

APPENDIX 5: DROUGHT AND EXTREME HEAT EMERGENCY

DESCRIPTION

Drought is a period of unusually persistent dry weather that lasts long enough to cause serious problems such as water supply shortages. Extreme heat or heat waves can occur during droughts or on their own. A heat wave is a prolonged period of excessive heat and high humidity.

Drought: Drought severity depends upon the degree of moisture deficiency, duration, and size of the affected area. Droughts can be defined four different ways:

Meteorological: A measure of how much the actual rainfall departs from the normal.

Agricultural: When the amount of moisture in the soil no longer supports a particular crop.

Hydrological: When surface and subsurface water supplies are below normal.

Socioeconomic: The situation that occurs when people are affected by water shortages.

The impacts of droughts are far reaching. They can last for long periods of time. Along with the more obvious impact of droughts such as inadequate precipitation, droughts can also impact air quality, forestry, energy production, and recreation. Droughts can also create environmental conditions that increase flash floods and landslides/debris flows.

A. Inadequate Precipitation

The result of long term, inadequate precipitation is the lowering of the water table and the ultimate diminishing of a water supply.

B. Air Quality

Drought impacts air quality by the general lack of clouds and moisture that in turn causes higher afternoon air temperatures that accelerate ground level ozone. Pollutants will also not be cleaned out of the air due to the lack of rainfall. Poor air quality affects senior citizens, children, and people with pulmonary problems. Extended periods of poor air quality can cause an increase in hospital admittances and emergency room visits.

C. Forestry

Drought can impact forested areas of a jurisdiction. The lack of moisture affects the growth of trees and makes them vulnerable to disease. Drought can also decrease forest fuel moisture. This will increase wildfire occurrence, the rate of spread and intensity, making wildfires more dangerous to fire fighters and more difficult to control. The lack of moisture will make it more likely that wildfires can start by lightning strikes or by carelessness.

D. Energy Production

During periods of drought and hot weather, the demand for electricity goes up. Water is needed for energy generation, and if the water supply significantly decreases then production capacity will be impacted. Special needs groups will be especially affected if energy generation is not at required levels.

E. Recreation

Drought can also be devastating to recreation in a community. Low water levels make it very difficult for boaters to launch, and they have decreased navigability of streams, rivers, and canals. Watering of recreation areas must also be curtailed.

The impacts of drought can be far reaching and even after a period of average rainfall, drought conditions will still exist. This was seen in Newport News during the drought that began in 1999 and lasted until winter 2002. The area experienced normal rainfall during March, April, and May 2002, but drought conditions lasted throughout the summer. This rain did improve moisture conditions across the state of Virginia and prevented a drought of record.

The severity of a drought is indicated by using the Palmer Drought Severity Index¹. This index uses temperature and rainfall information in a formula to determine dryness. The index is most effective in determining long-term drought and has become the semi-official drought index. Zero is used as normal, and negative numbers for drought. Minus two is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought.

Climatologists often refer to the recurrence interval when talking about how common a hydrologic condition is. The recurrence interval of a 7-day low flow of a stream is a statistic commonly used to measure drought severity. For example, a 7-day low flow with a recurrence interval of 1 to 5 years would be a common condition, a recurrence interval of 10 to 25 years would be more unusual, and a recurrence interval of more than 50 years would be very unusual for a stream or river.

Heat Wave

In the United States about 175 people die annually as the result of a heat wave. Only the cold of winter takes a greater toll. During the period from 1936 through 1975, nearly 20,000 people died in the United States from the effects of heat and solar radiation. In 1980, more than 1,250 people succumbed to the affects of a widespread heat wave.

In the National Weather Service Wakefield office, heat advisories are put out to the public when the Heat Index is between 105 degrees Fahrenheit (F) and 115 F for less than three hours per day, and minimum temperatures are equal or above 80 F for two days. A heat warning is issued when the Heat Index is above 105 F for more than three hours per day for two or more days or the heat index is equal or greater than 115 F.

DROUGHT HISTORY OF NEWPORT NEWS

The first documented record of drought in the Tidewater region was in 1606 -1612. This drought likely played a part in the high death rate of the Jamestown Colony². One of the worst droughts in the Tidewater area occurred in 1850-55. Fort Monroe rainfall records showed that the Fort only received 60 percent of its average rainfall in half a decade. There have also been five major droughts in Virginia since the early 1900's: 1930-1932, 1938 -1942, 1962-1971, 1980-1982, and 1998-2002.

The drought that occurred in the early 30's was one of the most severe droughts recorded in Virginia. Much of the Mid-Atlantic saw less than an inch of rain. Temperatures soared between approximately July 20 and August 10th. The James River almost ran dry and was referred to as a sea of rocks³. Damage estimates in 2002 dollars ran as high as 1 billion dollars in the state of Virginia.

The droughts of 1938-42 and 1962-71 were less severe than the drought in 1930. The cumulative stream flow deficit for the 1962-71 droughts though, was the largest because of the duration of the drought.

The 1980-82 droughts were less severe for the state, but the recurrence rate for the James River Basin was 80 years. The 1999–2002 drought saw below average winter precipitation. It is during these winter months that the ground water system is able to recharge itself because of the lack to transpiration. In July 2002, the James River set new record minimums for stream flow. Conditions were bad enough to warrant a state of emergency in July of 2002. Newport News Waterworks requested voluntary conservation during this drought.

¹ Retrieved on July 2004 from the National Oceanic and Atmospheric Administration Drought Information Center Web site <http://www.drought.noaa.gov>

HEAT INDEX

HEAT INDEX °F (°C)													
Temp.	RELATIVE HUMIDITY (%)												
	40	45	50	55	60	65	70	75	80	85	90	95	100
110 (47)	136 (58)												
108 (43)	130 (54)	137 (58)											
106 (41)	124 (51)	130 (54)	137 (58)										
104 (40)	119 (48)	124 (51)	131 (55)	137 (58)									
102 (39)	114 (46)	119 (48)	124 (51)	130 (54)	137 (58)								
100 (38)	109 (43)	114 (46)	118 (48)	124 (51)	129 (54)	136 (58)							
98 (37)	105 (41)	109 (43)	113 (45)	117 (47)	123 (51)	128 (53)	134 (57)						
96 (36)	101 (38)	104 (40)	108 (42)	112 (44)	116 (47)	121 (49)	126 (52)	132 (56)					
94 (34)	97 (36)	100 (38)	103 (39)	106 (41)	110 (43)	114 (46)	119 (48)	124 (51)	129 (54)	135 (57)			
92 (33)	94 (34)	96 (36)	99 (37)	101 (38)	105 (41)	108 (42)	112 (44)	116 (47)	121 (49)	126 (52)	131 (55)		
90 (32)	91 (33)	93 (34)	95 (35)	97 (36)	100 (38)	103 (39)	106 (41)	109 (43)	113 (45)	117 (47)	122 (50)	127 (53)	132 (56)
88 (31)	88 (31)	89 (32)	91 (33)	93 (34)	95 (35)	98 (37)	100 (38)	103 (39)	106 (41)	110 (43)	113 (45)	117 (47)	121 (49)
86 (30)	85 (29)	87 (31)	88 (31)	89 (32)	91 (33)	93 (34)	95 (35)	97 (36)	100 (38)	102 (39)	105 (41)	108 (42)	112 (44)
84 (29)	83 (28)	84 (29)	85 (29)	86 (30)	88 (31)	89 (32)	90 (32)	92 (33)	94 (34)	96 (36)	98 (37)	100 (38)	103 (39)
82 (28)	81 (27)	82 (28)	83 (28)	84 (29)	84 (29)	85 (29)	86 (30)	88 (31)	89 (32)	90 (32)	91 (33)	93 (34)	95 (35)
80 (27)	80 (27)	80 (27)	81 (27)	81 (27)	82 (28)	82 (28)	83 (28)	84 (29)	84 (29)	85 (29)	86 (30)	86 (30)	87 (31)

Category	Heat Index	Possible Heat Disorders for People in High Risk Groups
Extreme Danger	130°F or higher (54°C or higher)	Heat stroke or sunstroke likely.
Danger	105 - 129°F (41 - 54°C)	Sunstroke, muscle cramps, and/or heat exhaustion likely. Heatstroke possible with prolonged exposure and/or physical activity.
Extreme Caution	90 - 105°F (32 - 41°C)	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.
Caution	80 - 90°F (27 - 32°C)	Fatigue possible with prolonged exposure and/or physical activity.

Adapted from Lans Rothfusz, MIC at NWS Tulsa, OK