

4.4.7 Shortage or Outage of Critical Materials or Infrastructure

4.4.7.1 Characteristics

A shortage or outage of critical materials or infrastructure occurs when the demand for a life sustaining product exceeds the supply. These shortages and outages may include a wide variety of resources including energy-related products, power transmission, medical products, food, and water.

The disruption of the critical material supply system, whether caused by natural or human-caused disasters, global conflict, or embargoes, could severely diminish existing supplies, thereby threatening the immediate and long term health, safety, and well-being of North Dakota citizens.

Examples of shortages or outages of critical material or infrastructure include:

- Widespread and prolonged electric power failure that impacts both day-to-day and emergency capabilities.
- A lack of transportation fuels causing surface movement gridlock and disruption of commerce.
- Diminished supplies of heating fuels during the winter causing severe economic and health impacts.
- A lack of medical supplies especially vaccines, antibiotics, and anti-viral medications posing a public health and safety threat.
- Private hoarding, compounding a shortage problem.
- A lack of adequate food, water, and shelter.

The public has come to rely upon utility, communication, and fuel services for everyday life and basic survival. Many in North Dakota depend on the typical utility and communication infrastructure such as water, sewer, electricity, propane, natural gas, telephone, internet, and gasoline. Water and sewer services are either provided through a public system or through individual wells and septic systems. Electricity is primarily provided by regional electric companies through overhead or buried lines. Homes and businesses are heated with fuels such as natural gas, propane, oil, and electricity. Those buildings heated with propane or oil typically have a nearby tank that is refilled regularly by a local vendor but still rely on electricity to power their heating systems. Natural gas is provided through underground piping. Telephone, cellular telephone, and internet services are provided by several local and national companies. Privately-owned gas stations are located throughout the state.

Almost any hazard can cause a shortage or outage of critical materials or infrastructure, but disruptions can also occur due to human error, equipment failures, or low supplies. The most common hazards that interrupt electric services are heavy snow, ice, and wind. Water supplies may be threatened by drought. Sewer services can be disrupted by flood. Often these types of outages are short lived. Crews quickly respond and resolve the problem causing the outage. During a widespread or complicated outage, services may be down for days or even weeks. Most problems arise during these longer term outages. For example, electricity is needed to maintain water supplies and sewer systems, but also to run blowers for heating systems. Essentially, without electricity, most facilities are without heat, water, fuel, or other appliances during a long term outage. This problem becomes particularly significant during the cold winter months. Telephone services are important for day-to-day business, but are most important for 911 communications in an emergency. Without telephone service, emergency services can be severely

delayed. In most cases, a long term utility outage would force many businesses to close until the services were restored. Gasoline shortages are also common during times of disaster.

In the event of a critical material or infrastructure shortage or outage, the National Weather Service has the ability to send out messages over the Emergency Alert System and NOAA Weather Radio (the radios often have battery back-ups). Examples of alerts include:

- Local Area Emergency Message: This message defines an event that by itself does not pose a significant threat to public safety and/or property, but the event could escalate, contribute to other more serious events, or disrupt critical public safety services. Instructions, other than public protective actions, may be provided by authorized officials. Examples of when this message may be used include: utility disruptions, road closures, or a potential terrorist threat where the public is asked to remain alert.
- 911 Telephone Outage Emergency Message: This message notifies the public of a local or state 911 telephone network outage by geographic area or telephone exchange. The message may provide alternative phone numbers to reach 911 or dispatch personnel.

(National Weather Service, 2005)

Critical material or infrastructure shortages and outages are often related to other hazards. Hazards that have the potential to damage structures frequently have the ability to damage infrastructure, resulting in a loss of services. Critical material or infrastructure outages can be a component of almost any hazard, but the following hazards can directly cause outages: floods, strong winds, tornadoes, hail, lightning, wildfires, drought, homeland security incidents, transportation accidents, heavy snow, and ice storms. The ability to restore services may also depend on the ability of repair crews to access the affected areas. In the case of a quarantine or pandemic, repair crews may not be available to quickly restore services.

4.4.7.2 History

North Dakota has experienced three separate major statewide incidents involving shortages of critical materials:

1970's Oil Embargo: International events caused the price of gasoline to rise significantly, and many Americans experienced long lines at gas stations and were rationed in the amount of gasoline they were able to buy. During the oil embargo, a "state of disaster emergency" was declared to meet the dangers inherent from a critical fuel shortage to the citizens of North Dakota. As a result, the following steps were immediately implemented by all state agencies to conserve energy resources:

- Provisions to eliminate duplication of travel were implemented.
- Fuel-efficient policies regarding the use of and purchase of state vehicles were implemented.
- Temperature control limits and regulations were set for all state buildings.
- Lighting controls and regulations were set for all state buildings.
- Energy conservation public information was coordinated among state agencies and targeted to all residents of North Dakota.
- A fuel allocation program was established under federal authority whereby 3% of motor gasoline and 4% of middle distillate fuels brought into the state were "set aside" to be reallocated to retailers who were experiencing temporary shortages.

1970’s Anti-Freeze Shortage: The anti-freeze shortage occurred prior to and during the winter months when it is critical to protect cooling system liquids from freezing in automobile engines. Distributors were able to receive ample stocks, but state officials monitored the situation and prepared to activate the State Emergency Operations Plan, which would have allowed them to exercise control over existing supplies, making sure the needs of all citizens were addressed. Because of this situation, state officials monitor distribution of this product annually to ensure proper supply.

1980’s Farm Fertilizer Shortage: During the fertilizer shortage, phosphate, one of three primary ingredients used in farm fertilizers, was in short supply. Fertilizer has become an absolute necessity to maintain agricultural production levels, which aid in stabilizing the state’s economy. State officials monitored the situation and were prepared to activate the State Emergency Operations Plan to exercise controls over phosphate supplies. Much the same as during the anti-freeze shortage, specific actions were not required, but State Agriculture Department officials monitored distribution of farm fertilizers to ensure adequate supplies. Agriculture officials monitor fertilizer supplies on a yearly basis to ensure that timely actions are implemented to avert a shortage.

Table 4.4.7.2A North Dakota Shortage or Outage of Critical Materials or Infrastructure Declared Disasters and Emergencies

Declaration	Location	Date	Magnitude	Casualties	Damages
State EO	North Dakota	1998	State Declared Critical Shortage of Livestock Feed	Unknown	Unknown

Source: North Dakota Department of Emergency Services, 2007e.

4.4.7.3 Probability and Magnitude

Power outages of some magnitude are an annual event in most all areas. The probability of a more widespread, prolonged event is less certain but is more frequent during other hazard events. The probability can also be broken down by service type. Electric power outages are the most common, but significant water, sewer, communications, heat, propane, internet, or fuel outages can also occur, with somewhat lower probability. Since 1970, three major material shortages have occurred in the state.

Possibly the most significant outage scenario for North Dakota is the loss of electricity for a week or more during a particularly cold winter spell. Without generators, an extended power outage could additionally lead to the loss of running water, sewer services, and the ability to heat buildings, which in turn may lead to pipe ruptures. Any equipment such as medical equipment, computers, and cell phones requiring power to run would eventually be incapacitated. Those facilities with generators would still be able to use appliances, equipment, and heating systems, however, community water and sewer services may not be available. Such a long term outage could lead to emergency sheltering and necessitate the activation of other emergency resources. Fuel and other material shortages would primarily affect the economy.

4.4.7.4 Mapping

Essentially all jurisdictions rely on critical materials and infrastructure in some fashion. Table 4.3.2H and Map 4.3.2I in the Critical Facilities and Infrastructure Section show the dependence of the counties on the various home heating fuels and Map 4.3.3C shows the population at risk. Mapping of utility and communications infrastructure is maintained by the individual services providers. The North Dakota Public Service Commission maintains lists of providers of public utilities in the state for electricity, natural gas, and telecommunications.

4.4.7.5 Vulnerabilities of State-Owned Buildings and Property

State-owned buildings across the state could be without heat during a utility outage or flooded with sewer backups. During cold weather, structures without heat may be uninhabitable for a time. Generally, structures are not directly affected by critical material or infrastructure shortages or outages, but in some cases, direct damages may result.

4.4.7.6 Vulnerabilities of Critical Facilities and Infrastructure

Critical material or infrastructure outages do not often affect structures, however, an electric outage during winter could result in frozen and burst water pipes, causing water damage within the interiors of critical facilities. A propane, natural gas, or fuel oil outage could produce similar results. The failure of a sewer lift station could lead to a system back-up, and structures without sewer backflow valves could experience damages from sewer backwater; other structures could be flooded by overflowing sewage.

Utility or communication disruptions could also limit the ability to provide emergency services. For example, the medical facilities require electricity and water for certain types of medical equipment to work. Gas station pumps may not operate without electricity, and therefore, emergency vehicles may not have enough fuel during long term outages. Communications are vital to effective emergency operations and the lack of communication capabilities may significantly affect the abilities of emergency response organizations. Special needs facilities may need to move occupants to alternate locations due their dependence on local utilities.

Infrastructure supports utility and communication services. Therefore, outages or failures are often related to problems with the infrastructure. Minor damages or problems may indicate a short-term outage whereas large-scale damages may suggest a long term outage. Many services rely on other utilities to operate. For example, the water supply pumps and sewer lift stations both require electricity to continue operations. One or both may go down during long-term electric outages. Propane, oil, and gasoline refills require the transportation network to be open since deliveries are done by truck. This interdependency can lead to more complex utility outage problems.

Table 4.4.7.6A shows the critical facilities and infrastructure summary for the counties with a high or very high shortage or outage of critical materials or infrastructure rating. See Section 4.3.2 for more details.

Table 4.4.7.6A Critical Facilities and Infrastructure in High and Very High Shortage or Outage of Critical Materials or Infrastructure Hazard Counties

County	Local	State	Hospitals	National Guard	Comms	Energy	Trans.	Univ.	Schools	Special Needs
Barnes	M	L	L	M	VH	M	H	H	M	L
Burleigh	VH	H	H	VH	VH	M	VH	H	VH	H
Cass	VH	L	H	H	VH	L	VH	VH	VH	L
Grand Forks	VH	L	H	H	VH	L	VH	VH	H	L
Morton	H	L	L	M	VH	VH	H	M	M	H
Ramsey*	M	L	L	VH	M	L	H	H	M	L
Richland*	M	L	L	M	VH	M	H	H	M	L
Rolette*	M	L	L	L	M	L	M	M	M	L
Stark	H	L	H	L	VH	H	VH	H	M	L
Stutsman	H	L	L	M	VH	M	VH	M	M	H
Walsh	H	L	L	L	M	L	H	L	M	H
Ward*	H	L	H	H	VH	L	H	H	H	L
Williams	H	L	L	L	VH	H	H	H	M	L

VH=Very High; H=High; M=Moderate; L=Low

* includes at least part of the reservation

4.4.7.7 Vulnerabilities to Jurisdictions

Over the past 100 years, the population has become more and more dependent on the nation’s infrastructure. Heat, running water, sanitation, communications, grocery stores, and pharmacies all require electricity and without these services in the long term, the population may suffer. Propane, natural gas, fuel oil, and electricity are critical for heat, especially during the cold winter months. Approximately, 111,000 people in North Dakota rely on natural gas for heat, 40,000 rely on propane, 74,000 rely on electric heat, and 24,000 rely on fuel oil/kerosene (see Section 4.3.2). Personal and commercial food supplies may spoil during extended power outages. Telephone services are needed to call 911 for emergency assistance. Water is needed for cooking, cleaning, and drinking, and sewer is needed for sanitation. Grocery stores are the most common means of distributing the nation’s food supply and pharmacies deliver medications. Each is important for the health and safety of humans. Without these services, emergency resources may be needed. Emergency supplies can often hold the populations over temporarily but may take some time before arriving, in which case, individuals may need to rely on their own personal supplies.

The economy depends heavily on utility and communication services. Electricity alone powers many systems used in day-to-day business. Businesses, such as restaurants, require electricity and water to operate. Without these services, many businesses could be shut down. Closed businesses and government offices essentially put the economy at a standstill until services are restored. Fuel shortages due to a power outage, low supplies, high prices, or transportation closures, could have lasting effects on everyone from the individual commuter to any business that ships inventory. Ultimately, the economy has a high dependence on utility or communications services.

Social values such as going from one place to another could be disrupted by a fuel shortage or transportation closure. Other social events may be cancelled due to the reliance on the utility services.

Otherwise, ecological and historical values would remain unaffected. The ratings provided in Table 4.4.7.7A reflect the population at risk, and therefore, the number of people that would be affected should a shortage or outage occur. The ratings are “low” for populations less than 3,000, “moderate” for populations of 3,000 to 9,999, “high” for populations of 10,000 to 24,999, and “very high” for populations of 25,000 or greater. Determining the probability that a shortage or outage will occur in a given area is not practical or feasible.

Table 4.4.7.7A Shortage or Outage of Critical Materials or Infrastructure Risk to Jurisdictions

County	Shortage or Outage of Critical Materials or Infrastructure Hazard	Hazard Rating in Local/Tribal Plan	Additional Information from Local/Tribal Plan
Adams	Low	C	
Barnes	High	D	\$25M in potential losses
Benson	Moderate	NP	
Billings	Low	D	
Bottineau	Moderate	D	
Bowman	Low	B	
Burke	Low	C	
Burleigh	Very High	B	
Cass	Very High	C	
Cavalier	Moderate	D	
Dickey	Moderate	B	
Divide	Low	NP	
Dunn	Moderate	D	
Eddy	Low	D	
Emmons	Moderate	C	
<i>Fort Berthold^</i>	<i>Moderate</i>	<i>NP</i>	
Foster	Moderate	D	
Golden Valley	Low	C	
Grand Forks	Very High	D	
Grant	Low	C	
Griggs	Low	D	
Hettinger	Low	B	
Kidder	Low	D	
<i>Lake Traverse^</i>	<i>Low</i>	<i>NP</i>	
LaMoure	Moderate	C	
Logan	Low	A	
McHenry	Moderate	B	
McIntosh	Low	B	
McKenzie	Moderate	NP	
McLean	Moderate	C	
Mercer	Moderate	D	
Morton	Very High	B	

Table 4.4.7.7A Shortage or Outage of Critical Materials or Infrastructure Risk to Jurisdictions (continued)

County	Shortage or Outage of Critical Materials or Infrastructure Hazard	Hazard Rating in Local/Tribal Plan	Additional Information from Local/Tribal Plan
Mountrail	Moderate	B	
Nelson	Moderate	D	
Oliver	Low	D	
Pembina	Moderate	B	
Pierce	Moderate	C	
Ramsey	High	B	
Ransom	Moderate	D	
Renville	Low	D	
Richland	High	B	
Rolette	High	NP	
Sargent	Moderate	NP	
Sheridan	Low	NP	
Sioux	Moderate	NP	
Slope	Low	NP	
<i>Spirit Lake</i>	<i>Moderate</i>	<i>NP</i>	
<i>Standing Rock</i> [^]	<i>Moderate</i>	<i>NP</i>	
Stark	High	NP	
Steele	Low	NP	
Stutsman	High	B	
Towner	Low	D	
Traill	Moderate	B	
<i>Turtle Mountain</i> [^]	<i>Moderate</i>	<i>NP</i>	
Walsh	High	B	
Ward	Very High	NP	
Wells	Moderate	D	
Williams	High	D	

NP = no local plan

[^] includes only North Dakota parts of the reservation

4.4.7.8 Vulnerabilities to Future Development

Future development is not expected to have significant impacts on the shortage or outage of critical materials or infrastructure hazard. Increased populations add to the challenges of managing a long term utility outage but would not increase the damages necessarily. Population increases are being seen or are expected in Barnes, Benson, Burleigh, Cass, Grand Forks, Morton, Mountrail, Ransom, Rolette, Sargent, Sioux, and Stark Counties.

4.4.7.9 Data Limitations and Other Key Documents

Brief power outages occur regularly in North Dakota but since long-term critical material or infrastructure outages or shortages are not a normal event, understanding the specific problems and concerns of this hazard is the greatest limitation. Studies of each of the critical facilities would allow for a more in-depth discussion of their vulnerabilities, however, such data would likely be kept internal for security purposes. A record of the significant critical material or infrastructure outages and shortages in the state and the associated impacts could help pinpoint vulnerable times and locations.

Other key documents related to the Shortage or Outage of Critical Materials or Infrastructure hazard include:

- North Dakota Emergency Operations Plan, Shortage of Critical Materials Annex