2.2 FLOOD

Floods are natural and beneficial functions of stream and lacustrine systems. Floods occur when streams or lakes overflow their banks and spill onto the adjoining land area, which is called a floodplain. Loss of life and property can result when people build structures and develop in flood hazard areas. Numerous factors can cause or exacerbate flooding in Ohio including: heavy and/or prolonged periods of rainfall, snowmelt, soil saturation, ground freeze, severe wind events, and inadequate drainage systems. Floods damage private and public property and infrastructure in Ohio every year. Flooding is the most frequently occurring natural disaster in Ohio and the United States.

RISK ASSESSMENT

The two major drainage basins in Ohio are the Lake Erie and Ohio River basins. Streams in the northern third of the state flow into Lake Erie and eventually into the Atlantic Ocean. Streams in the southern two-thirds of the state flow into the Ohio River and eventually into the Gulf of Mexico.

There are many types of flooding that occur in Ohio including: riverine, flash flooding, coastal flooding, and shallow flooding. Riverine flooding is generally characterized by slower rising water, which allows for increased warning time, but has the potential to last for longer periods of time. Ohio communities experience riverine flooding on both large basins and smaller tributary streams throughout the state. Major sources of riverine flooding in Ohio include the Ohio River, Scioto River, Great Miami River, Muskingum River, Hocking River, Maumee River, Blanchard River, Sandusky River, Cuyahoga River, Grand River, Little Miami River, the Mahoning River and their larger tributaries.

Flash flooding can occur when a severe storm produces large amounts of rainfall in a short time. Flash flooding is generally characterized by high-velocity water that rises and recedes quickly allowing little or no warning time to evacuate. Ohio's Appalachian Region is particularly vulnerable to flash flooding because of the steep terrain and narrow stream valleys. Ohio's urban areas also experience flash flooding that may be attributed to inadequate or poorly maintained stormwater infrastructure, increased impervious area, and lost wetland areas. The U.S. Geological Survey (USGS) has concluded that urbanization generally increases the size and frequency of floods and may increase a community's flood risk.

Coastal flooding generally occurs in the counties that border Lake Erie. Flooding in coastal areas can be caused by stream overflow, wave run-up caused by strong winds, and higher than normal lake levels. Annual fluctuations in Lake Erie water levels are the result of seasonal changes and the amount of water flowing into and out of the lake. In-flow for Lake Erie includes drainage from the upper portion of the Great Lakes basin through the Detroit River, water from streams flowing directly into the lake, groundwater, and precipitation falling directly into the lake. Out-flow includes discharge into Lake Ontario through the Niagara River, evaporation, and any diversion or other withdrawals. Lake Erie levels also exhibit a wide range of long-term fluctuations that are the result of prolonged and persistent deviation from average climatic conditions.

Shallow flooding occurs in flat areas with inadequate channels that prevent water from draining easily. There are four types of shallow flooding: sheet flow, ponding, urban drainage, and rural drainage. Sheet flow flooding occurs in areas where channels are not defined. Sheet flow flooding moves downhill and covers a large area under a relatively uniform depth.

Ponding occurs in flat areas where runoff collects in depressions and cannot drain. Ponding can occur where glaciers carved out depressions in the landscape, and where manmade features such as roads have blocked drainage outlets.

Urban drainage systems can include combinations of ditches, storm sewers, detention ponds, house gutters, and yard swales. When a rainfall event exceeds the design capacity of the drainage system, it can result in the system's back-up and overflowing ditches. Basements are highly susceptible to flood damage caused by overloaded sewer and drainage systems. Urban drainage flooding can also occur behind levees when rainfall amounts exceed the capacity of pumps or other manmade systems designed to drain the landward side of the levees.

Rural drainage flooding in northwest Ohio is similar to urban drainage flooding in Ohio's cities and villages. Most of northwest Ohio was covered by a large swamp prior to European settlement that was subsequently drained for agriculture. The flat topography of this area is drained by an extensive system of ditches, swales, and small meandering streams. Rural drainage flooding occurs when rainfall exceeds the design capacity of the drainage system.

Ohio's river systems offer many benefits that have contributed to the development of the state such as: transportation, waste disposal, energy, commerce, recreation, and water supply. As a result, most major communities include development in flood hazard areas. Wetland areas have been developed, streamside forests have been removed, and streams have been straightened and channelized resulting in faster and increased runoff. After two centuries, these development patterns have drastically changed Ohio's riparian ecosystems, and resulted in escalating flood damages.

Historically, efforts to manage flooding can be divided into three major eras according to the Federal Interagency Floodplain Management Task Force. The Frontier Era (Pre-1917) is characterized by limited federal involvement in flood control or relief. During this time, many federal policies and programs encouraged land development with the common goal being "to conquer the wild landscape and to promote productive use of the land." Flood hazards were the problem of the individual property owner or dealt with cooperatively at the local level.

The Structural Era (1917-1959) is characterized by attempts to modify and control floodwater and move water off the land as quickly as possible. The federal government began assuming the costs to construct dams, levees, reservoirs, and other large structural flood control projects. As this era came to an end, resource managers began to realize that flood control projects were not eliminating flood damage and may be harming the environment.

During the Stewardship Era (1960-present), people began to recognize the important benefits and natural functions provided by floodplain areas such as natural flood and erosion control, water quality maintenance, groundwater recharge, recreation, wildlife habitat, agricultural production, and many others. The responsibility of floodplain management began to shift from the federal government to the local level again. The federal government began to focus on providing financial assistance to reduce and recover from the impacts of flooding. Congress created the National Flood Insurance Program (NFIP) in 1968 as a response to mounting flood losses and increasing disaster relief costs. The intent of the program is to reduce future flood damage through community floodplain management regulations, and provide a federally-subsidized insurance alternative to federal disaster relief.

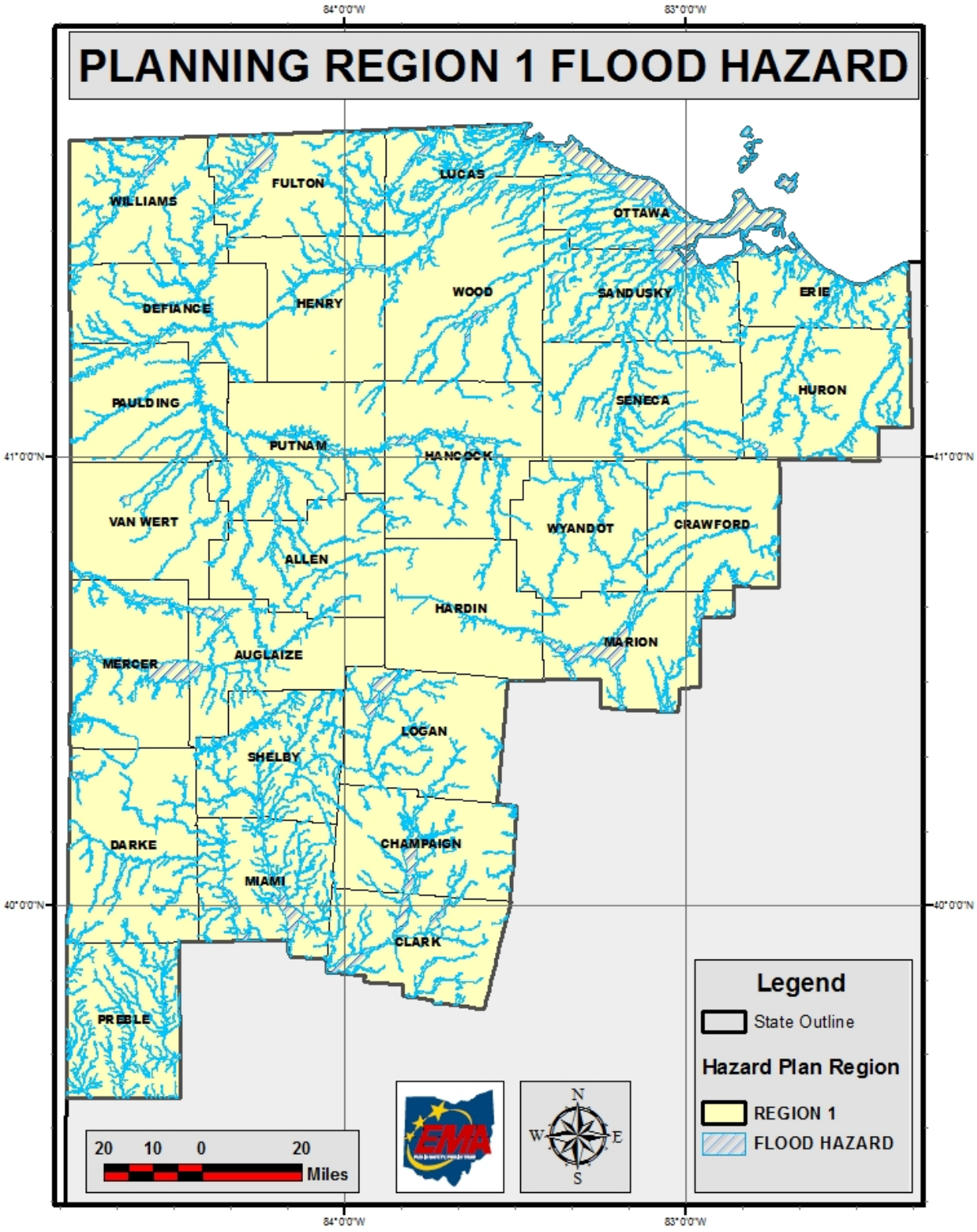
The political jurisdictions in Ohio that are eligible to participate in the NFIP include cities, villages, and unincorporated areas (through the county government). As of the 2010 Census, there are 247 cities, 686 villages, and 88 counties in Ohio. There are 754 Ohio communities that participate in the NFIP. The National Flood Insurance Program Community Status Book contains the complete list of communities in Ohio participating in the National Flood Program.

LOCATION

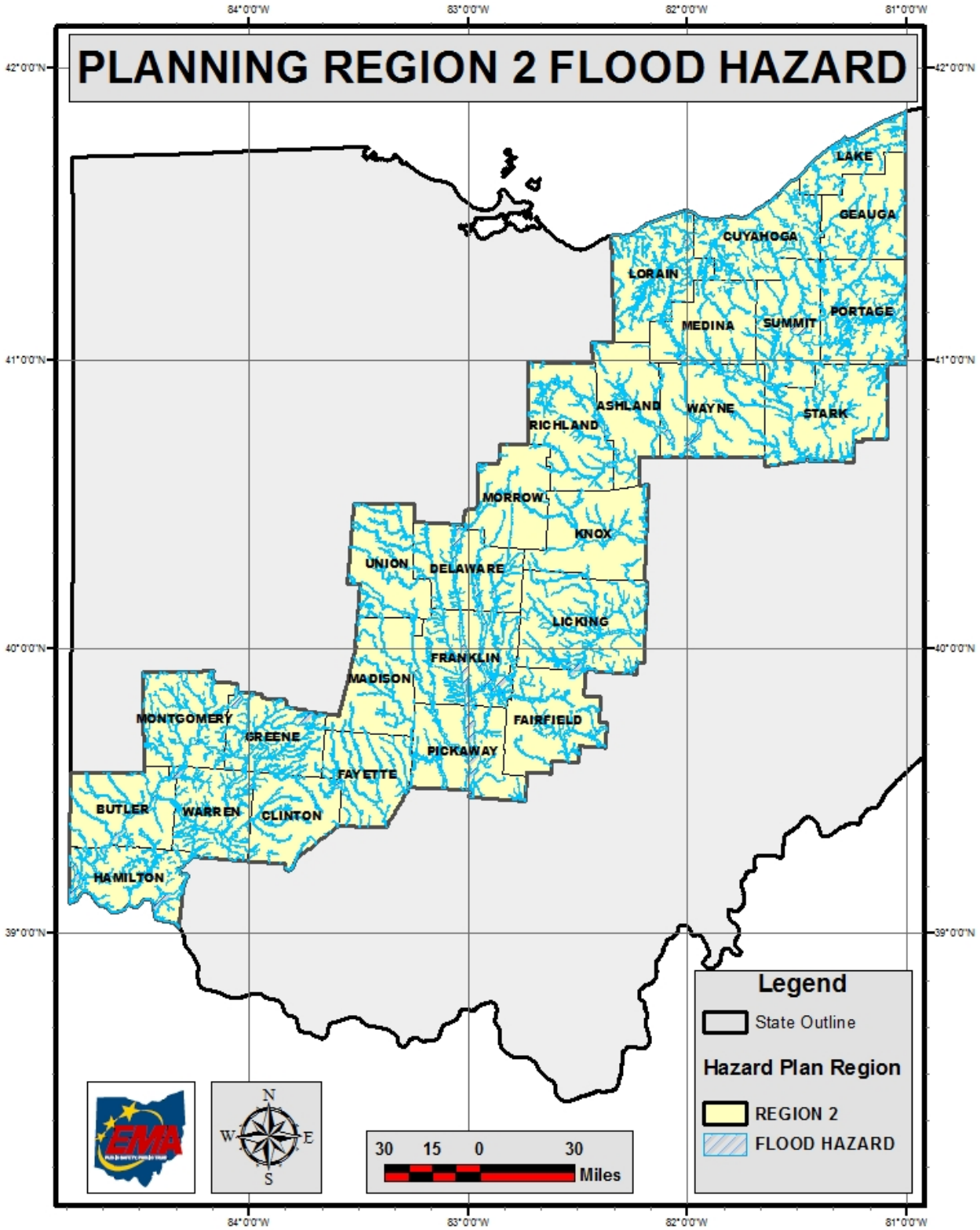
The four sources of information used to determine the location of flooding in Ohio are: FEMA flood maps and studies, NOAA data, information provided by the Ohio Department of Natural Resources - Division of Soil and Water Resources, and HAZUS analyses. Flood maps generated by FEMA to support the NFIP are the primary source of information on the location of special flood hazard areas (SFHAs) in the state. There are two main types of flood maps: the Flood Hazard Boundary Map (FHBM) and the Flood Insurance Rate Map (FIRM). The FHBM identifies approximate SFHAs based on the best available data at the time the map was created.

Generally, Flood Insurance Studies (FISs) and FIRMs are issued by FEMA following a detailed engineering analysis of flood hazard areas in participating communities. The FIS and FIRM identify 1%-annual-chance flood elevations and boundaries for selected stream reaches in the community. The FIRM will contain flood elevation information for various flood frequencies and may also delineate floodway boundaries. Flooding occurs in every county in Ohio. There are over 60,000 miles of named, unnamed, and intermittent streams in Ohio. FEMA has mapped approximately 2,777 square miles of flood hazard area in the state. Maps 2.2.a -2.2.c display FEMA’s identified SFHAs in the State of Ohio for the designated Regions.

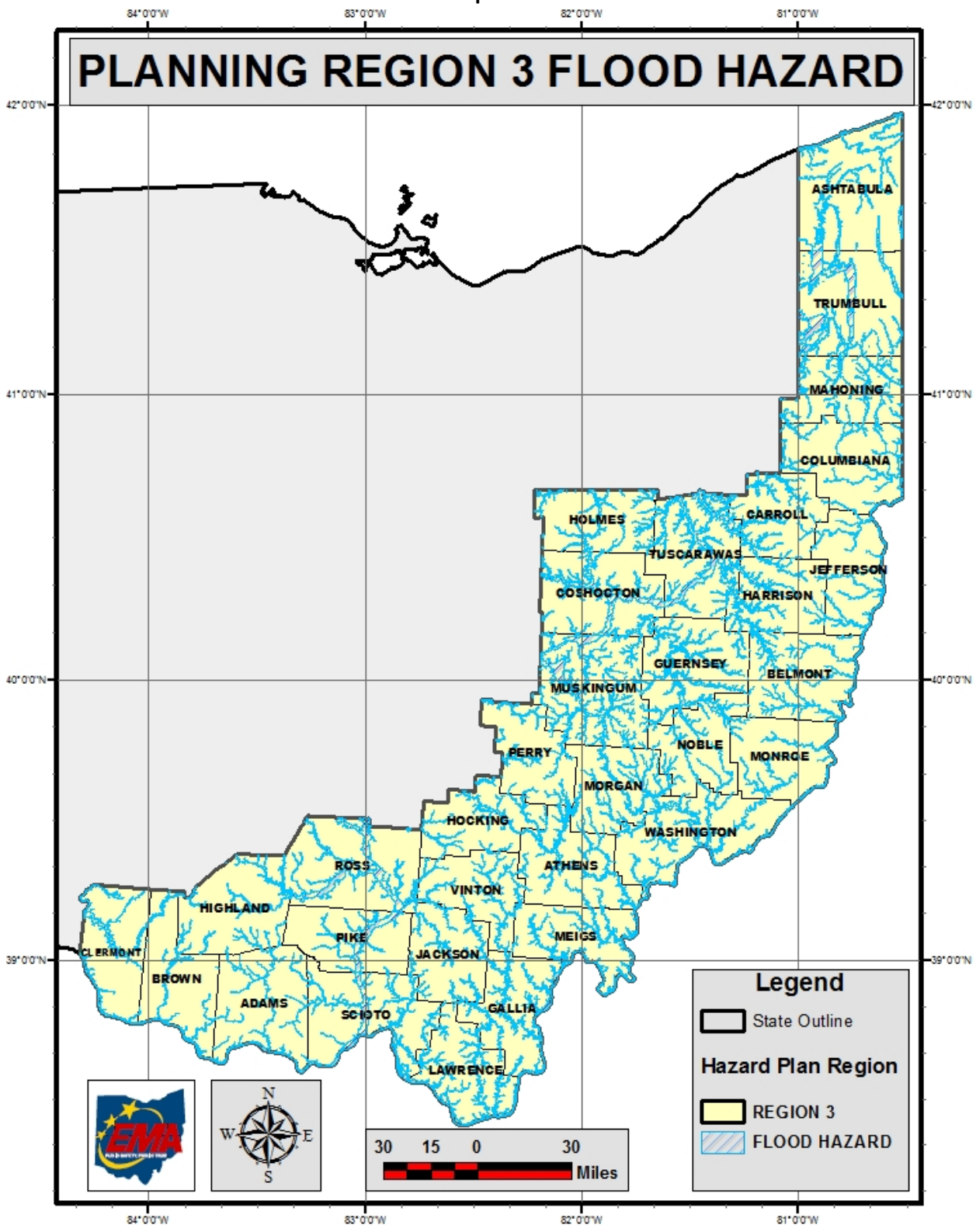
Map 2.2.a


PLANNING REGION 1 FLOOD HAZARD
84°0'0"W
83°0'0"W
41°0'0"N
40°0'0"N
FULTON
LUCAS
WILLIAMS
OTTAWA
DEFIANCE
HENRY
WOOD
SANDUSKY
ERIE
PAULDING
SENECA
HURON
PUTNAM
HANCOCK
VAN WERT
WYANDOT
CRAWFORD
ALLEN
HARDIN
MARION
MERCER
AUGLAIZE
LOGAN
SHELBY
DARKE
CHAMPAIGN
MIAMI
CLARK
PREBLE
20 10 0 20
Miles
EMA
N
W
E
S
Legend
State Outline
Hazard Plan Region
REGION 1
FLOOD HAZARD

Map 2.2.b


PLANNING REGION 2 FLOOD HAZARD
84°0'0"W
83°0'0"W
82°0'0"W
81°0'0"W
42°0'0"N
41°0'0"N
40°0'0"N
39°0'0"N
LAKE
GEAUGA
CUYAHOGA
LORAIN
MEDINA
SUMMIT
PORTAGE
ASHLAND
WAYNE
STARK
RICHLAND
MORROW
KNOX
UNION
DELAWARE
LICKING
FRANKLIN
MADISON
MONTGOMERY
GREENE
FAIRFIELD
PICKAWAY
FAYETTE
BUTLER
WARREN
CLINTON
HAMILTON
Legend
State Outline
Hazard Plan Region
REGION 2
FLOOD HAZARD
N
W
E
S
30 15 0 30
Miles

Map 2.2.c


PLANNING REGION 3 FLOOD HAZARD
84°0'0"W
83°0'0"W
82°0'0"W
81°0'0"W
42°0'0"N
41°0'0"N
40°0'0"N
39°0'0"N
ASHTABULA
TRUMBULL
MAHONING
COLUMBIANA
CARROLL
HOLMES
TUSCARAWAS
JEFFERSON
COSHOCTON
HARRISON
GUERNSEY
BELMONT
MUSKINGUM
NOBLE
MONROE
PERRY
MORGAN
HOCKING
WASHINGTON
ROSS
ATHENS
VINTON
HIGHLAND
PIKE
MEIGS
CLERMONT
JACKSON
BROWN
ADAMS
SCIOTO
GALLIA
LAWRENCE
EMA
N
W
E
S
30 15 0 30
Miles
Legend
State Outline
Hazard Plan Region
REGION 3
FLOOD HAZARD

The NOAA's National Climate Data Center (NCDC) Storm Events Database contains information on the location of flood events in Ohio. The database can be searched by county and includes a written description of the location of flood events reported in the state. The database also contains latitude and longitude values for some events and contains information on reported deaths, injuries, and estimated property and crop damage. The database can be found on the NCDC website.

The Ohio Department of Natural Resources, Division of Soil and Water Resources is mandated to be a state repository for flood hazard information (Ohio Revised Code Section 1521.13(C)(2)). The Floodplain Management Program maintains copies of flood hazard data generated by various federal, state, local, and private entities.

PAST OCCURRENCES

Profiling past occurrences of flooding at the state level involves gathering and compiling data from many different sources. The data sources used to profile the past occurrences of flooding include FEMA, the ODNR, the Ohio EMA, the NOAA, and the book Thunder in the Heartland by Thomas W. and Jeanne Applehans-Schmidlin, 1996. Table 2.2.a displays a summary of historic flooding information from 1860 to 1990 based on the chronicle Thunder in the Heartland: A Chronicle of Outstanding Weather Events in Ohio. More specific information on these events as well as events post 1990 can be found in the narrative of this section.

Table 2.2.a

Summary of Historic Flood Events 1860-1990			
Date of Event	**Affected Area(s)**	**Water Bodies Affected**	**Event Description**
8/12/1861	Columbiana County, Elkton, Lisbon	Beaver Creek, Elk Run	Every home in Elkton was damaged and four persons drowned when one home was washed off its foundation.
2/17/1867	Toledo, Maumee		Ice jams destroyed one bridge and damaged several others. Flooding in downtown Toledo.
2/11/1881	Toledo, Grand Rapids, Columbus, Findlay	Maumee River, Scioto River, Blanchard River	Four bridges were damaged by ice jams and debris in Toledo. Flooding in downtown Toledo.
2/1883	Statewide	Auglaize, Blanchard, Maumee, Portage, and Sandusky Rivers	A combination of snowmelt, ice jams, frozen ground and heavy rains caused flooding statewide.
2/14/1884	Statewide	Ohio, Hocking, Maumee, and Muskingum Rivers	Second highest stage on the Ohio River in Cincinnati. Thousands were evacuated and 3000 buildings were submerged.
5/12/1886	Xenia	Shawnee Creek	Flash flooding washed away several homes killing 21 people and destroying one bridge.
1/23/1904	Lorain, Toledo, Waverly	Black, Scioto, Mahoning and Maumee Rivers	Ships, bridges, and structures were damaged by ice jams and flooding.
3/14-18/1907	Ohio River Watershed	Southern 2/3 of Ohio	Large scale flooding in the Ohio River Watershed resulted in 32 casualties, hundreds of flooded structures, utility and infrastructure damage.
3/23-27/1913	Statewide	Statewide	Described as "Ohio's Greatest Weather Disaster". Four days of heavy rain on saturated soils resulted in 467 casualties, over 2,200 homes destroyed, over 40,000 damaged, and over $2.5 Billion damage in 2003 dollars.

Table 2.2.a (Continued)

Summary of Historic Flood Events 1860-1990			
Date of Event	**Affected Area(s)**	**Water Bodies Affected**	**Event Description**
7/16/1914	Cambridge	Wills Creek Watershed	Over 7.09 inches of rain in 1.5 hours causing flash flooding.
8/16/1920	Toledo	Maumee River	Flash flooding in downtown Toledo damaged homes, businesses and infrastructure.
2/26/1929	Cleveland, Dayton, Mt. Vernon, Bridgeport, Springfield	Little Miami, Maumee, Miami, Rocky, Mad, and Kokosing Rivers, Wheeling and Buck Creeks	Two to three inches of rain, melting snow, and ice jams caused widespread flooding.
3/21/1933	Cincinnati and Southern Ohio	Ohio River	Two periods of heavy rain cause widespread minor flooding.
8/7/1935	Coshocton and surrounding counties	Tuscarawas Watershed	Heavy rain on saturated soils saturated soils caused flash flooding.
3/19/1936	Ohio River Communities from Pittsburgh to Steubenville	Upper Ohio River	Snow melt and heavy rains in Penn. and W. Virginia caused the Ohio River to rise 20 feet in two days.
1/26/1937	All Ohio River Communities	Ohio River	Described as the "Greatest Flood on the Ohio River". Record levels on the Ohio River from Gallipolis to the confluence with the Mississippi.
7/7/1943	Akron and Steubenville	Cuyahoga River, Cross and Wills Creeks	Six to seven inches of rain in several hours caused flash flooding and landslides.
6/16/1946	Wayne and Holmes Counties	Killbuck and Salt Creeks	Heavy rain caused flash flooding resulting in one death, a train wreck destroying 5 bridges and seriously damaging 55 others.
6/8/1947	Adams, Lawrence and Scioto Counties	South Fork of Scioto Brush Creek and other small tributaries to the south emptying into the Ohio River	Flash flooding damaged many homes, bridges, roads, and crops.
3/21/1948	Counties in the Lake Erie Watershed	Lake Erie Watershed	The most severe damage was reported in along the Chagrin River in Cleveland. Twenty buildings were destroyed and 153 were damaged.
6/16/1950	Crooksville, Roseville	Moxahala Creek Watershed	One of the most intense rainfalls ever known in Ohio caused severe flood damages to homes and businesses.
1/21/1959	Statewide	Statewide	Rainfall in January 1959 ranging from 3-6 inches on snow-covered, frozen ground caused the most severe statewide flooding since 1913. Streams reached flood stage from January 21-24 killing 16 people, forcing 49,000 people from their homes, and causing extensive damage to homes, businesses and infrastructure.
6/5/1963	Guernsey County	Wills Creek Watershed	Official records indicate 7.95 inches of rainfall in 16- hours in Cambridge. One railroad bridge was destroyed, all major highways were inundated, and water supplies were polluted.
3/10/1964	Southern and Central Ohio	All Streams in Southern and Central Ohio	Two periods of heavy rain cause widespread flooding resulting in eight deaths, thousands evacuated, 84 homes destroyed, and 8,200 damaged.
7/21/1964	Akron	Ohio Canal and Little Cuyahoga River	Official records indicate 3.05 inches of rain in 75 minutes, but rain distribution was variable. The resulting flooding caused a sewer line to collapse a large section of road killing 3 people.

Table 2.2.a (Continued)

Summary of Historic Flood Events 1860-1990			
Date of Event	**Affected Area(s)**	**Water Bodies Affected**	**Event Description**
4/27/1966	Communities Along Lake Erie's Western Basin	Lake Erie's Western Basin	Several hours of winds up to 55 mph from the northeast pushed the western end of Lake Erie to flood stage. Fifteen hundred were evacuated, hundreds of homes were damaged, and utility services were interrupted.
7/12/1966	Erie, Ottawa, and Huron Counties	Sandusky and Huron River Watersheds	Rainfall totals ranging from 9-12 inches of rainfall over and approximately one-day period. Total damages exceed $27 million in 2003 dollars, including damages to 12,000 homes and businesses in Sandusky.
5/23-27/1968	Central and Southern Ohio	Hocking, Scioto, Little Miami	Two periods of heavy rain within 5 days on already saturated soils caused flooding on many streams. Four deaths have been attributed to this event.
7/4/1969	Northern Ohio	Lake Erie Watershed	Severe thunderstorms moved from Lake Erie into Ohio's coastal communities on July 4, 1969. Flooding combined with strong wind and tornadoes caused 41 deaths and injured 559 people. Loss estimates for this event totaled $65 million dollars in 1969, or over $328 billion in 2003 dollars.
11/14/1972	Coastal communities from Toledo to Cedar Point	Lake Erie	Northeast wind setup caused Lake Erie to rise 3 feet at Toledo and fall 4 feet at Buffalo resulting in coastal flooding. Total damages were estimated at $22 million in 1972 dollars.
4/9/1973	Coastal communities from Toledo to Port Clinton	Lake Erie	Northeast winds caused 8 to 10 foot waves and flooding.
9/14/1979	Southeastern half of the state	N/A	The remains of Hurricane Frederic brought six inches of rain in a band from Cincinnati to Youngstown causing widespread flooding.
3/12/1982	Communities in the Maumee River Watershed	Maumee River Watershed	Two inches of rainfall on snow covered, frozen ground caused flooding. Loss estimates totaled $11 million in 1982 dollars with Defiance County being the hardest hit.
6/14/1990	Shadyside in Belmont County	Pipe Creek and Wegee Creek	Twenty-six people died in a flash flood near Shadyside. Approximately 80 homes were destroyed and 250 were damaged. An estimated that 3-4 inches of rain fell in a little over an hour.
12/31/1990	Widespread	Widespread	The wettest year on record ended with extensive flooding on New Year's Eve causing $50 million (1990 dollars) in damages.

Historically, significant floods in Ohio occurred in 1913, 1937, 1959, and 1969. Heavy rain on saturated soils caused flooding throughout Ohio during March 23rd to 27th, 1913, killing 467 people, destroying 2,200 homes, and flooding 40,637 residences. Losses were totaled at $113 million in 1913 (approximately $2.5 billion in 2010 dollars), including: $78 million to buildings and personal property, $12 million to roads and bridges, $12 million to railroad property, which includes lost profit, $6 million to the agricultural industry, and $4 million dollars to machinery. This flood set record water levels on many Ohio streams. The Miami River Watershed experienced the highest casualties and damages during this event.

The flood of record for the Ohio River occurred the last two weeks in January 1937. Normal January precipitation in Ohio is 2-3 inches. The statewide average rainfall in January 1937 was 9.57 inches, with some stations recording over 14 inches. Ohio River levels on January 26th and 27th were the highest ever recorded from Gallipolis, Ohio to the confluence with the Mississippi River. Every Ohio community along the river was flooded resulting in 10 casualties, 16 injuries, thousands of damaged structures, and over 54,000 evacuations statewide.

Rainfall in January 1959, ranging from 3-6 inches on snow-covered, frozen ground, caused the most severe statewide flooding since 1913. Streams reached flood stage from January 21-24, killing 16 people, forcing 49,000 people from their homes, and causing extensive damage to homes, businesses, and infrastructure. Loss estimates for this event totaled $100 million in 1959, or over $752 million in 2010 dollars. Some of the factors that reduced casualties and damages from the 1913 flood include: less intense rainfall amounts, the construction of flood-control reservoirs built after 1913, and improved emergency management procedures and capabilities.

Severe thunderstorms moved from Lake Erie into Ohio's coastal communities on July 4th, 1969. This line of storms became nearly stationary for more than eight hours, aligned from Toledo southeast to Wooster. Official records indicate over 10 inches of precipitation lasting over a two-day period. Flooding combined with strong winds and tornadoes caused 41 deaths and injured 559 people. Loss estimates for this event totaled $65 million dollars in 1969, or over $388 million in 2010 dollars. This flood caused extensive damage to homes, businesses, infrastructure, utilities, boats, and automobiles.

Twenty-six people died in a flash flood near Shadyside, Ohio on June 14th, 1990. The National Weather Service estimated that 3-4 inches of rain fell in a little over an hour near Pipe Creek and Wegee Creek. Total rainfall is estimated at 5.5 inches in three hours. The saturated soils and narrow, steep-sided valleys caused the water to drain quickly into the creeks. Flash flooding began at 9:30 PM and was over in 30 minutes. During that time, a wall of water six feet high (reported to be 20 feet in some areas) rushed through the valley at seven to ten miles-per-hour. Approximately 80 homes were destroyed and 250 were damaged.

Storms that produced heavy rains during March 1st and 2nd, 1997, resulted in severe flooding in southern Ohio. The largest accumulations of rainfall were recorded in southern Adams and Brown Counties and ranged from 10-12 inches over the two-day period. Generally, rainfall amounts of four or more inches fell on most of the counties along or near the southern border of Ohio. Widespread damages to private and public property occurred throughout the area. Preliminary loss estimates totaled nearly $180 million in 1997, or over $245 million in 2010 dollars. Approximately 20,000 people were evacuated and 6,500 residences and 833 businesses were affected. Five deaths were attributed to flooding; all of the fatalities were the result of attempts to drive through flooded roads.

Storms during June 26th through 30th, 1998, resulted in flooding and widespread damage throughout much of central, east-central and southeastern Ohio. More than 10 inches of rain fell during a four-day period in parts of southeast Ohio. Twelve storm or flood-related fatalities were reported and infrastructure and utilities were heavily impacted. Loss estimates totaled nearly $178 million in 1998, or over $239 million in 2010 dollars.

PRESIDENTIAL DISASTER DECLARATION DATA

Flood vulnerability can also be expressed as historic expenditures on disaster recovery for flood events. Total expenditures for programs triggered by a Presidential Disaster Declarations are tracked and summarized by Ohio EMA (Appendix A). Between the 2005 and 2019 plan updates, six flood events resulted in Presidential disaster declarations. These six events are described below.

DR-1651-OH declared July 2, 2006

Severe thunderstorms and tornado touchdowns caused two deaths and widespread damage in northern Ohio from June 21st and 23rd, 2006. The primary causes of damage in this event were flash flooding, which overwhelmed urban stormwater infrastructure, and riverine flooding. Huron County and the City of Brecksville were especially impacted. The communities of Toledo, Norwalk, Valley View, and Independence also experienced significant flooding.

The USGS estimated flood recurrence intervals for gaged streams based on flood stage for this event. The flooding on the Vermilion River was estimated to be a 50-year event. The flooding on the Cuyahoga River and Tinkers Creek were estimated to be 25 to 50-year events.

DR-1656-OH declared August 1, 2006

Two separate weather systems produced storms resulting in more than 11 inches of rain in parts of Lake County, Ohio on July 27th and 28th, 2006. As a result of the storms and ensuing flooding, the counties of Lake, Geauga, and Ashtabula were declared Federal Disaster Areas. The flooding caused one fatality and 600 evacuations in Lake County. Over all of Lake County, 100 homes and businesses were destroyed and an additional 731 homes and businesses were damaged. Flooding destroyed five bridges in Lake County and closed 13 roads. The City of Painesville experienced heavy damages.

The USGS streamflow-gaging station at the Grand River near Painesville, Ohio had record peak stream flow and peak stage. The recurrence interval for this event was estimated to be 500 years (Ebner, A.D.; Sherwood, J.M.; Astifan, Brian; and Lombardy, Kirk, 2007, Flood of July 27-31, 2006, on the Grand River near Painesville, Ohio: U.S. Geological Survey Open-File Report 2007-1164).

DR-1720-OH declared August 26, 2007

Heavy rainfall inundated multiple communities across northern Ohio during a two-day period. The rain developed along a nearly stationary frontal boundary that was oriented from west to east across north central Ohio. Moisture from the Gulf of Mexico, as well as the remnants of Tropical Depression Erin, was drawn northward resulting in tropical downpours. The heaviest rains redeveloped each night, starting Sunday night August 19th, 2007, into Monday morning and then again on Monday night into the early morning hours of Tuesday, August 21st, 2007.

Stream gage reports from four locations in the affected area indicated that 24-hour rainfall totals ending at 8 AM on August 21st, 2007, exceeded the 1,000 year/24-hour rainfall frequency. Peak flood stage of the Blanchard River in the City of Findlay was 0.04 less than the flood of record in 1913 (National Weather Service Forecast Office in Cleveland, Ohio). Communities in the Blanchard, Sandusky, and Mohican River

watersheds were heavily impacted. There were approximately 2,500 flooded structures in the City of Findlay. The communities of Ottawa, Bucyrus, Shelby, Lima, Carey, and Bluffton also had many flooded structures.

DR-4002-OH declared July 13, 2011

Heavy rains and thunderstorms moved through the state on February 27th, 2011, as 3-4 inches of rain accumulated over a 24-hour period in already saturated areas across northern Ohio. This system exited the state and a second wave of precipitation moved through Southern Ohio. Warm temperatures, heavy snow pack, and snowmelt resulted in moderate to major flooding in many areas of the state. The State monitored river crests and falling temperatures over a 48-hour period for impacts, including potential issues with debris, wastewater, sewage, and shelters. Major to moderate flood river levels were recorded in Northern Ohio. The Cuyahoga River reached near-record flood levels.

In March and April, much of Ohio continued to experience heavy rain, severe storms, flooding, and flash flooding across the southern portion of the state. The cumulative effect of these conditions, coupled with flooding in neighboring states along the Ohio and Mississippi Rivers, resulted in dangerous conditions and damages, which affected the health, safety, and welfare in 21 southern Ohio counties. More severe storms moved across the south-central part of the state in May, producing heavy rain and high winds. These conditions further intensified the previously affected citizens in Gallia, Jackson, Lawrence, Pike, Ross, Scioto, and Vinton Counties. During this time, the Governor had issued two proclamations and requested a Presidentially-declared disaster for 13 counties along the Ohio River and 8 adjacent counties.

DR-4098-OH declared January 3, 2013

Hurricane Sandy brought heavy rainfall and significant flooding to northern portions of Ohio on October 29th and 30th, 2012. The flooding was the result of three consecutive weather events; a cold front, hurricane Sandy remnants, and lake enhanced showers. Rain started on October 26th as a slow moving cold front moved into the Ohio Valley. This front brought widespread 0.75 to 2.0 inches of rainfall to northern Ohio, highest near the lake.

By Monday, the remnants of Hurricane Sandy moved into Pennsylvania, and the pressure gradient between it and high pressure over Missouri produced storm force winds over Lake Erie. Moisture from Sandy moved into the region producing an additional rainfall of 2 to 3 inches by Tuesday the 30th. Rain continued at a rate averaging 0.10 inches per hour for the day, but increased to 0.75 inches per hour overnight and early Wednesday morning. This band of heavier rain caused the rivers, which were receding to once again rise. Areal flooding was limited to more northern counties; however, some small streams and creeks came out of their banks as far south as Ashland County. Numerous roads were closed due to flooding in Cuyahoga, Lake, and Medina Counties. In Ashtabula County, docks were damaged at the Port of Ashtabula due to severe wind and violent wave actions on Lake Erie, and marinas had to be dredged at the Port Authority of Conneaut. A flood watch was in effect for the lakefront counties and flood advisories were issued during the event.

A few dozen homes and businesses were impacted as water inundated basements or first floors. A number of homes affected were located in the floodplain of the rivers or along the shoreline where the raised lake level combined with the increased stream flows to produce flooding in areas not typically affected. Two rivers along the lakeshore reached major flood stage (based on NWS stage categories), the Cuyahoga and the Huron Rivers. The rest of the Lake Erie tributaries saw minor or moderate flooding. Many basements

flooded further inland as sump pumps failed due to power outages. As the result of Hurricane Sandy, an estimated $17.8 Million in public assistance funds has been awarded to this point.

DR-4360-OH declared April 17, 2018

Beginning on February 14, 2018, and continuing through February 25, 2018, a persistent band of moderate to severe storms moved across Region V impacting Illinois, Indiana, Michigan, Ohio, and Wisconsin. While precipitation levels and storm-related damages varied, Ohio experienced a significant amount of flooding and subsequent damage along the southern portion of the state. The snowmelt and continued rain throughout the incident period, combined with the frozen soils, led to flooding along area streams, rivers, and low-lying areas. Numerous flood gauges in this area rose to moderate flood stage, and rainfall totals in the impacted areas during the incident period ranged from a total of five to nine inches. Following these storms, there were several road closures as well as reports of inaccessible areas throughout southern Ohio due to standing water.

Widespread flooding culminated February 26, 2018, when the Ohio River at Cincinnati rain gauge showed a crest of 60.53 feet, 8 feet above flood stage and the highest crest since 1997. Communities near the river and its tributaries incurred damages to roads, bridges, and public buildings, as well as basement flooding and sewage backup. According to the Governor, preventative steps on the part of state and local agencies, such as Ohio EMA, shielded the area from the worst possible damage. The SEOC was partially activated with Emergency Support Functions (ESFs). A FEMA Region V Liaison Officer was deployed to the SEOC from February 25, 2018, through February 27, 2018, and the SEOC returned to normal operations on February 27, 2018.

There were several local evacuations due to flooding and the American Red Cross opened three shelters in the impacted areas. There was one confirmed fatality (Shelby County) as a result of this event, and at its peak, there were 10,449 customers without power statewide. On March 6, the Governor requested a joint preliminary damage assessment (PDA) conducted by local, state, and federal emergency management officials. The joint PDA resulted in documentation of approximately $44 million worth of damages to county, village and township roads, bridges, and public buildings. On March 26, the Governor requested a Presidential Disaster Declaration. On April 17, 2018, a disaster was declared for the State of Ohio, due to severe storms, flooding, and landslides that occurred during the incident period of February 14, 2018, through February 25, 2018. As a result of that declaration, Public Assistance has been made available for Adams, Athens, Belmont, Brown, Columbiana, Gallia, Hamilton, Jackson, Lawrence, Meigs, Monroe, Muskingum, Noble, Perry, Pike, Scioto, Vinton, and Washington Counties. The Disaster impact data is fluid as only half of the Public Assistance projects have been awarded as of January 2019.

NOAA DATA SUMMARY

Table 2.2.b lists the number of reported floods in Ohio since the year 2000, and associated loss totals according to the NOAA's NCDC Storm Events Database. The information in this database comes from NWS, who receives their data from a variety of sources including: county, state, and federal emergency management officials, local law enforcement officials, weather spotters, NWS damage surveys, newspaper clipping service, and the insurance industry and the public. An effort is made to use the best available information, but because of time and resource constraints, information from these sources may be unverified by the NWS.

Table 2.2.b

Ohio Flood Data Summary from the National Climatic Data Center					
Year	**Number of Reported Flood Events [1]**	**Deaths**	**Injuries**	**Estimated Property Damage (2017 Dollars)**	**Crop Damage (2017 Dollars)**
2000	44	3	2	$11,727,310	None Reported
2001	37	3	1	$16,151,620	None Reported
2002	38	1	None Reported	$2,831,820	None Reported
2003	63	4	None Reported	$391,232,610	$3,263,460
2004	40	2	None Reported	$164,640,140	$1,073,650
2005	39	3	None Reported	$71,997,770	None Reported
2006	33	4	1	$620,812,770	$42,438,060
2007	115	None Reported	None Reported	$277,897,680	$18,256,410
2008	105	1	None Reported	$5,871,830	$50,140
2009	38	1	None Reported	$5,004,190	$58,860
2010	71	5	4	$14,985,320	$1,090
2011	47	2	None Reported	$48,788,400	$194,020
2012	25	None Reported	2	$340,692	None Reported
2013	31	None Reported	None Reported	$4,292,160	$105,200
2014	31	None Reported	None Reported	$72,226,440	$78,660
2015	37	5	3	$27,679,146	$284,350
2016	26	None Reported	None Reported	$4,733,356	None Reported
2017	39	None Reported	None Reported	$18,762,000	$1,500,000
Total:	**859**	**34**	**13**	**$1,759,975,254**	**$61,892,000**

1 - The number of reported flood events was calculated by adding one record for each date in the data set.

PROBABILITY OF FUTURE EVENTS

The probability of occurrence of flooding is the likelihood that a specific event will happen. The likelihood of a flood event happening is usually expressed in terms of frequency. The NFIP provides maps and studies that use the 1 percent annual chance floodplain area (area inundated during a 100-year flood) as the national standard for regulating floodplain development. It is critical to establish the probability of occurrence for flooding so that the state and local communities can make informed decisions about the sustainability of future development, and determine the feasibility of proposed mitigation projects.

The primary sources of data for determining the probability of occurrence of flooding are the FEMA FISs and FIRMs. Nearly every community that participates in the NFIP has a map that identifies at least some area of flood hazard in the community that has a 1 percent annual chance of being equaled or exceeded in any given year. This area is referred to as the 1%-annual-chance floodplain, or the 100-year floodplain, and is graphically represented on a FIRM or FHBM.

Communities that do not have FISs, usually have an FHBM or FIRM that shows the approximate area that would be inundated by the 1%-annual-chance flood. An FHBM was intended for interim use in most

communities, until a FIS could be completed. FHBMs are still being used in some Ohio communities where a detailed FIS has yet to be produced.

Approximately 81 percent of Ohio communities that participate in the NFIP have a portion of their flood hazard areas identified in a FIS. The purpose of a FIS is to investigate the existence and severity of flood hazards in a certain geographic area. The information in a FIS is used to establish actuarial flood insurance rates and assist the community in its efforts to regulate flood hazard areas. A FIS contains data on: historical flood events, the area and flood sources studied, and the engineering methods employed to generate the flood hazard data. A FIS will have flood elevation profiles for the 100-year recurrence probability flood, and usually the 10-, 50-, and/or 500-year floods. It may also contain tables summarizing floodway data and other flood hazard information; however, it does not usually contain data for every flood hazard area in a community. The remaining areas may have approximate flood hazard data, or none at all.

There are several other possible data sources for determining the area affected by a particular probability flood event. The Ohio Department of Natural Resources, Division of Soil and Water Resources, is the state repository for flood hazard information and has copies of flood hazard information generated by various federal, state, local and private entities. The Floodplain Management Program maintains current copies of all FEMA FISs and flood maps in the state.

LHMP DATA

As stated at the beginning of Section 2, integration of LHMP data into the state HIRA is an ongoing effort. As local plans continue to expire and jurisdictions update their plans, vulnerability information and loss estimation are collected and assembled. Highlighted below is some of the more notable jurisdictional plan information that has been assembled and integrated into the state HIRA.

Hamilton County - The 2013 updated Multi-Hazard Mitigation Plan examined flash flooding, river flooding and urban flooding (categorized in their plan as Non- Flood Zone flooding). Since the previously approved plan in October 2006, Hamilton County has experienced 31 events with a total of $82,000 in property damage. Additionally, river flooding assessment is conducted for each of the major watersheds that affect the county: the Great Miami River, the Little Miami River, the Ohio River, and the Mill Creek watershed plus its tributaries. Each of the watersheds are mapped and analyzed to include properties, repetitive loss areas, and critical facilities. These analyses projected 2,377 residential structures at risk at a value of $72,428,000, an estimated 750 non-residential structures valued at $319,464,000 and 173 critical facilities valued at $30,404,000.

Belmont County - The 2013-2018 Belmont County Multi-Jurisdictional Hazard Mitigation Plan provides an analysis of riverine and flash flooding. Although it is considered a small, rural county, projections show potential losses approaching $2 billion. A Level-1 HAZUS-MH 100-year flood scenario estimated 10,469 residential structures at risk at a value of $1,388,080,000, an estimated 3,552 non-residential structures valued at $471,071,000 and 839 critical facilities valued at $113,140,000. Flooding continues to be a frequent and damaging hazard as a result of the Ohio River, several streams and creeks. There have been eight Presidential declarations due to flooding since 1980, three of which occurred in the month of June. However, riverine flooding occurs in the winter as well. In January 1996, floodwaters from the conveyance of two rivers in Pittsburgh caused the Ohio River to crest over 4 feet above flood stage. This caused 61 residences to be destroyed, 136 with major damage, 107 with minor damage and 14 residences to be affected. Belmont County also has 52 repetitive loss properties: 37 are residential with 36 losses while 15

are classified as non-residential with 87 losses. One of the residential properties is a Severe Repetitive Loss property with four losses. Flash flooding occurs more often than riverine flooding with 65 events recorded between 1996 and 2013 and damaging $7,159,000 in property and $5 million in crop losses. The most significant event was in June 1990, recorded as the most devastating flash flood to strike Ohio in recent years, resulting in 26 fatalities.

Jackson County - The Jackson County Natural Hazards Mitigation Plan of 2017 used HAZUS-MH to project damage in its most flood prone areas. These are identified as the Cities of Jackson and Wellston, and the Villages of Coalton and Oak Hill and various unincorporated jurisdictions. These areas experienced flooding in 1997 when the Little Salt Creek, Meadow Run, Little Raccoon Creek and other watersheds exceeded their banks. A Level-1 HAZUS- MH 100-year flood scenario performed in 2017, estimated the value of residential structures at risk at $453,142,000 (68.7%), and estimated the value of non-residential structures at $206,755,000 (31.3%). There were 24 essential facilities (fire stations, hospitals, police stations, and schools) at risk with one school expected to have loss of use.

SHARPP

Flood ranks highly amongst local hazard mitigation plans. It ranks in terms of frequency and response time, second in terms of impact on property, and third in impact (magnitude), and impact on business.

FLOOD SHARPP RANK AND SCORE							
Flood Rank	**1**	**1**	**6**	**3**	**3**	**4**	**2**
Criteria Score	**3.70**	**2.95**	**2.54**	**2.42**	**2.11**	**1.96**	**2.19**
	Hazard Frequency	Response Time	Onset Time	Impact	Impact on Business	Impact on Humans	Impact on Property

VULNERABILITY ANALYSIS

Flooding vulnerability is the likelihood of something to be damaged in a flood. A vulnerability analysis is a measurement of a community's flood risk. Vulnerability can be measured using many different methods. The method selected is highly dependent on the type and format of available data. If site-specific information on flood elevation, lowest floor elevation, structure type, and replacement value exist, a detailed vulnerability analysis can be performed using flood damage curves. The State of Ohio, and most communities in the state, lack all or a component of the data required for a detailed analysis and must use more simplified methods. Several different data sources are utilized in this discussion to help develop a clearer picture of Ohio's flood vulnerability including: HAZUS-MH analyses, the statewide Structure Inventory, NFIP repetitive loss data, and local data uploaded into SHARPP.

NFIP REPETITIVE LOSS PROPERTIES

The NFIP has identified a subset of structures covered by flood insurance policies that are referred to as "repetitive loss" and "severe repetitive loss" (see Appendix B). For this analysis, a repetitive loss structure is any property covered under an NFIP flood insurance policy with two or more losses of more than $1,000 each, in any 10-year rolling period, and at least two losses that are more than 10 days apart.

Severe repetitive loss (SRL) structures are defined as residential structures that are covered under an NFIP flood insurance policy and a) that have at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amounts of such claims payments exceed $20,000; or b) for which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building. For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.

NFIP repetitive loss data can be used to identify some of the structures vulnerable to flooding throughout the state. In Ohio, it is estimated that approximately 63% of the structures in the SFHA are not covered by flood insurance for any number of reasons. Some reasons include: misinformation about flood insurance as a mitigation option; the structure is not required to be covered by flood insurance because there is no current mortgage; lack of resources to purchase coverage; and lack of enforcement by the mortgage holder.

The Ohio EMA Mitigation Branch examined repetitive flood loss data for all 88 counties and their affected communities. First, data were compiled and analyzed for the top twelve communities with the greatest number of repetitive flood loss structures. These counties were identified as Belmont, Cuyahoga, Erie, Franklin, Guernsey, Hamilton, Hancock, Lake, Lucas, Ottawa, Summit, and Washington. The Mitigation Branch discussed the significance of both categories, counties and jurisdictions, and decided that the focus should be on the top 12 counties with the highest number of repetitive loss structures. The counties are summarized in Table 2.2.c. The "Total Paid" column is the summed building and contents payments from the repetitive loss structures.

Table 2.2.c

RANK	COUNTY	LOSS STRUCTURES			Losses	Total Paid
		TOTAL RL/SRL STRUCTURES	REPETITIVE LOSS STRUCTURES	SEVERE REPETITIVE LOSS STRUCTURES		
1	Hancock	266	221	45	835	$ 19,786,550
5	Cuyahoga	148	117	31	557	$ 21,638,500
2	Washington	202	183	19	510	$ 11,975,540
4	Hamilton	141	123	18	437	$ 12,824,763
3	Ottawa	130	125	5	375	$ 3,291,518
6	Erie	99	84	15	331	$ 3,533,345
8	Lucas	80	72	8	227	$ 2,753,382
9	Lake	78	71	7	225	$ 3,369,267
7	Summit	89	84	5	222	$ 5,517,466
10	Franklin	70	68	2	164	$ 2,123,454
11	Belmont	61	59	2	146	$ 2,604,347
12	Guernsey	57	55	2	139	$ 4,874,974
TOTAL		**1,421**	**1,262**	**159**	**4,168**	**$ 94,293,107**

Appendix B lists the repetitive loss properties by county and region, indicates the status of flood insurance, estimates the structure and content value, and demonstrates the number of flood losses per structure. As of August 2018, there are 2,661 repetitive and severe repetitive loss structures in Ohio with a total of 7,589 losses and $154,034,302 dollars paid.

Region 1 has the highest number of repetitive loss and severe repetitive structures in the state as identified by the NFIP at 931 structures, including 107 severe repetitive loss structures. The amount paid out for repair of these structures through August 2018, is $47,531,834 for structure repairs and contents replacement. Within Region 1, the most significant concentration of repetitive loss structures is located in the City of Findlay (Hancock County), which is along the Blanchard River. In total, Findlay has 253 repetitive loss structures identified with 801 losses, which have paid a total of $19,317,244 for structure repairs and contents replacements.

Region 2 is identified as having the second highest number of repetitive loss structures in the State. All of the counties within the region have identified repetitive loss structures. As a whole Region 2 has 880 repetitive loss structures identified, with the total of contents replacements and total payments equaling $65,459,581 in paid claims. There are two areas of significant loss identified within the region. The City of Cincinnati (Hamilton County) is located in the southwestern portion of the state on the Ohio River. It has 65 repetitive loss structures with 220 claims for $8,736,956 in repairs paid and contents replaced. The second area includes the City of Independence (Cuyahoga County). Independence has 20 identified repetitive loss structures with 114 claims for a total of $12,103,200.

Region 3 is third in the state for all statistics regarding repetitive loss structures. In total, there are 880 repetitive loss structures with 2,195 losses totaling $41,042,888 in repairs and contents paid. The City of Marietta (Washington County) has 120 repetitive loss structures with 298 reported claims representing $8,092,239 in repairs and contents replacements. The second highest RFC count in this region resides in the unincorporated area of Washington County, 54 structures with 139 losses totaling $2,625,547 in repairs and contents replacements.

NFIP COMMUNITY RATING SYSTEMS (CRS) PROGRAM

According to the October 2018 NFIP Flood Insurance Manual, the Community Rating System (CRS) is a voluntary program for communities participating in the National Flood Insurance Program (NFIP). The CRS offers flood insurance policy premium discounts in communities that develop and execute extra measures beyond minimum floodplain management requirements to provide protection from flooding. A community's eligibility for the CRS depends upon participating in the Regular Program and maintaining full compliance with the NFIP. CRS flood insurance policy premium discounts range from 0 percent to 45 percent depending on the community's floodplain management measures and activities.

The CRS recognizes measures for flood protection and flood loss reduction. The four main activity categories include Public Information, Mapping and Regulation, Flood Damage Reduction, and Flood Preparedness.

In order to participate in the CRS, a community must complete and submit an application to FEMA. Subsequently, FEMA reviews the community's floodplain management efforts and assigns the appropriate CRS classification based on credit points earned for various activities. A community's classification may change depending on the level of continued floodplain management efforts. Classifications range from

one to ten and determine the premium discount for eligible flood insurance policies. All community assignments begin at Class 10 with no premium discount. Communities with a Class 1 designation receive the maximum 45 percent premium discount.

The table below highlights the available CRS premium discounts organized by class and flood zone. In addition to the Rate Class of the, the discount amount also varies depending on whether the insured property is in a Special Flood Hazard Area (SFHA), or not.

CRS Premium Discounts by Class and Flood Zone

Rate Class	Discount for SFHA*	Discount for Non-SFHA**	Credit Points Required
1	45%	10%	4,500 +
2	40%	10%	4,000–4,499
3	35%	10%	3,500–3,999
4	30%	10%	3,500–3,499
5	25%	10%	3,000–2,999
6	20%	10%	2,500–2,499
7	15%	5%	1,500–1,999
8	10%	5%	1,000–1,499
9	5%	5%	500–999
10	0	0	0–499

* Special Flood Hazard Area

** Preferred Risk Policies are available only in B, C, and X Zones for properties that are shown to have a minimal risk of flood damage. The Preferred Risk Policy does not receive premium rate credits under the CRS because it already has a lower premium than other policies. Although they are in SFHAs, Zones AR and A99 are limited to a 5% discount. Premium reductions are subject to change.

Source: 2018 National Flood Insurance Program (NFIP) Community Rating System (CRS): A Local Official's Guide to Saving Lives, Preventing Property Damage, Reducing the Cost of Flood Insurance

As of October 2018, 13 communities in Ohio are currently participating in the CRS program. The table below shows their current class and status.

CRS Communities in Ohio

Effective October 1, 2018

STATE	COMMUNITY NUMBER	COMMUNITY NAME	CRS ENTRY DATE	CURRENT EFFECTIVE DATE	CURRENT CLASS	% DISCOUNT FOR SFHA[1]	% DISCOUNT FOR NON SFHA	STATUS[2]
OH	390183	Delta, Village of	10/1/1992	10/1/2016	8	10	5	C
OH	390038	Fairfield, City of	10/1/1993	10/1/1998	8	10	5	C
OH	390110	Highland Heights, City of	10/1/1991	10/1/1992	10	0	0	R
OH	390412	Kettering, City of	10/1/1995	10/1/2000	8	10	5	C
OH	390328	Licking County	10/1/1993	5/1/2009	7	15	5	C
OH	390378	Medina County	5/1/2007	5/1/2012	8	10	5	C
OH	390071	New Richmond, Village of	10/1/1992	10/1/2002	8	10	5	C
OH	390176	Obetz, Village of	10/1/1996	10/1/2016	10	0	0	R
OH	390737	Orange, Village of	10/1/1991	10/1/2016	7	15	5	C
OH	390472	Ottawa, Village of	10/1/1995	10/1/1995	9	5	5	C
OH	390432	Ottawa County	10/1/1992	10/1/1992	9	5	5	C
OH	390460	Preble County	10/1/1998	10/1/1998	9	5	5	C
OH	390479	Shelby, City of	10/1/1992	5/1/2012	8	10	5	C
OH	390131	South Euclid, City of	10/1/1991	10/1/2016	8	10	5	C
OH	390419	West Carrollton, City of	5/1/2002	5/1/2009	8	10	5	C

1. For the purpose of determining CRS discounts, all AR and A99 Zones are treated as non-SFHAs.
2. Status: C = Current, R = Rescinded

OCTOBER 2018 NFIP FLOOD INSURANCE MANUAL

Source: October 2018 NFIP Flood Insurance Manual, Appendix F

Risk MAP

Not only is flooding one of the most common and costly disasters, flood risk can also change over time because of new building and development, weather patterns and other factors. Although the frequency or severity of impacts cannot be changed, FEMA is working with federal, state, and local partners across the nation to identify flood risk and promote informed planning and development practices to help reduce that risk through the Risk Mapping, Assessment and Planning (Risk MAP) program

Risk MAP provides high quality flood maps and information, tools to better assess the risk from flooding and planning and outreach support to communities to help them take action to reduce or mitigate flood risk. Each Risk MAP flood risk project is tailored to the needs of each community and may involve different products and services.

Risk MAP outreach and discovery meetings in Ohio

The FEMA, ODRN, Ohio EMA and the Strategic Alliance for Risk Reduction hosted outreach and discovery meetings with local officials and the public to discuss floodplain mapping needs and potential mitigation projects on the following dates. Those meetings highlighted in black led directly to a Hazard Mitigation Assistance project being developed and funded.

2014

- **Cuyahoga County Pilot Meeting – 05/22/14**
- City of Columbus – 9/17/14
- Marion County – 9/18/14
- Delaware County 9/23/14
- City of Columbus – 12/9/14
- City of Reynoldsburg – 12/9/14
- Marion County – 12/10/14
- City of Marysville – 12/10/14

2015

- City of Miamisburg – 4/28/15
- City of Oxford – 4/29/15
- City of Eaton – 4/29/15
- City of Clayton – 4/30/15
- City of Hamilton – 4/30/15
- Shelby County – 6/30/15
- Sandusky County – 7/7/15
- Lake County – 7/7/15
- City of Westlake – 7/8/15
- City of Toledo – 7/9/15
- Tuscarawas County – 9/16/15 & 12/2/15
- Stark County – 9/16/15 & 12/1/15
- Mercer County – 11/4/15
- Summit County – 12/1/15
- Morrow County – 1/6/15
- Delaware County – 1/6/15
- City of Circleville – 1/7/15
- City of Hilliard – 1/7/15
- City of Eaton – 1/21/15
- Butler County – 1/21/15

2016

- Portage County – 7/27/16

2017

- **Summit County – 6/22/17**
- City of Troy – 8/8/17
- Coastal Map Meetings – Lucas, Ottawa, Erie, Lorain, Cuyahoga, Lake, Ashtabula – 11/28/17 thru 12/7/17

HAZARDS U.S.-MULTI-HAZARD (HAZUS-MH)

Ohio EMA cooperated with the US Army Corps of Engineers (USACE) to undertake a HAZUS analysis project under the USACE's Silver Jackets program. In this project, the USACE completed Level 2 flood analysis for 24 counties. The Corps analyzed Ashland, Ashtabula, Butler, Cuyahoga, Delaware, Fairfield, Franklin, Geauga, Greene, Hamilton, Lake, Licking, Mahoning, Medina, Montgomery, Pickaway, Portage, Richland, Stark, Summit, Warren, and Wayne Counties. The remainder of the state was done with a Level 1 analysis and was completed by Ohio EMA from 2017 to 2018. The analyses completed for all counties in the state included the 100-year and 25-year flood intervals. Results of these and other HAZUS-MH runs are shared with counties and jurisdictions when possible to assist in updating local mitigation plans.

The results of the HAZUS-MH runs have been broken down by region and are reported by county for total building exposure, number of structures impacted by percentage damaged, number of critical facilities impacted, total business interruption losses, and the total building loss (Tables 2.2.d, 2.2.e, 2.2.f, 2.2.g, 2.2.h, and 2.2.i). Tables ending in d, e, and f contain the results based on a 100-year event while g, h, and i contain the 25-year results. **It is important to remember all the information reported via the state's HAZUS-MH analyses is an estimate and cannot be interpreted as precise losses**. Future HAZUS analyses will include more refined property, flood, and topographic data to reduce this uncertainty.

RESULTS

Table 2.2.d

Table 2.2c Estimate of Potential Losses from Flooding in the 100-Year Event, Region 1*										
County	2010 Population	Building Exposure Value (thousands)	1-10% Damage Count	11-20% Damage Count	21-30% Damage Count	31-40% Damage Count	41-50% Damage Count	>50% Damage Count	Estimated Business Interrupt	Estimated Building Loss
Allen	106,331	$ 2,938,683	144	133	38	15	10	8	$ 125,540,000	$ 108,770,000
Auglaize	45,949	$ 1,263,355	68	72	33	15	6	3	$ 330,000	$ 70,570,000
Champaign	40,097	$ 993,906	73	30	1	0	0	0	$ 50,000	$ 22,590,000
Clark	138,333	$ 2,509,518	136	144	29	7	3	6	$ 122,410,000	$ 124,430,000
Crawford	43,784	$ 660,181	8	11	2	0	0	0	$ 15,030,000	$ 16,410,000
Darke	52,959	$ 1,340,402	40	20	4	1	1	5	$ 35,660,000	$ 50,680,000
Defiance	39,037	$ 1,187,341	12	17	11	2	5	7	$ 42,380,000	$ 49,550,000
Erie	77,079	$ 2,524,903	132	130	35	25	3	10	$ 145,000,000	$ 91,790,000
Fulton	42,698	$ 685,737	17	19	3	1	0	0	$ 19,900,000	$ 19,640,000
Hancock	74,782	$ 2,026,624	137	76	11	4	1	4	$ 181,950,000	$ 95,970,000
Hardin	32,058	$ 726,799	20	26	7	2	2	5	$ 23,080,000	$ 24,940,000
Henry	28,215	$ 983,530	30	12	1	0	0	0	$ 17,250,000	$ 19,710,000
Huron	59,626	$ 1,556,642	60	66	12	2	0	0	$ 26,200,000	$ 39,930,000
Logan	45,858	$ 1,325,213	69	55	13	3	0	0	$ 22,960,000	$ 29,120,000
Lucas	441,815	$ 9,520,884	376	414	138	63	46	75	$ 373,160,000	$ 530,890,000
Marion	66,501	$ 1,299,338	74	79	15	2	0	0	$ 43,990,000	$ 43,330,000
Mercer	40,814	$ 926,354	23	15	3	1	1	0	$ 17,540,000	$ 22,850,000
Miami	102,506	$ 3,131,471	400	463	188	79	34	18	$ 285,810,000	$ 285,920,000
Ottawa	41,428	$ 1,650,536	39	25	1	0	0	0	$ 21,740,000	$ 15,460,000
Paulding	19,614	$ 727,272	18	13	3	0	0	0	$ 8,980,000	$ 17,520,000
Preble	42,270	$ 1,455,992	63	80	16	3	1	1	$ 47,820,000	$ 86,270,000
Putnam	34,499	$ 1,124,245	47	57	15	3	1	0	$ 29,140,000	$ 43,590,000
Sandusky	60,944	$ 1,436,449	37	17	1	0	0	0	$ 16,950,000	$ 24,730,000
Seneca	56,745	$ 1,341,176	81	125	33	11	3	7	$ 65,430,000	$ 80,830,000
Shelby	49,423	$ 983,159	30	60	26	15	3	4	$ 28,120,000	$ 54,230,000
Van Wert	28,744	$ 680,518	37	41	8	4	2	0	$ 41,040,000	$ 32,330,000
Williams	37,642	$ 1,192,933	12	27	12	5	1	0	$ 26,340,000	$ 35,760,000
Wood	125,488	$ 4,489,872	625	178	23	5	1	2	$ 1,410,000	$ 124,400,000
Wyandot	22,615	$ 663,692	16	26	4	1	0	0	$ 23,680,000	$ 20,550,000

Table 2.2.e

Table 2.2d Estimate of Potential Losses from Flooding in the 100-Year Event, Region 2*										
County	2010 Population	Building Exposure Value (thousands)	1-10% Damage Count	11-20% Damage Count	21-30% Damage Count	31-40% Damage Count	41-50% Damage Count	>50% Damage Count	Estimated Business Interrupt	Estimated Building Loss
Ashland*	53,139	$ 676,389	174	49	37	20	20	92	N/A	$ 21,640,944
Butler*	368,130	$ 752,889	1064	365	177	78	3	33	N/A	$ 113,773,231
Clinton	42,040	$ 1,194,907	12	25	18	12	5	7	$ 26,790,000.00	$ 43,700,000
Cuyahoga*	1,280,122	$ 3,934,170	446	282	148	89	46	58	N/A	$ 220,686,769
Delaware*	174,214	$ 1,519,539	180	97	55	237	41	117	N/A	$ 331,691,349
Fairfield*	146,156	$ 1,177,309	504	323	189	148	86	208	N/A	$ 89,832,202
Fayette	29,030	$ 890,747	29	45	4	1	0	0	$ 21,830,000.00	$ 31,220,000
Franklin*	1,163,414	$ 4,144,131	1195	423	183	91	40	39	N/A	$ 93,598,477
Geauga*	93,389	$ 428,036	90	78	41	17	12	37	N/A	$ 23,147,161
Greene*	161,573	$ 1,099,886	206	104	41	22	26	52	N/A	$ 55,160,646
Hamilton*	802,374	$ 3,963,959	385	441	383	264	244	771	N/A	$ 739,490,735
Knox	60,921	$ 2,193,096	132	161	38	7	1	1	$ 201,930,000.00	$ 131,690,000
Lake*	230,041	$ 1,416,495	254	259	136	109	66	138	N/A	$ 84,988,502
Licking*	166,492	$ 1,521,162	640	461	183	104	70	157	N/A	$ 108,353,322
Lorain	301,356	$ 10,061,999	435	247	34	13	5	8	$ 501,730,000.00	$ 324,900,000
Madison	43,435	$ 1,335,970	50	64	9	1	0	0	$ 31,630,000.00	$ 31,690,000
Medina*	172,332	$ 713,878	225	172	144	61	26	77	N/A	$ 66,018,995
Montgomery*	535,153	$ 1,646,665	744	479	222	139	68	161	N/A	$ 197,349,805
Morrow	34,827	$ 920,900	9	12	0	0	0	0	$ 15,560,000.00	$ 13,260,000
Pickaway*	55,698	$ 1,182,662	61	22	11	10	0	16	N/A	$ 13,169,415
Portage*	161,419	$ 1,196,404	248	127	57	33	19	58	N/A	$ 28,462,660
Richland*	124,475	$ 466,770	211	146	70	51	23	93	N/A	$ 30,230,452
Stark*	375,586	$ 1,399,265	621	312	161	89	69	171	N/A	$ 116,659,799
Summit*	541,781	$ 1,933,070	614	252	114	48	36	105	N/A	$ 73,402,447
Union	52,300	$ 1,539,110	54	64	9	2	0	0	$ 120,000.00	$ 39,540,000
Warren*	212,693	$ 168,782	177	159	134	94	119	203	N/A	$ 31,784,842
Wayne*	114,520	$ 564,231	201	52	23	20	19	45	N/A	$ 21,676,031

** The figures provided for the specific county was a result of a HAZUS level 2 run done in collaboration with the US Army Corp of Engineers*

Table 2.2.f

Table 2.2e Estimate of Potential Losses from Flooding in the 100-Year Event Region 3*										
County	2010 Population	Building Exposure Value (thousands)	1-10% Damage Count	11-20% Damage Count	21-30% Damage Count	31-40% Damage Count	41-50% Damage Count	>50% Damage Count	Estimated Business Interrupt	Estimated Building Loss
Adams	28,550	$ 819,637	2	16	9	4	3	24	$ 24,130,000	$ 49,170,000
Ashtabula*	101,497	$ 95,107,200	146	91	49	45	38	217	N/A	$ 52,565,007
Athens	64,757	$ 3,090,060	103	378	224	102	50	72	$ 577,820,000	$ 847,830,000
Belmont	70,400	$ 1,654,807	32	118	84	41	23	25	$ 98,460,000	$ 132,800,000
Brown	44,846	$ 1,264,472	6	26	14	5	4	7	$ 25,990,000	$ 48,350,000
Carroll	28,836	$ 1,113,047	62	121	48	14	4	4	$ 87,810,000	$ 61,300,000
Clermont	197,363	$ 4,224,485	3	25	36	28	22	62	$ 236,870,000	$ 361,230,000
Columbiana	107,841	$ 2,277,996	26	63	22	8	2	3	$ 67,550,000	$ 105,060,000
Coshocton	36,901	$ 1,322,188	9	69	73	39	30	81	$ 167,820,000	$ 242,940,000
Gallia	30,934	$ 1,185,928	5	23	9	2	1	5	$ 43,060,000	$ 82,340,000
Guernsey	40,087	$ 1,775,911	38	140	41	15	7	27	$ 299,980,000	$ 265,770,000
Harrison	15,864	$ 649,649	14	61	16	4	2	0	$ 62,210,000	$ 44,760,000
Highland	43,589	$ 1,102,474	10	20	7	3	0	0	$ 24,920,000	$ 25,350,000
Hocking	29,380	$ 1,441,311	91	121	45	13	6	10	$ 95,880,000	$ 125,170,000
Holmes	42,366	$ 1,066,689	21	35	11	3	0	0	$ 64,600,000	$ 44,420,000
Jackson	33,225	$ 866,659	10	47	11	1	0	0	$ 65,000,000	$ 88,490,000
Jefferson	69,709	$ 1,710,340	28	153	74	21	5	2	$ 58,460,000	$ 97,500,000
Lawrence	62,450	$ 2,123,631	3	68	62	42	32	287	$ 127,390,000	$ 308,560,000
Mahoning*	238,823	$ 680,989	89	46	20	17	4	39	N/A	$ 17,951,013
Meigs	23,770	$ 836,887	1	23	22	8	5	4	$ 34,880,000	$ 65,520,000
Monroe	14,642	$ 447,990	0	3	0	0	0	0	$ 22,340,000	$ 22,990,000
Morgan	15,054	$ 706,463	14	19	8	4	4	5	$ 15,760,000	$ 31,170,000
Muskingum	86,074	$ 2,836,667	50	137	108	58	46	135	$ 192,490,000	$ 309,180,000
Noble	14,645	$ 543,754	2	22	10	3	0	1	$ 38,060,000	$ 38,140,000
Perry	36,058	$ 999,528	31	70	20	6	1	1	$ 66,990,000	$ 59,610,000
Pike	28,709	$ 1,269,590	14	71	32	10	1	9	$ 105,850,000	$ 109,830,000
Ross	78,064	$ 2,160,166	74	184	94	39	21	36	$ 81,710,000	$ 137,990,000
Scioto	79,499	$ 2,235,436	36	190	118	42	15	40	$ 162,570,000	$ 210,770,000
Trumbull	210,312	$ 4,827,376	211	346	174	74	38	43	$ 296,600,000	$ 445,240,000
Tuscarawas	92,582	$ 3,440,893	267	489	225	80	44	76	$ 396,730,000	$ 542,600,000
Vinton	13,435	$ 525,275	2	21	11	3	2	1	$ 23,360,000	$ 38,190,000
Washington	61,778	$ 2,286,270	22	51	38	28	21	53	$ 96,540,000	$ 215,390,000

** The figures provided for the specific county was a result of a HAZUS level 2 run done in collaboration with the US Army Corp of Engineers*

Table 2.2.g

Table 2.2f Estimate of Potential Losses from Flooding in the 25-Year Event Region 1*										
County	2010 Population	Building Exposure Value (thousands)	1-10% Damage Count	11-20% Damage Count	21-30% Damage Count	31-40% Damage Count	41-50% Damage Count	>50% Damage Count	Estimated Business Interrupt	Estimated Building Loss
Allen	106,331	$ 2,854,063	140	114	29	13	7	2	$ 111,210,000	$ 92,100,000
Auglaize	45,949	$ 1,234,816	67	61	23	12	4	5	$ 250,000	$ 57,080,000
Champaign	40,097	$ 947,343	61	17	0	0	0	0	$ 40,000	$ 20,030,000
Clark	138,333	$ 2,757,199	144	109	17	4	3	7	$ 196,720,000	$ 123,160,000
Crawford	43,784	$ 660,181	7	8	2	0	0	0	$ 9,980,000	$ 9,760,000
Darke	52,959	$ 1,168,586	30	10	1	1	0	2	$ 29,960,000	$ 40,440,000
Defiance	39,037	$ 1,207,280	10	15	9	3	1	3	$ 34,220,000	$ 37,320,000
Erie	77,079	$ 2,926,531	129	135	30	20	3	8	$ 144,610,000	$ 93,310,000
Fulton	42,698	$ 662,743	14	14	2	0	0	0	$ 18,510,000	$ 16,320,000
Hancock	74,782	$ 1,785,086	121	61	9	4	0	1	$ 84,640,000	$ 81,020,000
Hardin	32,058	$ 668,841	12	17	6	1	2	6	$ 17,950,000	$ 20,850,000
Henry	28,215	$ 1,018,557	29	12	2	0	0	0	$ 16,840,000	$ 19,000,000
Huron	59,626	$ 1,498,457	61	55	5	0	0	0	$ 22,870,000	$ 30,630,000
Logan	45,858	$ 1,245,991	70	48	4	2	1	1	$ 20,710,000	$ 24,440,000
Lucas	441,815	$ 9,314,928	519	395	96	60	26	87	$ 381,250,000	$ 465,690,000
Marion	66,501	$ 1,138,768	69	59	5	0	0	0	$ 33,910,000	$ 30,380,000
Mercer	40,814	$ 935,039	20	16	3	1	1	0	$ 17,090,000	$ 19,740,000
Miami	102,506	$ 2,971,411	427	420	138	48	23	8	$ 227,060,000	$ 231,300,000
Ottawa	41,428	$ 1,524,829	45	17	0	0	0	0	$ 21,380,000	$ 13,950,000
Paulding	19,614	$ 715,293	14	8	1	1	0	0	$ 8,370,000	$ 15,180,000
Preble	42,270	$ 1,474,208	60	66	12	4	0	1	$ 44,040,000	$ 74,350,000
Putnam	34,499	$ 1,124,245	36	49	8	1	0	0	$ 25,250,000	$ 33,240,000
Sandusky	60,944	$ 1,436,449	23	11	1	0	0	0	$ 12,990,000	$ 17,790,000
Seneca	56,745	$ 1,341,176	79	76	16	5	1	4	$ 46,560,000	$ 55,280,000
Shelby	49,423	$ 983,159	23	49	18	8	3	2	$ 19,970,000	$ 38,370,000
Van Wert	28,744	$ 680,518	36	31	7	4	2	0	$ 37,390,000	$ 26,870,000
Williams	37,642	$ 1,131,286	11	22	9	3	0	0	$ 20,980,000	$ 25,270,000
Wood	125,488	$ 4,465,175	532	169	27	9	0	0	$ 1,190,000	$ 109,970,000
Wyandot	22,615	$ 651,674	18	26	3	2	0	0	$ 21,750,000	$ 18,510,000

Table 2.2.h

Table 2.2g Estimate of Potential Losses from Flooding in the 25-Year Event Region 2*										
County	2010 Population	Building Exposure Value (thousands)	1-10% Damage Count	11-20% Damage Count	21-30% Damage Count	31-40% Damage Count	41-50% Damage Count	>50% Damage Count	Estimated Business Interrupt	Estimated Building Loss
Ashland*	53,139	$ 676,389	184	45	23	21	14	82	N/A	$ 17,946,325
Butler*	368,130	$ 752,889	1028	271	90	23	1	23	N/A	$ 65,543,481
Clinton	42,040	$ 1,194,907	10	23	17	9	5	3	$ 26,000,000	$ 38,490,000
Cuyahoga*	1,280,122	$ 3,934,170	422	253	107	58	21	43	N/A	$ 177,713,853
Delaware	174,214	$ 1,519,539	163	90	159	124	29	88	N/A	$ 125,570,218
Fairfield*	146,156	$ 1,177,309	526	293	165	106	90	136	N/A	$ 68,453,798
Fayette	29,030	$ 890,747	27	41	3	0	0	0	$ 19,990,000	$ 25,950,000
Franklin*	1,163,414	$ 4,144,131	1048	330	140	56	18	27	N/A	$ 65,380,387
Geauga*	93,389	$ 428,036	94	70	30	16	14	26	N/A	$ 18,474,542
Greene*	161,573	$ 1,099,886	208	72	27	23	18	36	N/A	$ 40,788,723
Hamilton*	802,374	$ 3,963,959	396	449	275	268	175	601	N/A	$ 592,195,632
Knox	60,921	$ 2,193,096	115	119	17	2	0	1	$ 238,890,000	$ 138,710,000
Lake*	230,041	$ 1,416,495	280	250	88	71	47	76	N/A	$ 59,442,599
Licking*	166,492	$ 1,521,162	731	356	173	76	36	92	N/A	$ 87,496,547
Lorain	301,356	$ 10,061,999	368	205	32	12	5	10	$ 451,210,000	$ 277,700,000
Madison	43,435	$ 1,335,970	46	39	5	0	0	0	$ 25,310,000	$ 23,660,000
Medina*	172,332	$ 713,878	238	160	142	43	24	63	N/A	$ 57,245,360
Montgomery*	535,153	$ 1,646,665	769	391	156	61	36	126	N/A	$ 157,825,299
Morrow	34,827	$ 920,900	10	10	0	0	0	0	$ 11,740,000	$ 9,990,000
Pickaway*	55,698	$ 1,182,662	57	17	8	6	3	9	N/A	$ 10,435,412
Portage*	161,419	$ 1,196,404	217	109	38	25	22	38	N/A	$ 21,273,296
Richland*	124,475	$ 466,770	231	119	62	25	23	61	N/A	$ 23,097,903
Stark*	375,586	$ 1,399,265	612	253	136	87	58	127	N/A	$ 91,000,581
Summit*	541,781	$ 1,933,070	595	192	100	36	30	79	N/A	$ 57,907,010
Union	52,300	$ 1,539,110	51	54	5	2	0	0	$ 110,000	$ 32,130,000
Warren*	212,693	$ 168,782	168	152	119	107	84	143	N/A	$ 25,556,553
Wayne*	114,520	$ 564,231	168	35	19	22	14	22	N/A	$ 12,835,621

** The figures provided for the specific county was a result of a HAZUS level 2 run done in collaboration with the US Army Corp of Engineers*

Table 2.2.i

Table 2.2h Estimate of Potential Losses from Flooding in the 25-Year Event Region 3										
County	2010 Population	Building Exposure Value (thousands)	1-10% Damage Count	11-20% Damage Count	21-30% Damage Count	31-40% Damage Count	41-50% Damage Count	>50% Damage Count	Estimated Business Interrupt	Estimated Building Loss
Adams	28,550	$ 806,742	3	13	6	5	3	14	$ 22,260,000	$ 41,910,000
Ashtabula*	101,497	$ 95,107,200	154	87	48	42	33	170	N/A	$ 42,246,950
Athens	64,757	$ 2,970,685	125	357	175	79	32	42	$ 506,850,000	$ 690,570,000
Belmont	70,400	$ 1,641,711	49	116	70	29	14	17	$ 86,970,000	$ 107,760,000
Brown	44,846	$ 1,244,527	9	23	14	7	3	6	$ 24,350,000	$ 42,760,000
Carroll	28,836	$ 1,086,010	63	114	38	9	2	2	$ 82,760,000	$ 55,760,000
Clermont	197,363	$ 3,738,842	6	35	29	19	13	24	$ 180,520,000	$ 256,070,000
Columbiana	107,841	$ 2,019,902	26	50	13	3	1	1	$ 52,930,000	$ 76,820,000
Coshocton	36,901	$ 1,240,157	25	97	64	32	19	56	$ 152,680,000	$ 204,830,000
Gallia	30,934	$ 1,096,469	9	26	6	0	0	6	$ 34,480,000	$ 62,330,000
Guernsey	40,087	$ 1,446,710	31	95	26	7	7	20	$ 225,380,000	$ 163,920,000
Harrison	15,864	$ 567,174	15	40	9	2	0	0	$ 53,950,000	$ 33,040,000
Highland	43,589	$ 1,046,063	11	19	6	2	0	0	$ 21,180,000	$ 20,590,000
Hocking	29,380	$ 1,459,252	57	138	46	12	5	4	$ 100,380,000	$ 137,860,000
Holmes	42,366	$ 977,093	12	15	1	0	0	0	$ 50,610,000	$ 25,440,000
Jackson	33,225	$ 812,675	4	31	5	0	0	0	$ 62,450,000	$ 78,220,000
Jefferson	69,709	$ 1,665,524	25	151	54	124	4	3	$ 48,950,000	$ 81,560,000
Lawrence	62,450	$ 2,022,620	11	89	64	32	39	228	$ 112,640,000	$ 276,560,000
Mahoning*	238,823	$ 680,989	94	37	19	7	3	22	N/A	$ 12,850,170
Meigs	23,770	$ 745,723	4	24	18	8	2	1	$ 22,020,000	$ 45,340,000
Monroe	14,642	$ 386,960	0	2	2	0	0	0	$ 18,680,000	$ 19,150,000
Morgan	15,054	$ 668,989	9	12	5	4	0	4	$ 13,700,000	$ 25,800,000
Muskingum	86,074	$ 2,555,694	34	125	84	43	25	80	$ 149,160,000	$ 212,790,000
Noble	14,645	$ 546,848	2	24	7	2	0	0	$ 39,150,000	$ 34,800,000
Perry	36,058	$ 995,375	33	65	25	4	2	0	$ 62,050,000	$ 56,240,000
Pike	28,709	$ 992,569	8	39	9	3	0	0	$ 47,200,000	$ 50,540,000
Ross	78,064	$ 1,881,596	70	135	47	23	10	16	$ 75,070,000	$ 102,110,000
Scioto	79,499	$ 2,112,517	40	204	84	21	10	23	$ 119,590,000	$ 175,340,000
Trumbull	210,312	$ 4,577,649	170	274	123	51	25	21	$ 255,790,000	$ 360,200,000
Tuscarawas	92,582	$ 3,125,095	180	417	146	46	30	49	$ 319,120,000	$ 409,460,000
Vinton	13,435	$ 563,827	4	23	6	3	0	0	$ 22,180,000	$ 29,540,000
Washington	61,778	$ 2,143,932	12	42	41	27	16	22	$ 95,080,000	$ 172,360,000

** The figures provided for the specific county was a result of a HAZUS level 2 run done in collaboration with the US Army Corp of Engineers*

STATE-OWNED AND STATE-LEASED CRITICAL FACILITIES VULNERABILITY ANALYSIS & LOSS ESTIMATION

The estimates for losses to state-owned and state-leased critical facilities were developed using the DAS-maintained databases. The structures deemed critical facilities in Appendix C, were intersected with the 1-percent annual chance floodplain. Because first-floor elevations have not been collected for these structures, estimated damages cannot be calculated via depth/damage curves. Instead, an exposure analysis was used to determine the number of critical facilities in the floodplain and the value of these structures. For State-owned critical facilities, the full value of building and contents were assessed. For State-leased critical facilities, only the content value was assessed. A project being implemented by DAS in 2019-2022 will collect lowest floor data for all state-owned structures, which will enable a more accurate vulnerability analysis in the next plan update. Table 2.2.j lists the number and value of critical facilities in the floodplain by county.

RESULTS

In Region 1, there are 366 critical facilities within the 100-year floodplain with a total owned/leased value of $326,276,310.

- 165 of these facilities were in Ottawa County valued at $87,812,602.
    - 52 of these 165 are owned or leased by the Ohio Adjutant General's Department with a total value of $57,636,943.
    - 98 of these 165 are owned or leased by the Ohio Department of Natural Resources with a total value of $28,553,259.
- Erie County, however, had a larger value of critical facilities in the floodplain at $154,276,447 with only 39 critical facilities.
    - 21 of these 39 critical facilities are owned/leased by the Ohio Department of Veteran Services with a total value of $147,257,900.
    - 16 of these 39 critical facilities are owned/leased by the Ohio Department of Natural Resources with a total value of $3,752,121.

In Region 2, there are 159 critical facilities within the 100-year floodplain with a total owned/leased value of $365,023,256.

- The vast majority of critical facilities in the floodplain were in Franklin County at 56 facilities worth $300,571,406.
    - 2 of these 56 are owned or leased by the Capitol Square Review Board with a total value of $190,242,623.
    - 13 of these 56 are owned or leased by the Ohio Department of Rehabilitation and Correction with a total value of $37,404,034.

In Region 3, there are 244 critical facilities within the 100-year floodplain with a total owned/leased value of $126,000,433.

- The majority of critical facilities in Region 3 are in Tuscarawas with 44 facilities worth $50,705,402.
    - 35 of these 44 structures are owned or leased by the Ohio Department of Transportation with a total value of $45,976,154.

Table 2.2.j

State-Owned and State-Leased Critical Facilities in 100-Year Floodplain								
Region 1			Region 2			Region 3		
County	Critical Facilities in Floodplain	Value of CF in Floodplain	County	Critical Facilities in Floodplain	Value of CF in Floodplain	County	Critical Facilities in Floodplain	Value of CF in Floodplain
Allen	6	$ 216,859	Butler	4	$ 678,145	Athens	23	$ 28,215,959
Auglaize	2	$ 1,100,630	Fairfield	9	$ 1,011,336	Belmont	9	$ 907,461
Champaign	19	$ 498,450	Fayette	1	$ 392,391	Brown	1	$ 910,920
Clark	7	$ 1,172,191	Franklin	56	$ 300,571,406	Clermont	12	$ 1,346,611
Defiance	5	$ 176,750	Greene	4	$ 995,000	Coshocton	1	$ 1,250,000
Erie	39	$ 151,849,185	Knox	2	$ 58,750	Gallia	5	$ 927,908
Fulton	4	$ 407,208	Licking	12	$ 9,843,704	Guernsey	4	$ 328,064
Hancock	1	$ 37,171	Lorain	2	$ 691,715	Harrison	7	$ 966,956
Huron	2	$ 817,929	Medina	3	$ 131,288	Highland	1	$ 39,235
Logan	3	$ 112,000	Montgomery	2	$ 56,558	Holmes	1	$ 14,832
Lucas	59	$ 52,802,770	Morrow	1	$ 25,000	Jackson	5	$ 2,631,673
Marion	3	$ 864,811	Pickaway	29	$ 18,986,141	Jefferson	4	$ 402,000
Ottawa	165	$ 87,812,602	Portage	1	$ 1,400,000	Meigs	4	$ 2,902,674
Putnam	1	$ 43,687	Richland	1	$ 206,250	Monroe	9	$ 683,055
Sandusky	7	$ 1,426,250	Summit	16	$ 5,640,781	Morgan	3	$ 152,797
Seneca	38	$ 26,155,953	Warren	16	$ 24,334,791	Muskingum	51	$ 2,779,869
Shelby	3	$ 53,600	**Total**	**159**	**$ 365,023,256**	Noble	8	$ 4,117,405
Williams	1	$ 572,714				Pike	7	$ 2,585,816
Wyandot	1	$ 155,550				Ross	23	$ 19,816,292
Total	**366**	**$ 326,276,310**				Scioto	4	$ 1,002,216
						Tuscarawas	44	$ 50,705,402
						Vinton	8	$ 342,675
						Washington	10	$ 2,970,613
						Total	**244**	**$ 126,000,433**