and the 500-year floods. B Zones are also used to designate 100-year floodplains of lesser hazards, such as areas protected by levees from the 100-year flood, shallow flooding areas with average depths of less than one foot or drainage areas of less than one square mile.
	Zone C and Zone X (not shaded)	Area of minimal flood hazard, usually depicted on FIRMS as above the 500-year flood level. Zone C may have ponding and local drainage problems that don't warrant a detailed study or designation as a 100-year floodplain. Zone X is the area determined to be outside the 500-year floodplain and protected by levee from the 100-year flood.
	Zone D	Area of undetermined but possible flood hazards.

Pottawatomie County has fourteen repetitive loss properties. Three of those properties are located in the Town of Tecumseh. One is a commercial property and two are single family, residential properties. The eleven remaining properties are all single family residences located within Shawnee. Five of these properties are located in the same neighborhood while four more are in an adjoining neighborhood. Of the fourteen properties, three have had more than five claims (5, 7 and 8).





**Table 3-19 POTTAWATOMIE COUNTY FLOOD EVENTS
2000-2013**
Information provided by the National Climatic Data Center
(NCDC)

Date	Location	Description
17 Apr 2013	Shawnee	<p>Flash Flood - A strong warm front became stationary along the interstate 44 corridor during the early afternoon of the 17th. Through the day, areas south of the warm front and east of a well-defined dryline became very unstable. As a large upper trough shifted into the Southern Plains, scattered thunderstorms developed near the dryline/warm front triple point. Heavy rainfall from several rounds of thunderstorms led to flooding in downtown Shawnee. Numerous streets were in curb deep water. No major damage was reported and no injuries or fatalities occurred.</p>

**Table 3-19 POTTAWATOMIE COUNTY FLOOD EVENTS
2000-2013
Information provided by the National Climatic Data Center
(NCDC)**

Date	Location	Description
14 Jun 2010	Bethel Acres Shawnee	<p>Thunderstorms developed again over central Oklahoma late in the afternoon and evening, but luckily, the duration of the thunderstorms was relatively short. By the time it was all said and done, widespread totals of five to nine inches were reported over much of Oklahoma City. Will Rogers World Airport reported its largest daily precipitation since records began in 1891, with 7.62 inches. Even higher totals were reported over the north-central portion of Oklahoma City, where nine to twelve inches was measured.</p> <p>Bethel Acres - Several roadways between Bethel Acres and Shawnee had to be closed again when another round of heavy rain led to more flooding. Water reached 2 to 3 feet in some spots. One car became stranded in the rapidly rising water. No injuries were reported.</p> <p>Shawnee/Tecumseh - flash flooding also occurred near the Shawnee and Tecumseh areas. Several locations along Highway 177 and 18 were impassable, with vehicles becoming stranded in the rapidly rising water. A few swift water rescues occurred north of Tecumseh as two cars were swept off the roadway. Several homes also sustained damage. One residence had to be evacuated along Squirrel Creek as water rose out of its banks.</p>

**Table 3-19 POTTAWATOMIE COUNTY FLOOD EVENTS
2000-2013
Information provided by the National Climatic Data Center
(NCDC)**

Date	Location	Description
19 Aug 2007	Tecumseh	<p>Flash Flood- Tropical Storm Erin, the fifth named storm of the 2007 Atlantic Hurricane season, developed quickly over the northeast Gulf of Mexico on the 15th, before moving onshore during the morning hours of the 16th. Erin moved onshore near Lamar, TX as a weak tropical storm, but was quickly downgraded to a tropical depression as it moved over land. Erin maintained her depression status as it then began to move northeast into southwest Oklahoma between Hollis and Erick during the afternoon hours of Saturday, August 18th.</p> <p>Rainfall amounts exceeded five inches over a large area, with some locations receiving eight to ten inches. Rivers and creeks easily exceeded their banks, with water also rising quickly in many towns. Dozens of people were rescued by boat and helicopter as numerous homes and businesses quickly took on water. A couple of feet of water covered the wastewater treatment plant. Several outlets, fans, and pumps were damaged as a result. The Tecumseh High School had one inch of water in several classrooms. Five feet of water accumulated at Broadway and Tecumseh. Water was over the vehicle roofs near the US 177 interchange. Five residences received minor flood damage. A couple of residents had to be rescued from their home, as well as 5 people from their vehicles due to the high water. Numerous streets were flooded in Shawnee as well due to the high water. The southern portions of Pottawatomie county had extensive fence damage due to baled hay and other debris being washed through them. Numerous roads were closed in Bethel Acres, Pink, Brooksville, Macomb, and Wanette. In Earlsboro, one woman and two children had to be rescued from their vehicle at Kings Road. No injuries were reported at any location.</p>

**Table 3-19 POTTAWATOMIE COUNTY FLOOD EVENTS
2000-2013
Information provided by the National Climatic Data Center
(NCDC)**

Date	Location	Description
30 Jul 2007	Shawnee	<p>Flash Flood- A weak stationary front was draped from northwest Oklahoma into eastern Oklahoma. Other outflow boundaries from the previous day's thunderstorms were scattered around much of Oklahoma. Showers and thunderstorms with very heavy rainfall developed during the late morning and afternoon hours, with the strongest thunderstorms occurring in the afternoon. The almost stationary nature of the heavy thunderstorms created areas of flash flooding, especially over central Oklahoma, including the Oklahoma City metro area. Numerous roads were closed due to rapidly rising water. Several cars stalled while attempting to drive through high water. The rising water also entered a few businesses, with minor damage reported. Several county roads were closed due to high water, especially over the southern portions of the county.</p>
10 Jul 2007	Shawnee	<p>Flash Flood- A boundary moved southeast into Oklahoma during the afternoon hours of the 9th. An upper level wave accompanied this front, and combined with afternoon heating helping severe thunderstorms to develop during the afternoon and overnight hours. Thunderstorms also developed on the many outflow boundaries that were created throughout the event. Hail, high winds and flash flooding were reported. Squirrel Creek came out of its banks on the south side of Shawnee. Campers were evacuated as a result.</p>

**Table 3-19 POTTAWATOMIE COUNTY FLOOD EVENTS
2000-2013
Information provided by the National Climatic Data Center
(NCDC)**

Date	Location	Description
26 Jun 2007	Tecumseh Shawnee Earlsboro	<p>Flood- Waves of intense showers and thunderstorms continued to move north through the eastern two thirds of Oklahoma. The heavy rainfall and already saturated ground made for easy flash flood conditions through the morning and early afternoon hours. Monetary damages were estimated.</p> <p>Tecumseh- Six inches of water was reported in the Kwik Stop convenience store. A woman was evacuated from her home when a nearby creek overflowed its banks. Water got into the high school, damaging all the flooring.</p> <p>Shawnee- 45th Street between West Bryant and East Harrison was closed due to high water. Forty-six single-family homes and seven commercial buildings sustained major flood damage. About sixty homes were reported to have minor flood damage.</p> <p>Earlsboro- State HWY 9 was flooded and impassable.</p>
18 Jun 2007	Maud	<p>Flash Flood- The upper low-pressure center began to slowly move east throughout the day on the 18th, with heavy rainfall developing along and east of its track. Flash flooding was reported over parts of southeast and central Oklahoma. Several roads were closed due to the high water, and some businesses reported water rising several inches inside. A couple of houses were evacuated in Maud due to rapidly rising water. Several county roads also were closed due to high water. Monetary damages were estimated.</p>

**Table 3-19 POTTAWATOMIE COUNTY FLOOD EVENTS
2000-2013
Information provided by the National Climatic Data Center
(NCDC)**

Date	Location	Description
8 May 2007	Shawnee	<p>Flood - Showers and thunderstorms developed and moved over the main body of Oklahoma during the morning hours. Widespread flash flooding was reported over central Oklahoma, with rivers rising out of their banks. After a lull in precipitation for a few hours, the other disturbance moved over Oklahoma during the late afternoon and evening hours. Widespread showers and thunderstorms developed over southwest Oklahoma and continued to develop into central and southern Oklahoma. Large hail and severe wind gusts were reported, with flash flooding and river flooding continuing to be a concern due to the heavy rainfall earlier in the day. Hardesty Road and Donna Lane were closed due to a culvert collapsing. The roads were closed between HWY 102 and Stevens Road.</p>
17 Nov 2004	Pottawatomie Co.	<p>Flood - Strong thunderstorms dropped storm total rainfall amounts of 1-2 inches in west-central Pottawatomie County during the late evening hours of November 17. The rain fell over areas where the soil had been saturated from previous rainfall events during the month and produced short-lived river flooding along the Little River. Minor rural flooding occurred along the Little River 5 miles south of Tecumseh, OK at the river gage site. The Little River crested at 11.1 feet, 0.1 feet above flood stage, at 8:30 am CST on November 17 and was above flood stage from 10:30 pm on November 17 to 12:30 am on November 18.</p>

**Table 3-19 POTTAWATOMIE COUNTY FLOOD EVENTS
2000-2013**
Information provided by the National Climatic Data Center
(NCDC)

Date	Location	Description
7 Jul 2004	Pottawatomie Co.	Flood - Strong thunderstorms dropped isolated storm total rainfall amounts of 2 + inches in west-central Pottawatomie County during the early morning hours of July 7, and produced short-lived river flooding along the Little River. Minor rural flooding occurred along the Little River 5 miles south of Tecumseh, OK at the river gage site. The Little River crested at 12.8 feet, 1.8 feet above flood stage, at 8:30 am CST on July 7 and was above flood stage from 7:00 am to 1:00 pm on July 7.
3 Mar 2004	Pottawatomie Co.	Flood - On March 3-4, a warm front stalled across southwest and central Oklahoma. The front focused very heavy rainfall along a 50- mile wide band along and southeast of Interstate 44. Rainfall amounts of 1.5 to 3.5 inches were common. As a result of the heavy rains and subsequent runoff, the Little River near Tecumseh rapidly rose above a flood stage of 11 feet during the afternoon of March 3, and crested at 15 feet during the evening of March 3. Minor to moderate flooding occurred for a brief time during the evening of March 3 and early morning of March 4 over agricultural lands near the Little River in Pottawatomie and western Seminole counties.
30 Apr 2000	Earlsboro	Flash Flood - A slow moving thunderstorms formed over portions of western and central Oklahoma during the late morning of the 30th and continued through mid-evening. These storms were responsible for isolated areas of wind damage, large hail, lightning damage, and some flooding.

PROBABILITY OF FUTURE EVENTS

The communities in Pottawatomie County are sometimes host to the remnants of hurricanes from the Gulf of Mexico. By the time they arrive in Pottawatomie County,

however, they have been downgraded to Tropical Depressions. These storms tend to produce extremely heavy rains over a sustained period and often lead to flooding throughout Pottawatomie County.



Based on history and input from the Pottawatomie County Hazard Mitigation Planning Team, the potential of flooding in Pottawatomie County, Bethel Acres; Earlsboro; Shawnee and Tecumseh and areas of the unincorporated county is “**LIKELY**”. Based on the fact that Dale and Tecumseh Public Schools are located in a Special Flood Hazard Area, the potential of a flood event affecting

the schools and the areas of the community affected are also “**POSSIBLE**” although there have been no previous events. The rest of the Pottawatomie County, the participating jurisdictions, public schools and Gordon Cooper Technology Center is “**UNLIKELY**”.

VULNERABILITY AND IMPACT

Flooding is a destructive force whether it occurs from the river streams, dam failure, or most often by the flash floods transpiring from overtaxed water drainage. Neither property nor lives are exempt from its ravages. In Pottawatomie County, vehicles have driven into flooded roadways and been swept off by the heavy currents or drive off into a hole caused by a washed out roadway that was “hidden” by the floodwater. Emergency Services have then been called to perform rescues. Flooding rivers and streams have invaded homes and businesses destroying floors, walls and contents causing people to have to relocate and some become unemployed due to the closure of their business. Farmers and ranchers lose thousands of dollars’ worth of wheat, cotton, sorghum, and hay, as well as livestock when floodwaters overrun their fields. The impact of their losses not only affect Pottawatomie County's economy but also the State of Oklahoma and national economies

since many of the local farmers and ranchers sell to buyers who deal in these markets.

Communications towers, telephone and electric lines are above ground and are often impacted by flooding rivers or creeks. Transportation routes are always affected by floodwaters whether they are the local county roads or major highways. Pottawatomie County has a number of main highways including Interstate 40 that runs through the county. Although seldom affected by flooding the possibility exists. Such an event would create massive transportation problems.

Dale PS and Tecumseh Middle School have a possible risk of flooding because of their locations within the flood plain. Neither have any history of flooding.

CONCLUSION

Flooding in Pottawatomie County is a concern, although the most common occurrence is flash flooding when rainfall is exceedingly heavy and storm drains are unable to handle the runoff from the event. Exceedingly heavy rainfall can and has damaged and destroyed property in communities located in Pottawatomie County. Mitigation projects currently underway and new projects will help alleviate the flooding in communities in Pottawatomie County.



SOURCES

National Flood Insurance Program (NFIP)

National Weather Service – Norman(NWS)

www.srh.noaa.gov/oun/

Oklahoma Climatological Survey (OCS)

www.climate.mesonet.org/

National Climatic Data Center (NCDC)

www.ncdc.noaa.gov/stormevents/

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