

## Drought

### General

Drought can be broadly defined as a time period of prolonged dryness that contributes to the depletion of ground and surface water. There are three types:

**Meteorological Drought** – a deficiency in moisture in the atmosphere. This will have very little effect on the crops and water supply, depending on the preceding conditions.

**Agricultural Drought** – inhibits the growth of crops, because of a moisture deficiency in the soil. This type of drought, if persistent, can lead to a hydrologic drought.

**Hydrologic Drought** – a prolonged period of time without rainfall that can have adverse effects on agriculture, streams, lakes, and groundwater levels.

Leaving areas with little moisture, droughts are often one of the leading contributing factors to wildfires.

The effects of drought are:

- a depletion of consumable water supply
- a depletion of agricultural water supply
- a depletion of forest water and water used to fight forest fires
- a depletion of water for navigational and recreational purposes
- a depletion of water for natural irrigation (besides crops and forests)
- poor water quality

Droughts can have adverse effects on farms and other water-dependent industries. This can result in a local economic loss. From a citizen perspective, public safety is an issue in terms of consumable water not being available, as well as water for fire protection and emergency services.

Drought preparation includes three phases: drought watch, drought warning, and drought emergency.

### **History**

Data collected from several disparate sources shows that Perry County has experienced several periods of drought conditions over the last few decades. The Pennsylvania Emergency Management Agency (PEMA) maintains data on all state and federally declared disasters affecting the Commonwealth. A review of PEMA's disaster history indicates that Perry County has experienced two declared drought events from 1963 to 2002. While both droughts required a gubernatorial proclamation of a state of disaster emergency, the drought of 1999 was the most severe, resulting in an agricultural disaster which affected all 67 counties of the Commonwealth.

**Table C.2  
Perry County Drought Event History**

<b>Date</b>	<b>Type</b>	<b>Affected Area</b>	<b>Action</b>
February 2002	Drought, Water Shortage	Adams, Bedford, Berks, Bucks, Carbon, Chester, Cumberland, Dauphin, Delaware, Franklin, Fulton, Huntingdon, Lancaster, Lebanon, Lehigh, Montgomery, Monroe, Northampton, Perry, Philadelphia, Pike, Schuylkill, Wayne and York counties	Governor Mark S. Schweiker; Governor's Proclamation -
July 1999	Drought	Adams, Allegheny, Beaver, Bedford, Berks, Blair, Bradford, Bucks, Cambria, Cameron, Carbon, Centre, Chester, Clearfield, Clinton, Columbia, Cumberland, Dauphin, Delaware, Fayette, Franklin, Fulton, Greene, Huntingdon, Indiana, Perry, Lackawanna, Lancaster, Lawrence, Lebanon, Lehigh, Luzerne, Lycoming, Perry, Monroe, Montgomery, Montour, Northampton, Northumberland, Perry, Philadelphia, Pike, Potter, Schuylkill, Snyder, Somerset, Sullivan, Susquehanna, Tioga, Union, Washington, Wayne, Westmoreland, Wyoming, and York	Governor's Proclamation, Individual Assistance, Hazard Mitigation Grant Program - Amended to include all 67 counties for an agricultural disaster
July 1991	Drought	Adams, Bedford, Blair, Bradford, Cambria, Cameron, Carbon, Centre, Clearfield, Clinton, Columbia, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Perry, Lackawanna, Lancaster, Lebanon, Luzerne, Lycoming, Perry, Monroe, Montour, Northumberland, Perry, Pike, Potter, Schuylkill, Snyder, Somerset, Sullivan, Susquehanna, Tioga, Union, Wayne, Wyoming, and York	Governor's Proclamation

**Source: Pennsylvania Emergency Management Agency (PEMA)**

A further examination of drought data obtained from the National Climatic Data Center (NCDC) between January 1, 1950 and January 31, 2013 shows that Perry County experienced six recorded drought events and one period of unseasonably dry weather. While this data differs slightly from records maintained by PEMA, there is some correlation, specifically in relation to the droughts of July 1999 and September of 1995. While the PEMA data more accurately reflects *declared* drought disasters in the Commonwealth, the NCDC data provides an indication of the *impact* these events had on the County relative to residents, property, and local economic vitality. While none of these events resulted in injury or loss of life to County residents, or caused significant property damage to any County structures, the drought of July 1999 did result in an estimated \$500 million in crop damage among 35 affected counties in the Commonwealth, including Perry.

The data obtained by the NCDC also provides a more detailed understanding of the existing weather conditions and impact to Perry County for the seven recorded events.

The drought of 1995 started in August with a one-month period of drought conditions for several Commonwealth counties, including Perry. Unseasonably dry weather continued into September 1995, with two consecutive months of below-normal precipitation, and culminated in one of the driest springs on record for the Poconos and the Middle Susquehanna Valley. In September 1995, the drought continued unabated throughout eastern Pennsylvania for the first half of September. Rainfall was closer to normal during the second half of the month; however, most counties had about 75 percent of their normal rainfall. The rain came too late to help farmers and by the end of the month, most of eastern Pennsylvania was under a drought emergency.

Harrisburg set a record for the longest period without measurable precipitation – 28 days – from August 10 through September 7 of 1995. September started dry and a drought warning was declared by the Pennsylvania Department of Environmental Protection for all of Eastern Pennsylvania on September 1, 1995. On September 14, 1995, the Susquehanna River Basin Commission declared a drought warning. On September 20, 1995, the drought warning was upgraded to a drought emergency for all of eastern Pennsylvania except Perry, Dauphin, Lebanon, Cumberland, York and Lancaster Counties. It was the first drought emergency declared in Pennsylvania since July 1991. Mandatory restrictions were in place concerning water use on lawns, gardens, golf courses, paved surfaces, water fountains and vehicles. Preliminary crop losses caused by the drought were estimated at \$300 million statewide. Corn yields averaged 106 bushels per acre, versus a normal of 120 bushels per acre. Soybean yields averaged 40 bushels per acre, versus a normal of 60 bushels per acre. In alfalfa fields, there were three cuttings instead of four. The lack of water took its toll on livestock, although the greatest damage was done during the oppressive heat wave in the middle of July 1995.

The drought of October 1997 occurred as the growing season drew to a close. Forty-six counties, including Perry, and their contiguous neighbors were declared agricultural disaster areas by the U.S. Department of Agriculture. Farmers in all Pennsylvania counties became eligible for disaster relief. Precipitation deficits for the growing season from April through October ranged from -1.6 inches in Cumberland County to a disastrous -8.5 inches in York County.

The drought of December 1998 was the result of abnormally dry conditions through the months, which developed into a drought across all of central Pennsylvania by mid-December. Former Governor Tom Ridge declared drought emergency conditions in nine central Pennsylvania counties and drought warnings in others, calling for restrictions on water use and reduced water consumption of 10 to 15 percent. Precipitation departures from normal for the four months leading up to the declaration totaled more than eight inches in a number of locations, with nearly all areas in deficit by more than four inches. Bans were placed on outdoor burning, as numerous woodland and brush fires occurred across the region.

The drought of July 1999 caused Governor Ridge to declare a drought emergency in 55 of the 67 counties of Pennsylvania, following extended dry weather through much of the summer. Water usage was restricted. Precipitation deficits for many counties for the months of May through July averaged between five and seven inches. Precipitation departures for the 365 day period ending in mid-July were over one foot below normal in many places. This is about one-third of total annual normal precipitation in most areas. Streams were empty, wells dried up, and the Susquehanna River hit record low flows. Hot, sunny days combined with the dry weather to take a large toll on crops. Preliminary estimates by the U.S. Department of Agriculture indicated possible crop losses in excess of \$500 million. Some counties experienced 70-100 percent crop loss. The \$500 million figure did not include a 20 percent decrease in milk production due to the drought that would also result in several million dollars in losses. In August 1999, the drought emergency remained in effect for all 55 affected counties. In spite of severe flash flooding in a few locations and normal or above normal precipitation in many others, water tables remained low and water usage was restricted.

**Vulnerability**

Drought vulnerability depends on the duration and area of impact. However, other factors contribute to the severity of a drought. Unseasonably high temperatures, prolonged winds, and low humidity can heighten the impact of a drought. Droughts are not uncommon in this area. According to the Pennsylvania Department of Environmental Protection, Perry County has been included in 45 state drought declarations. Nine of these have been classified as a drought emergency, thirteen have been drought warnings, and twenty-two have been drought watches.

Several public water suppliers have made major improvements to their systems over the past several years, by incorporating systems to utilize river water, and drilling of additional wells.

Perry County completed a Countywide Water supply Study in July of 1999. This study identifies existing water systems, water demands, water supply alternatives, and a recommended plan to address shortfalls.

With seven droughts affecting Perry County in the past 18 years, the threat of drought conditions is high, occurring every five to six years. The Commonwealth Water Plan and the Perry County Water Management Study has addressed many of the shortfalls and provided guidance and recommendations for mitigation.

During these periods of drought conditions, the County Emergency Management Office, in cooperation with the Commonwealth, has assisted public water suppliers with guidance and recommendations of approved water uses. Several municipalities have declared water emergencies during periods of decreased yield.

The Perry County Commissioners have appointed a Drought emergency Task Force which monitors water suppliers, drought conditions, and makes recommendations during times of declared drought emergencies. This Task Force reports directly to the Commonwealth on a monthly basis with drought conditions in the county.

**Probability**

**Table C.3  
Perry County Drought Status History  
(1980-2012)**

<b>Date</b>	<b>Drought Status</b>	<b>Date</b>	<b>Drought Status</b>
Nov 18, 1980 - Apr 20, 1982	Emergency	Dec 14, 1998 - Dec 16, 1998	Warning
Apr 26, 1985 - Jul 29, 1985	Watch	Dec 16, 1999 - Feb 25, 2000	Watch
Jul 29, 1985 - Oct 22, 1985	Watch	Jan 15, 1999 - Mar 15, 1999	Warning
Oct 22, 1985 - Oct 29, 1985	Watch	Mar 15, 1999 - Jun 10, 1999	Watch
Oct 29, 1985 - Dec 19, 1985	Watch	Jun 10, 1999 - Jun 18, 1999	Warning
Jul 7, 1988 - Aug 24, 1988	Watch	Jul 20, 1999 - Sep 30, 1999	Emergency
Aug 24, 1988 - Dec 12, 1988	Warning	Sep 30, 1999 - Dec 16, 1999	Watch
Mar 3, 1989 - May 15, 1989	Watch	Dec 16, 1999 - Feb 25, 2000	Watch
Jun 28, 1991 - Jul 24, 1991	Warning	Feb 25, 2000 - May 5, 2000	Watch
Jul 24, 1991 - Aug 16, 1991	Emergency	Aug 8, 2001 - Aug 24, 2001	Watch

Aug 16, 1991 - Sep 13, 1991	Emergency	Aug 24, 2001 - Nov 6, 2001	Watch
Sep 13, 1991 - Oct 21, 1991	Emergency	Nov 6, 2001 - Dec 5, 2001	Warning
Oct 21, 1991 - Jan 16, 1992	Emergency	Dec 5, 2001 - Feb 12, 2002	Warning
Jan 17, 1992 - Apr 20, 1992	Emergency	Feb 12, 2002 - May 13, 2002	Emergency
Apr 20, 1992 - Jun 23, 1992	Warning	May 13, 2002 - Jun 14, 2002	Warning
Jun 23, 1992 - Sep 11, 1992	Warning	Jun 14, 2002 - Aug 9, 2002	Watch
Sep 11, 1992 - Jan 15, 1993	Watch	Sep 5, 2002 - Nov 7, 2002	Emergency
Sep 1, 1995 - Sep 20, 1995	Warning	Apr 11, 2006 - Jun 30, 2006	Watch
Sep 20, 1995 - Nov 8, 1995	Warning	Aug 8, 2007 - Sep 5, 2007	Watch
Nov 8, 1995 - Dec 18, 1995	Watch	Oct 5, 2007- Jan 11, 2008	Watch
Jul 17, 1997 - Oct 27, 1997	Watch	Jan 11, 2008 Feb 15, 2008	Watch
Oct 27, 1997 - Nov 13, 1997	Watch	Sep 16, 2010-Nov 10, 2010	Watch
Dec 3, 1998 - Dec 8, 1998	Watch	Aug 5, 2011-Sep 2, 2011	Watch
Dec 8, 1998 - Dec 14, 1998	Warning		

**Source: PA Department of Environmental Protection  
Watershed Management Drought Information Center**

The potential for a drought to occur in Perry County is high. According to DEP, during the time period from 1980-2006, there were only eight years in which Perry County did not experience drought conditions. During all other years on record, the County experienced a drought watch, drought warning, or drought emergency. Due to the frequency of drought conditions over this 26-year period, it is logical to assume that the potential for drought is significant in any given year. While some form of drought condition exists frequently in Perry County, the impact depends on the duration of the event, severity of conditions, and area affected.

Drought and drought conditions creating water shortages are likely to increase in frequency as well as severity with increasing water demands by various residential, industrial, and agricultural consumers. The growing trend for irrigation is of particular concern since the demand for irrigation usually increases as normal water supply decreases.

### **Maximum Threat**

With 36.4 percent of the County devoted to farming, the greatest threat to Perry County is to commercial and family farm operations, agriculture-dependent industries and businesses, and outlying rural areas of the County. The impact drought has on these areas ultimately affects the financial and economic vitality of the County.

### **Secondary Effects**

Wildfire is the most severe secondary effect associated with drought. Wildfires can devastate wooded and agricultural areas, threatening natural resources and farm production facilities. Prolonged drought conditions can cause major ecological changes, such as increases in scrub growth, flash flooding, and soil erosion.

Long-term water shortages can have a high impact on agribusinesses, hydropower-dependent utilities, and other industries reliant on water for production services. Drought can cause municipalities to enforce water rationing and distribution. This strains the availability of consumable water for the community. It also increases Perry County's vulnerability to other hazards such as

severe weather, extreme heat, and public health emergencies. The special needs population of any county also must be considered during drought conditions.