

Dam Failure

General

A dam is defined as an artificial barrier with the ability to impound water, wastewater, or any liquid-borne material, for the purpose of storage or control of water. A dam failure is a catastrophic type of failure characterized by the sudden, rapid, and uncontrolled release of impounded water or the likelihood of such an uncontrolled release. It is recognized that there are lesser degrees of failure, and that any malfunction or abnormality outside the design assumptions and parameters that adversely affects a dam's primary function of impounding water is properly considered a failure. These lesser degrees of failure can progressively lead to or heighten the risk of a catastrophic failure. Dam failures are usually a secondary effect of massive rainfall and flooding, and occur when too much water enters the spillway system. This will occur with little or no warning. Spring thaws, severe thunderstorms, and heavy rainfall are also contributory factors. Additionally, poor engineering or poor maintenance may also cause dam failures. According to the Federal Emergency Management Agency, dams can fail for one or a combination of the following reasons:

- overtopping caused by floods that exceed the capacity of the dam;
- deliberate acts of sabotage;
- structural failure of materials used in dam construction;
- movement and/or failure of the foundation supporting the dam;
- settlement and cracking of concrete or embankment dams;
- piping and internal erosion of soil in embankment dams; and
- inadequate maintenance and upkeep.

The Pennsylvania Department of Environmental Protection and the U.S. Army Corps of Engineers award permits for dams and share inspection responsibilities. Inspection results are characterized as either safe or unsafe. Dams are evaluated on categories, such as slope instability, excessive seepage, and inadequate spillways.

The National Inventory of Dams is a registry that captures information about structures that are greater than or equal to 25 feet in height or impounding 50-acre-feet or more of water (an acre-foot is equal to 325,851 gallons of water), and also includes structures above six feet in height, where failure would potentially cause damage downstream. The dams are classified in terms of hazard potential as "high," "significant," or "low," with high-hazard dams requiring Emergency Action Plans. There is only one dam in Juniata County that is registered with the U.S. Army Corps of Engineers in the National Inventory of Dams. The Licking Creek Dam is a low-hazard dam and does not require an Emergency Action Plan (EAP).

Juniata County Dam Inventory						
Dam Name	River	Owner Name	Year Completed	Drainage Area	Hazard	EAP Completed
Licking Creek	Licking Creek	Mifflintown Municipal Authority		24	L	

Source: National Inventory of Dams

History

The National Performance of Dams Program, which maintains a database of failures for all dams listed in the National Inventory of Dams, lists no occurrences of dam failure or major incidents occurring at the dam in Juniata County. While dam failures are mostly minor and cause little damage, Pennsylvania has experienced severe dam failures. The National Performance of Dams Program lists 19 dam failures in Pennsylvania since 1889. The worst dam failure experienced in the Commonwealth was in Johnstown in 1889. The resulting flood claimed 2,209 lives and resulted in an estimated \$3.5 million in damage.

Vulnerability

There is always the possibility any dam could fail, however, the probability is low. According to the Pennsylvania Emergency Management Agency (PEMA), minor dam failures occur every year, but their impact is minimal. Usually, they are gradual, low-volume releases that are unexpected and do not cause loss of life or damage to the environment. Juniata County only has one recorded dam and it is a low-hazard dam. Therefore, the County has a relatively low vulnerability to dam failures.

Dams assigned the significant-hazard potential classification are those where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, or disruption of lifeline facilities, or can impact other concerns. Significant-hazard potential classification dams are often located in predominantly rural or agricultural areas, but could be located in areas with population and significant infrastructure. Dams assigned the high-hazard potential classification are those where failure or mis-operation will probably cause loss of human life.

Probability

There is always the possibility that a dam could fail. However, the probability of a significant dam failure occurring in Juniata County is low. Minor failures occur annually, but have little to no impact. Dam failures are most often a secondary effect of another hazard, such as severe weather, flooding, hurricanes and tropical storms, and severe winter weather.

Maximum Threat

Juniata County is home to one dam recorded with the National Inventory of Dams. It is a low-hazard dam not requiring an EAP. The greatest threat for a dam failure in Juniata County would occur at the Licking Creek Dam.

Secondary Effects

Should a severe dam failure occur at the Licking Creek Dam, a large amount of water would enter riverbeds and overflow the stream banks for miles. A dam failure could cause a power failure or other utility failures. Significant environmental damages might occur as a result of the flooding from the dam failure releasing debris and hazardous materials. Debris could block roads, bridges, and culverts, causing flooding, transportation accidents, and economic and financial damages due to necessary business closings. The economic and financial impact from damage and recovery could range from minimal to severe, depending on the magnitude of damage and scale of the failure.