

## **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.

<b>Drought Preparation Phases</b>				
	<b>General Activity</b>	<b>Actions</b>	<b>Request</b>	<b>Goal</b>
Drought Watch	Early stages of planning and alert for drought possibility	Increased water monitoring, awareness, and preparation for response among government agencies, public water suppliers, water users, and the public	Voluntary water conservation	Reduce water use by 5%
Drought Warning	Coordinate a response to imminent drought conditions and potential water shortages	Reduce shortages, relieve stressed sources, develop new sources if needed	Continue voluntary water conservation, impose mandatory water use restrictions if needed	Reduce water use by 10-15%
Drought Emergency	Management of operations to regulate all available resources and respond to emergency	Support essential and high priority water uses and avoid unnecessary uses	Possible restrictions on all nonessential water users	Reduce water use by 15%

Source: PA Department of Environmental Protection

**History**

Data collected from several disparate sources shows that Juniata 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 Juniata County has experienced two declared drought emergencies 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.

<b>Juniata County Drought Event History</b>			
<b>Date</b>	<b>Type</b>	<b>Affected Area</b>	<b>Action</b>
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, Juniata, Lackawanna, Lancaster, Lawrence, Lebanon, Lehigh, Luzerne, Lycoming, Juniata, 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, Juniata, Lackawanna, Lancaster, Lebanon, Luzerne, Lycoming, Juniata, 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 March 31, 2007 shows that Juniata County experienced six recorded drought events. While this data differs 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 a more complete inventory of drought events.

<b>Juniata County Drought Event History</b>	
<b>Date</b>	<b>Time</b>
8/1/1995	Not recorded
9/1/1995	Not recorded
10/31/1997	8:00 AM
12/15/1998	12:01 AM
7/1/1999	12:00 AM
8/1/1999	12:01 AM

**Source: National Climatic Data Center (NCDC)**

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

The drought of 1995 started in August with a one-month period of drought conditions for several Commonwealth counties, including Juniata. In September 1995, the drought continued unabated throughout eastern Pennsylvania. Rainfall was closer to normal during the second half of the month; however, most counties had about 75 percent of their normal rainfall.

On September 14, the Susquehanna River Basin Commission declared a drought warning. On September 20, 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.

The drought of October 1997 occurred as the growing season drew to a close. Forty-six counties, including Juniata, 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 prompted 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 counties. In spite of the 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.

According to the Pennsylvania Department of Environmental Protection, Juniata County has been included in 44 statewide declared droughts since 1980. The County has been issued a drought watch 24 times, 13 drought warnings, and 7 drought emergencies during this time period. Juniata County is currently under an October 2007 issued drought watch.

<b>Juniata County Drought Status History (1980-2007)</b>			
<b>Date</b>	<b>Drought Status</b>	<b>Date</b>	<b>Drought Status</b>
Nov 18, 1980 - Apr 20, 1982	Emergency	Dec 3, 1998 - Dec 8, 1998	Watch
Apr 26, 1985 - Jul 29, 1985	Watch	Dec 8, 1998 - Dec 14, 1998	Watch
Jul 29, 1985 - Oct 22, 1985	Watch	Dec 14, 1998 - Dec 16, 1998	Warning
Oct 22, 1985 - Oct 29, 1985	Watch	Dec 16, 1999 - Feb 25, 2000	Watch
Oct 29, 1985 - Dec 19, 1985	Watch	Jan 15, 1999 - Mar 15, 1999	Warning
Jul 7, 1988 - Aug 24, 1988	Watch	Mar 15, 1999 - Jun 10, 1999	Watch
Aug 24, 1988 - Dec 12, 1988	Warning	Jun 10, 1999 - Jun 18, 1999	Warning
Mar 3, 1989 - May 15, 1989	Watch	Jul 20, 1999 - Sep 30, 1999	Emergency
Jun 28, 1991 - Jul 24, 1991	Warning	Sep 30, 1999 - Dec 16, 1999	Watch
Jul 24, 1991 - Aug 16, 1991	Emergency	Dec 16, 1999 - Feb 25, 2000	Watch
Aug 16, 1991 - Sep 13, 1991	Emergency	Feb 25, 2000 - May 5, 2000	Watch
Sep 13, 1991 - Oct 21, 1991	Emergency	Aug 8, 2001 - Aug 24, 2001	Watch
Oct 21, 1991 - Jan 16, 1992	Emergency	Aug 24, 2001 - Nov 6, 2001	Watch
Jan 17, 1992 - Apr 20, 1992	Emergency	Nov 6, 2001 - Dec 5, 2001	Watch
Apr 20, 1992 - Jun 23, 1992	Warning	Dec 5, 2001 - Feb 12, 2002	Warning
Jun 23, 1992 - Sep 11, 1992	Warning	Feb 12, 2002 - May 13, 2002	Warning
Sep 11, 1992 - Jan 15, 1993	Watch	May 13, 2002 - Jun 14, 2002	Warning
Sep 1, 1995 - Sep 20, 1995	Warning	Aug 8, 2002 - Sep 5, 2002	Watch
Sep 20, 1995 - Nov 8, 1995	Warning	Sep 5, 2002 - Nov 7, 2002	Warning
Nov 8, 1995 - Dec 18, 1995	Watch	Apr 11, 2006 - Jun 30, 2006	Watch
Jul 17, 1997 - Oct 27, 1997	Watch	Aug 8, 2007 - Sep 5, 2007	Watch
Oct 17, 1997 - Nov 13, 1997	Watch	Oct 5, 2007 - Jan 11, 2008	Watch

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

### **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.

Data collected from DEP on the Commonwealth's declared drought status indicates that from November 6, 1980 to the present, Juniata County has experienced 44 occasions where the County's declared drought status was above the normal level.

### **Probability**

The probability of a drought occurring in Juniata County is high. According to DEP, Juniata County has been included in some level of drought declaration 11 times in the last 10 years. Additionally, Juniata County is currently under the October 25, 2007 issued drought warning. Due to the frequency of these drought conditions, this hazard is considered an annual event. While some level of drought exists frequently in Juniata County, the impacts depend on the duration of the event, the severity of the conditions, and the areas affected.

### **Maximum Threat**

Commercial areas, farming operations, agriculture-dependent industries, and outlying rural areas of Juniata County will suffer the greatest impact from a drought. The impact to these areas ultimately affects the financial and economic vitality of the County. The longer the drought occurs, the greater the impacts.

### **Secondary Effects**

Long-term water shortages can have a high impact on agri-businesses, hydro-power-dependent utilities, and other industries reliant on water. Droughts can cause municipalities to enforce water rationing and distribution as well as bans on burning. This strains the availability of consumable water for the community. It also increases Juniata County's vulnerability to other hazards such as severe weather, extreme heat, public health emergencies, urban fires, and wildfires. Juniata County's special needs population must also be considered during drought conditions.