4.10 Extreme Temperatures: Cold / Wind Chill

4.10.1 Hazard Profile

Extreme cold/wind chill temperature is the temperature that people and animals feel when outside and it is based on the rate of heat loss from exposed skin by the effects of wind and cold. What is considered an excessively cold temperature varies according to the normal climate for that area. Whenever temperature drops decidedly below normal and wind speed increases, heat leaves the human body more rapidly, increasing the possibility of negative effects of the extreme cold temperatures. When cold temperatures and wind combine, dangerous wind chills can develop.

Warming Center

A warming center is a short-term emergency heated facility that operates when temperatures or a combination of precipitation, wind chill, wind and temperature become dangerously inclement. Its paramount purpose is the prevention of death and injury from exposure to the elements.

Wind chill is how cold it feels when outside. Wind chill is based on the rate of heat loss on exposed skin from wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature, and eventually the internal body temperature. Therefore, the wind makes it feel much colder than the actual temperature. For example, if the temperature is 0°F and the wind is blowing at 15 mph, the wind chill is -19°F. [58] At this wind chill, exposed skin can freeze in 30 minutes.

4.10.1.1 Geographic Location/Extent

Extreme cold temperature is not a hazard with a defined geographic boundary. All localities within the CVPDC area are exposed to this hazard.

4.10.1.2 Magnitude or Severity

Extreme cold weather has a wide range of extent and severity markers and characteristics. The NWS created a wind chill chart that measures the apparent temperature felt on exposed skin due to the combination of air temperature and wind speed (Figure 4-131). While wind chill is not necessarily related to extreme cold as a single cause, the advisory system that the NWS currently uses relies on wind chill to relay warning and advisory information to the public. Extreme cold severity is a function of wind chill and other factors, such as precipitation amount (rain, sleet, ice, and/or snow).

4.10.1.3 Previous occurrences

4.10.1.3.1 Cold/Wind Chill

In 1996, the NCEI began keeping records of occurrences of extreme temperatures. The most reliable records are found at the county level because of the widespread spatial nature of the hazard.

From 1996 to 2018, there have been at least 20 cold/wind chill event reports recorded by NCEI for the CVPDC area. Approximately $539,000 in crop damages were recorded in the CVPDC area.

[58] http://www.skyviewweather.com/learning/wind-chill-questions-and-answers/

4.10.1.3.2 Frost/ Freeze

Typically, frost can occur when the temperature falls below 36°F, especially in rural areas. The National Weather Service does not keep track of "frost" in observations per se. It is a localized phenomenon and can be quite variable across a small area. Frost becomes more widespread when the temperature falls below 32°F with some freeze possible. A hard freeze is possible when temperatures fall below 28°F.

From 2005 to 2018, there have been at least 17 frost/freeze days, and 2 days resulted in crop damage were recorded by NCEI for the CVPDC area. Approximately $1,388,000 in crop damages were recorded in this area.

4.10.1.4 Relationship to Other Hazards

Figure 4-132 shows the interrelationship (causation, concurrence, *etc.*) between this hazard and other hazards discussed in this plan update.

4.10.2 Impact and Vulnerability

4.10.2.1 Human Health

The greatest danger from extreme cold is to people, as prolonged exposure can cause frostbite or hypothermia, and can become life threatening. Body temperatures that are too low affect the brain, making it difficult for the victim to think clearly or move well. This makes hypothermia particularly dangerous for those suffering from it, as they may not understand what is happening to them or what to do about it. Hypothermia is most likely at very cold temperatures, but can occur at higher temperatures (above 40 degrees Fahrenheit) if the person exposed is also wet from rain, sweat, or submersion. Warning signs of hypothermia include shivering, exhaustion, confusion, fumbling hands, memory loss, slurred speech, or drowsiness. In infants, symptoms include bright red, cold skin and very low energy. A person with hypothermia should receive medical attention as soon as possible, as delays in medical treatment may result in death. There is no designated warming center/community shelter facility under operation in the CVPDC area.

4.10.2.2 Critical facility

In addition to the threat posed to humans, extreme cold weather poses a significant threat to utility production, which in turn threatens facilities and operations that rely on utilities, specifically climate stabilization. As temperatures drop and stay low, increased demand for heating places a strain on the electrical grid, which can lead to temporary outages. These outages can impact operations throughout the campus, which can result in interruptions and delays in services. Broken pipes may cause flooding in buildings, causing property damage and loss of utility service. Some of the secondary effects presented by extreme/excessive cold include dangerous conditions to livestock and pets.

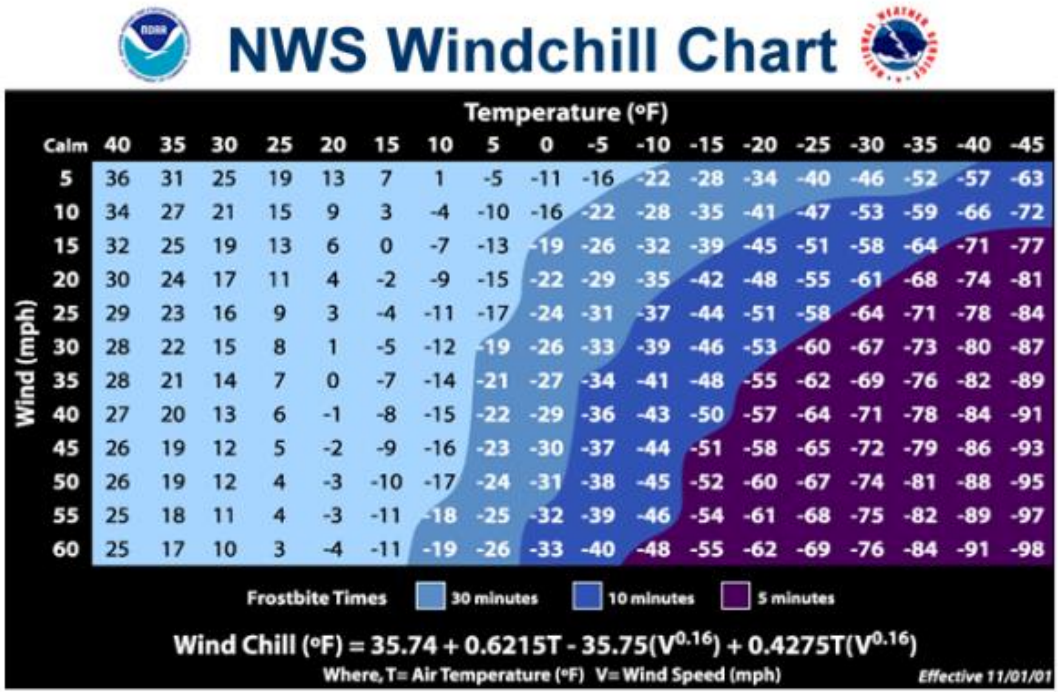

Figure 4-131 National Weather Service Wind Chill Chart

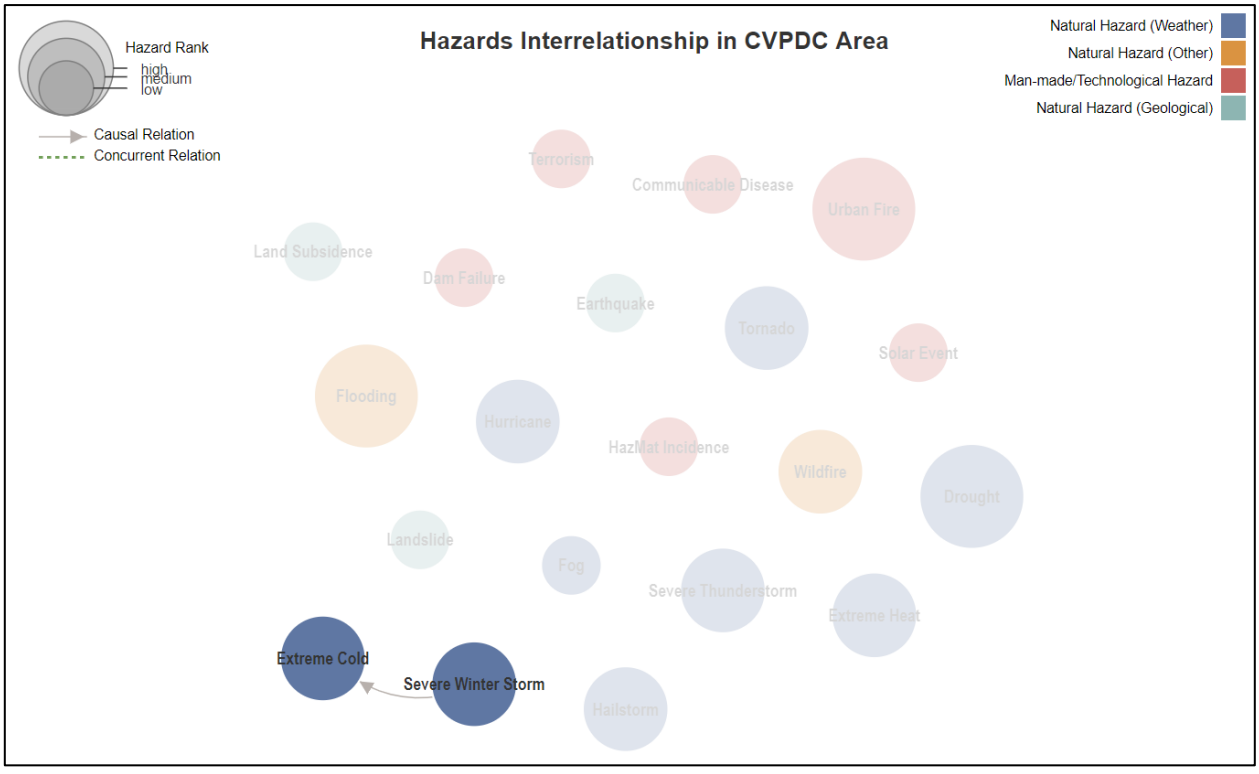

Figure 4-132 Hazards interrelationship

4.10.3 Risk Assessment

Manufactured homes (mobile homes) and antiquated or poorly constructed facilities may have inadequate capabilities to withstand extreme temperatures due to lack of insulation and poor heating and cooling systems. Please refer to the Tornado chapter about geographic concentrations of mobile homes in the CVPDC area.

4.10.4 Probability of Future Occurrences

The likelihood or future probability of occurrence of excessive cold / wind chill in the CVPDC area is occasional. Future extreme weather conditions are difficult to predict, as the climate warms, extreme cold events may decrease in frequency.

4.10.5 References

- National Weather Service. *NWS Products and Information Guide*. 2011. https://www.weather.gov/media/gjt/services/GJT_Service_Guide.pdf
- National Weather Service. *Frost and Freeze Information*. https://www.weather.gov/iwx/fallfrostinfo
- National Centers for Environmental Information. *Storm Events Database - Cold/Wind Chill and Extreme Cold/ Wind Chill*
- National Centers for Environmental Information. *Storm Events Database - Frost/ Freeze*