3.4 Dam/Levee Failure Risk Assessment

Hazard Description

According to the Mississippi Department of Environmental Quality's Dam Safety Regulations, a dam is defined as - Any artificial barrier, including appurtenant works, constructed to impound or divert water, wastewater, liquid-borne materials, or solids that may flow if saturated. All structures necessary to maintain the water level in an impoundment or to divert a stream from its course will be considered one dam. A levee is defined as an embankment built to prevent the overflow of a river.

Dam Categories

The Surface Water and Dam Safety Divisions of the Office of Land and Water Resources, Mississippi Department of Environmental Quality (MDEQ) develop regulations related to dam safety for the state. Dams are categorized according to what lies downstream, as well as the expected impact of a dam failure. The following is taken from regulations for dams in Mississippi that describe the dam categories:

Low Hazard (Category III, or Class A) – A class of dam in which failure would at the most result in damage to agricultural land, farm buildings (except residences), or minor roads.

High Hazard (Category I, or Class C) – A class of dam in which failure may cause loss of life, serious damage to residential, industrial, or commercial buildings; or damage to, or disruption of, important public utilities or transportation facilities such as major highways or railroads. Dams that meet the statutory thresholds for regulation that are proposed for construction in established or proposed residential, commercial, or industrial areas will be assigned this classification unless the applicant provides convincing evidence to the contrary. The term "High Hazard" does not speak to the quality of the structure, but rather the potential for loss of life or damage to property downstream in case of a failure.

Significant Hazard (Category II, or Class B) - A class of dam in which failure poses no threat to life, but may cause 4 significant damage to main roads, minor railroads, or cause interruption of use or service of public utilities.

Hazard Profile

The hazard profile for dam failure in Mississippi includes current statistics regarding dam/levee failures and safety regulations that have been adopted by the State. According to the Mississippi Department of Environmental Quality - Dam Safety Division, there are 6,867 dams in Mississippi, of which 414 are classified as either high or significant hazard class (**Figure 3.4.1**). It should be noted that the number of dams currently in the MDEQ inventory is significantly increased from 2018 (3,833). The MDEQ Dam Safety Division has been working to more thoroughly identify and accurately classify all dams in the State. It is also important to note that of the 6,867 dams identified, 1,470 remain unclassified or are classified as "Further Investigation

Needed". It is anticipated that the number of High Hazard and Significant Hazard dams will increase in coming years as these unclassified dams undergo further investigation.

As with other engineered systems, dams have a design lifetime. Private dams are likely to go without periodic maintenance essential to minimize failure. Despite a five-year inspection period for high-hazard dams, conditions may exist that have the potential to contribute to dam failure.

Catastrophic dam failure is characterized by the sudden, uncontrolled release of impounded water produced by either overtopping or a break in the dam. Lesser degrees of failure tend to lead up to or increase the risk of catastrophic failure. Catastrophic failure can often be avoided by frequent inspections, mitigation of adverse conditions, and routine maintenance.

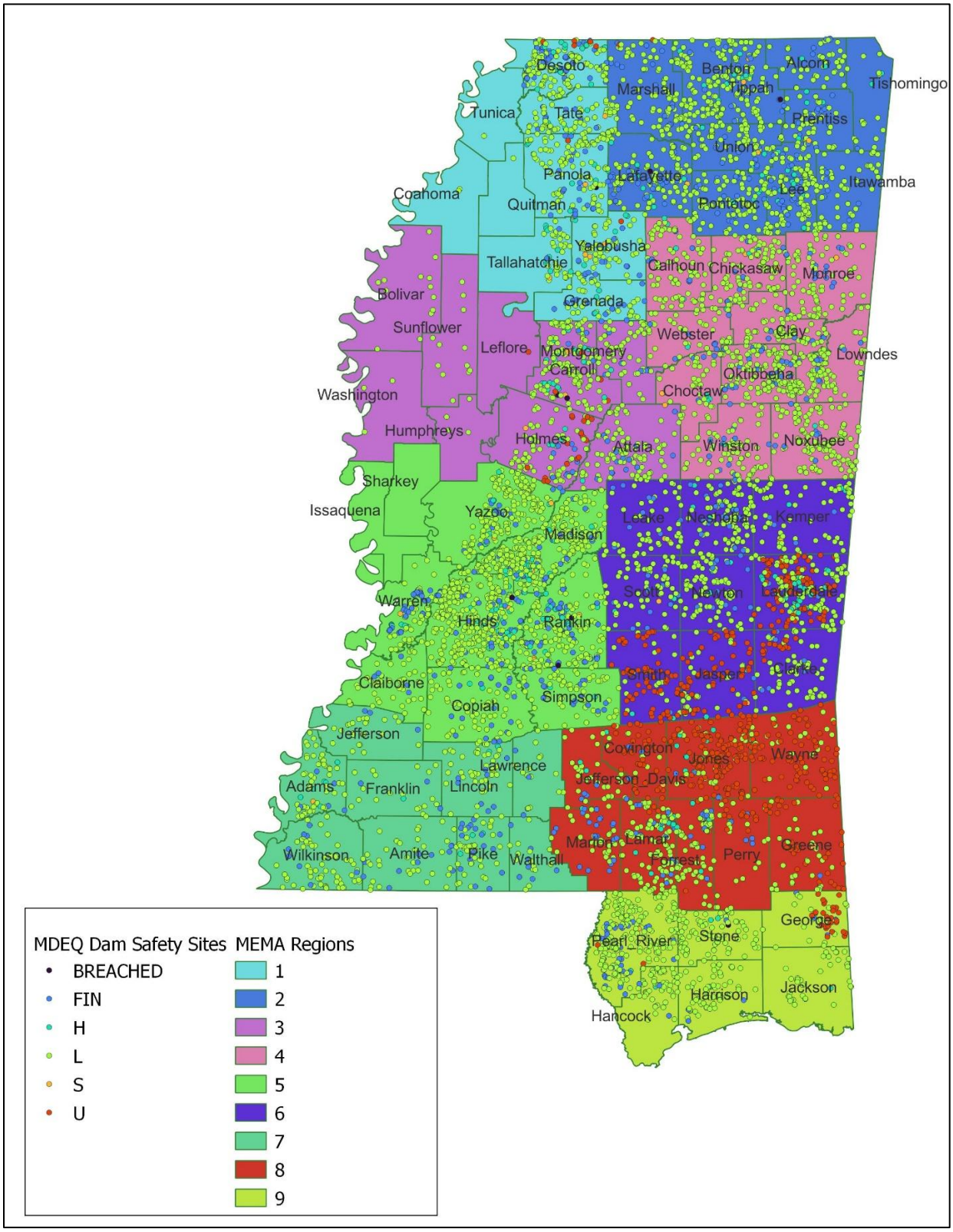
Mississippi's dam safety program is intended to minimize the risks posed by unsafe dams, the false sense of security that often arises from the presence of an upstream dam (no matter its function), and the tendency of localities and private landowners to develop areas that seem protected but that could be inundated if a dam fails.

Emergency Action Plans

Section 51-3-39 of the Mississippi Code of 1972 charges dam owners with responsibility for maintaining and operating their dams in a safe condition. Dam Safety Regulations adopted by the Mississippi Commission on Environmental Quality in 2004 require owners of High Hazard and Significant Hazard Dams to have their dams inspected by a registered professional engineer before March 2006. Additionally, the owners were required to prepare an Emergency Action Plan (EAP) for submission to MDEQ. Significant Hazard dams that may impact public infrastructure are also required to have EAPs in place.

The MDEQ Office of Land and Water Resources, Division of Dam Safety administers the state's dam safety program. This office conducts comprehensive file reviews and current hazard evaluations of all dams in their inventory. The Division's list of dams can be found in **Appendix 7.3.4-A**. This list includes dams consisting of at least 50 acres of surface drainage area. Any size dam can be determined to be "High Hazard".

Figure 3.4.1
Mississippi Dams



Source: MDEQ Dam Safety Division

Mississippi Floodplain Management

Mississippi has 5.2 million acres of high-risk flood zones, not counting the areas protected by certified levees. Mississippi has approximately 665 miles of major levees, which are generally located in the western border counties. All levees are constructed to provide a specific level of protection, such as the year or 500-year flood. The 500-year flood level plus the additional freeboard height is considered a minimum protection standard for levees protecting urban areas. If a flood occurs that exceeds that design, the levee will be overtopped or otherwise fail from saturation, leakage, etc. When this happens, the results are catastrophic. The threat of earthquakes also increases the risk of areas protected by levees.

Dam Failure vs Dam Incident

Dam incidents are events of engineering and safety interest that provide insight into the structural and functional integrity of dam systems and their operation. An incident does not necessarily result in a failure, but often failure is adverted by intervention. Since 2010, there have been 26 recorded incidents. There were 16 incidents at high or significant hazard dams, with three of those not being on the inventory at the time of the incident. At least eight incidents occurred at low hazard dams. At the time of the incident, two were not on the inventory. Since 2019, 47 incidents or failures have occurred. Of these incidents, 21 were categorized as failures, and 26 were categorized as incidents. Two of the dams were unclassified at the time of the incident, 17 were classified as High Hazard, 26 were classified as Low Hazard and 2 were classified as Significant Hazard dams.

Past Occurrences - Incidents

Robinhood #4 Dam Incident
Incident occurred on January 3, 2017 in Rankin County. Piping was caused by animals burrowing in the embankment.

Trace State Park Dam Incident
Incident occurred on November 26, 2016 in Pontotoc County. Major slide of working surface occurred.

Shahkoka Lake Dam Incident
Incident occurred on March 10, 2016 in DeSoto County. The incident is a result of sliding on the downstream slope.

Piney Woods Lake Dam Incident
Incident occurred on February 15, 2016 in Rankin County. This incident was a result of overtopping.

Delta Crest Lake Dam Incident
Incident occurred on February 1, 2016 in DeSoto County. This was a result of severe erosion under the primary spillway slab.

Oktibbeha County Lake Dam Incident
Incident occurred on January 29, 2016 as a result of a major slide on the upstream slope.

Truman Robert #1 Dam Incident
Incident occurred on November 20, 2015 in Forrest County. The incident occurred due to a failure of the CMP primary spillway.

Albritton Lake Dam Incident
Incident occurred on January 21, 2015 in Pearl River County. Failure of the abandoned CMP primary spillway is the

McCoy Lake Dam Incident
Incident occurred on April 15, 2014 in Simpson County. A slope failure incident led the owner to attempt a controlled breach.

Maximum Dam Failure Threat

The maximum threat to citizens of Mississippi from dam failure will not originate from state or privately-owned dams but from federal flood control structures such as the United States Corps of Engineers' Arkabutla, Sardis, Grenada, or Enid reservoirs. Simultaneous failure of these structures could occur due to an earthquake in the New Madrid Seismic Zone. It is also important to note that extensive flooding from states upstream that feed into the Mississippi River could also contribute to major flooding due to levee breaches. However, a scenario of a failure at Lake Arkabutla Dam is provided in the vulnerability assessment section.

When a dam has been designated as a High Hazard Dam Failure, Dam Safety Regulation, Title II: Part 7, Chapter 3, requires all owners of High Hazard and Significant Hazard Dams to have their dams inspected by a registered professional engineer at recurring intervals to be set by the division. All High Hazard dams must also have an Emergency Action Plan (EAP). EAPs may also be required for some Significant Hazard Dams. Guidelines for the inspections and the preparation of the EAPs can be accessed from the links located on MDEQ's website.

Past Occurrences – Dam Failure

Since 2013, MDEQ Dam Safety Division has recorded 41 breaches. **Table 3.4.2** shows all breaches that have occurred since 1982. It is important to note that some failures may not have been detected and reported.

Table 3.4.2
Dam Failures 1982 – 2022

Date	County	Structure Name	Cause of Failure
August 2022	Rankin	Easthaven Lake Dam	Flooding/Overtopping
August 2022	Hinds	Raymond Sewage Lagoon	Backslope erosion
August 2022	Rankin	Jones Lake Dam	Flooding/Overtopping
June 2021	Pearl River	MS04059	Unknown
June 2021	Carroll	Pellucia Creek WS Lake	Headcutting at auxiliary spillway
June 2021	Holmes	Black Creek WS Lake	Headcutting at auxiliary spillway
June 2021	Lafayette	Lake Tara Dam	Piping
May 2021	Winston	Lake Tiak O'Khata Dam	Seepage/Sloughing
April 2021	Madison	JF Jackson Lake Dam	Conduit/Infrastructure Collapse
April 2021	Stone	Hall Lake Dam	Pipe corrosion/piping failures
April 2021	Pearl River	Covered Bridge Lake Dam	Blocked spillway/overtopping/head cutting
April 2021	Marshall	Brown Lake Dam	Head cutting
April 2021	DeSoto	Fogg Road Dam	Overtopping, spillway blockage (beaver dam)
April 2021	Pearl River	Albritton Lake Dam	Overtopping caused by blocked conduit causing downstream slope erosion.
March 2021	Lauderdale	Highway 19 NOI	Overtopping/erosion
March 2021	Panola	Klepzig Lake Dam	Auxiliary spillway failure from beaver activity.
March 2021	Hinds	Linda Drive	Downstream slope seepage
July 2020	Madison	Lake Cavalier	Downstream slope erosion

Date	County	Structure Name	Cause of Failure
April 2020	Leake	MS06876	Overtopping/Erosion
April 2020	Rankin	Southern Acres Lake	Headcutting
February 2020	Itawamba	Biddle Lake Dam	Overtopping/Erosion
February 2020	Smith	Jennings Lake Dam #1	Spillway blockage (beavers)
February 2020	Madison	Lake Cavalier	Downstream slope erosion
February 2020	Yazoo	Springridge Place Dam	Spillway blockage lead to overtopping which caused scouring and erosion on the backslope.
February 2020	Leake	Blanche Street Pond Dam	Piping
February 2020	Leake	Bilbro Lake Dam	Overtopping
February 2020	Smith	Jennings Lake Dam #2	Overtopping caused by spillway blockage
January 2020	Lauderdale	Lakemont Lake Dam	Erosion around spillway
January 2020	Hinds	Holmes Lake Dam	Piping
January 2020	Lauderdale	Murphy Road Dam	Erosion and slope stability issues
January 2020	Oktibbeha	Oktibbeha County Lake	Surface erosion on downstream slope
January 2020	DeSoto	Dunn Lake Dam	Tree damage on the dam from a tornado
January 2020	Adams	Southwood Lodge Lake	Extreme headcut through spillway and overtopping
January 2020	Adams	Robins Lake Dam	Flooding/Overtopping
July 2019	Holmes	Black Creek WS Lake	Headcutting at auxiliary spillway
April 2019	Lauderdale	Mirror Lake Dam	Pipe separation causing internal erosion
February 2019	Lafayette	Audubon Pond Dam	Pipe separation causing internal erosion
February 2019	Panola	Hotopia Creek WS Lake	Insufficient spillway capacity
January 2019	Madison	MS06004	Unknown
December 2018	Jones	Flowers Lake Dam	Piping
December 2018	Jones	Francis Lowery Lake Dam	Slope erosion
September 2018	Carroll	Abiaca Creek WS 34-09	Beaver activity
September 2018	Carroll	Abiaca Creek WS 34-29	Animal burrowing
March 2018	Rankin	NOI	Piping
February 2018	Lauderdale	Reed Lake Dam	Piping
February 2018	Rankin	Piney Woods Lake Dam	Overtopping
January 2018	Forrest	Shelby Thames Lake Dam	Piping
June 2017	Wayne	Lirette Lake Dam	Unknown.
June 2017	Jones	Flowers Lake Dam	The primary spillway conduit which was made of 8' diameter fuel tanks partially collapsed and water exited the pipe and eroded the center of the embankment above the conduit
June 2017	Jones	Flowers Lake Dam	The primary spillway conduit which was made of 8' diameter fuel tanks partially collapsed and water exited the pipe and eroded the center of the embankment above the conduit
May 2017	Lamar	Gumpond Road Dam	Seepage/piping through animal burrows
May 2017	Pearl River	Catfish Lake Dam	Overtopping
May 2017	Smith	Vowell Lake Dam	Slide occurs in the center of the crest and downstream slope
April 2017	Forrest	Sharra Lake Dam	Partial failure of concrete chute spillway

Date	County	Structure Name	Cause of Failure
January 2017	Franklin	Gayle Evans Lake Dam	Spillway erosion
March 2016	Smith	Vowell Lake Dam	Piping around the primary spillway pvc and a slide that formed on the downstream slope of the dam
March 2016	Winston	Lake Tiak O Khata Dam	New area of seepage/piping
March 2016	Hinds	Regency Estates Lake Dam	During heavy rains, the reservoir filled to top of dam and began eroding around the siphon pipe causing significant damage
March 2016	Marion	Regency Estates Lake Dam	During heavy rains, the reservoir filled to top of dam and began eroding around the siphon pipe causing significant damage
February 2016	Rankin	Piney Woods Lake Dam	Overtopping cause large slide on the downstream slope at an area between the left abutment and the middle of the dam.
February 2016	Desoto	Delta Crest Subdivision Lake Dam	Piping/severe erosion under the primary spillway
January 2016	Oktibbeha	Oktibbeha County Lake Dam	Slide on the upstream slope near the right abutment
January 2016	Jones	Lonesome Pines Lake Dam	Piping approximately half way down downstream slope
December 2015	Itawamba	Biddle Lake Dam	Overtopping
November 2015	Forrest	Truman Roberts Number 1 Dam	Failure of primary spillway conduit (corrugated metal pipe)
November 2015	Hinds	Latham Pond Dam	Overtopping of a breach section constructed by the owner
July 2015	Pontotoc	Trace State Park Lake Dam	Major slide on the downstream slope just to the left of the outlet
May 2015	Monroe	Clark Lake Dam	Erosion around the primary spillway culvert in the left abutment (refer to picture taken in the file)
March 2015	Tate	Senatobia Lake Subdivision Dam	Failure of the primary spillway (cmp) that was previously filled with concrete
June 2014	Webster	Savannah Lake Dam	Through piping that began to headcut
April 2014	Warren	Silver Creek Dam	Headcut back through the earthen spillway during a large rain event
April 2014	Scott	Whiteway Farms Dam	Severe seepage through dam that will eventually lead to failure if the seepage areas are not repaired. At the time of inspection, seepage was estimated at 20-30 gpm but it did not appear that piping was occuring.
March 2014	Hancock	St Regis Paper Company Lake Dam	The area received 3-5" of rainfall which led to activation of the spillway with large flows that started a series of headcuts in the spillway channel.
October 2013	Lamar	Lake Serene North	Piping under the spilllway slab. Further investigation is taking place.
May 2013	Forrest	Noi	Corrosion and piping around riser and conduit

Date	County	Structure Name	Cause of Failure
May 2013	Jackson	Spring Lake Dam	Owner attempted to rebuild dam. Construction breached during heavy rain
January 2013	Adams	Robbins Lake Dam	Dam overtopped after a large rain event. Crest of dam was damaged and a large hole scoured out along the edge of the crest.
January 2013	Desoto	MF Harris Pond Dam	Seepage caused by trees and animal burrows
December 2012	Madison	Madison Baptist Fellowship Dam	Seepage due to animal burrows
August 2012	Pike	Percy Quinn	Large slides developed with seepage. Did not lead to uncontrolled release of pool.
August 2012	Wayne	Unknown	Failure around conduit. Exact cause unknown.
August 2012	Pearl River	Portie Dam	Heavy rains from Hurricane Isaac caused the dam to overtop and significant water backed up onto owners' property. A slide occurred near the center of the dam. A superficial crack formed on the dam.
August 2012	Pike	Percy Quinn	Large slides developed with seepage. Did not lead to uncontrolled release of pool.
August 2012	Lamar	Lake Serene Southeast Dam	Large slide on downstream face of dam. Did not lead to uncontrolled release of pool.
January 2010	Jones	Lake Getaway	A plane of weak clay, failure to mix layers well during construction and poor maintenance
April 2005	Hinds	Dennery Lake	Seepage, piping, biological growth caused section near center of dam to erode away
2005	Desoto	Allen Subdivision Lake	Animal penetration, causing dam to breach
June 2004	Hinds	Lake Dockery	Animal penetration. Dam failed near center. Controlled breach continued at the failed section
2004	Lamar	Bennett York	Dam owner attempted to lower water level by controlled breach but lost control
May / June 2004	Hinds	Lake Dockery	Piping
April 2004	Pearl River	Dove Lake	Piping
March 2004	Lamar	Big Bay Lake	Piping
February 2004	Yazoo	Dr. Freeman Lake	Piping
February 2004	Simpson	Peacock Lake	Overtopping
September 2003	Warren	Lake Forrest	Piping
July 2003	Lamar	Emmit Graves	Piping
May 2003	Lauderdale	Wild Duck Lake	Piping
April 2003	Lauderdale	Lake Evelyn	Piping
January 2003	Madison	Andover South	Piping
December 2002	Lafayette	Royal Oaks	Piping
October 2002	Harrison	Windy Hills Lake	Piping along primary spillway conduit
September 2002	Madison	Andover South	Piping
September 2002	Pike	Lake Dixie Springs	Overtopping
August 2002	Lauderdale	State Hospital Lake	Poor overall condition

Date	County	Structure Name	Cause of Failure
July 2002	Lafayette	Horseshoe Lake	Massive slides, erosion on downstream slope, leading to dam breach
April 2002	Carroll	Billups Dam	Piping
March 2002	Lauderdale	Lake Tom Bailey	Deterioration for primary concrete spillway
February 2002	Panola	Unnamed Dam	Piping along primary spillway leading to dam breached
January 2002	Lauderdale	John Kasper Lake	Excessive seepage leading to dam breach
July 2001	Lamar	Bridgefield	Massive slides on downstream face leading to dam breach
May 2001	Madison	Francis Calloway	Piping leading to dam being breached
May 2001	Madison	Robinson Springs	Overtopping
March 2001	Lamar	West Lake First Addition	Piping leading to dam being breached
January 2001	Hinds	Turtle Lake	Piping leading to dam being breached
September 2000	Warren	Lake Haven	Animal penetration
April 2000	Hinds	Whites Lake	Piping/Breached
May 1995	Lauderdale	Vise Lake Dam	Sand boils - problem with longevity of dam
January 1995	Panola	Lake Village Dam	Spillway Failure
November 1994	Hinds	Spring Lake	Spillway Failure
April 1994	Desoto	Strickland Lake	Breached by Regulators
July 1993	Jones	Indian Springs Lake	Breached
December 1991	Benton	Porter Creek	Breached
June 1989	Leflore	Abiaca Creek	Breached
April 1984	Hinds	Lakeview Lake	Breached
April 1984	Hinds	Lake Larue	Breached by Design
March 1984	Lauderdale	Dalewood Shores	Minor Breach
March 1984	Panola	Pine Lake	Breached
March 1984	Forrest	Burketts Creek	Breached
March 1984	Forrest	West Lake	Overtopped
March 1984	Rankin	Ross Barnett Reservoir	Sandbags on Levee
May 1983	Hinds	Jackson County Club	Breached
May 1983	Leake	State Highway 35	Overtopped
April 1983	Leflore	Pelucia Bayou	Breached
April 1983	Pearl River	Anchor Lake	Breached
April 1983	Adams	Robins Lake	Breached
April 1983	Hancock	Boy Scout Camp	Breached
April 1983	Lamar	Lake Serene	Spillway Out
December 1982	Leflore	Pelucia Bayou	Overtopped

Source: MDEQ Dam Safety Division

Dam Failures

MF Harris Dam Failure
Failure occurred on January 10, 2013 in DeSoto County. Seepage caused by trees and animal burrows.

Silver Creek Dam Failure
Failure occurred on April 6, 2014 in Warren County. Headcut back through the earthen spillway during a large rain event.

Truman Roberts Number 1 Dam Failure
Failure occurred on November 20, 2015 2013 in Forrest County. Failure of primary spillway conduit (corrugated metal pipe)

Gayle Evans Lake Dam Failure
Failure occurred January 19, 2017 in Franklin County. Failure occurred due to spillway erosion.

Flowers Lake Dam Failure

Failure occurred on June 6, 2017 in Jones County. The primary spillway conduit which was made of 8' diameter fuel tanks partially collapsed and water exited the pipe and eroded the center of the embankment above the conduit

Probability of Future Dam Failure Events

In each subsequent plan update, the probability of dam failure was considered high due to the State's reduced inspection capabilities, potentially resulting in a series of dam failures. Through subsequent plan updates, MDEQ has continued to update policies, regulations, and data relative to dams in Mississippi. These policy improvements allow the state to more effectively track each known location and monitor conditions more closely to better understand when and where failures are likely to occur. Dam breach evaluations have been completed for some, but not all high hazard dams. As further analysis are completed, those studies will be utilized.

While the structural weakness of a dam is apparent from outside observation, sudden dam failure that occurs during normal operations, with the water level at full supply and the water released causing the largest change in flows is called a sunny day failure. It may be caused by foundation failure, earthquakes, or another such event. This scenario normally refers to internal erosion (piping) failure. There are ways to evaluate the imminent failure of a structure, but these do not always provide the information needed to foretell future events. State policies that have been promulgated to provide for a periodic inspection period require five-year inspections for "high hazard" dams.

Levee Failures

The Great Flood of 1927 unleashed a series of catastrophic events along the banks of the Mississippi River. The flooding was a result of heavy rainfall across the Central U.S. starting in August 1926 and continuing through the spring of 1927. The weather system stalled over the Midwest resulting in record rainfalls for the region. The region's expanding tributaries caused the Mississippi River to overflow in eleven states from

Illinois to Louisiana. That same system brought heavy rainfall to the Yazoo-Mississippi Delta, an alluvial plain located in northwest Mississippi.

After several months of heavy rain, the Mississippi River reached record levels, causing a levee to break in Illinois on April 16th. On April 21st, the levee in Mounds Landing, Mississippi breached. This levee lay below the confluence of the Mississippi and Arkansas Rivers, approximately 12 miles north of Greenville, Mississippi. Greenville was flooded the next day. The combination of record rainfalls and the levee breach caused over one million acres of Mississippi land to be inundated with ten feet of water. The entire levee system collapsed soon after the initial levee breach at Mounds Landing. The Mississippi Delta received some of the worst damage, with water as high as 30 feet in some areas. It took nearly two months for flood waters in the Delta to recede. Figure 3.4.2 on the following page is a map showing the inundated area. The map also shows the levee breaks that occurred along the Mississippi River. Finally, in August 1927 that the last of the floodwaters flowed into the Gulf of Mexico.

This 1927 flood resulted in significant impacts on people and property in the Midwest and Southeast United States, including:

- The loss of more than 246 lives,
- flood damage to hundreds of cities, towns, and villages,
- displacement of over 700,000 people,
- inundation of over 1,800 square miles,
- The loss of 1.5 million farm animals,
- Economic losses amounting to many hundreds of millions of dollars,
- Suspension of interstate freight and passenger traffic,
- Disruption of telegraph and telephone communications,
- Disruption of the United States postal service, and
- A significant disruption of industry and commerce.

As a result of this disaster, on May 15, 1928, Congress passed a general flood control act that allowed the federal government to assume the cost and oversight of levee construction and outlined the policy of the federal government assuming the construction of levees necessary for the protection of the valley.

The 1927 flood resulted in property damage estimated at $350 million, equivalent to approximately $5 billion today. Economic losses were estimated at $1 billion (1927 dollars), which was equivalent to almost one-third of the federal budget at that time.

Some examples of levee failures along the Mississippi River before the General Flood Control Act of 1928 are recounted by Walter Sillers below:

- In 1882, the entire line of levees in Bolivar County, about 85 miles, seemed to snap in a hundred places in one night, during a terrible storm on the night of February 28th, and the whole county was under water.
- A section of the levee a mile long caved into the river just south of the town of Prentiss in 1865, and other levees, north and south, in Bolivar County, either caved in or broke; and as the stage of water was high for that day, a disastrous overflow swept over the country, drowning stock, sweeping away

fences, destroying crops, and carrying destruction and disaster in its wake.

- A private levee along Lake Vermillion from Lake Beulah to Neblett's Landing was adopted as a part of the main levee system, instead of the abandoned levee. Despite all the work and care given to the levee proper, there were many breaks in it – 1867, 1882, 1874, and 1897. A break occurred in the Catfish Point Levee in 1890, causing the entire Point with its improved plantations to be thrown outside the levee and abandoned. The most disastrous of all was in 1912 in which the water was the highest on record and caused a disastrous break in the levee four miles below Beulah.
- In 1922, the closure of the Cypress Creek levees on the Arkansas side of the Mississippi River raised the flood line to the extent that carries the water over the top of the Mississippi Levees from Kentucky Ridge to Mound Landing, causing a desperate struggle and a vast expenditure of money to top it off and hold it against the increased flood line of the river.
- In 1926, Bolivar County was operating under the second Flood Control Act of 1923, under which act all the levee boards contributed one-third of the cost of construction of the levees and maintained the works after they were constructed.

The Mississippi River Flood of 1927 was the nation's greatest natural disaster. The National Safety Council estimated deaths in the Yazoo-Mississippi Delta at 1,000. In Mississippi, it directly affected an estimated population of 185,495. A total of 41,673 homes were flooded; 21,836 buildings were destroyed; 62,089 buildings were damaged; 2,836 work animals, 6,873 cattle, 31,740 hogs, and 266,786 poultry were drowned. An entire crop year was lost. A major outcome of the 1927 flood, which had an impact in eleven states, was the National Flood Control Act of 1928 passed by the U. S. Congress.

Figure 3.4.2

Greenville, MS (Washington Co.) – April 30, 1927

Cary (Sharkey Co.) – May 1, 1927

Downtown Greenville, MS (Washington Co.) – April 30, 1927

Egremont (Sharkey Co.) – May 2, 1927

Onward (Sharkey Co.) – May 2, 1927

Valley Park (Issaquena) – May 2, 1927

Source: National Museum of African American History and Culture

Assessing Vulnerability to Dam Failure

Dam and levee failures have the potential to result in loss of life and property. However, loss of life is the primary concern in assessing vulnerability to dam and levee failure. For this reason, a dam is classified as a high hazard if only one life is at-risk due to inundation in the event of a failure. Structures of all types are vulnerable to damage if waters are released due to dam or levee failure. In many cases, a dam or levee failure results in property damage that may not be returned to pre-incident levels.

Each year, there are several dam failures in Mississippi, and probably an equal number of dams are breached under controlled conditions to avoid the possibility of a sudden failure. Some dam failures in the state have caused significant property damage. However, it is important to note that there have been no fatalities in Mississippi attributable to a dam failure.

Damages from Flooding as a Result of Dam Failure

Flooding, while a by-product of a dam or levee failure, is the primary force causing injury, death, and property damage. Damages due to flooding will affect both man-made and natural systems.

Vulnerability of People

Dam classifications are subject to change over time as development downstream increases the potential risk of a dam failure. Homeowners generally are not able to conduct routine site inspections of a dam potentially impacting their property and may not detect warning signs of an imminent failure.

When water is released from a breached dam, its course and destination can become unpredictable. The National Weather Service will generally issue a Flash Flood Warning in the event of a dam failure. A dam failure's effect on property, human health and welfare, and public infrastructure represents widespread vulnerabilities because of the number of existing dams in the state.

Vulnerability of Natural Resources

Water that is impounded loses its dissolved oxygen. When a dam empties into a watercourse, fish in the watercourse suffocate and die as a result of a lack of biologically dissolved oxygen. Silt is often at the bottom of a dam impoundment and will enable water-borne bacteria and microbes to grow in an environment free of the cleansing action of sunlight. Mining operations utilize dams to impound tailings and may include processed water, process chemicals, and portions of unrecovered minerals, all of which are toxic to aquatic and human life. This does not imply that dams are a hazard to people and the environment, but water-borne minerals and water without aeration need to remain impounded behind a dam.

Assessing Vulnerability by County

When assessing vulnerability, all dams must be considered, regardless of hazard classification. Any residential structure built in an inundation area of a dam may justify a change in the dam's classification. Information obtained for the 2023 update indicates that 62 of Mississippi's 82 counties contain high or significant hazard dams reflecting an increase of four counties from the 2018 update. To date, there are approximately 6,872 inventoried dams in the State of Mississippi. The breakdown of hazard types is as follows:

Overall inventory of Dams		
	2018	**2023**
High Hazard Dams	361	361
Significant Hazard Dams	59	53
Unclassified Hazard Dams	828	665
Low Hazard Dams	3,564	4,916
Further Investigation Needed	49	881
Total	**5,300**	**6,876**

A county summary by MEMA Region is provided in **Table 3.4.3** and Table **3.4.4**. lists the top ten counties in the total number of dams. Significant work from the MDEQ Dam Safety Division has increased the total number of dams in the State's inventory. The table below depicts the differences from the 2018 plan update to the 2023 plan update.

Total Number of Dams per Region		
District	**2018**	**2023**
1	575	596
2	846	947
3	290	443
4	498	937
5	1,215	1,357
6	740	927
7	168	371
8	435	741
9	533	557
Total	**5,300**	**6,876**

Table 3.4.3
Dam Inventory by County/MEMA Region

MEMA District 1												
	2018						2023					
County	**S**	**H**	**L**	**U**	**FIN**	**Total**	**S**	**H**	**L**	**U**	**FIN**	**Total**
Coahoma	0	0	2	0	0	2	0	0	2	0	0	2
DeSoto	1	21	112	0	51	185	1	24	120	5	54	204
Grenada	0	3	32	0	22	*57*	0	3	32	0	20	55
Panola	1	9	95	1	23	129	1	9	95	1	23	129
Quitman	0	0	1	0	0	1	0	0	1	0	0	1
Tallahatchie	2	10	32	0	2	46	1	11	35	0	2	49
Tate	1	4	65	0	8	78	1	4	65	0	8	78
Tunica	0	0	1	0	0	1	0	0	1	0	0	1
Yalobusha	3	7	50	3	13	76	3	8	53	1	12	77
Total	**8**	**54**	**390**	**4**	**119**	**575**	**7**	**59**	**404**	**7**	**119**	**596**

MEMA District 2												
	2018						2023					
County	**S**	**H**	**L**	**U**	**FIN**	**Total**	**S**	**H**	**L**	**U**	**FIN**	**Total**
Alcorn	0	1	27	0	8	36	0	2	43	0	6	51
Benton	0	4	62	16	0	82	0	3	88	0	4	95
Itawamba	0	0	30	24	1	55	0	0	54	0	7	61
Lafayette	1	14	94	4	35	148	1	12	98	1	35	147
Lee	0	14	66	38	21	139	0	17	104	0	26	147
Marshall	0	0	79	0	14	93	0	0	85	2	15	102
Pontotoc	1	7	42	53	0	103	1	8	77	0	17	103
Prentiss	0	3	13	7	6	29	1	4	37	0	12	54
Tippah	3	4	50	10	5	72	2	7	68	0	11	88
Tishomingo	0	2	4	0	1	7	0	2	15	0	1	18
Union	1	4	33	44	0	82	1	4	65	0	11	81
Total	**6**	**53**	**500**	**196**	**91**	**846**	**6**	**59**	**734**	**3**	**145**	**947**

MEMA District 3												
	2018						2023					
County	S	H	L	U	FIN	Total	S	H	L	U	FIN	Total
Atalla	1	2	44	6	1	54	1	1	88	0	14	104
Bolivar	0	0	14	0	0	14	0	0	14	0	0	14
Carroll	4	23	86	0	5	118	4	24	114	4	5	151
Holmes	1	5	39	2	9	56	1	4	64	16	12	97
Humphreys	0	0	4	0	0	4	0	0	4	0	0	4
Leflore	0	0	0	1	0	1	0	0	0	1	0	1
Montgomery	0	2	22	2	2	28	0	2	48	0	7	57
Sunflower	0	0	12	0	0	12	0	0	12	0	0	12
Washington	0	0	3	0	0	3	0	0	3	0	0	3
Total	**6**	**32**	**224**	**11**	**17**	**290**	**6**	**31**	**347**	**21**	**38**	**443**

MEMA District 4												
	2018						2023					
County	S	H	L	U	FIN	Total	S	H	L	U	FIN	Total
Calhoun	0	4	52	0	0	56	0	4	79	0	10	93
Chickasaw	2	1	65	0	2	70	2	1	88	0	10	101
Choctaw	0	4	5	0	0	9	1	4	37	0	5	47
Clay	0	0	40	0	9	49	1	0	66	0	9	76
Lowndes	0	2	49	0	5	56	0	2	86	0	13	101
Monroe	1	0	52	0	24	77	1	0	77	0	16	94
Noxubee	2	0	32	0	0	34	1	1	123	0	8	133
Oktibbeha	1	1	73	0	0	75	1	1	134	0	25	161
Webster	0	1	21	0	0	22	0	2	40	0	8	50
Winston	0	1	44	0	5	50	0	2	67	0	12	81
Total	**6**	**14**	**433**	**0**	**45**	**498**	**7**	**17**	**797**	**0**	**116**	**937**

MEMA District 5												
	2018						2023					
County	S	H	L	U	FIN	Total	S	H	L	U	FIN	Total
Claiborne	0	1	20	20	0	41	0	1	43	0	5	49
Copiah	0	4	26	3	1	34	0	3	62	0	22	87
Hinds	3	34	183	136	3	359	3	26	285	0	38	352
Madison	10	30	208	48	10	306	5	31	262	0	26	324
Rankin	2	30	94	49	19	194	3	26	131	0	38	198
Simpson	0	2	32	12	7	53	0	2	58	0	18	78
Warren	1	7	28	11	4	51	1	6	46	0	38	91
Yazoo	2	4	153	1	17	177	2	7	153	0	16	178
Total	**18**	**112**	**744**	**280**	**61**	**1215**	**14**	**102**	**1040**	**0**	**201**	**1357**

MEMA District 6												
	2018						2023					
County	S	H	L	U	FIN	Total	S	H	L	U	FIN	Total
Clarke	0	0	59	15	9	83	0	0	61	15	7	83
Jasper	1	3	21	20	2	47	2	2	27	70	3	104
Kemper	1	3	42	34	1	81	1	3	72	0	4	80
Lauderdale	2	32	87	98	4	223	1	26	104	95	3	229
Leake	2	0	18	6	2	28	2	0	47	0	10	59
Neshoba	1	2	56	45	11	115	0	3	89	0	23	115
Newton	1	3	51	34	5	94	0	3	77	0	14	94
Scott	1	2	29	9	1	42	1	2	65	0	11	79
Smith	0	3	14	10	0	27	0	3	16	64	1	84
Total	**9**	**48**	**377**	**271**	**35**	**740**	**7**	**42**	**558**	**244**	**76**	**927**

MEMA District 7												
	2018						2023					
County	S	H	L	U	FIN	Total	S	H	L	U	FIN	Total
Adams	0	5	33	1	2	41	1	6	49	0	6	62
Amite	0	0	15	0	2	17	0	0	36	0	12	48
Franklin	0	1	11	0	4	16	0	1	18	0	3	22
Jefferson	0	0	18	0	0	18	0	0	25	0	3	28
Lawrence	0	0	10	0	2	12	0	0	13	0	4	17
Lincoln	0	1	13	0	0	14	0	2	43	0	8	53
Pike	0	0	6	0	6	12	0	3	33	0	17	53
Walthall	0	0	6	0	2	8	0	0	14	0	7	21
Wilkinson	0	0	29	0	1	30	0	0	58	0	9	67
Total	**0**	**7**	**141**	**1**	**19**	**168**	**1**	**12**	**289**	**0**	**69**	**371**

MEMA District 8												
	2018						2023					
County	S	H	L	U	FIN	Total	S	H	L	U	FIN	Total
Covington	1	1	5	15	0	22	1	1	11	37	2	52
Forrest	1	7	68	2	12	90	1	8	3	68	15	95
Greene	2	0	26	0	2	30	2	0	32	33	2	69
Jefferson Davis	0	2	20	3	3	28	0	2	28	0	6	36
Jones	0	6	21	40	2	69	0	7	30	131	4	172
Lamar	0	14	84	2	21	121	0	10	94	2	15	121
Marion	0	2	12	1	7	22	0	2	29	0	22	53
Perry	0	0	20	0	5	25	0	1	20	16	5	42
Wayne	0	0	28	0	0	28	0	0	28	73	0	101
Total	**4**	**32**	**284**	**63**	**52**	**435**	**4**	**31**	**275**	**360**	**71**	**741**

MEMA District 9												
	2018						2023					
County	S	H	L	U	FIN	Total	S	H	L	U	FIN	Total
George	1	0	18	0	4	23	0	0	21	28	4	53
Harrison	0	1	56	0	2	59	0	1	64	0	3	68
Hancock	0	1	63	0	3	67	0	1	56	0	2	59
Jackson	0	1	37	0	1	39	0	1	37	0	0	38
Pearl River	1	3	207	2	37	250	1	2	206	2	35	246
Stone	0	3	90	0	2	95	0	3	88	0	2	93
Total	**2**	**9**	**471**	**2**	**49**	**533**	**1**	**8**	**472**	**30**	**46**	**557**

Source: MDEQ Dam Safety Division (S – Significant Hazard; H – High Hazard; L – Low Hazard; U – Unclassified; FIN – Further Investigation Needed)

Table 3.4.5
Top Ten Counties in Total Number of Dams

County	S	H	L	U	FIN	Total
Hinds	3	26	285	0	38	352
Madison	5	31	262	0	26	324
Pearl River	1	2	206	2	35	246
Lauderdale	1	26	104	95	3	229
DeSoto	1	24	120	5	54	204
Rankin	3	26	131	0	38	198
Yazoo	2	7	153	0	16	178
Jones	0	7	30	131	4	172
Oktibbeha	1	1	134	0	25	161
Carroll	4	24	114	4	5	151

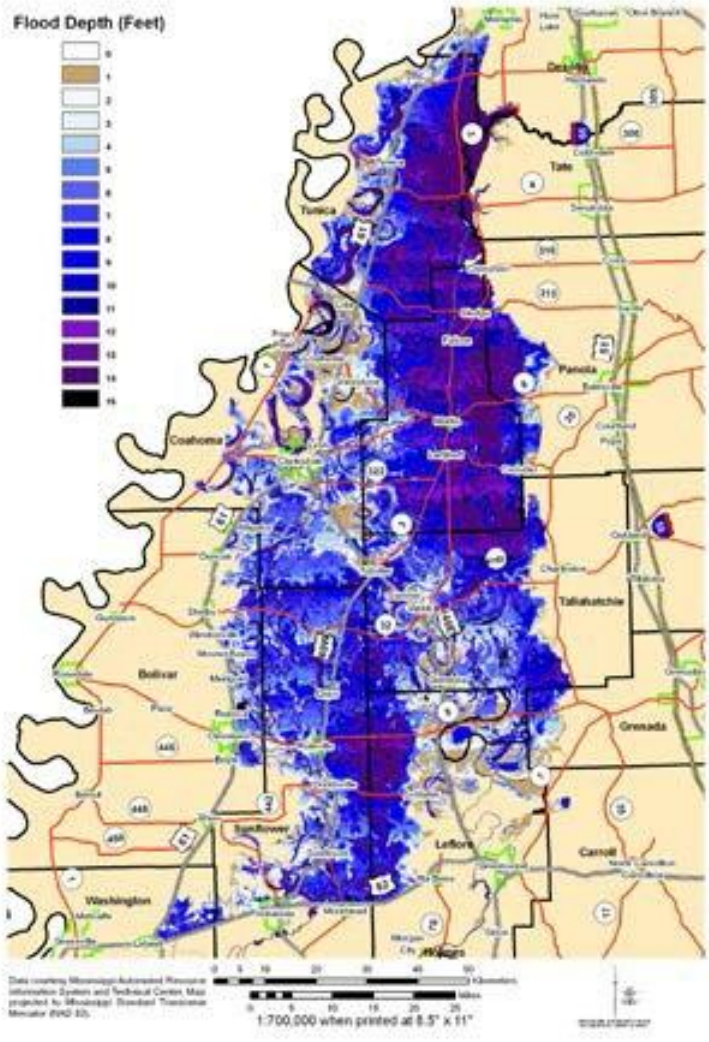
Source: MDEQ Dam Safety Division

When assessing the categories of the dams, in addition to the standard Significant, High, and Low, there is Unclassified, and Further Investigation Needed (FIN). **FIN** means that the dams are unclassified and need additional analysis or field checks. **U** signifies that the dam is unclassified. There were a group of dams under MDEQ purview that failed from 2017 – 2022. Outside engineers were hired to conduct assessment reports for inspections.

Lake Arkabutla Dam Failure Scenario

To assess dam failure, a multi-county scenario was developed. The scenario remains the same as the previous plans (2010, 2013, and 2018). The failure of Lake Arkabutla Dam is still considered the worst-case scenario. The Lake Arkabutla Dam failure scenario indicates that water from a dam failure originating in Desoto County and ending in Leflore County would take 45 days to travel to the Sunflower River and would result in significant damage to private and public properties. Because the movement of water would be slowed in its journey to the Sunflower River, there would be sufficient warning to people downstream to enable evacuation. Although it may be difficult to predict in specifics, it is estimated that deaths could be in the hundreds because of the length of time water would public infrastructure including potential evacuation routes. The disruption to business and the costs of recovery would range in billions of dollars. Figure 3.4.3 depicts flooding that could be expected as a result of a Lake Arkabutla Dam Failure.

Figure 3.4.3
Lake Arkabutla Dam Failure Scenario



Local Plan Risk Assessment Summary

Below is a summary of the risk classification in the individual local mitigation plans by MEMA Region.

MEMA Region	Low	Medium	High	MEMA Region	Low	Medium	High
1	-	-	-	6	-	9	-
2	-	-	-	7	9	-	-
3	8	1		8	-	-	-
4	-	-	-	9	6	-	-
5	16	31	-				