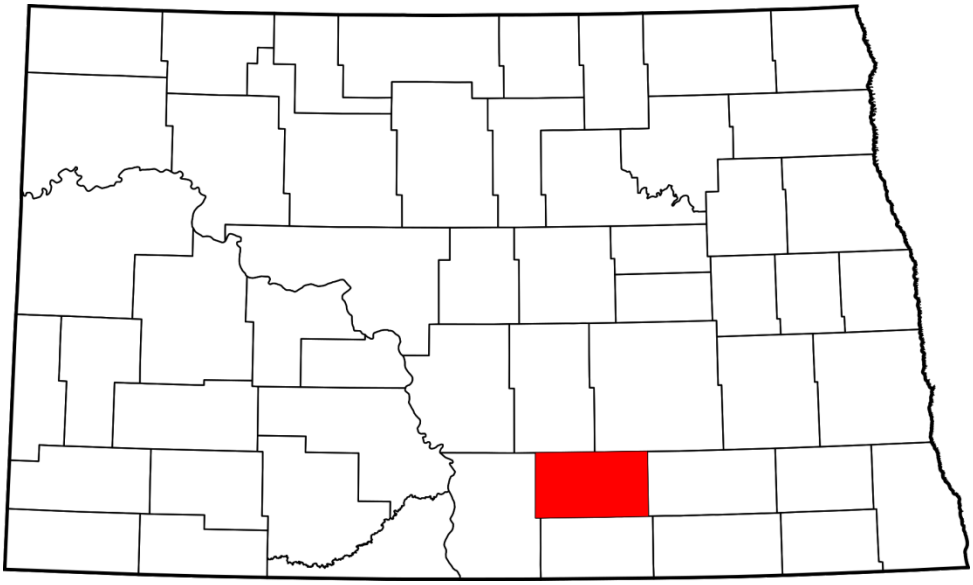
Logan County
Multi-Hazard Mitigation Plan



Participating Communities:

Logan County
City Fredonia
City Gackle
City Lehr
City Napoleon

Pending **FEMA Approved:** ***June, 2017 – July, 2022***

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Executive Summary

The Logan County Multi-Jurisdictional Multi-Hazard Mitigation Plan (MHMP) was originally developed and approved by the Federal Emergency Management Agency (FEMA) in 2003 and subsequently approved in 2010 for an additional five years (March 8, 2015) to address the needs of the community of Logan County and the four incorporated cities: Fredonia, Gackle, Lehr, and Napoleon.

The purpose of the plan is an effort to reduce loss of life and property by lessening the impact of disasters. The planning process involves multiple elements with the two main elements being:

- Hazard Identification and Risk Assessment
- Mitigation Strategies

The14 hazards were ranked by the planning team and communities utilizing the Risk Analysis Worksheet:

Frequency	Negligible	Limited	Critical	Catastrophic
Highly Likely	C	B Drought	A Flood Summer Storm Winter Storm	A
Likely	C	C	B Shortage of Critical Materials	A
Possible	D Transportation Accident Urban Fire or Structure Collapse Wilfire	C Dam Failure	B	B
Unlikely	D	D	C Homeland Security	C

Severity

Associated with each hazard are mitigation strategies that can be done at a local level.

Logan County completed step one of the Threat and Hazard Identification and Risk Assessment in 2013 with 12 responses.

The Logan County Multi-Hazard Mitigation Plan meets the requirements and procedures for a local mitigation plan as found in the Code of Federal Regulations (CFR), Title 44, Chapter 1, Part 201 (44 CFR Part 201).

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Adoption

The jurisdictions in the Logan County Multi-Hazard Mitigation Plan (MHMP): Logan County and the incorporated cities of Fredonia, Gackle, Lehr, and Napoleon adopt the plan as submitted to the ND Department of Emergency Services and the Federal Emergency Management Agency (FEMA).

Logan County

(Insert Signed Resolution)

City of Fredonia

(Insert Signed Resolution)

City of Gackle

(Insert Signed Resolution)

City of Lehr

(Insert Signed Resolution)

City of Napoleon

(Insert Signed Resolution)

Introduction

Purpose: Reduce the vulnerability of the life and health of people, property, environment, and economy of Logan County and its communities from the impacts of natural and technological hazards as well as adversarial threats.

Scope: The scope of the Logan County Multi-Hazard Mitigation Plan is countywide. Due to Logan County's limited resources, any incident or hazard that may occur or exist affects the entire jurisdiction. The Plan is not necessarily limited to Federal, State, or locally-declared disasters or emergencies. Any time situations or incidents occur that produce an opportunity for mitigation actions; they will be developed and incorporated into the Logan County Multi-Hazard Mitigation Plan.

Authority: The Logan County Multi-Hazard Mitigation Plan has been prepared pursuant to Section 322 of the Disaster Mitigation Act of 2000 (Public Law 106-390) which requires local government to develop mitigation plans that shall:

- Describe actions to mitigate hazards, risks, and vulnerabilities identified under the plan; and
- Establish a strategy to implement those actions.

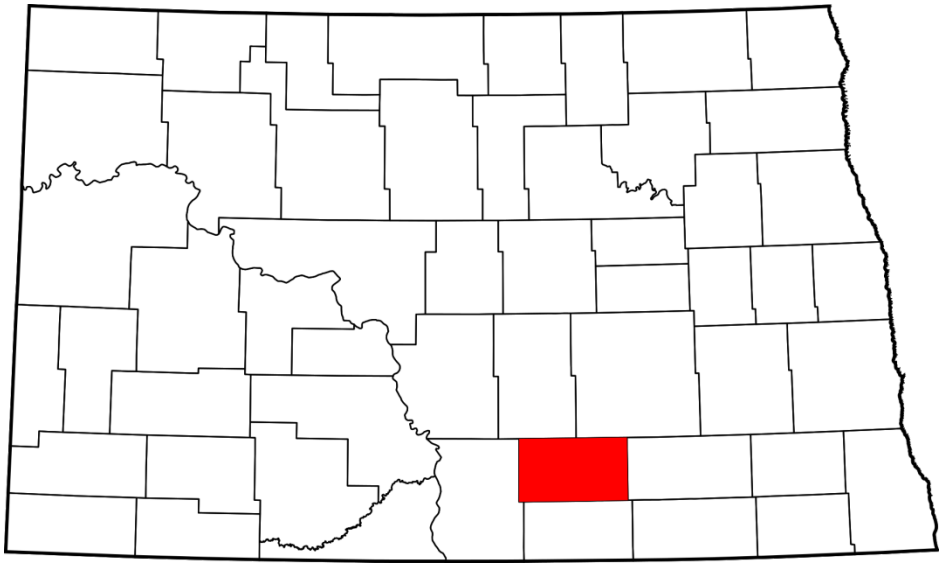
The Disaster Mitigation Act of 2000 became law on October 30, 2000 and amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as Amended (The Stafford Act) (P.L. 93-288, as amended). Regulations for this activity can be found in 44 CFR, Part 201.

The North Dakota Century Code 37-17.1-07 (Local or regional emergency management organizations.) states that "Each local or regional emergency management organization shall prepare and keep current a local disaster or emergency operational plan for its area." Logan County and incorporated cities consider the Mitigation Plan an integral part of the Logan County Emergency Management Program.

Local governments play an essential role in implementing effective mitigation, both before and after disaster events. Each local government jurisdiction will review all damages, losses, and related impacts to determine the need or requirement for mitigation action and planning whenever seriously affected by a disaster, or when applying for state or federal recovery assistance. In Logan County the executive body responsible for carrying out plans and policies is the Board of County Commissioners. Each jurisdiction develops an annual budget which may or may not include monies for mitigation projects; however, budgets do include monies for continued agency services.

Community Profile

Logan County is located in southeast portion of North Dakota, and the City of Napoleon is the County seat. Incorporated cities in Logan County include Fredonia, Gackle, Lehr, and Napoleon.



It has the 38th largest area of the 53 counties in the State, and is 1,011 square miles (24 miles from north to south and 42 miles from east to west).

Picture Source: Wikipedia website

Borders

Northwest:	Kidder County
Northeast:	Stutsman County
East:	LaMoure County
South:	McIntosh County
West:	Emmons County

Residential and commercial development is concentrated in the incorporated areas of Logan County with the largest, single concentration occurring in and around the City of Napoleon.

"The soils in the ground moraine uplands have a loam surface with a clay loam subsoil. These soils make good cropland and excellent pastures. These moderately sloping soils have medium surface runoff and a moderate water erosion hazard. The soils on the outwash plain have a loam surface with sand and gravel substrate, a low water-holding capacity, and a high wind erosion hazard. The flood plain has been modified by roads, streets, houses, and fills. Some native herbaceous plant species remain or have returned to disturbed areas. Trees and shrubs have been introduced into the flood plain, and growth of indigenous cottonwood and willow trees continues." (Source: Flood Insurance Study, City of Napoleon, North Dakota, Logan County, Revised: February 19, 1987 available from the FEMA Map Service Center, Product 380044V000)

Beaver Creek is the principal drainage system. The county is a land of prairies, croplands, river valleys, and rolling hills.

Planning Process

Multi-hazard mitigation planning is a continuous process whereby risk analyses, updating the situation assessment, research, coordinating, disaster response or other activities are occurring simultaneously.

The goal is to have the Logan County Hazard Mitigation Plan is updated every five years. The original plan was developed in 2003 and subsequently updated in 2010. The current plan update process began in 2016 with the collection of background information and soliciting technical advice and guidance from the ND Department of Emergency Services' Mitigation Division.

An introduction to the Multi-Hazard Mitigation Plan update process was provided during the Logan County Local Emergency Planning Committee Meeting on August 24, 2016

The plan update process officially began November 10, 2016 with a Multi-Hazard Mitigation Plan Kickoff Meeting. Agenda items included:

- Confirm plan purpose
- Review current mitigation plan
- Refine plan scope and schedule
- Establish responsibilities
- Development an outreach strategy.

On April 19, 2017, a planning meeting was hosted to:

1. Review and classify risks
2. Review and update listing of key facilities (critical infrastructure)
3. Review current mitigation projects and provide current status
4. Develop new mitigation project ideas and prioritize
5. Review public survey before distribution

Simultaneously, since August, 2016 and months following, involved a lot of research, data gathering and outreach to regulatory agencies and other governmental entities (US Army Corps of Engineers, ND State Water Commission, Logan County Water Resource Board, ND Forest Service, ND Fire Marshal's Office, US National Weather Service). Additionally, a vast amount of phone calls and emails were utilized to elicit feedback from the participating jurisdictions.

Information was obtained from regulatory agencies: ND Water Commission, US Army Corps of Engineers, and the local Water Resource Board were accomplished through meetings and/or emails.

Outreach to contiguous counties was accomplished through meeting invites and online survey participation.

Monitoring, Evaluating, and Updating the Plan: The plan will be evaluated annually by Logan County Emergency Management with input from the planning committee members. As a means of monitoring the plan and progress made on the projects, Logan County Emergency Management will continually collaborate with planning committee members and representatives identified as "lead agencies" to discuss progress of the projects, existing and potential grant opportunities, and changes in regulations. It will be the responsibility of Emergency Management to update the hazard history sections on an annual basis as events occur.

All disaster or emergency incidents will be evaluated for general/specific mitigation recommendations to be added to the plan as they occur. A comprehensive plan review by the planning committee will occur every five years unless the need arises earlier through aforementioned reviews and actions.

The approved plan always remains available on the Logan County website for review by stakeholders and the general public.

Plan Integration: The Logan County Multi-Hazard Mitigation Plan will be considered as building codes are developed and/or updated. The awareness of the hazards and vulnerability may affect future development in hazard-prone areas.

Participating Jurisdictions in the Plan Review

Jurisdictions Located within Logan County	Jurisdictions Asked to Participate in the Plan	Jurisdictions Represented in the Plan	Participation Status
Logan County	Logan County	Logan County	Continuing Participation (2003, 2010, 2017)
City of Fredonia	City of Fredonia	City of Fredonia	Continuing Participation (2003, 2010, 2017)
City of Lehr	City of Lehr	City of Lehr	Continuing Participation (2003, 2010, 2017)
City of Gackle	City of Gackle	City of Gackle	Continuing Participation (2003, 2010, 2017)
City of Napoleon	City of Napoleon	City of Napoleon	Continuing Participation (2003, 2010, 2017)

All jurisdictions were invited to participate in the update process. If they were unable to attend, there was outreach to obtain input on the overall plan and mitigation opportunities.

Planning Team Members

Agency	Name/Title	Email
LOGAN COUNTY		
Commission		
PO Box 257, Gackle, 58442	Dean Entizminger, Chair	entzming@daktel.com
PO Box 103, Napoleon, 58561	Blanche Shumacher, Commissioner	baschuma@nd.gov
415 2nd St W, Napoleon, 58561	John Wald	jcwald@bektel.com
911 Coordinator	Cynthia Doll, 911 Coordinator	cldoll@nd.gov
301 Broadway, Napoleon		
Auditor's Office		
PO Box 207, Napoleon	Brenda Fischer, Auditor	bkfischer@nd.gov
Economic Development	Eric Hoberg	edc@bektel.com
Extension Agent	Sheldon Gerhardt	sheldon.gerhardt@ndsu.edu
Public Health	Frank Balak,	fbalak@nd.gov
	Emergency Response Coordinator	
	Central Valley Health, Jamestown	
Sheriff		
405 4th Ave E, Apt 1, Gackle	Andrew Bartholomaus, Sheriff	abartholomaus@nd.gov
Water Resource Board	Mike Horner	marg@bektel.com
FREDONIA CITY		
208 Minnesota St, Fredonia	Darwin Kungel, Mayor	
Fire Department		
PO Box 15, Fredonia	Lauren Hehr, Board President	
7471 Hwy 56, Fredonia	Alden Lautt, Board Secretary/Treasurer	
102 1st Ave E, Fredonia	Jeff Lautt, Chief	

GACKLE CITY		
PO Box 54, Gackle	Ritchie Jacobson, Mayor	citygackle@daktel.com
	Larry Larson, City Countil	larrymech78@hotmail.com
Ambulance	Melody Owen, Training Officer	owenmelody@msn.com
602 Main St, Gackle	James Owen, Board President	gackle.ems@gmail.com
Auditor	Sam Remboldt, Auditor	
Fire Department		
5451 Hwy 56, Gackle	Ardell Schmidt, Chief	citygackle2@daktel.com
LEHR CITY		
208 McIntosh St S, Lehr	L Chauncey Brown, Mayor	lcb@bektel.com
Fire Department	Lane Bader, Chief	rcbader@bektel.com
LEPC Member	Cory Schlecht	csranch@drtel.net
NAPOLEON CITY		
625 C Ave E, Napoleon	Todd Moos, Mayor	tkmoos@bektel.com
Ambulance	Steve Fettig, Board Chair	ssfettig@bektel.com
Fire/Emergency Rescue		
PO Box 77, Napoleon	Marvin Lang, Chief	rights@bektel.com
Police Department	VACANT	npdbek@bektel.com

Review and Incorporation of Existing Plans, Studies, Reports, and Technical Information: The Logan County Multi-Hazard Mitigation Plan was developed in coordination with other local, state, and federal agencies, non-profit organizations, and local businesses and schools.

Agency	Plans and Programs
911Coordinator Sheriff's Department	• Alert and Warning • Communications • Emergency/Disaster Procedures
American Red Cross (West Dakota)	•Disaster Recovery • Mass Care • Shelter • Windshield Damage Assessment•
Central Valley Health District	• Mass Inoculation • Medical Sheltering • Points of Distribution • Regional EOP Mass Fatality • Regional EOP Pandemic Influenza • Regional Strategic National Stockpile
Economic Development Council	• Comprehensive Economic Development Strategy
Fredonia City Commission	• Budget Allocations • Disaster/Emergency Declarations
Gackle City Commission	• Budget Allocations • Disaster/Emergency Declarations
Lehr City Commission	• Budget Allocations • Disaster/Emergency Declarations
Logan County Auditor	• Audits • Fiscal Management
Logan County Building/Planning/Zoning	• Development • Floodplain Administration • Inspections • Planning • Plat Reviews
Logan County Commission	• Budget Allocations • Disaster/Emergency Declarations

Agency	Plans and Programs
Logan County Emergency Management	• Audit Lead • Campaigns • Disaster Recovery • Emergency Notification • Evacuation Annex • Grants Coordination • Local Emergency Operations Plan • Local Emergency Planning Committee • Mass Care Annex • Multi-Hazard Mitigation Plan • Public Information Officer • Shelter Annex • Social Media Coordination
Logan County Extension Service	• Animal Health • Community Education • Plant Health
Logan County GIS (contracted)	• Ambulance Districts • City of Fredonia • City of Gackle • City of Lehr • City of Napoleon • Farms and Dwellings • Fire Districts • Logan County • ND Water
Logan County Highway Department	• Bridges • Debris Removal • Primary Routes
Logan County Local Emergency Planning Committee	• Community Education • Hazardous Materials Response Plan • Planning and Training • Tier II Reporting
Logan County Schools	• Curriculum Standards (safety drills)
Logan County School Superintendent	• Curriculum Standards (safety drills)
Logan County Sheriff's Department	• Emergency Notification • Evacuation Routes • Traffic Control and Safety
Logan County Social Services	• Shelter Assistance
Logan County State's Attorney	• Legal Review
Logan County Water Resource Board	• Permitted Uses • Planning Commission

Agency	Plans and Programs
Logan County Zoning Ordinance	• Floodplain Management • Planning and Zoning
Napoleon City Attorney	• Legal Review
Napoleon City Commission	• Budget Allocations • Disaster/Emergency Declarations
Napoleon Ministerial Association	• Disaster Recovery • Mental Health
Napoleon Police Department	• Emergency Notification • Evacuation Routes • Traffic Control and Safety
ND Pipeline Association	• Education/Training • Maps • Planning and Zoning
ND State Water Commission	• Strasburg Slough Preliminary Findings Report
Salvation Army	• Disaster Recovery • Mass Care • Shelter • Windshield Damage Assessment
South Central Regional Water	• Planning • Rural Water
US Army Corps of Engineers	• Beaver Creek Study (underway) • Planning Assistance (Section 22)
US Geological Survey	• Creek/River Gages
US National Weather Service	• Hazard Advisories • Spot Forecasting • Training • Weather Advisories

The American Red Cross includes the shelter information provided by Logan County Emergency Management within their National Shelter System.

The Logan County Commission and Logan County Highway Department utilize the mitigation projects as appropriate when developing future budgets and road priorities.

Flood mitigation projects are closely tied to the Logan County Water Resource Board and their continuing discussions.

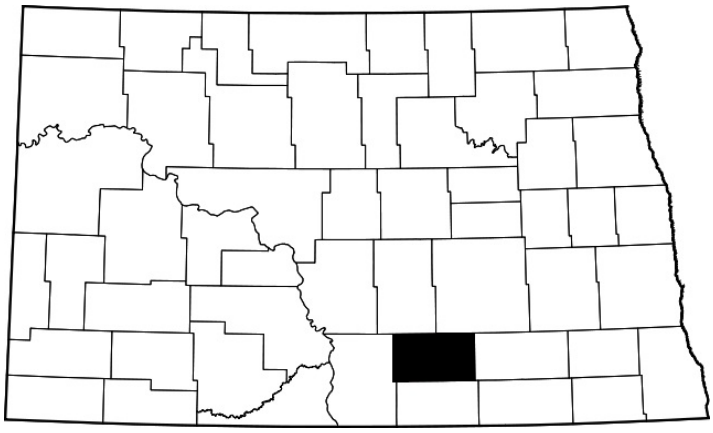
The Logan County Zoning Floodplain Ordinance is evaluated and based upon current NFIP guidelines.

Communicable Disease activities parallel with the Central Valley Health District Emergency Preparedness planning efforts.

The US National Weather Service (Bismarck Office) remains in contact with Logan County responders and Skywarn Spotters to “truth” forecasts and/or impacts.

Changes in Development

General: Logan County is located in the southeast portion of North Dakota.



Borders

Northwest:	Kidder County
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South:	McIntosh County
West:	Emmons County

It has the 38th largest area of the 53 counties in the State, and is 1,011 square miles (24 miles from north to south and 42 miles from east to west).

Demographics

Logan County	
2010 population	1,990
2010 persons per square mile	2

According to the US Census Bureau (2011-2015 American Community Survey 5-Year Estimates), the 2015 population estimate is 1,945 (2.3% decrease from 2010 and 15.73% decrease since 2000). The projected population shows a slight decrease:

2015 estimate	1,945
2010	1,990
2000	2,308

Median Age: 49.8
Source: US Census Bureau, 2010

Logan County has four incorporated cities including the County Seat, Napoleon.

City	Population
Fredonia	46
Gackle	310
Lehr	80
Napoleon	792

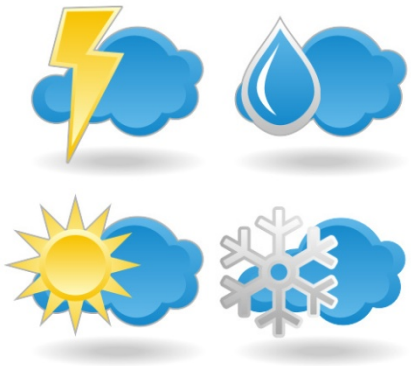
Source: US Census Bureau 2010 Population Estimates

Source: Photo http://www.napoleonnd.com/county-government

Climate

The County's geographic location results in a sub-humid continental climate characterized principally by marked fluctuations in daily and seasonal maximum and minimum temperatures, and light to moderate precipitation. The precipitation tends to be irregular in occurrence, amount, and area of coverage. Summers are usually hot and dry, with periods of prolonged high temperatures occurring from May through September. Winters are cold and dry, but the region is subject to severe blizzards. July is the warmest month, and December is the coldest month.

Normally the temperature is moderate until the beginning of July, after which short, hot periods are experienced until the end of August. The freeze-free period is the number of days between the average last occurrence of freezing temperatures in the spring and the average first occurrence of 32 degrees F or lower in the fall. The length of the freeze-free period approximates the length of the growing season which ranges from 110 days to over 130 days between May 12th and September 23rd. Topography and local weather conditions can produce subfreezing temperatures at the ground surface while the air temperature a few feet above the ground remains above 32 degrees F.



2016 Average	
Annual Precipitation	27.31 inches
Average Snowfall	58.8 inches
Warmest Month	July
Coldest Month	December
Temperature Extremes	-24 / +94

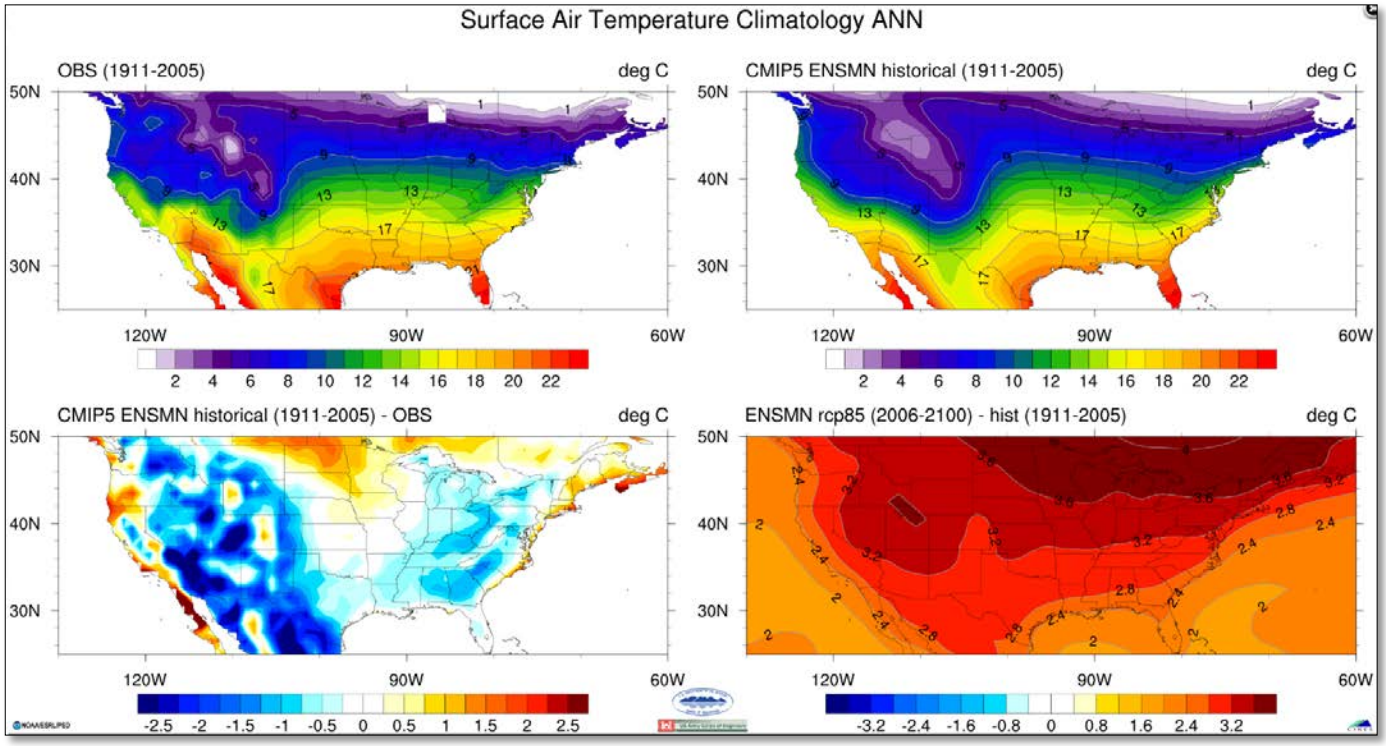
2012-2016 Average	
Annual Precipitation	21.48 inches
Average Snowfall	46.8 inches
Warmest Month	July
Coldest Month	December
Temperature Extremes	-27 / +102

Source: Corey King, Emergency Response Specialist, National Weather Service, Bismarck Office

Climate Change

How climate changes in response to increases in man-made greenhouse gases is one of the foremost questions for the scientific community, policy makers and the general public.

A key approach for examining climate, especially how it will change in the future, uses complex computer models of the climate system that include atmosphere, ocean, sea ice and land components. Some models also include additional aspects of the earth system, including chemistry and biology.



Source: US Department of Commerce, National Oceanic & Atmospheric Administration, Earth System Research Laboratory, Physical Sciences Division, NOAA Climate Change Web Portal

The current science is estimating an approximately 3.6°C increase in temperature for the Logan County area, which does not adversely affect crops, livestock, or other economic driver.

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Economy

According to the US Census Bureau 2011-2015 American Community Survey 5-Year Estimates, the largest percentage of the population (38.2%) is employed in the category of “Management, business, science, and arts occupations”, followed by 18.9% in the category of “Service occupations”.

The largest industry is "Educational services, and health care and social assistance" at 22.8% followed by "Agriculture, forestry, fishing and hunting, and mining" at 21.1%.

A total of 58.4% of the workers are “Private wage and salary workers”, 27.8% are “Self-employed in own not incorporated business workers", and 11.8% are “Government workers”.

The median household income was $51,548. The poverty status was 5.9% of the families below the poverty level, 4.5% of the individuals 18-64 years of age below the poverty level, and 19.9% of 65 and older individuals below the poverty level.

Land Use Concerns

Agriculture remains the primary land use in Logan County. Census data indicated that Logan County had 379 farms in 2012 (down from 426 in 2007) that average 1,508 acres per farm for a total acreage of 571,599 acres. (Source: USDA Census of Agriculture)

Soil erosion due to wind and water remains a problem. On steep gradients, rain washes out gullies in cultivated fields, and fields cultivated in the fall suffer extensive damage from wind. The county has 16,747 acres enrolled in the Conservation Reserve Program (CRP) which has helped mitigate the erosion problem; however, the acreage enrollment is steadily decreasing.

Conservation Reserve Program
Cumulative Enrollment by Fiscal Years (Acres)

Year	Acres
2014	14,133
2013	16,747
2012	30,352
2011	36,678
2010	38,120
2009	41.427
2008	48,455
2007	63,017

Source: US Department of Agriculture, Farm Service Agency

Logan County continues to study a variety of mitigation activities. Soil erosion, water supply, and water quality are major land use concerns of the county.

Additionally, the Logan County Water Resource Board utilizes previous flood event data when considering flood control projects and includes non-structural project recommendations such as amending floodplain ordinances in direct correlation with National Flood Insurance Program recommendations and FEMA’s flood insurance rate map data.

Development

The Logan County Economic Development and local jurisdictions promote and encourage opportunities for the area as a destination to live, work, and play.

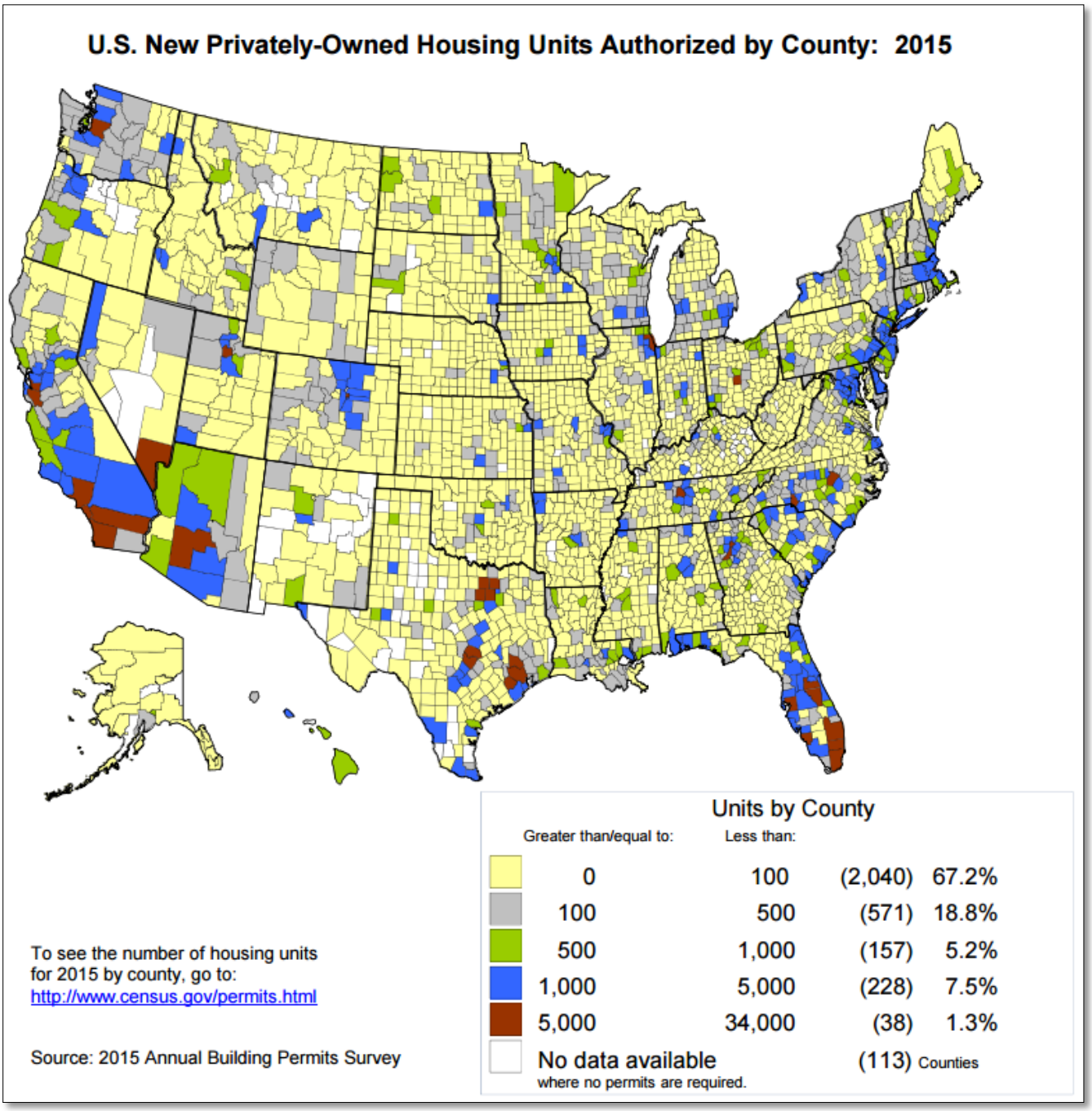
Development has stabilized with no significant increases.

Building Permits (Reported Only)			
Year	**Type**	**Buildings**	**Unit**
2016	Single Family	3	
	Two Family		
	Three & Four Family		
2015	Single Family	2	
	Two Family	1	2
	Three & Four Family		
2014	Single Family	7	
	Two Family		
	Three & Four Family		
2013	Single Family	2	
	Two Family		
	Three & Four Family	1	3
2012	Single Family	5	
	Two Family		
	Three & Four Family		

(Source: Logan County Assessor/Tax Director)

2016 Valuations			
Jurisdiction	**Agricultural Land**	**Residential Property**	**Commercial Property**
Logan County	$ 251,445,800	$ 4,335,800	$ 1,508,970
Fredonia	$ 35,600	$ 718,000	$ 996,550
Gackle	$ 36,600	$ 6,308,200	$ 1,592,000
Lehr		$ 345,250	$ 240,640
Napoleon	$ 144,500	$ 23,313,300	$ 9,139,725

(Source: Logan County Assessor/Tax Director)



Source: US Census Bureau

Risk Assessment and Hazard Profile

Logan County and the incorporated cities (Fredonia, Gackle, Lehr, and Napoleon) contributed to the risk assessment for the Logan County Multi-Hazard Mitigation Plan.

The 14 hazards identified by the ND Department of Emergency Services were utilized for the risk assessment. (Source: State of North Dakota Multi-Hazard Mitigation Plan, February 2014)

Risk Assessment by Jurisdiction					
	Logan County	Fredonia	Gackle	Lehr	Napoleon
Communicable Disease	X	X	X	X	X
Dam Failure					
Drought	X	X	X	X	X
Flood	X	X	X	X	X
Geologic Hazards					
Hazardous Materials Incident	X	X	X	X	X
Homeland Security Incident	X	X	X	X	X
Shortage or Outage of Critical Materials or Infrastructure	X	X	X	X	X
Severe Summer Storm	X	X	X	X	X
Severe Winter Storm	X	X	X	X	X
Transportation Accident	X	X	X	X	X
Urban Fire or Structure Collapse	X	X	X	X	X
Wildland Fire	X	X	X	X	X
Windstorm	X	X	X	X	X

The majority of jurisdictions are affected by the hazards with slight variances in susceptibility as described below:

Communicable Disease
Although each jurisdiction is susceptible to communicable disease, the more rural communities of Fredonia, Gackle, Lehr, and unincorporated Logan County are particularly susceptible to those diseases that impact plants and animals. The cities, particularly the most populous city, Napoleon, are more susceptible to communicable disease.

The general age for disease susceptibility considers children under the age of 14 and adults over the age of 65 as most susceptible to disease (especially if exacerbated by underlying medical conditions). The table below depicts the susceptible ages for each jurisdiction.

Community	Population	0-14 Years	15-64 Years	65+ Years
Logan County	1,945	304	1,085	556
Fredonia	46	4	34	8
Gackle	371	69	198	104
Lehr	76	0	33	43
Napoleon	767	101	390	276

Source: US Census 2015 American Community Survey

Dam Failure
There are no high-hazard dams located in Logan County. All dams are classified as a low hazard.

Drought, Urban Fire or Structure Collapse, and Wildland Fire
The impacts of drought and wildland fire could impact residents in a number of ways; however, rural Logan County is more susceptible to these hazards due to open prairie and agricultural activities. The four cities are more vulnerable to urban fire with losses greater in the more populated cities.

Although many rural residents have their own wells, rural Logan County would suffer great agricultural losses in drought with 379 farms in 2012 (down from 426 in 2007) that average 1,508 acres per farm for a total acreage of 571,599 acres. (Source: USDA Census of Agriculture)

Grain elevators in the City of Napoleon and the City of Fredonia as well as area agronomy centers may suffer losses due to drought and loss of crops.

Water resources include:

Fredonia: City-owned well
Lehr: 50,000-gallon capacity water tower fed by two underground wells
Gackle: 50,000-gallon capacity water tower
Napoleon: 50,000-gallon capacity, gravity fed water tower

Resources for potable water supplies are identified in the Logan County Emergency Operations Plan.

Fire Departments adding and/or replacing equipment is always needed and sought through donations and grants.

Flood

The following figure displays that no jurisdiction is immune to flood vulnerability and has either experienced the vulnerability or has the increasing susceptibility to experience the vulnerability.

Flood Vulnerabilities by Jurisdiction					
	Logan County	Fredonia	Gackle	Lehr	Napoleon
Lagoon Overruns					
Lift Stations			X		X
Overland Flooding	X	X	X	X	X
River Flooding					
Road Washouts	X	X	X	X	X

Geological Hazards

No jurisdictions have significant history of this hazard.

Hazardous Materials Release and Transportation Accident

Varied levels of susceptibility are apparent for all jurisdictions with multiple county roads transecting the county. Throughout the year, farmers transport anhydrous ammonia in pup tanks.

ND 3, 30, and 58 run north-south through the County; ND 13, 34 and 36 run east-west through the county.

Source: https://www.dot.nd.gov/docs/maps/base-maps/counties/logan.pdf

The City of Napoleon is far more susceptible to the hazards due to being an urban center with the highest population density in Logan County. Other factors increasing susceptibility include:

- Governmental Buildings (local)
- Tourism Destination
- Commercial and Agricultural Industries
- Increased Transportation Flow

Hazardous Materials Release and Transportation Accident					
	Logan County	Fredonia	Gackle	Lehr	Napoleon
Anhydrous Ammonia	X	X	X	X	X
Bulk Fertilizer	X	X	X	X	X
Bulk Fuel	X	X	X	X	X
Farm Chemicals	X	X	X	X	X
Fuel and Gas	X	X	X	X	X
Major Transportation Route	X	X	X	X	X
Natural Gas					
Propane	X	X	X	X	X
Railroad	X	X		X	X

Homeland Security Incident
All jurisdictions could be impacted by a homeland security event; the greater vulnerability would be expected to be in the most populous city of Napoleon.

Severe Summer Weather and Severe Winter Weather
All jurisdictions are impacted. Severe summer weather incidents may cause major economic losses based on the level of impact. Severe winter weather often results in blocked roads and can affect each jurisdiction and may lead to economic loss dependent upon severity and length of time.

Rural Logan County residents have backup power sources (generators, coal or wood-burning stoves) and extra fuel sources (gas and propane).

The communities of Fredonia, Gackle, Lehr, and Napoleon each maintain an outdoor warning siren system to alert a tornado. The system is also utilized to alert fire crews.

Disability Population*

	Population	Total with Disability	Under 18 Years	Total with Disability	18-64 Years	Total with Disability	65+ Years	Total with Disability
Logan County	1,870	290	401	24	977	77	492	189

*2011-2015 American Community Survey 5-Year Estimates

Logan County does not have the resources and shelter space to accommodate functional needs and general population for a large-scale event. (Source: Logan County Evacuation and Shelter Plan)

Vulnerable Population*

Category	Facility	Address	Jurisdiction
Assisted Living	Gackle Care Center	304 1st Ave W	Gackle
	Napoleon Care Center	311 4th St E	Napoleon
Camping	J & S		Napoleon
	Napoleon Park (SW side)		Napoleon
	Rivinius Campgroun		
	Beaver Creek		Logan County
	Fredonia Campground (City)		Fredonia
	Fredonia Campground (3 miles out of City)		Logan County

*Medical facilities and assisted living centers are required to have emergency plans. Mobile home dwellers are encouraged to find alternate locations for severe weather events during the "Watch" phase.

Shortage or Outage of Critical Materials or Infrastructure
All jurisdictions could be impacted. The City of Napoleon has the largest population and would experience a greater impact without fuel, utilities, and/or medical supplies. Likewise, agriculture activities would be drastically impacted without utilities and fuel supplies.

Windstorm
Very similar to severe summer and winter storms, windstorms have the capacity to affect each jurisdiction. Downed power lines would have the greatest affect coupled with damages from flying debris and damage to facilities.

Mobile home dwellings are encouraged to have tie-downs.

Hazards Excluded from this Plan

Hazard	Why Excluded/Where Addressed
Avalanche	Avalanches generally require long stretches of 25-55 degree slopes; Logan County has no areas that meet this criteria. North Dakota is not covered by a National Avalanche Center. North Dakota does not have a history of any declared state or federal avalanche disasters.
Coastal Erosion	Logan County does not have an ocean coastline.
Coastal Storm	Logan County does not have an ocean coastline.
Hurricane	Logan County does not have an ocean coastline, nor is it located in a potential hurricane impact area.
Tsunami	Logan County does not have an ocean coastline.
Volcano	Volcanic ashfall can occur over Logan County, but the frequency is relatively rare and the potential impacts are not expected to exceed local capabilities. North Dakota does not have a history of any declared state or federal volcano disasters.

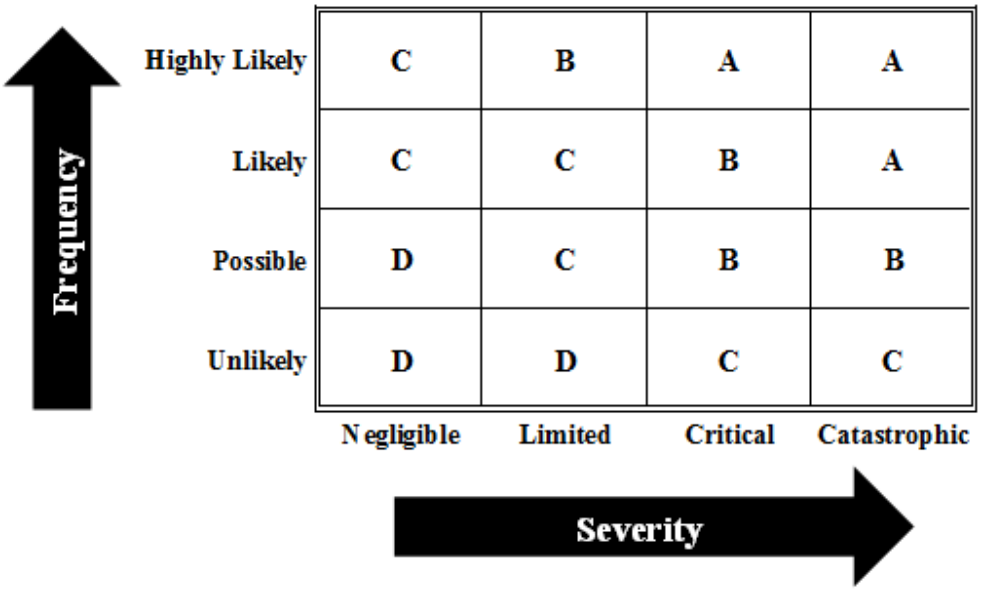
Risk Analysis Worksheet

Frequency: How often is this hazard likely to develop in this area?

Highly Likely	Nearly 100% probability in the next year
Likely	10–100% probability in the next year, or at least 1 chance in next 10 years
Possible	1–10% probability in the next year, or at least 1 chance in next 100 years
Unlikely	Less than 1% probability in next 100 years

Severity: What is the expected extent of damage caused by this type of hazard?

Catastrophic	More than 50% of jurisdiction affected
Critical	25–50% of jurisdiction affected
Limited	10–25% of jurisdiction affected
Negligible	Less than 10% of jurisdiction affected



(Source: FEMA Multi-Hazard Identification and Risk Assessment, January 1, 1997, Risk Assessment Approaches – Chapter/Section Number: Part 3)

Risk Class: Classification of the overall risk posed to the jurisdiction and immediacy of necessary action:

Seasonal Pattern: When is the type of hazard most likely to occur?

Probable Duration: How long will this event typically have an impact on the community?

Speed of Onset: How much advance warning does the community have for this type of event?

Location/Jurisdiction: Which areas are affected?

Risks: Types of situations that might result from the hazard.

Hazard
Frequency: _____
Severity: _____
Risk Class: _____
Seasonal Pattern: _____
Duration: _____
Speed of Onset: _____

DESCRIPTION:

IDENTIFIED IMPACTS:

HISTORY:

Logan County Hazard Risk Analysis Chart with Vulnerabilities for each Hazard

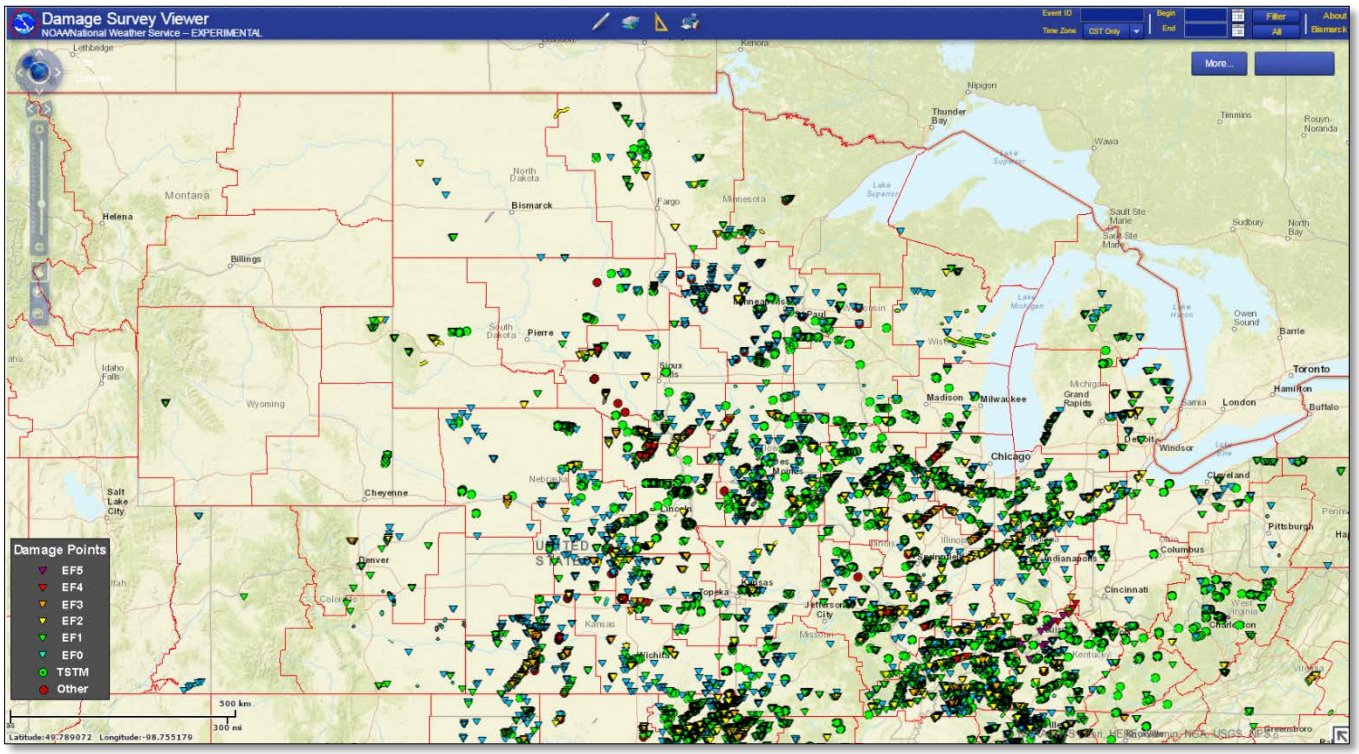
Risk Class:	C	D	B	B	D	B	C	A	A	B	D	D	C	A
HAZARD:	Communicable Disease	Dam Failure	Drought	Flood	Geologic Hazards	Hazardous materials Release	Homeland Security Incident	Severe Summer Weather	Severe Winter Weather	Shortage or Outage of Critical Materials or Infrastructure	Transportation Accident	Urban Fire or Structure Collapse	Wildland Fire	Windstorm
Blocked Roads		X		X	X	X	X	X	X		X	X	X	X
Building Collapse		X		X	X		X	X	X			X		X
Business Interruptions	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Delayed Emergency Response	X	X		X	X	X	X	X	X	X	X			X
Downed Power Lines		X		X	X			X	X			X	X	X
Downed Trees		X		X	X			X	X				X	X
Evacuation (Full)		X		X		X								
Evacuation (Localized)		X		X	X	X	X	X	X		X	X	X	X
Explosion						X	X	X			X	X	X	
Flooding (Street)		X		X				X	X					
Flooding (Structure)		X		X				X	X					
HAZMAT Release	X	X		X		X	X	X	X		X	X	X	X
Increased Fire Potential			X			X	X	X	X			X	X	X
Increased Public Safety Runs	X	X		X		X	X	X	X	X	X	X		X
Livestock Injury/Death	X	X	X	X		X		X	X	X			X	X
Loss of Economy	X	X	X	X		X	X	X	X	X		X	X	X
Loss/Overcrowded Medical Facilities	X	X				X	X	X	X		X	X		X
Loss of Potable Water	X	X	X	X	X	X	X	X	X	X				X
Loss of Power		X		X	X		X	X	X	X		X	X	X
Mass Casualties	X	X				X	X	X			X	X		X
Property Damage		X	X	X	X	X	X	X	X		X	X	X	X
School Closure	X	X		X		X	X	X	X	X		X		X
Sewer Backup		X		X				X						
Wind Chill									X					X

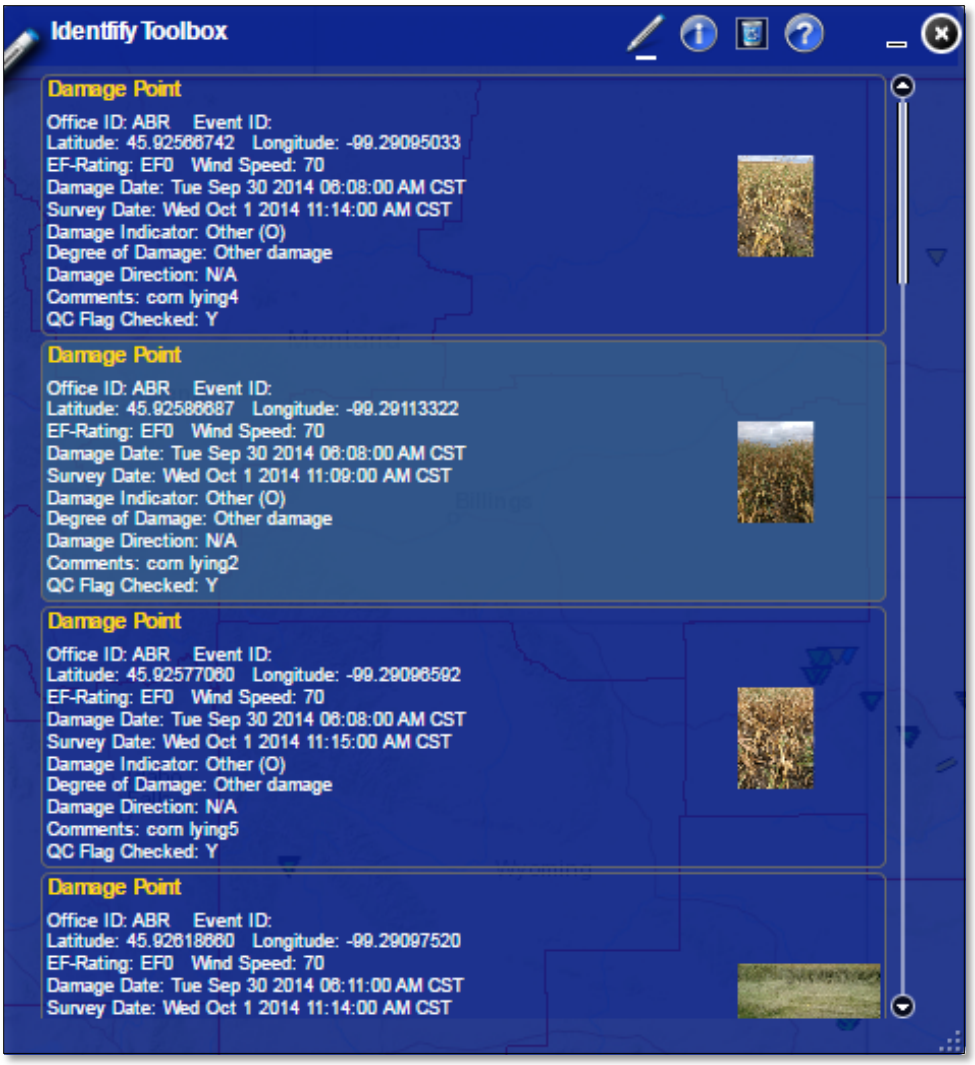
Overall Vulnerability Summary

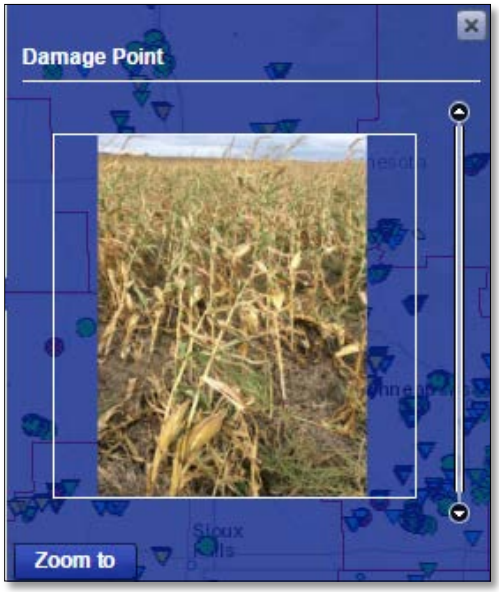
HAZARD	Description
Communicable Disease	New hazard to match the State Plan.
Dam Failure	Reclassified from “C” to "D" due to all dams having a Federal Hazard Classification of "low" and no previous history.
Drought	
Flood	Reclassified from “A” to "B" due to percentage of area affected.
Geologic Hazards	New hazard to match the State Plan.
Hazardous Materials Release	
Homeland Security Incident	
Severe Summer Weather	
Severe Winter Weather	
Shortage or Outage of Critical Materials or Infrastructure	
Transportation Accident	
Urban Fire or Structure Collapse	
Wildland Fire	Reclassified from “D” to “C” based on area affected.
Windstorm	New hazard to match the State Plan.

Damage Assessment

NOAA National Weather Service has developed an online Damage Survey Viewer (experimental).




Identify Toolbox
Damage Point
Office ID: ABR Event ID:
Latitude: 45.92586742 Longitude: -99.29095033
EF-Rating: EF0 Wind Speed: 70
Damage Date: Tue Sep 30 2014 06:08:00 AM CST
Survey Date: Wed Oct 1 2014 11:14:00 AM CST
Damage Indicator: Other (O)
Degree of Damage: Other damage
Damage Direction: N/A
Comments: corn lying4
QC Flag Checked: Y
Damage Point
Office ID: ABR Event ID:
Latitude: 45.92586687 Longitude: -99.29113322
EF-Rating: EF0 Wind Speed: 70
Damage Date: Tue Sep 30 2014 06:08:00 AM CST
Survey Date: Wed Oct 1 2014 11:09:00 AM CST
Damage Indicator: Other (O)
Degree of Damage: Other damage
Damage Direction: N/A
Comments: corn lying2
QC Flag Checked: Y
Damage Point
Office ID: ABR Event ID:
Latitude: 45.92577060 Longitude: -99.29096592
EF-Rating: EF0 Wind Speed: 70
Damage Date: Tue Sep 30 2014 06:08:00 AM CST
Survey Date: Wed Oct 1 2014 11:15:00 AM CST
Damage Indicator: Other (O)
Degree of Damage: Other damage
Damage Direction: N/A
Comments: corn lying5
QC Flag Checked: Y
Damage Point
Office ID: ABR Event ID:
Latitude: 45.92618660 Longitude: -99.29097520
EF-Rating: EF0 Wind Speed: 70
Damage Date: Tue Sep 30 2014 06:11:00 AM CST
Survey Date: Wed Oct 1 2014 11:14:00 AM CST

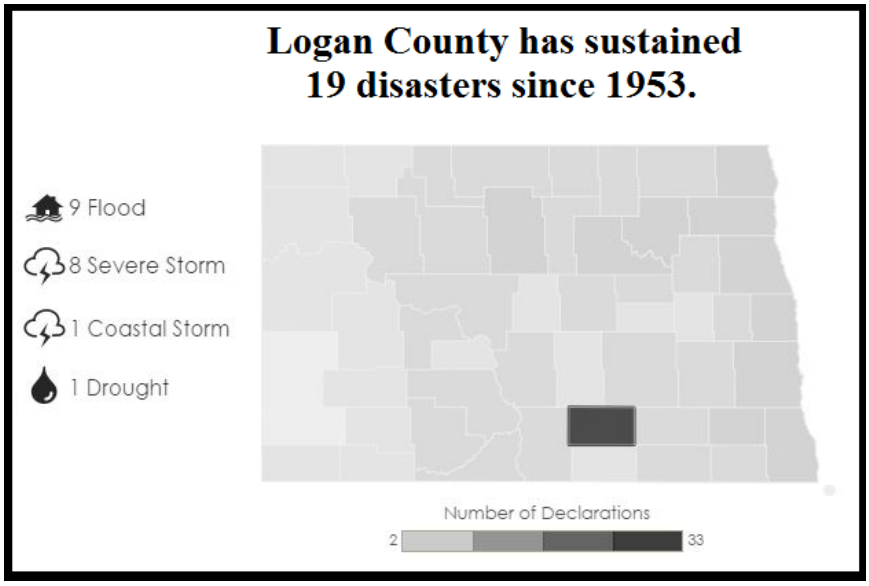

Damage Point
Zoom to

THIRA Survey Results
As of 10-02-14

2013 Logan County Hazard/Threat Identification Comparison*						
		Very Likely	**Likely**	**Possible**	**Unlikely**	**Improbable**
	Score	**5**	**4**	**3**	**2**	**1**
Catastrophic	**5**					
Significant	**4**					
Moderate	**3**					
Minor	**2**		• Summer Storms • Winter Storms	• Animal Disease Outbreak • Biological Food Contamination • Chemical/Biological Food Production Attack • Cyber Attack • Explosives • Flood • Human Pandemic Outbreak Terrorism Attack		
None/ Negligible	**1**		• Armed Assault • Chemical Substance Spill or Release	• Chemical Terrorism Attack (Nonfood) • Wildfire	•Aircraft as a Weapon • Biological Terrorism Attack (Nonfood) • Nuclear Terrorism Attack • Radiological Substance Release • RDD Terrorism Attack	• Dam Failure

*Based on 11 responses

Logan County Disaster Declarations



#	Declared	Description
1981	05/10/2011	Flooding
1907	04/21/2010	Flooding
1879	02/26/2010	Severe Winter Storm
1829	03/24/2009	Severe Storms and Flooding
1713	07/17/2007	Severe Storms and Flooding
3247	09/13/2005	Hurricane Katrina Evacuation
1376	05/28/2001	Severe Storms, Flooding, Ground Saturation
1334	06/27/2000	Severe Storms, Flooding, Ground Saturation
1279	06/08/1999	Severe Storms, Flooding, Snow, Ice, Ground Saturation, Landslides, Mudslides, Tornadoes
1174	04/07/1997	Severe Flooding, Severe Winter Storms, Snowmelt, Spring Rains
1157	01/12/1997	Severe Winter Storms, Blizzard Conditions
1118	06/05/1996	Severe Storms, Flooding, Ice Jams
1050	05/16/1995	Severe Storms, Flooding, Ground Saturation
1032	07/01/1994	Severe Storms, Flooding
1001	07/26/1993	Severe Storms, Flooding
581	04/26/1979	Severe Storms, Snowmelt, Flooding
554	04/17/1978	Storms, Ice Jams, Snowmelt, Flooding
3016	07/21/1976	Drought
256	04/18/1969	Flooding

Source: https://www.fema.gov/data-visualization-disaster-declarations-states-and-counties

Communicable Disease

Frequency	Possible (1-10% probability in the next year, or at least 1 chance in next 100 years)
Severity	Limited (25-50% of jurisdiction affected)
Risk Class	C
Seasonal Pattern	None
Duration	Hours/Days
Speed of Onset	No warning
Location	Countywide

Description
Naturally occurring biological diseases in humans as well as those biological agents found in the environment, or diagnosed in animals, that have the potential for transmission to humans.

According to the US Census Bureau 2011-2015 American Community Survey 5-Year Estimates, agriculture is the second largest industry in Logan County.

The probability of communicable disease in Logan County presents challenges due to a limited history of outbreaks. Medical advances over the past fifty years prevent many disease outbreaks, yet the potential still remains. Logan County is primarily a rural setting and somewhat isolated from the rapid spread of global diseases, however, international and domestic travel is so common that, like the Spanish Influenza Pandemic of 1918, North Dakotans would most likely be affected at some point. Urban areas could see rapid spread of such diseases through their populations.

Identified Impacts

- Business Interruptions
- Delayed Emergency Response
- HAZMAT Release
- Increased Public Safety Runs
- Livestock Injury/Death
- Loss of Economy
- Loss/Overcrowded Medical Facilities
- Loss of Potable Water
- Mass Casualties
- School Closure

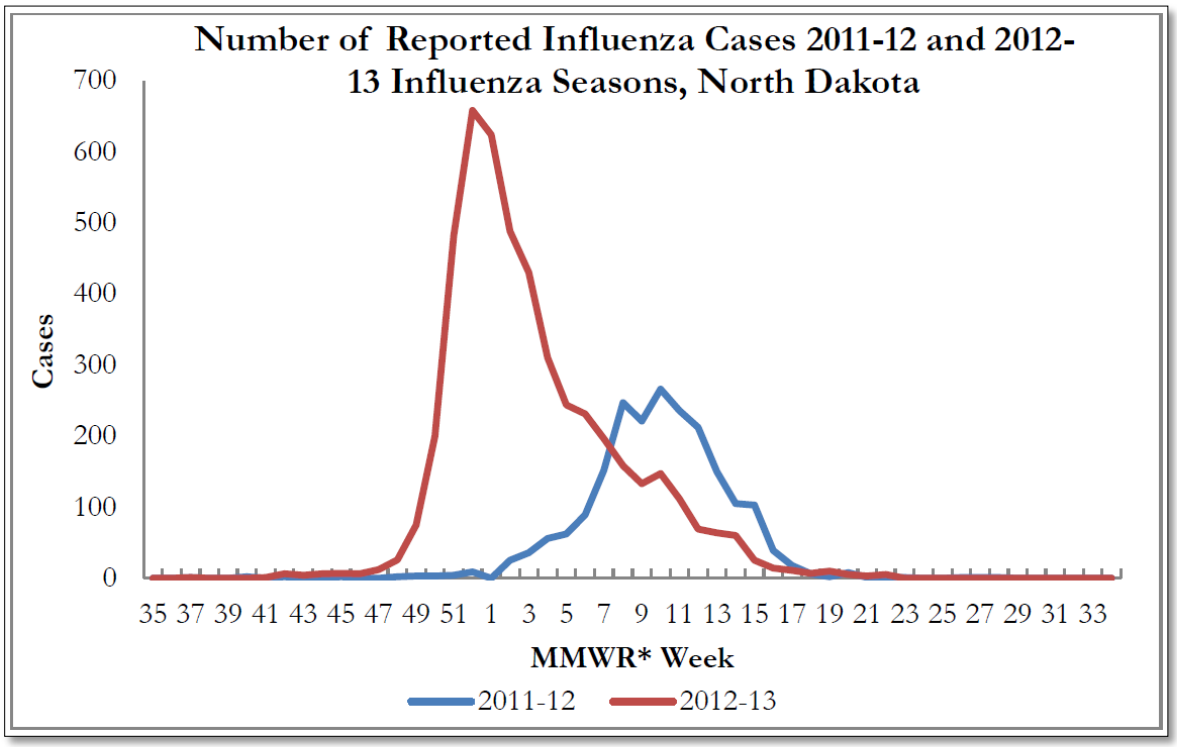
History

Although Logan County has not experienced a communicable pandemic in recent years, seasonal influenza outbreaks occur annually. West Nile and Lyme diseases remain yearly possibilities.

Logan County Influenza Season Summary

Season	Cases Identified in Logan County	Cases Identified in North Dakota
2012-2013	51	4,833
2011-2012	19	1,487
2010-2011	18	2,089
2009-2010	27	3,259

Source: ND Department of Health



Source: www.ndflu.com

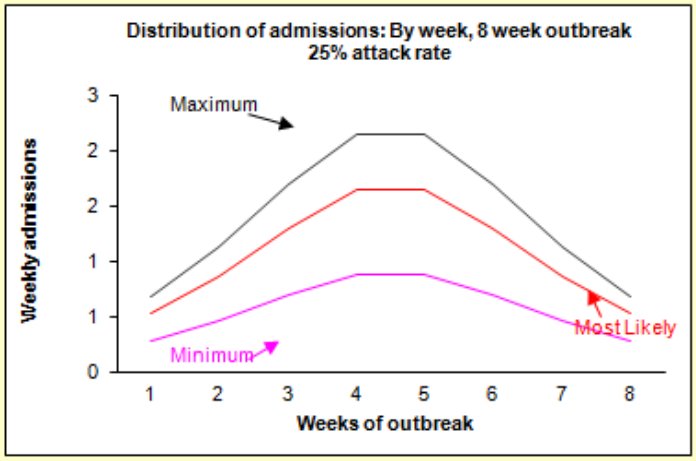
North Dakota has had three influenza pandemics in the 20th century: 1918 caused 5,100 deaths in North Dakota, 500,000 deaths in the United States; 1957 resulted in 70,000 deaths in the United States; and 1968 resulted in 34,000 deaths in the United States.

Spanish Influenza Pandemic of 1918

The magnitude of a communicable disease outbreak varies from everyday disease occurrences to widespread infection. During the 1918 Influenza Pandemic, infection rates approached 28% in the United States. (Billings, 1997) Other pandemics produced infections rates as high as 35% of the total population. (World Health Organization, 2007) Such a pandemic affecting North Dakota represents a severe magnitude event. Almost any highly contagious, incapacitating disease that enters the North Dakota population would quickly overwhelm local and state health resources. Similarly, any rapidly spreading bioterrorism event for which little vaccination or containment capability exists is a high magnitude event.

1918 Pandemic and Impact Rate
Based on 2011-2015 American Community Survey 5-Year Estimates*
Logan County

Pandemic Influenza Impact / Attack Rate	25%
Total Hospital Admissions	
Most Likely Scenario	9
Minimum Scenario	5
Maximum Scenario	11
Total Deaths	
Most Likely Scenario	2
Minimum Scenario	2
Maximum Scenario	3



Hosp Adm. / Week	1	2	3	4	5	6	7	8
Most Likely Scenario	1	1	1	2	2	1	1	1
Minimum Scenario	0	0	1	1	1	1	0	0
Maximum Scenario	1	1	2	2	2	2	1	1

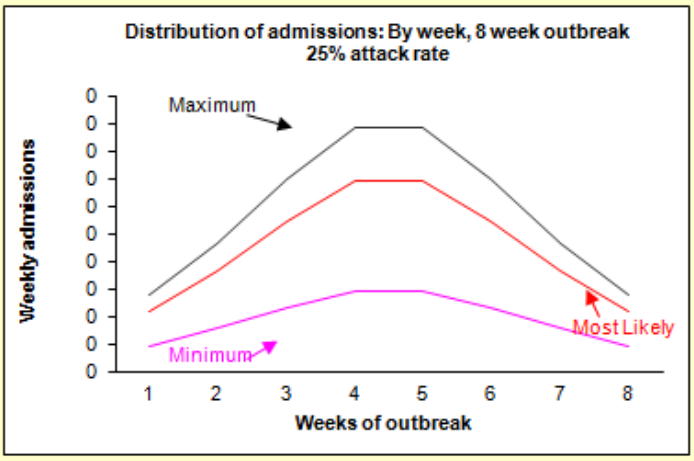
*According to Billings (1997) the 1918 attack rate was 28%, the figures above represented a 25% attack rate generated by FluSurge.

Community	Population	0-19 Years	20-64 Years	65+ Years
Logan County	1,945	426	963	556
Fredonia	46	8	30	8
Gackle	371	75	192	104
Lehr	80	0	37	43
Napoleon	767	143	348	276

Source: US Census 2015 American Community Survey

1918 Pandemic and Impact Rate
Based on 2011-2015 American Community Survey 5-Year Estimates*
City of Fredonia

Pandemic Influenza Impact / Attack Rate	25%
Total Hospital Admissions	
Most Likely Scenario	0
Minimum Scenario	0
Maximum Scenario	0
Total Deaths	
Most Likely Scenario	0
Minimum Scenario	0
Maximum Scenario	0

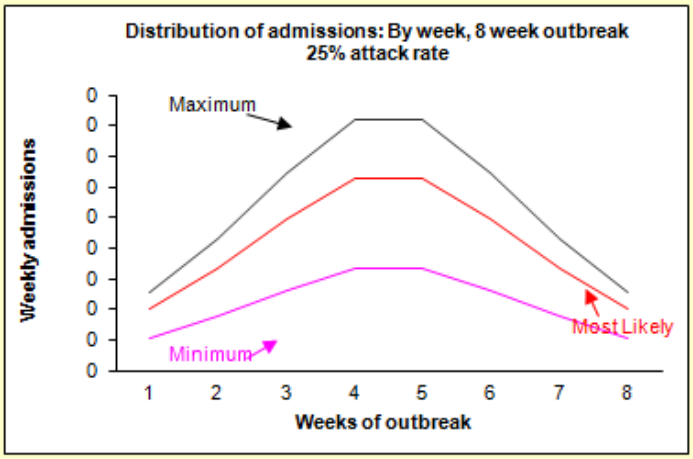


Hosp Adm. / Week	1	2	3	4	5	6	7	8
Most Likely Scenario	0	0	0	0	0	0	0	0
Minimum Scenario	0	0	0	0	0	0	0	0
Maximum Scenario	0	0	0	0	0	0	0	0

*According to Billings (1997) the 1918 attack rate was 28%, the figures above represented a 25% attack rate generated by FluSurge.

1918 Pandemic and Impact Rate
Based on 2011-2015 American Community Survey 5-Year Estimates*
City of Gackle

Pandemic Influenza Impact / Attack Rate	25%
Total Hospital Admissions	
Most Likely Scenario	2
Minimum Scenario	1
Maximum Scenario	2
Total Deaths	
Most Likely Scenario	0
Minimum Scenario	0
Maximum Scenario	1

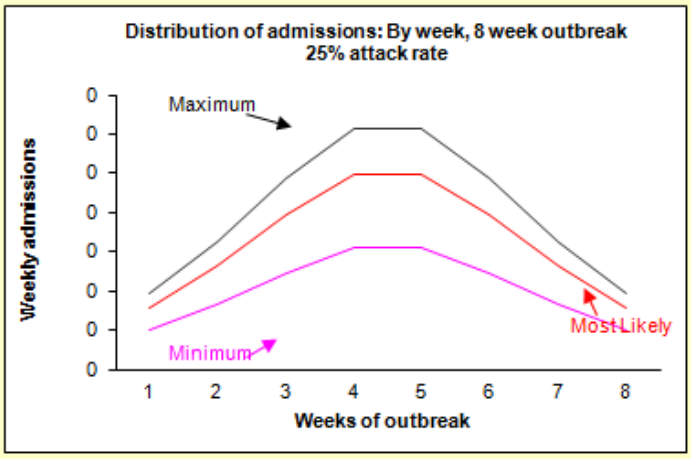


Hosp Adm. / Week	1	2	3	4	5	6	7	8
Most Likely Scenario	0	0	0	0	0	0	0	0
Minimum Scenario	0	0	0	0	0	0	0	0
Maximum Scenario	0	0	0	0	0	0	0	0

*According to Billings (1997) the 1918 attack rate was 28%, the figures above represented a 25% attack rate generated by FluSurge.

1918 Pandemic and Impact Rate
Based on 2011-2015 American Community Survey 5-Year Estimates*
City of Lehr

Pandemic Influenza Impact / Attack Rate	25%
Total Hospital Admissions	
Most Likely Scenario	1
Minimum Scenario	0
Maximum Scenario	1
Total Deaths	
Most Likely Scenario	0
Minimum Scenario	0
Maximum Scenario	0

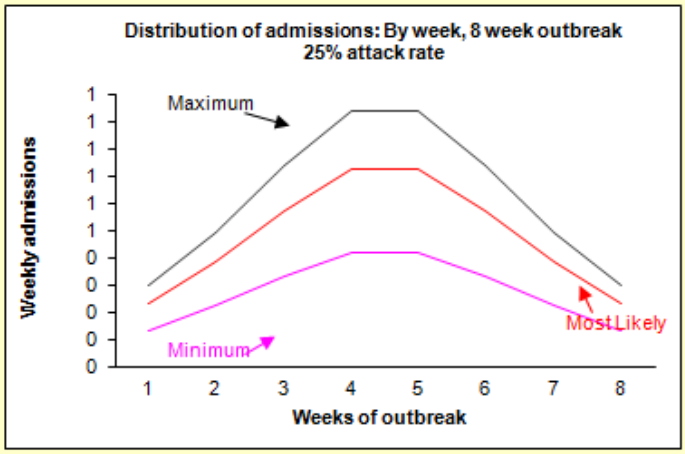


Hosp Adm. / Week	1	2	3	4	5	6	7	8
Most Likely Scenario	0	0	0	0	0	0	0	0
Minimum Scenario	0	0	0	0	0	0	0	0
Maximum Scenario	0	0	0	0	0	0	0	0

*According to Billings (1997) the 1918 attack rate was 28%, the figures above represented a 25% attack rate generated by FluSurge.

1918 Pandemic and Impact Rate
Based on 2011-2015 American Community Survey 5-Year Estimates*
City of Napoleon

Pandemic Influenza Impact / Attack Rate	25%
Total Hospital Admissions	
Most Likely Scenario	4
Minimum Scenario	2
Maximum Scenario	5
Total Deaths	
Most Likely Scenario	1
Minimum Scenario	1
Maximum Scenario	1



Hosp Adm. / Week	1	2	3	4	5	6	7	8
Most Likely Scenario	0	0	1	1	1	1	0	0
Minimum Scenario	0	0	0	0	0	0	0	0
Maximum Scenario	0	0	1	1	1	1	0	0

*According to Billings (1997) the 1918 attack rate was 28%, the figures above represented a 25% attack rate generated by FluSurge.

Agricultural Diseases, Noxious Weeds, and Pests

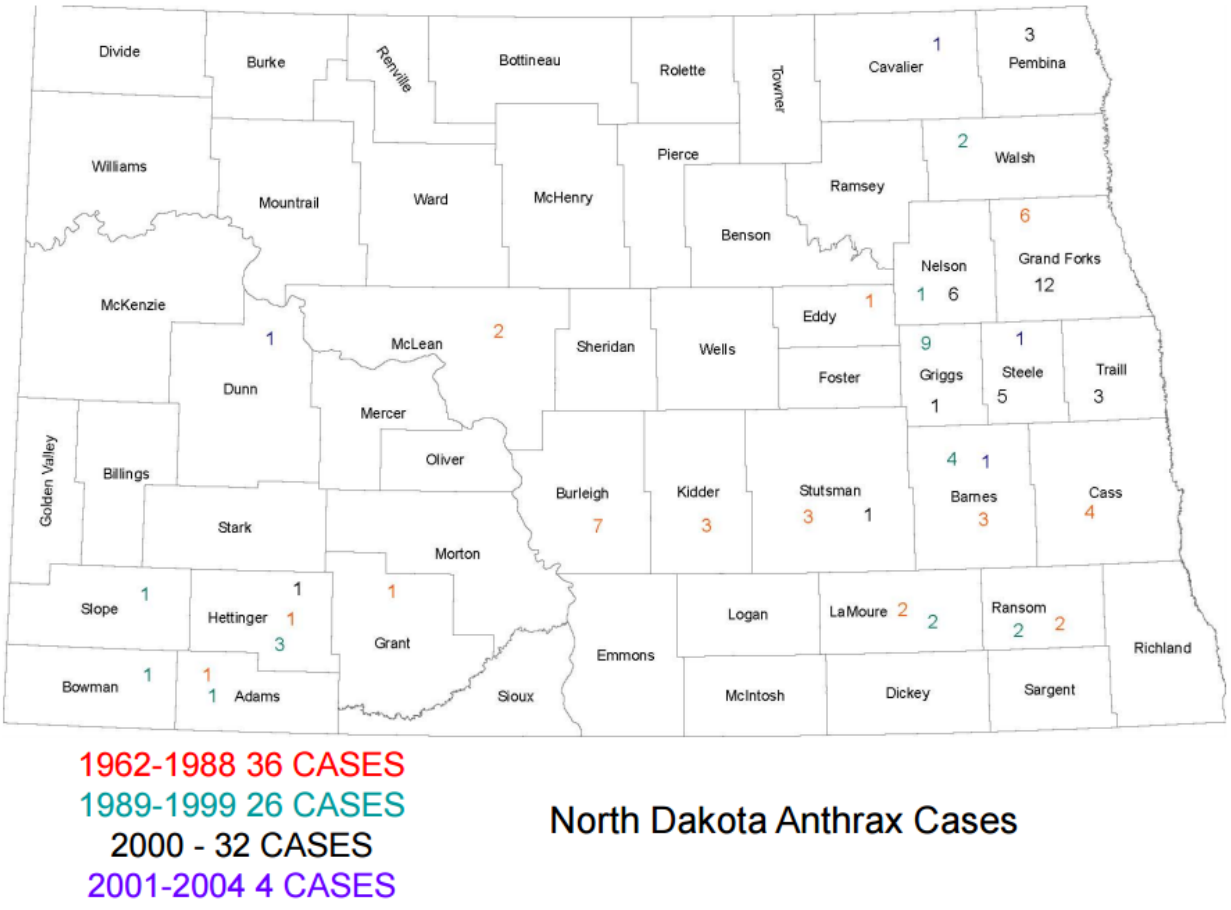
A comprehensive list of reportable conditions is maintained by the ND Department of Agriculture and available on their website.

Anthrax

"Anthrax occurs worldwide and is associated with sudden death of cattle and sheep. Anthrax can infect all warm-blooded animals, including humans. The anthrax organism (*Bacillus anthracis*) has the ability to form spores and become resistant to adverse conditions. Pasteurization or ordinary disinfectants may destroy anthrax organisms in animals or their secretions. However, if the animal carcass is opened and the organisms are exposed to air, they will form spores. Sporulated anthrax organisms are highly resistant to heat, cold, chemical disinfectants and drying. The anthrax spore may live indefinitely in the soil of a contaminated pasture or yard."
(Source: ND Department of Agriculture website)

Logan County has no case history:

Anthrax Cases in Logan County	
2015	0
2014	0
2013	0
2010	0

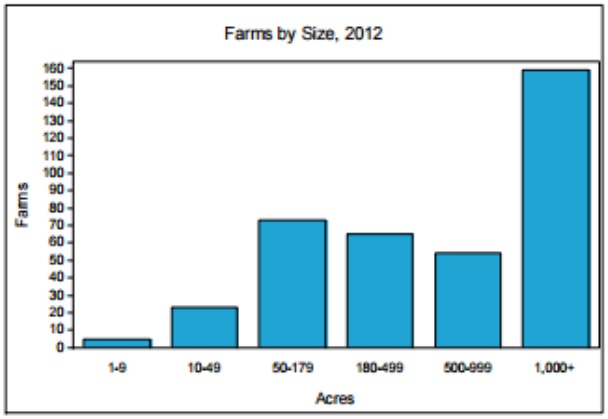


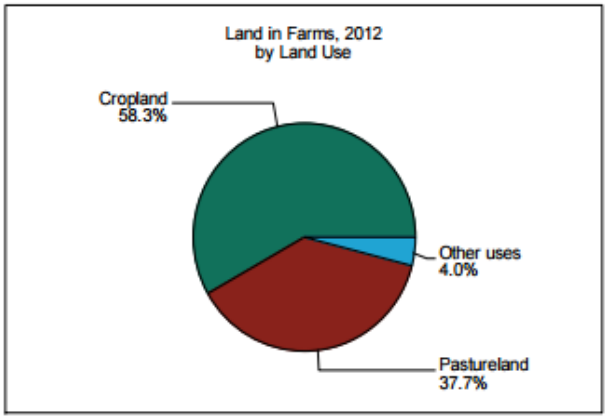
2012 CENSUS OF AGRICULTURE
COUNTY PROFILE

Logan County – North Dakota

	2012	2007	% change
Number of Farms	379	426	- 11
Land in Farms	571,599 acres	577,086 acres	- 1
Average Size of Farm	1,508 acres	1,355 acres	+ 11
Market Value of Products Sold	$172,099,000	$84,541,000	+ 104
Crop Sales $86,069,000 (50 percent) Livestock Sales $86,030,000 (50 percent)			
Average Per Farm	$454,087	$198,452	+ 129
Government Payments	$3,296,000	$4,722,000	- 30
Average Per Farm Receiving Payments	$9,665	$12,329	- 22

Source: 2012 Census of Agriculture website





Source: 2012 Census of Agriculture website

Ranked items among the 53 state counties and 3,079 U.S. counties, 2012

Item	Quantity	State Rank
MARKET VALUE OF AGRICULTURAL PRODUCTS SOLD ($1,000)		
Total value of agricultural products sold	172,099	26
Value of crops including nursery and greenhouse	86,069	42
Value of livestock, poultry, and their products	86,030	1
VALUE OF SALES BY COMMODITY GROUP ($1,000)		
Grains, oilseeds, dry beans, and dry peas	(D)	42
Tobacco	-	-
Cotton and cottonseed	-	-
Vegetables, melons, potatoes, and sweet potatoes	-	-
Fruits, tree nuts, and berries	(D)	16
Nursery, greenhouse, floriculture, and sod	-	-
Cut Christmas trees and short rotation woody crops	-	-
Other crops and hay	(D)	18
Poultry and eggs	1	50
Cattle and calves	82,367	1
Milk from cows	(D)	11
Hogs and pigs	14	30
Sheep, goats, wool, mohair, and milk	-	-
Horses, ponies, mules, burros, and donkeys	65	37
Aquaculture	-	-
Other animals and other animal products	(D)	15
TOP CROP ITEMS (acres)		
Soybeans for beans	80,984	23
Corn for grain	70,465	15
Forage-land used for all hay and haylage, grass silage, and greenchop	58,545	11
Wheat for grain, all	39,818	49
Spring wheat for grain	34,492	47
TOP LIVESTOCK INVENTORY ITEMS (number)		
Cattle and calves	64,400	7
Colonies of bees	(D)	11
Horses and ponies	232	48
Broilers and other meat-type chickens	150	19
Hogs and pigs	90	28

Source: 2012 Census of Agriculture website

Dam Failure

Frequency	Possible (1-10% probability in next year, or at least 1 chance in next 100 years)
Severity	Negligible (Less than 10% of jurisdiction affected)
Risk Class	D
Seasonal Pattern	Spring/Summer
Duration	Days/Weeks
Speed of Onset	Little warning
Location	Countywide

Description

A dam is any artificial barrier, including appurtenant works, which impounds or diverts water. Its purposes include the storage of water for irrigation, hydroelectric power generation, flood control, water supply, recreation, wildlife, etc. A dam failure is defined as a sudden, rapid, and uncontrolled release of impounded water that will create a potential significant downstream hazard. The dam failure hazard is determined by the potential loss of life and downstream property damage it may cause, and not by any particulars of the dam itself. There are many reasons and/or potential causes for dam failure such as terrorism, earthquakes, etc.; however, the most common reasons are hydraulic inadequacy, seepage problems, and structural defects.

The "FEMA Federal Guidelines for Dam Safety, Hazard Potential Classification System for Dams, April 2004" defines three classification levels:

- Low Hazard Potential: Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

- Significant Hazard Potential: Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

- High Hazard Potential: Dams assigned the high hazard potential classification are those where failure or mis-operation will probably cause loss of human life.

Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable. One or more expected	Yes (but not necessary for this classification)

Identified Impacts

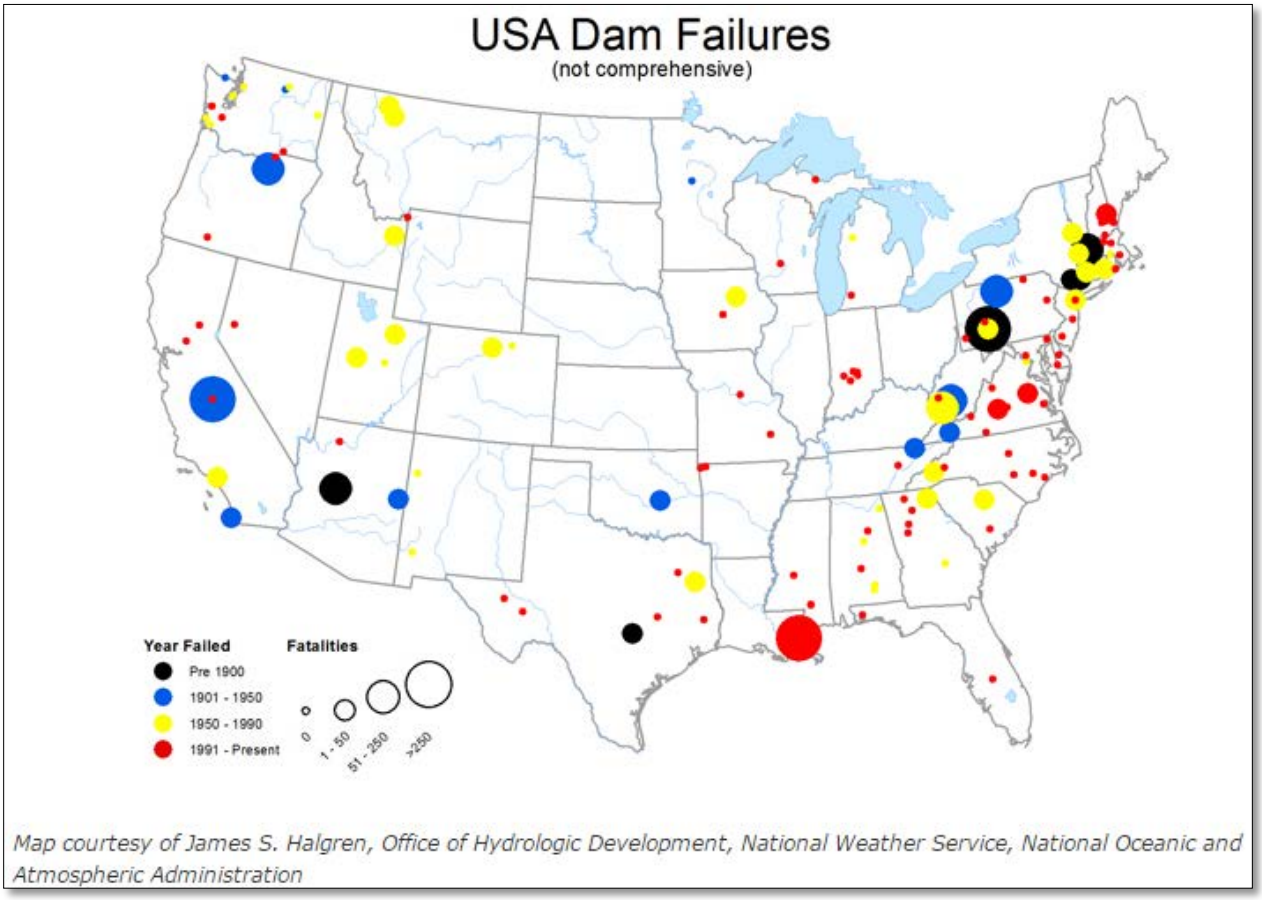
- Blocked Roads
- Building Collapse
- Business Interruptions
- Delayed Emergency Response
- Downed Power Lines
- Downed Trees
- Evacuation (Full)
- Evacuation (Localized)
- Flooding (Street)
- Flooding (Structure)
- HAZMAT Release
- Increased Public Safety Runs
- Livestock Injury/Death
- Loss of Economy
- Loss/Overcrowded Medical Facilities
- Loss of Potable Water
- Loss of Power
- Mass Casualties
- Property Damage
- School Closure
- Sewer Backup

The ND State Water Commission identifies 20 dams in Logan County. All of these dams have an element of hazard to cause loss of life and property damage should the dam fail. One dam is classified as "Significant" and one dam is classified as "High".

Location	Type	Structure Name	County	Purpose	Federal Hazard Class
13407133AB	Dam	BEAVER LAKE DAM	Logan	Recreation	Low
13606720AB	Dam	ROALDSON DAM; GERALD	Logan	Fish & Wildlife	Low
13407213CA	Dam	LUBBERS DAM; GEORGE	Logan	Livestock	Low
13606934AD	Dam	LANG DAM; KEN	Logan	Fish & Wildlife	Low
13307121CA	Dam	HILDENBRAND DAM	Logan	Livestock	Low
13507103DA	Dam	RATTEI DAM; GERALD	Logan	Fish & Wildlife	Low
13606833BA	Dam	ANDERSON DAM; JONATHON 1	Logan	Fish & Wildlife	Low
13607226CB	Dam	GRENZ DAM; HARLEY K	Logan	Livestock	Low
13506715BD	Dam	GUMKE DAM; RAY	Logan	Livestock	Low
13307010BC	Dam	SCHAEFFER DAM; JACOB 1	Logan	Livestock	Low
13307303DD	Dam	SPERLE DAM	Logan	Recreation	Low
13406804AD	Dam	GRABER DAM; DAVE	Logan	Waste Lagoon	None
13506830AB	Dam	FIECHTNER DAM; ELROY	Logan	Livestock	Low
13307010BA	Dam	SCHAEFFER DAM; JACOB 2	Logan	Livestock	Low
13607106DC	Dam	JOHNSON DAM; WILLIAM JR	Logan	Livestock	Low
13506902AD	Dam	MILLER DAM; MARVIN 2	Logan	Other	Low
13506901BDB	Dam	MILLER DAM; MARVIN 1	Logan	Other	Low
13606833BC	Dam	ANDERSON DAM; JONATHON 2	Logan	Other	Low
13307321AA	Dam	WOLD DAM; MARKUS	Logan	Livestock	Low
13607106DDB	Dam	JOHNSON DAM; WILLIAM	Logan	Livestock	Low

History – There has been no history of a dam failure within Logan County.

The Association of State Dam Safety Officials presents a map on their website compiled of a list of dam and levee failures.



Map courtesy of James S. Halgren, Office of Hydrologic Development, National Weather Service, National Oceanic and Atmospheric Administration

Drought

Frequency	Likely (10-100% probability in the next year, or at least 1 chance in next 100 years)
Severity	Critical (25-50% of jurisdiction affected)
Risk Class	B
Seasonal Pattern	Summer
Duration	Weeks/Months
Speed of Onset	Slow onset

Description

Drought is a condition of climatic dryness which is severe enough to reduce soil moisture and water below the minimum necessary for sustaining plant, animal, and human life systems. Drought characteristics usually include precipitation levels well below normal and temperatures higher than normal. In addition to severe damage to vegetation, soil in a drought area becomes dry and crumbles. Often, topsoil is blown away by hot, dry winds. Streams, ponds, and wells often dry up during a drought, thus wildlife and livestock suffer and even die. Although agriculture production is the most obvious recipient of drought losses, this hazard will also attack urban areas by impacting on domestic and industrial water supplies.

Identified Impacts
It is a fact that precipitation deficits as little as four to six inches can cause severe drought conditions.

Drought severity regarding our agriculture procedures depends on time of year, timing of precipitation, amount of stored soil water, type of crop, stage of growth, and meteorological variables such as temperature, humidity, and wind.

A number of secondary hazards are generally associated with drought. Rural grassland fires increase because of dry vegetation. Reduction in vegetation cover will expose the soil to wind, and dust storms and soil erosion will occur. Because of reduction in flow, the chemical quality of river and lake water will change, and the sediment transport regimes of streams will be altered.

Deterioration in water quality, in turn, results in injury and death to plants and animals. Stagnant pools along river courses will provide favorable habitats for insects, particularly mosquitoes and grasshoppers. Finally, with the return of the rains, the dry and unstable topsoil is vulnerable to gullying and flooding.

There are a wide range of possible consequences that have and can occur again in regard to drought.

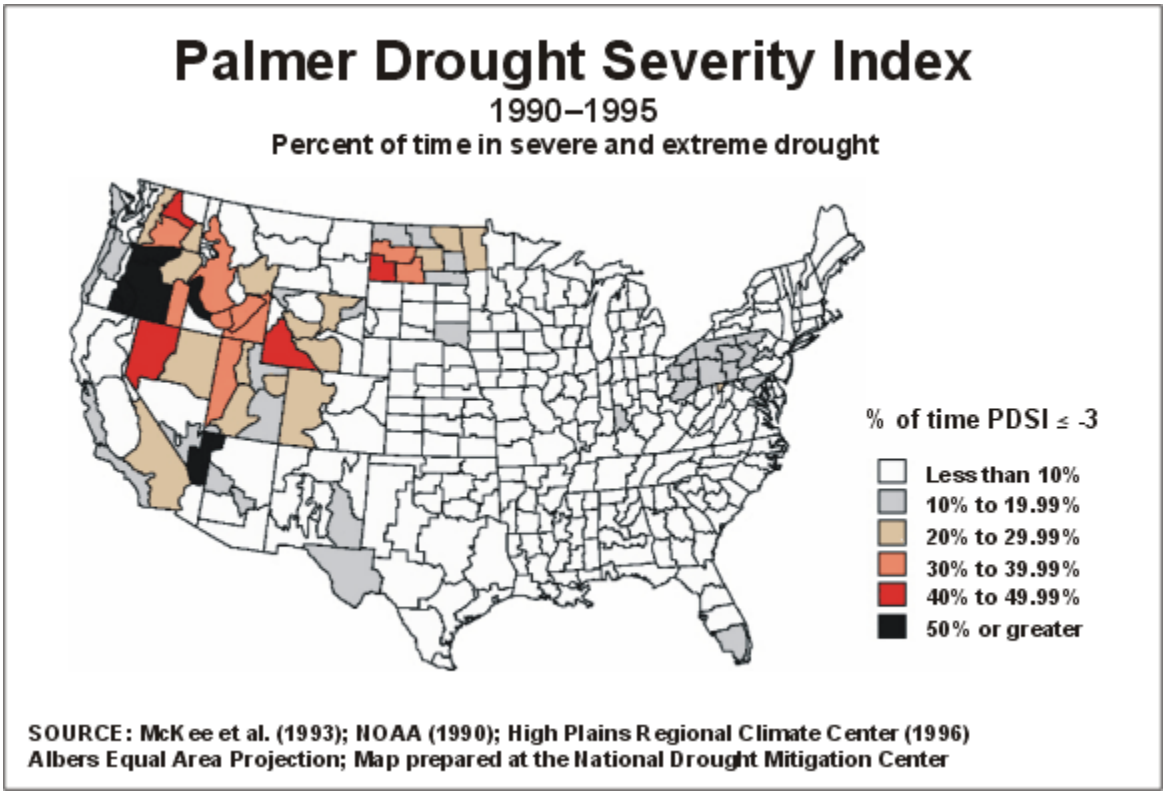
- Business Interruptions
- Increased Fire Potential
- Livestock Injury/Death
- Loss of Economy
- Loss of Potable Water
- Property Damage

History

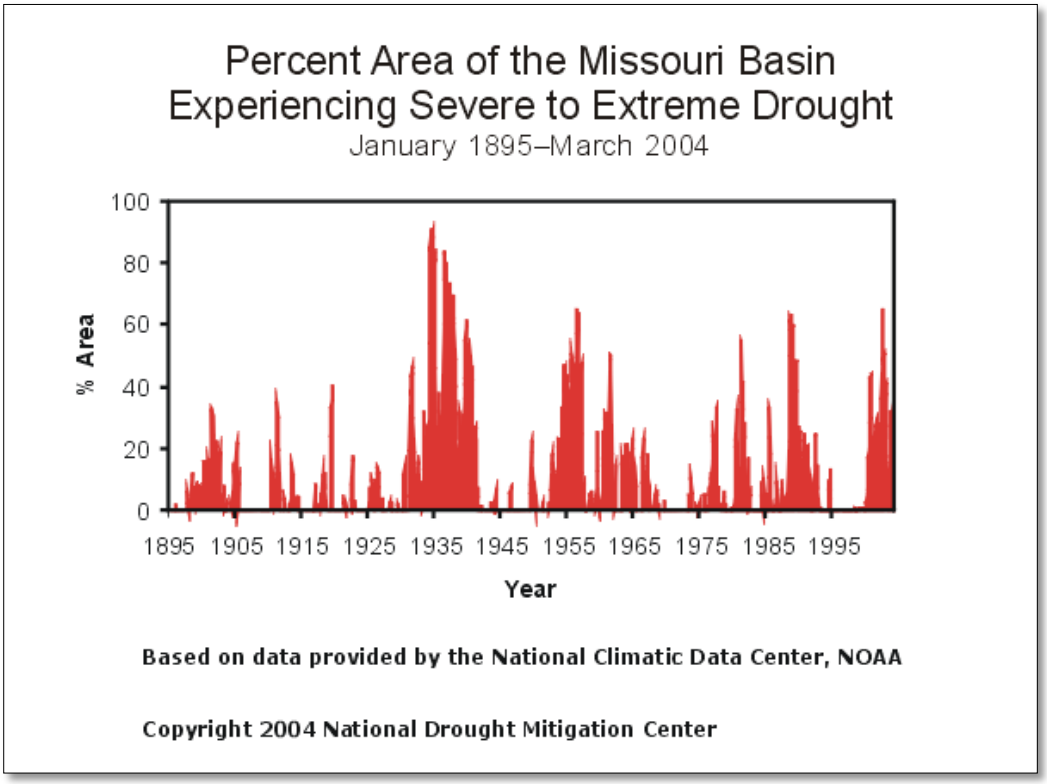
Heat, Excessive Heat

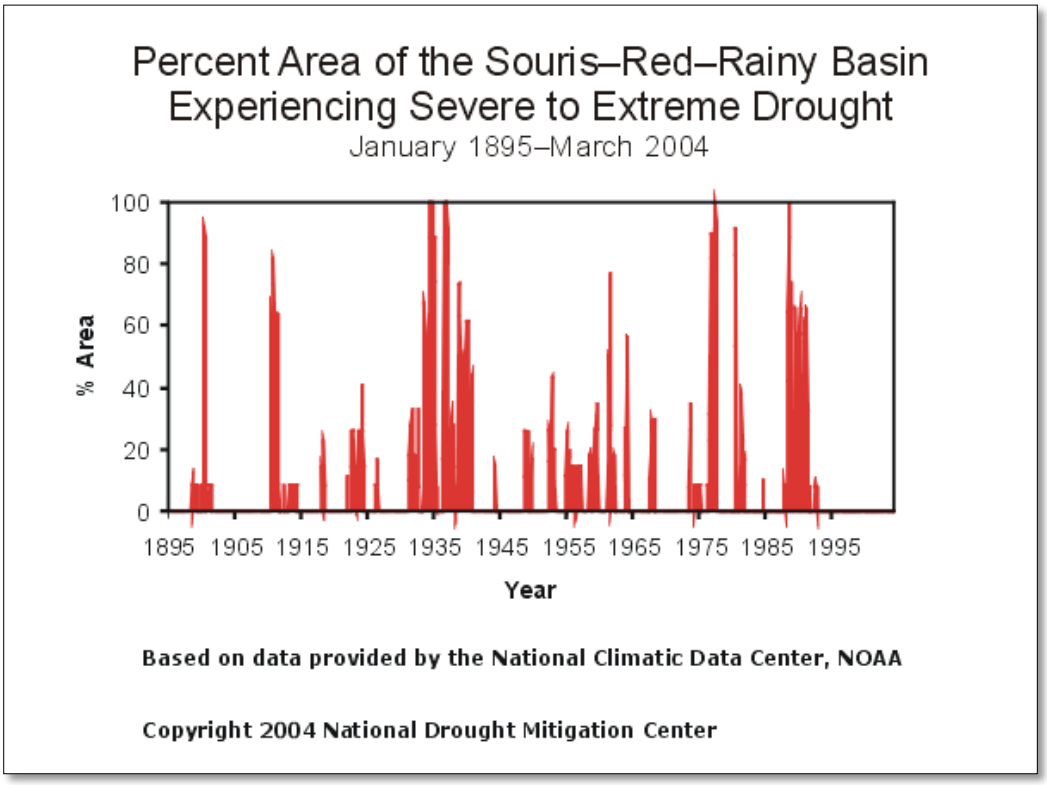
Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
LOGAN (ZONE)	7/16/2011	Excessive Heat		0	0	$0	$0
LOGAN (ZONE)	8/5/2001	Heat		0	0	$0	$0

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)



Source: National Drought Mitigation Center website

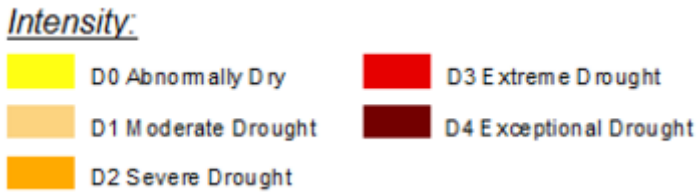




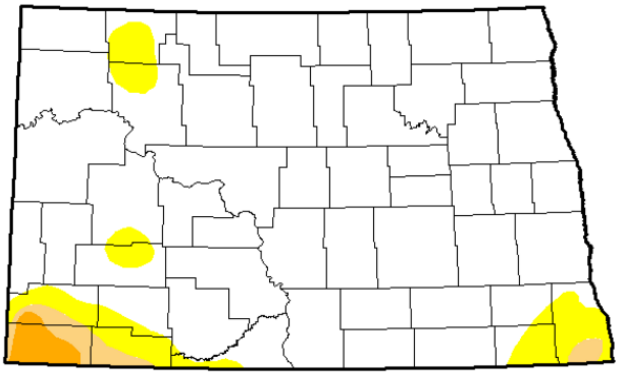
Source: National Drought Mitigation Center website

U.S. Drought Monitor, North Dakota

Source: http://droughtmonitor.unl.edu/MapsAndData/MapArchive.aspx



August 2, 2016



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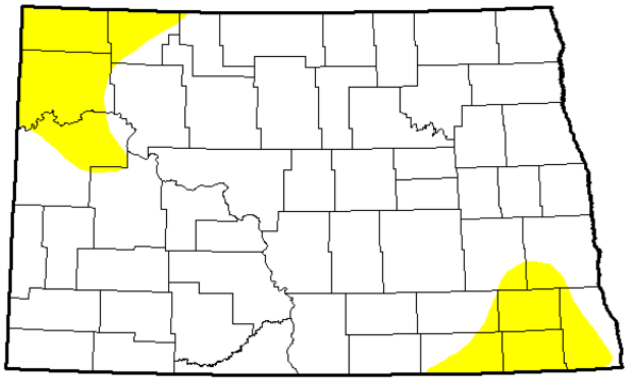

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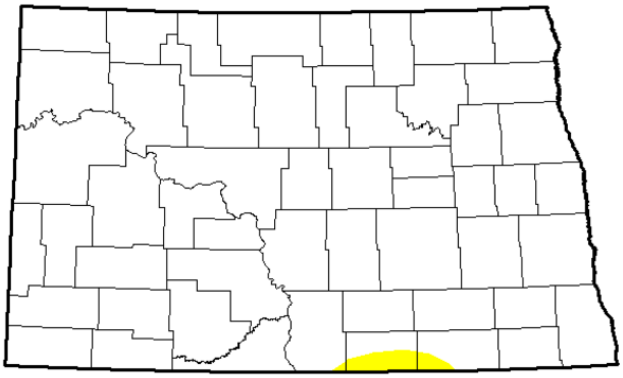

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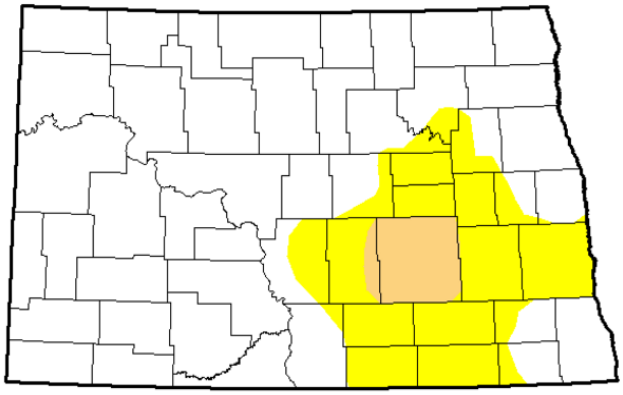

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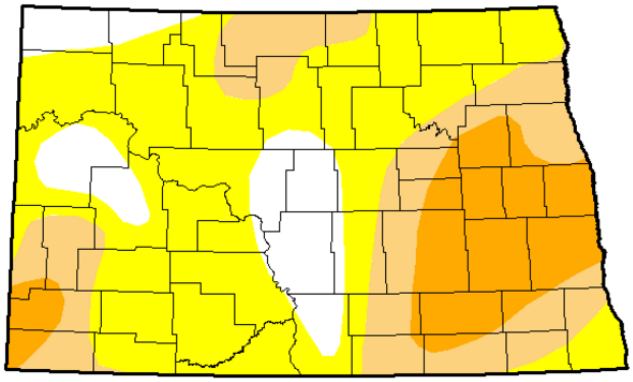

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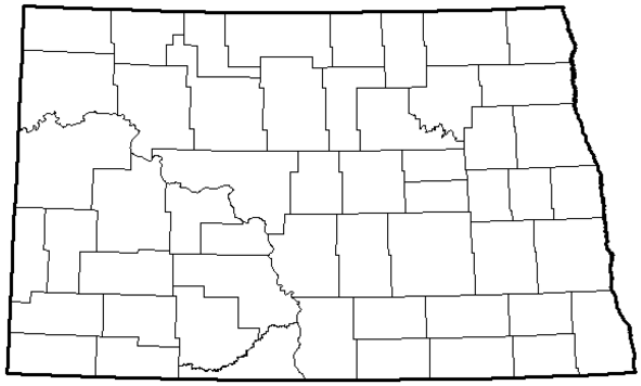


Flood

Frequency	Likely (10-100% probability in the next year, or at least 1 chance in next 10 years)
Severity	Critical (25-50% of jurisdiction affected)
Risk Class	B
Seasonal Pattern	Spring and Summer
Duration	1 to 10 days
Speed of Onset	More than 24 hours warning
Location	Countywide

Description
Flooding is defined as an overflow of water on land not normally covered by water.

Flood hazards arise from the complex effects of water on land surfaces and by water pressure. Flooding and its impact occur from the overflow of rivers, creeks, drainage channels, streams, lakes, and other bodies of standing water. Also, the inundation of low lands, the temporary backup of sewer and storm water systems, the rise of ground water, and finally the failure of flood control facilities such as dams, dikes, and levees.

Floods can occur when the ground is frozen and/or saturated with moisture and cannot absorb any further moisture. This moisture can come from several different sources and circumstances. One source is heavy snowpack which is affected by a rapid warming trend as well as spring rain falling directly on the snowpack. Another source of flooding occurs when heavy rain falls in such a short time that the soil cannot absorb it. Flooding is also caused when heavy rain falls over a prolonged period of time and the ground becomes saturated and cannot absorb the additional moisture.

Flooding can also result from ice jamming or blockage along streams. Ice breaking up into pieces, called floes, move along with the flowing rivers or streams. The ice floes can jam at curves, narrow places in the channel, and at structures creating an effective dam that produces water backup and overflow. Finally, flooding can occur as a result of dam, dike, or levee failure, overtopping or breaching.

The spring flood danger period generally occurs during March and April. A wet fall, early freeze up with saturated ground at the time of freezing, heavy winter precipitation, and warm rains during and after spring haw add to the seriousness of the spring flooding situation.

Floodplain Management in North Dakota

Flood control development had its beginning with the Flood Control Act of 1936. This Act provided a basic plan and an authorized program for the control of water resources. In the early 1940's the North Dakota State Water Commission cooperated with the Federal agencies to plan and engineer the overall program for North Dakota.

The U.S. Army Corps of Engineers occupies one of the major roles in flood control planning and construction. Two reservoirs built by the U.S. Soil Conservation Service have contributed materially to flood control by the construction of watershed projects in North Dakota. These watershed projects include channel work and flood retention structures. In such projects, the Soil Conservation District has the responsibility for assuring that 50 percent of the farms above a structure are under a basic conservation plan.

Floodplain Management in North Dakota: North Dakota has recognized that good floodplain management involves the utilization of a variety of tools to reduce the impact of flood disasters. It is also recognized that a balance must be reached between the three aspects of floodplain management which are: structural works designed to modify the flood itself, regulatory functions which may reduce susceptibility to flooding, and emergency preparedness actions which may reduce susceptibility to flooding, and emergency preparedness actions which minimize a flood's effect during a disaster.

The Federal Disaster Protection Act of 1973 requires state and local government to participate in the National Flood Insurance Program (NFIP) as a condition to the receipt of any federal loan or grant for construction projects in flood prone areas.

Participation in the NFIP requires communities to adopt floodplain regulations that meet NFIP objectives, which are: New buildings must be protected from flooding damages that occur as a result of the 100-year flood, and new development must not cause an increase in flood damages to other property.

Communities have been provided assistance through passage, in 1981, of the state's first Floodplain Management Act which directs the State Engineer to aid local governments to reduce flood damages through sound floodplain management. As a start, the state legislature provided the State Engineer with an appropriation to be used in assisting communities to obtain base flood (100-year) elevation data. With appropriate planning, we will see continued reduction in flood damage susceptibility across the state, but it will likely take many years to achieve the established goals.

Missouri River Basin

The Missouri River Basin, comprised of seven major sub-basins, is the largest in the state, draining approximately 48 percent of the state's total area. The basin coincides roughly with the portion of the state having a semiarid climate. The tributaries on the south and west sides of the Missouri River typically occupy small but sharply defined valleys. This area is well drained with very few natural lakes. Numerous flat-topped, steep-sided buttes and hills characterize the topography. The most prominent are located in the Badlands along the Little Missouri River. Numerous small lakes and wetlands characterize the area east of the Missouri River. Annual mean precipitation in the basin ranges from 13 inches in the northwest to 17 inches in the east.

Lake Sakakawea was formed by the construction of the Garrison Dam in 1953. Lake Sakakawea covers 368,000 surface acres, can store a maximum of 24.5 million acre-feet, and has 1,600 miles of shoreline is six counties. Lake Oahe Dam in South Dakota covers 40,000 to 80,000 surface acres in North Dakota, with an average storage of 989,605 acre-feet and a maximum storage of 1,626,588 acre-feet, depending upon the management elevation of the lake. The two projects required a total of 550,000 acres of land in North Dakota, including shoreline acres needed for flood conditions.

Hydrologic Analyses

Hydrologic analyses were completed on the following area as part of the Flood Insurance Study, City of Napoleon, North Dakota, Revised: February 19, 1987 (available from the FEMA Map Service Center, Product 380044V000):

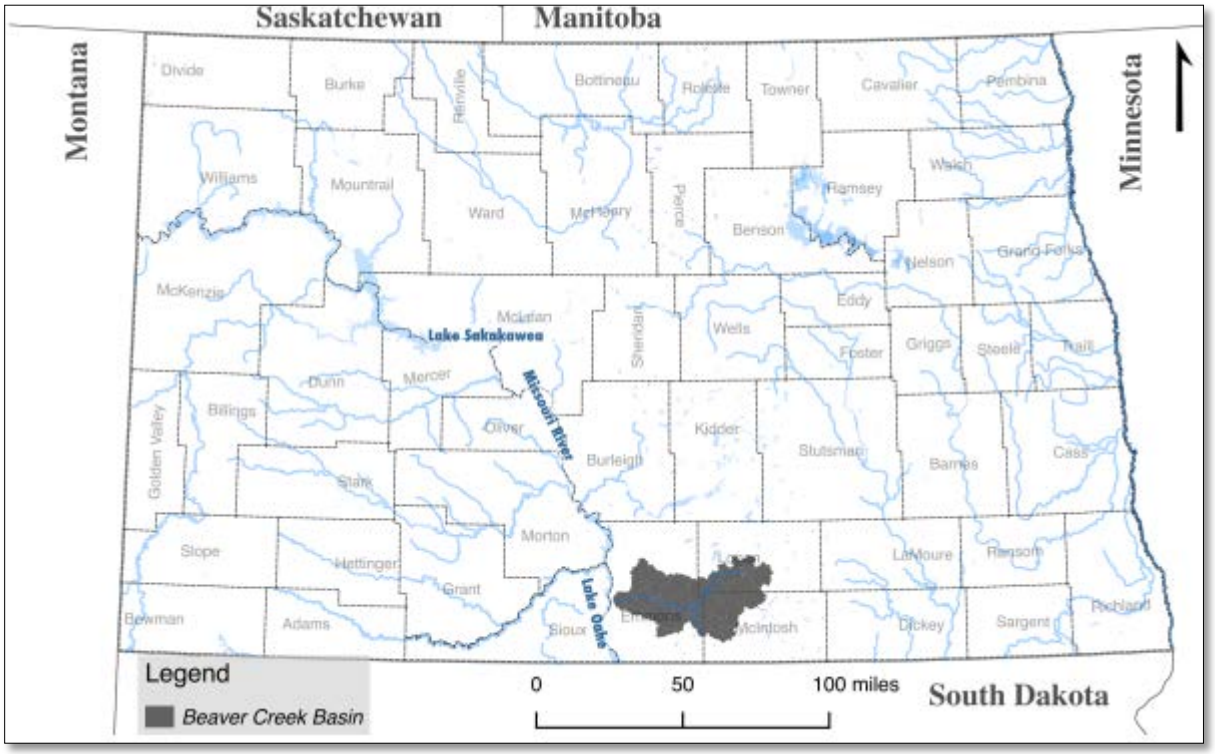
- McKenna Coulee

Beaver Lake

The ND State Water Commission completed the Beaver Creek Hydrology Report, Emmons, Logan, and McIntosh Counties, North Dakota, in August 2016.

Beaver Creek is a tributary to the Missouri River that flows through Logan, McIntosh, and Emmons Counties in North Dakota. "The meandering creek flows west from Beaver Lake to the Missouri River. The northern and eastern portions of the watershed are characterized by steep, rolling hills and hummocky areas with nonintegrated drainage existing near the southern and eastern edges of the basin." Source: Beaver Creek Hydrology Report, August 2016

The majority of floods on Beaver Creek are driven by snowmelt or rain-on-snow events impacting Emmons County. "The hydrologic analysis shows that flash flooding at Linton can be caused by runoff from local subbasins, and upper basin runoff can cause long sustained flood peaks at Linton. Many times these occur in tandem; however, if the initial rapid peak is delayed by storage, peak flows could be increased by amplifying the longer, sustained flood peak with the retained water." Source: Beaver Creek Hydrology Report, August 2016



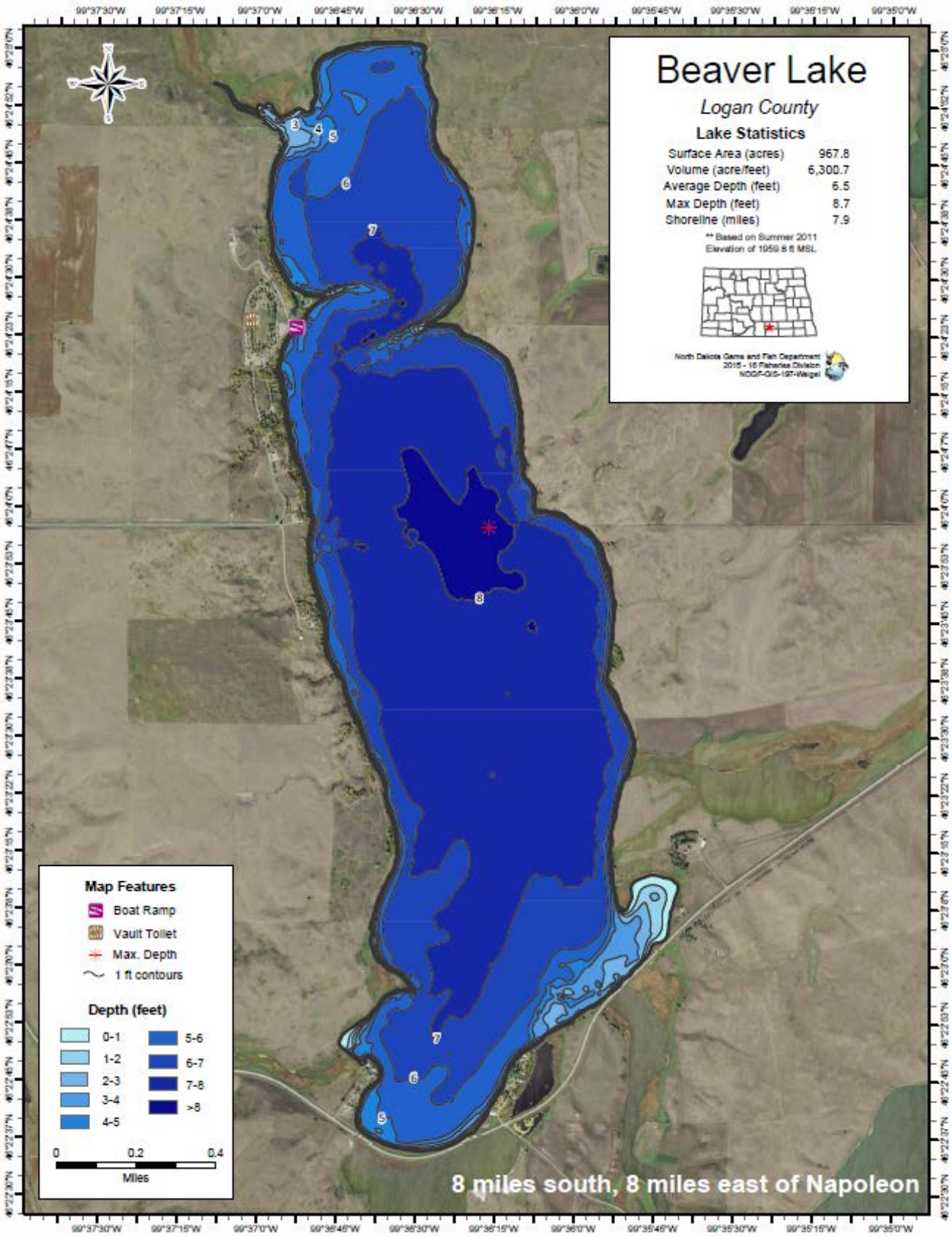
Source: Beaver Creek Hydrology Report, Emmons, Logan, and McIntosh Counties, North Dakota, SWC Project #558, August 2016.

Beaver Lake State Park

Beaver Lake is located in Logan County, North Dakota and is approximately 968 acres in size. It is estimated to be eight feet deep at its deepest point.

Beaver Lake State Park is located southeast of Napoleon. Beaver Creek was dammed in 1933, raising the level of the lake. In 1935, a Works Progress Administration (WPA) crew was assigned to the park to build roads and pathways, construct an earthen dock, and to terrace the picnic area. In the summer, the lake attracts visitors for boating, canoeing, water skiing and fishing.

Source: ND Parks and Recreation Department website



Source: ND Game and Fish website

Identified Impacts
Short-duration, high-intensity spring rainstorms and snowmelt (or combination thereof) are the principal cause of flooding in Logan County.

Floodplains consist primarily of cropland and open rangeland with some brushy and wooded areas.

(Source: Flood Insurance Study, City of Napoleon, North Dakota, Revised: February 19, 1987 (available from the FEMA Map Service Center, Product 380044V000)

- Blocked Roads
- Building Collapse
- Business Interruptions
- Delayed Emergency Response
- Downed Power Lines
- Downed Trees
- Evacuation (Full)
- Evacuation (Localized)
- Flooding (Street)
- Flooding (Structure)
- HAZMAT Release
- Increased Public Safety Runs
- Livestock Injury/Death
- Loss of Economy
- Loss of Potable Water
- Loss of Power
- Property Damage
- School Closure
- Sewer Backup

History

Flood, Flash Flood, Heavy Rain

Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
NAPOLEON	8/16/2014	Flash Flood		0	0	$250,000	$100,000
NAPOLEON	6/22/2013	Heavy Rain		0	0	$0	$0
NAPOLEON	6/20/2013	Flash Flood		0	0	$9,000	$0
NAPOLEON	4/1/2009	Flood		0	0	$50,000	$0
NAPOLEON	3/6/2009	Flood		0	0	$121,000	$0
NORTHEAST PORTION	8/17/2005	Flash Flood		0	0	$10,000	$0
LOGAN (ZONE)	3/21/1997	Flood		0	0	$0	$0
						$20,154,000	$4,510,000

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

Special Flood Hazard Areas (SFHA) are located within the City of Lehr and the City of Napoleon. Unincorporated Logan County and the City of Gackle have no SFHA. Special Flood Hazard Areas (identified on flood maps as zones beginning with the letters 'A' or 'V') are defined as the area that will be inundated by the flood event having a 1% chance of being equaled or exceeded in any given year. In high-risk areas, there is at least a 1 in 4 chance of flooding during a 30-year mortgage. All home and business owners in these areas with mortgages from federally regulated or insured lenders are required to buy flood insurance.

As a means of providing protection from large monetary losses, the County encourages property owners to purchase flood insurance through the National Flood Insurance Program (NFIP). Properties that have sustained two or more losses of $1000 or more in a 10-year period since 1978 are considered to be repetitive loss properties.

Policy and Claims Report

CID	Community Name	Total Premium	V-Zone	A-Zone	No. Policies	Total Coverage	Total Claims Since 1978	Total Paid Since 1978
380691	Logan County	$412	0	0	1	$350,000	1	$252,920
	County Total:	$412	0	0	1	$350,000	1	$252,920

Source: Dionne Haynes, State NFIP Coordinator

Repetitive Loss

There are no repetitive loss structures in Logan County.

This type of insurance is only available to property owners whose jurisdiction participates in the NFIP. The following jurisdictions participate in the National Flood Insurance Program (NFIP):

Federal Emergency Management Agency
Community Status Book Report
NORTH DAKOTA

Communities Participating in the National Flood Program

CID	Community Name	County	Init FHBM Identified	Init FIRM Identified	Curr Eff Map Date	Reg-Emer Date	Tribal
380334	GACKLE, CITY OF	LOGAN COUNTY	03/24/78		(NSFHA)	02/29/80	No
380691	LOGAN COUNTY*	LOGAN COUNTY			(NSFHA)	05/04/98	No
380044#	NAPOLEAN,CITY OF	LOGAN COUNTY	03/14/78	05/15/80	02/19/87	05/15/80	No

Summary:

Total In Flood Program	3
Total In Emergency Program	0
Total In the Regular Program	3
Total In Regular Program with No Special Flood Hazard	2
Total In Regular Program But Minimally Flood Prone	0

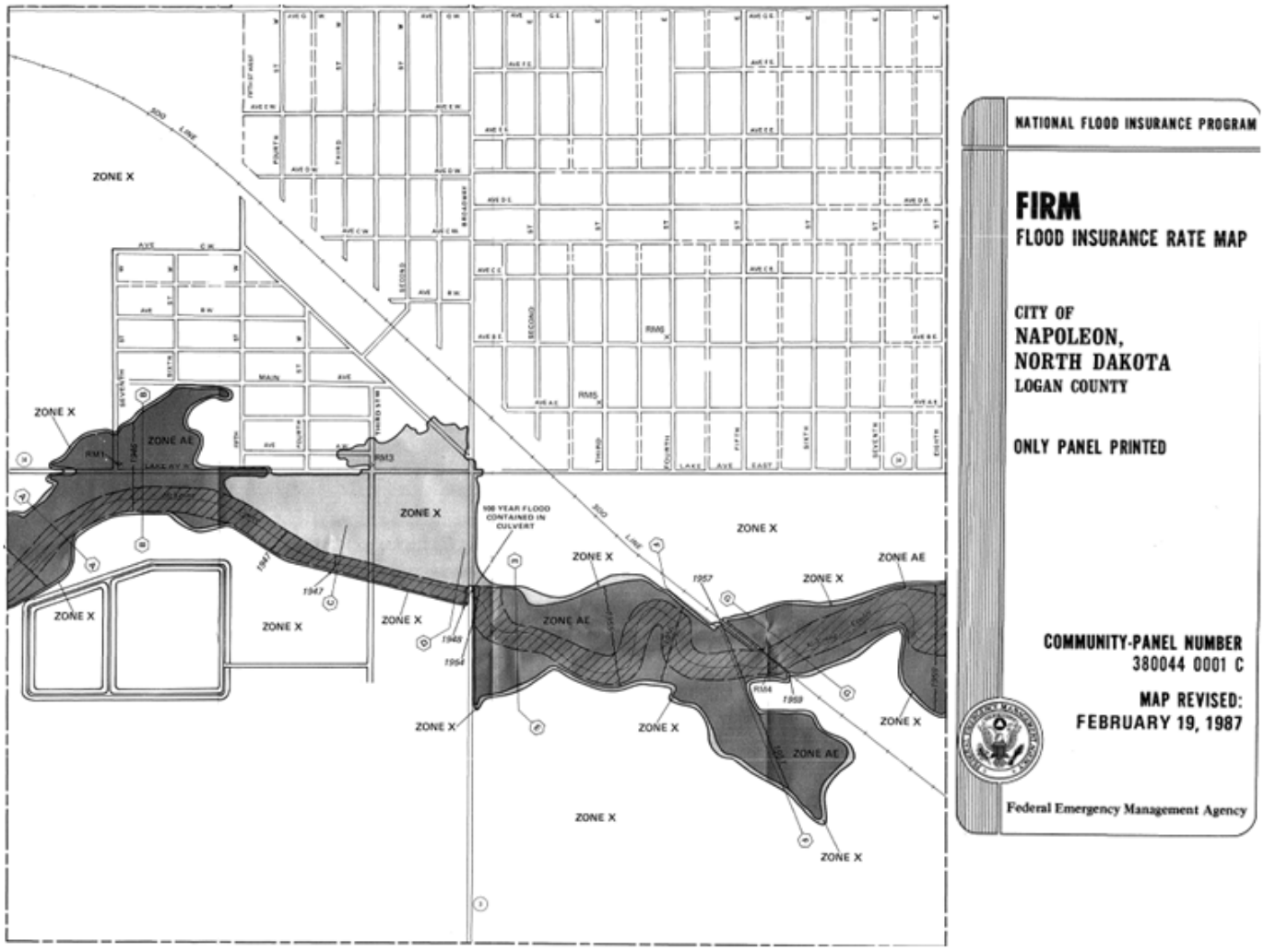
Source: Dionne Haynes, State NFIP Coordinator

Logan County is trying to foster participation from the Cities of Fredonia and Lehr. Additional NFIP strategies are listed in the Appendices.

Flood Insurance Study (FIS)
The last Flood Insurance Study (FIS), February 19, 1987, covered the jurisdiction of the City of Napoleon is available from the FEMA Map Service Center, Product 380044V000. The Study reaffirms the history of the principal flood problems on pages 5-6.

Flood Maps

The only Flood Insurance Rate Map for Logan County is for the City of Napoleon.



Source: [FEMA Flood Map Service Center]

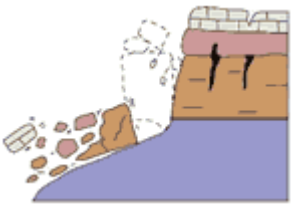
Geologic Hazards

Frequency	Unlikely (Less than 1% probability in the next 100 years)
Severity	Negligible (Less than 10% of jurisdiction affected)
Risk Class	D
Seasonal Pattern	Spring and Summer
Duration	1 to 10 days
Speed of Onset	Hours to days
Location	Countywide

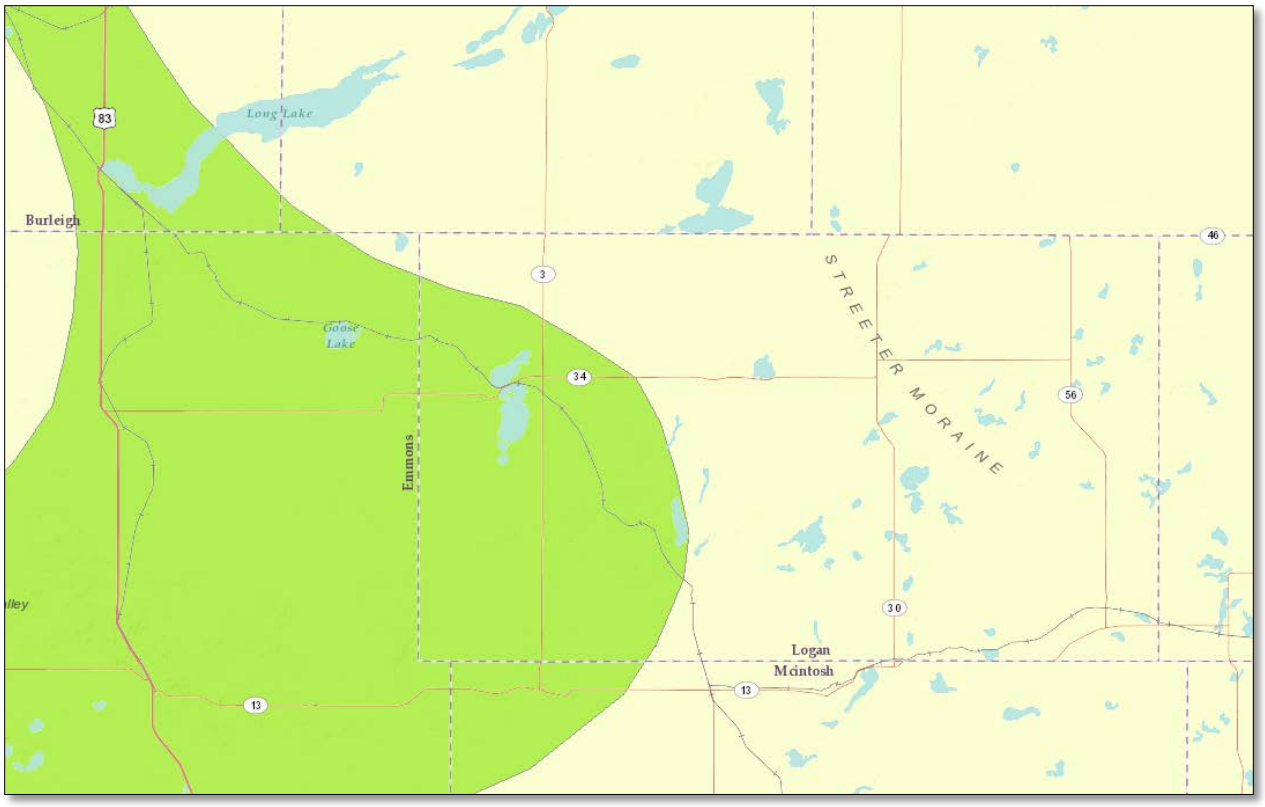
Description
Geologic hazards in Logan County are not anticipated to cause severe damage; however, the potential exists for the occasional landslide or earthquake to cause some loss.

Landslide
The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over-steepened slope is the primary reason for a landslide, there are other contributing factors:

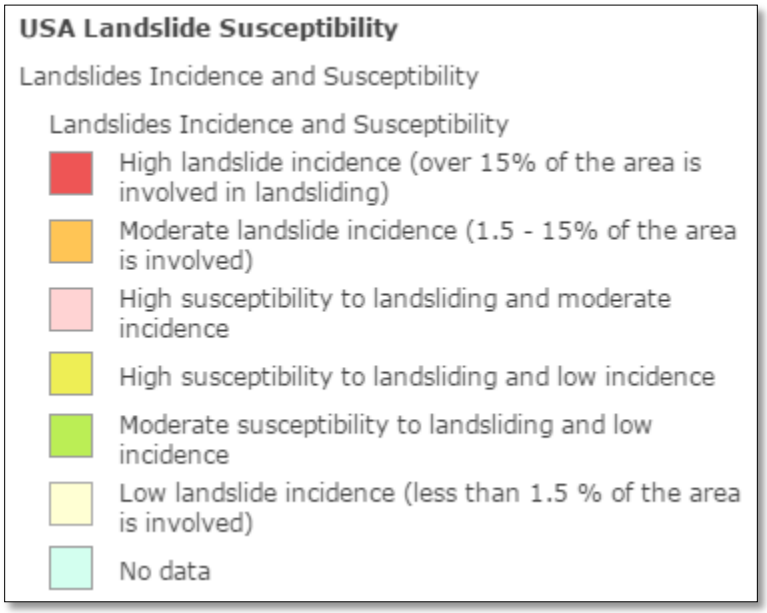
- erosion by rivers, glaciers, or ocean waves create oversteepened slopes
- rock and soil slopes are weakened through saturation by snowmelt or heavy rains
- earthquakes create stresses that make weak slopes fail
- earthquakes of magnitude 4.0 and greater have been known to trigger landslides
- volcanic eruptions produce loose ash deposits, heavy rain, and debris flows
- excess weight from accumulation of rain or snow, stockpiling of rock or ore, from waste piles, or from man-made structures may stress weak slopes to failure and other structures



Slope material that becomes saturated with water may develop a debris flow or mud flow. The resulting slurry of rock and mud may pick up trees, houses, and cars, thus blocking bridges and tributaries causing flooding along its path.
(Source: US Geological Survey website)



Source: ArcGIS USA Landslide Susceptibility website



Identified Impacts

- Blocked Roads
- Building Collapse
- Business Interruptions
- Delayed Emergency Response
- Downed Power Lines
- Downed Trees
- Evacuation (Localized)
- Loss of Potable Water
- Loss of Power
- Property Damage

History

There is no significant history of geologic hazards for Logan County; however, the landslide susceptibility has been identified for the western edge of Logan County.

Earthquake activity:

The closest earthquake activity was 159 miles from Napoleon.

Napoleon-area historical earthquake activity is near North Dakota state average. It is 68% smaller than the overall U.S. average.

- 8/18/1959 at 06:37:13, a magnitude 7.7 (7.7 UK, Class: Major, Intensity: VIII - XII) earthquake occurred 543.8 miles away from the city center, causing $26,000,000 total damage
- 3/4/1983 at 06:32:18, a magnitude 4.6 (4.4 MB, 4.6 LG, 4.4 ML, Class: Light, Intensity: IV - V) earthquake occurred 159.4 miles away from Napoleon center
- 7/9/1975 at 14:54:15, a magnitude 4.6 (4.6 MB) earthquake occurred 187.8 miles away from the city center
- 10/18/1984 at 15:30:23, a magnitude 5.5 (5.4 MB, 5.1 MS, 5.5 ML, Class: Moderate, Intensity: VI - VII) earthquake occurred 403.3 miles away from the city center
- 9/8/1984 at 00:59:31, a magnitude 5.1 (5.1 MB) earthquake occurred 338.0 miles away from Napoleon center
- 6/5/1993 at 01:24:53, a magnitude 4.1 (4.1 LG, Depth: 6.2 mi) earthquake occurred 176.3 miles away from the city center

  Magnitude types: regional Lg-wave magnitude (LG), body-wave magnitude (MB), local magnitude (ML), surface-wave magnitude (MS)

Source: http://www.city-data.com/city/Napoleon-North-Dakota.html#ixzz4YVZXlls0

Hazardous Materials Release

Frequency	Highly Likely (Nearly 100% probability in the next year)
Severity	Limited (10-25% of jurisdiction affected)
Risk Class	B
Seasonal Pattern	None
Duration	Hours/Days
Speed of Onset	No warning
Location	Countywide

Description

Hazardous materials are any substances in any quantity or form which may pose an unreasonable risk to the safety, health, environment, and property of citizens. The term "hazardous materials" covers a wide array of products, from relatively innocuous ones such as hair spray in aerosol dispensers and wash preservatives such as creosote to highly toxic or poisonous materials such as anhydrous ammonia and phosgene gas. The potential severity of hazards of these materials is varied, but the primary reason for their designation is their risk to public safety. Tier II forms are on file at the Logan County Courthouse.

The County is exposed to and is at risk from accidents and/or incidents involving hazardous materials. The economy is based upon agriculture, manufacturing, and industry. All of these rely on the production, use, storage, transportation, etc. of hazardous materials. Explosives, flammable liquids, flammable solids, gases, poisons, pesticides, oxidizing substances, miscellaneous dangerous substances, and radioactive materials are either used in or transported through Logan County.

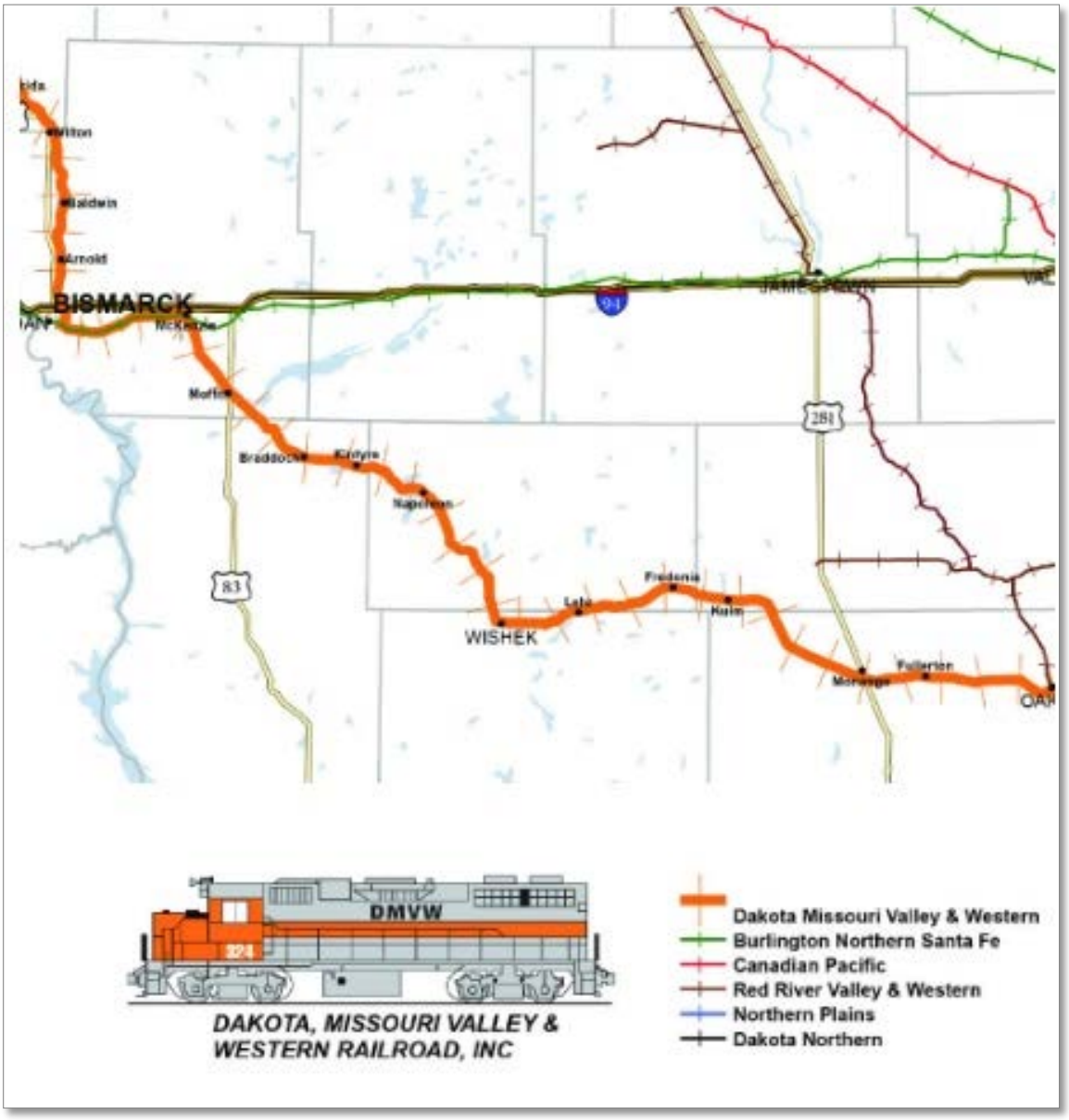
Hazardous materials are transported via two modes into and within Logan County:

Highways: ND 3, 30, and 58 run north-south through the County; ND 13, 34 and 36 run east-west through the county.
Source: https://www.dot.nd.gov/docs/maps/base-maps/counties/logan.pdf

Rail: Dakota Missouri Valley & Western Railroad, Inc (DMVWRR) owns/operates all railways in the county.

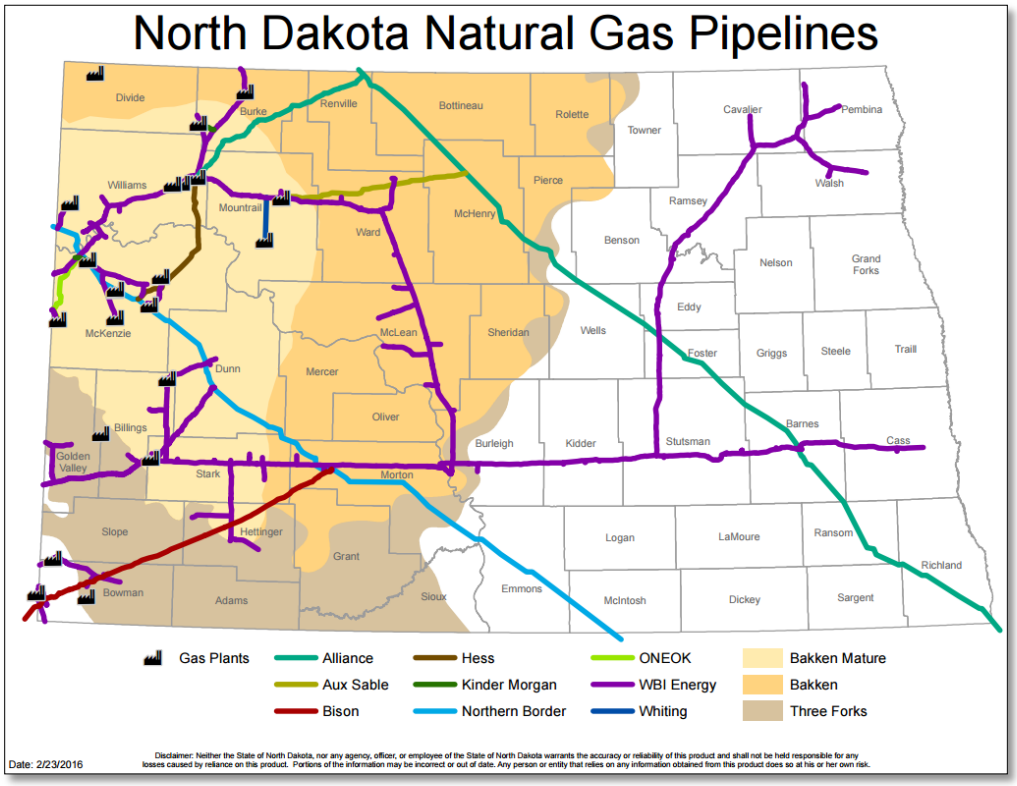
NOTE: No pipelines intersect Logan County. A natural gas pipeline runs southwest of the County, and a refined product pipeline runs east of the County.

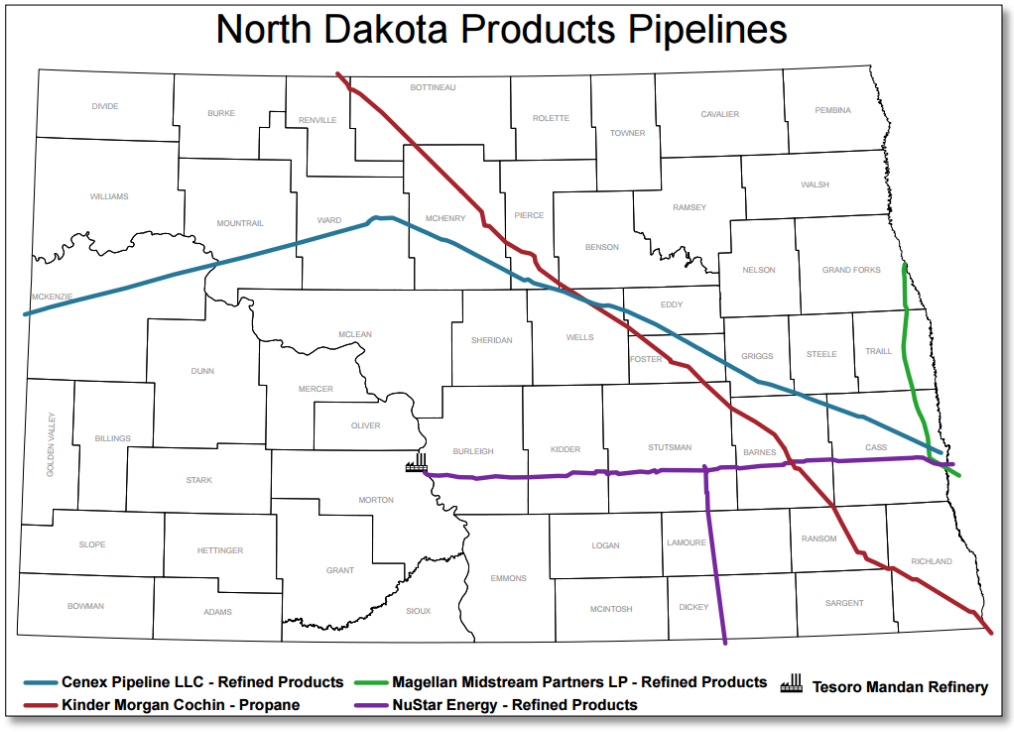
Rail



Source: Dakota Missouri Valley & Western Railroad, Inc website

Pipelines





Source: ND Pipeline Authority website

Identified Impacts

- Blocked Roads
- Business Interruptions
- Delayed Emergency Response
- Evacuation (Full)
- Evacuation (Localized)
- Explosion
- HAZMAT Release
- Increased Fire Potential
- Increased Public Safety Runs
- Livestock Injury/Death
- Loss of Economy
- Loss/Overcrowded Medical Facilities
- Loss of Potable Water
- Mass Casualties
- Property Damage
- School Closure

History

The ND Department of Health, Environment Health Section, records data whenever a General Environmental Incident report is filed. Logan County reportable data is identified below:

Incident ID	Date Reported	Date Incident	County	Twn Rng Sec	Contaminant	Volume	Units	Contained
EIR3649	2/10/2015	2/11/2015	Logan	13507217	Used Motor Oil	20	gallons	No
EIR3338	6/5/2014	6/4/2014	Logan	13506928	Diesel Fuel	3	gallons	Yes
EIR1269	7/15/2010	7/15/2010	Logan	13407221	2.23 gals of Section 2EC, 2.5 gals of Super B (crop oil), .8 gals of Interlock, 355 gals water	360	gallons	
EIR999	4/30/2008	4/30/2008	Logan	13607306	anhydrous ammonia	1450	gallons	

Source: ND Department of Health website

Homeland Security Incident

Frequency	Likely (10-100% probability in the next year, or at least 1 chance in next 100 years)
Severity	Limited (10-25% of jurisdiction affected)
Risk Class	C
Seasonal Pattern	None
Duration	Hours/Days
Speed of Onset	No warning

Description

A homeland security incident is any intentional adversarial human-caused incident, domestic or international, that causes mass casualties, large economic losses, or widespread panic in the country. Terrorism and civil unrest are examples of human-caused hazards that are intentional and often planned. Terrorism, both domestic and international, is a violent act done to try and influence government or the population of some political or social objective. Terrorist acts can come in many recognized forms or may be more subtle using untraditional methods. The primary recognized forms of terrorism are chemical, explosive, biological, radiological/nuclear, and cyber; however, terrorism‘s only limitation is the human imagination. (Source: State of North Dakota Multi-Hazard Mitigation Plan, February 2014)

Identified Impacts

- Blocked Roads
- Building Collapse
- Business Interruptions
- Delayed Emergency Response
- Evacuation (Localized)
- Explosion
- HAZMAT Release
- Increased Fire Potential
- Increased Public Safety Runs
- Loss of Economy
- Loss/Overcrowded Medical Facilities
- Loss of Potable Water
- Loss of Power
- Mass Casualties
- Property Damage
- School Closure

Key Facilities within Logan County

Due to the critical nature and sensitivity, key facilities are on file at the Logan County Emergency Management Office.

History

There is no history of homeland security incidents within Logan County; however, any suspicious activity is reported to the ND State and Local Intelligence Center.

Severe Summer Weather

Frequency	Highly Likely (Nearly 100% probability in the next year)
Severity	Critical (25-50% of jurisdiction affected)
Risk Class	A
Seasonal Pattern	April to November
Duration	2 to 5 hours
Speed of Onset	Little to no warning
Location	Countywide

Description

Severe summer storms are generated by temperature imbalances in the atmosphere, and as warm, moist are rises, the thunderstorm develops. These conditions will produce updrafts and downdrafts which are the reason for gust fronts, heavy rain (flash flooding), lightning, hail, and high winds. Downburst or straight-line winds can be as deadly as tornadoes. If the thunderstorm continues to intensify, a tornado may develop.

Why Worry About Thunderstorms?

Lightning:

- Causes an average of 55-60 fatalities and 400 injuries each year
- Occurs with all thunderstorms
- Costs more than $1 billion in insured losses each year

Tornadoes:

- Cause an average of 60-65 fatalities and 1,500 injuries each year
- Can produce wind speeds in excess of 200 mph
- Can be 1 mile wide and stay on the ground over 50 miles

Straight-line Winds:

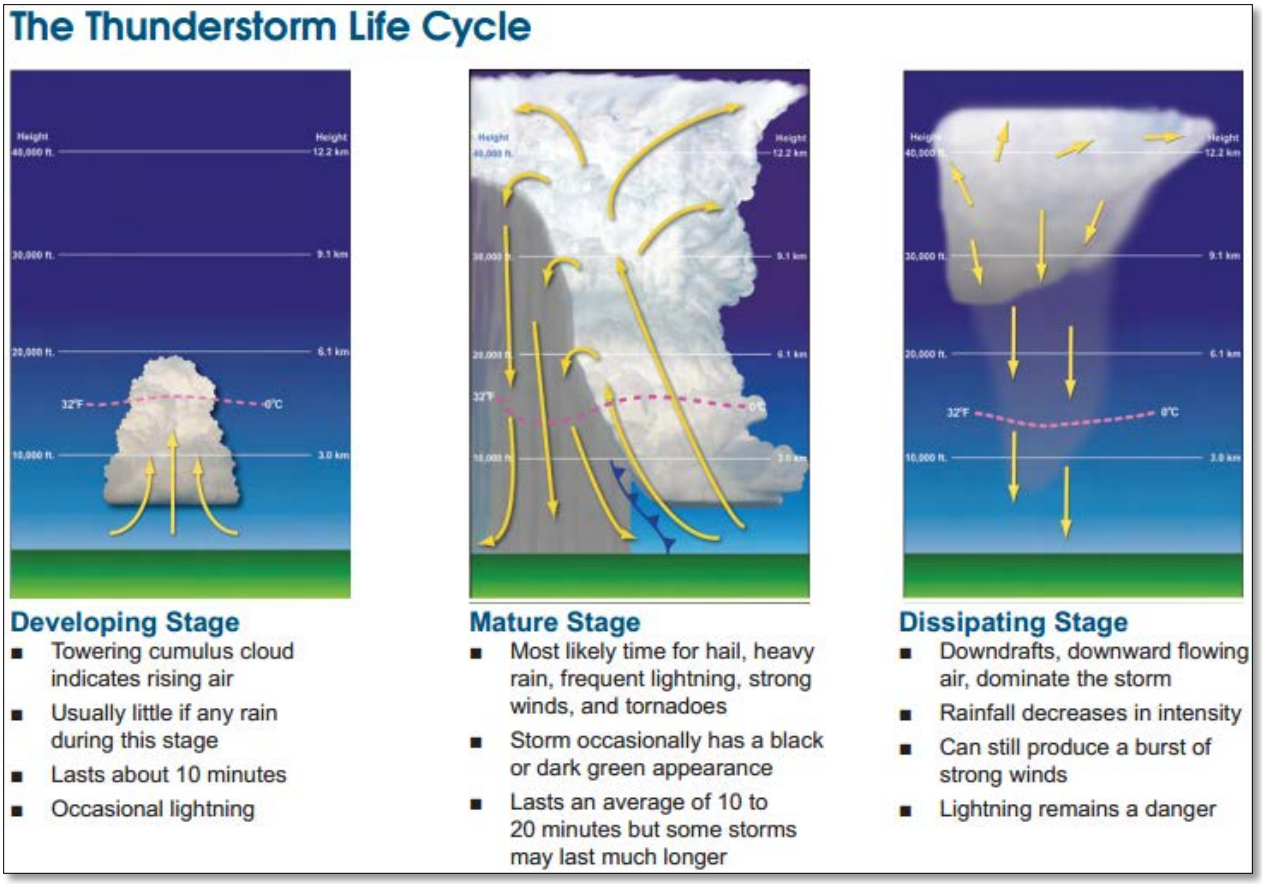
- Can exceed 125 mph
- Can cause destruction equal to a tornado
- Are extremely dangerous to aviation

Hail:

- Can be larger than a softball (5 inches in diameter)
- Causes more than $1 billion in crop and property damage each year

A thunderstorm affects a relatively small area when compared to a winter storm. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Despite their small size, all thunderstorms are dangerous! Every thunderstorm needs:

- Moisture—to form clouds and rain
- Unstable air—warm air that can rise rapidly
- Lift—caused by cold or warm fronts, sea breezes, mountains, or the sun's heat.



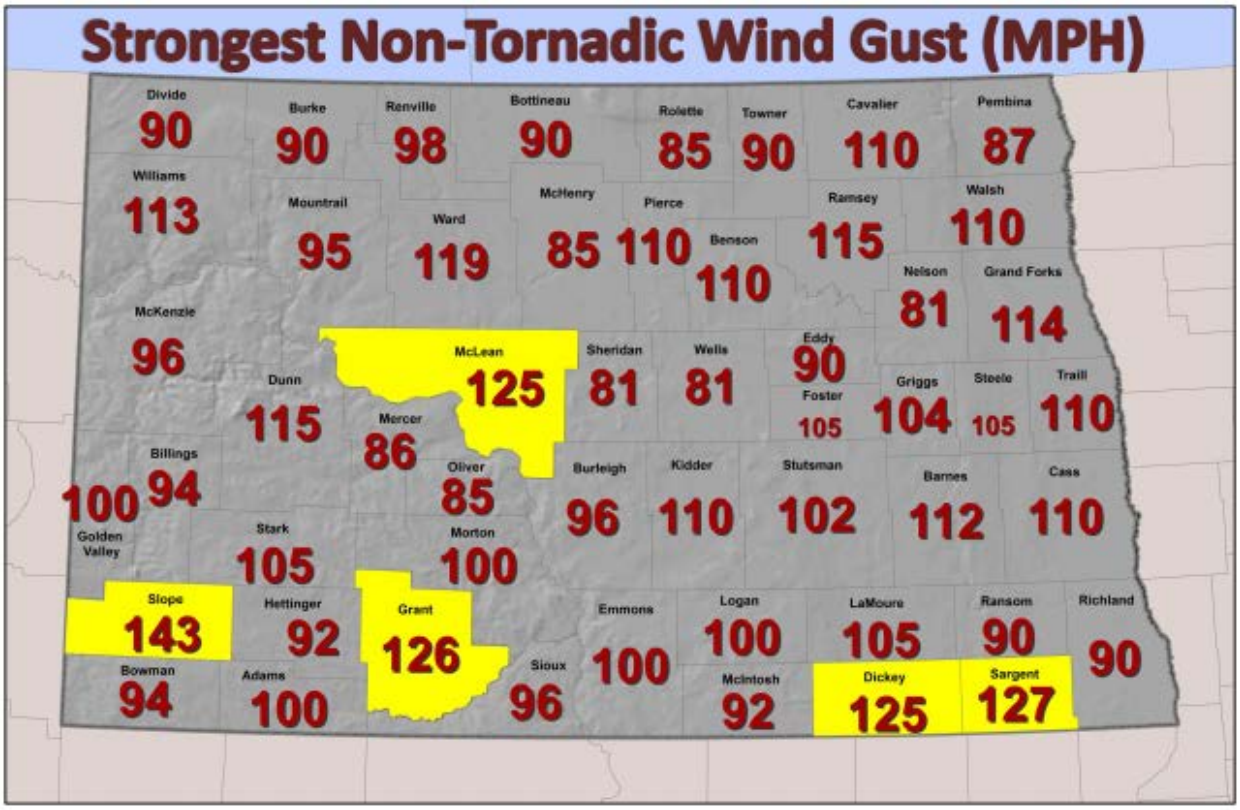
Source: Thunderstorms, Tornadoes, Lightning…A Preparedness Guide, US Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service

Downbursts/Straight-Line Winds

Straight-line winds are any winds not associated with the rotation of a tornado and are responsible for most thunderstorm damage. The winds can exceed 125 mph! A downburst is a small area of rapidly descending air beneath a thunderstorm and can cause damage equivalent to a strong tornado and can be extremely hazardous to aviation.

The number one cause of wind damage in North Dakota is from downburst winds, not tornadoes.

1950-2015



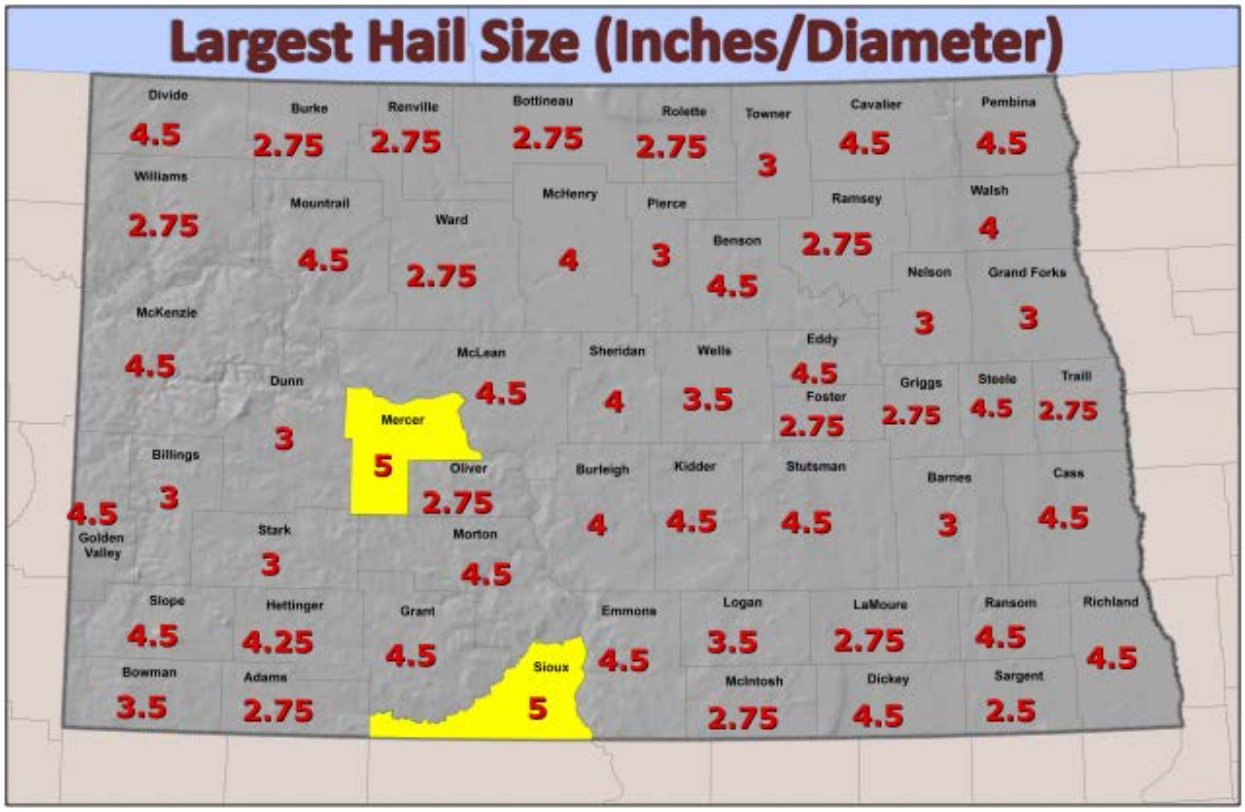
Source: National Weather Service Weather Forecast Office, Bismarck, ND website

Hail

Strong rising currents of air within a storm (updrafts) carry water droplets to a height where they freeze. Ice particles grown in size, becoming too heavy to be supported by the updraft, and fall to the ground. Hail is larger than sleet and forms only in thunderstorms. Hail stones can range from pea size to the size of a grapefruit. Hail has the potential to be life-threatening due to falling from great heights; large hailstones can fall at speeds faster than 100 mph!

The major hazard is to crops, aircraft, automobiles, roofs, and windows, etc. The destructiveness of hailstorms is not due to the hailstones alone. Hail damage is difficult to determine, as hail, wind, and rain frequently occur at the same time.

1950-2015



Source: National Weather Service Weather Forecast Office, Bismarck, ND website

Lightning

The rising air in a thunderstorm cloud causes various types of frozen precipitation to form within the cloud. Included in these precipitation types are very small ice crystals and much larger pellets of snow and ice. The smaller ice crystals are carried upward toward the top of the clouds by the rising air while the heavier and denser pellets are either suspended by the rising air or start falling toward the ground. Collisions occur between the ice crystals and the pellets, and these collisions serve as the charging mechanism of the thunderstorm. The small ice crystals become positively charged while the pellets become negatively charged. As a result, the top of the cloud becomes positively charged and the middle to lower part of the storm becomes negatively charged. At the same time, the ground underneath the cloud becomes charged oppositely of the charges directly overhead.

When the charge difference between the ground and the cloud becomes too large, a conductive channel of air develops between the cloud and the ground, and a small amount of charge (step leader) starts moving toward the ground. When it nears the ground, an upward leader of opposite charge connects with the step leader. At the instant this connection is made, a powerful discharge occurs between the cloud and the ground. We see this discharge as a bright visible flash of lightning.

Source: Thunderstorms, Tornadoes, Lightning…A Preparedness Guide, US Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service

Severe Thunderstorms can occur any time of the day or night, but are most frequent during the late afternoon and evening hours. This is mostly due to the daytime heating which creates the extra heat energy to form these large thunderstorms. The criteria used by the National Weather Service for calling a thunderstorm severe is winds of 58 mph or more and/or hail three-quarters of an inch larger in diameter. There are other elements that make thunderstorms deadly, such as severe lightning, heavy rains, hail, straight-line winds, and tornadoes.

The general makeup of a severe thunderstorm is similar to that of a regular thunderstorm, except that each element is enhanced or more intense. This can be seen in the cloud formations and the weather that the storm produces.

Tornado

Tornadoes are nature's most destructive weapons. They occur in many parts of the world—most frequently in the United States and can occur at any time of day.

- A tornado is a violently rotating column of air extending from a cumuliform cloud, such as a thunderstorm, to the ground.
- Tornadoes may appear nearly transparent until dust and debris are picked up or a cloud forms within the funnel. The average tornado moves from southwest to northeast, but **tornadoes can move in any direction** and can suddenly change their direction of motion.
- The average forward speed of a tornado is 30 mph but may vary from nearly stationary to 70 mph.
- The strongest tornadoes have rotating winds of more than 200 mph.
- Tornadoes can accompany tropical storms and hurricanes as they move onto land.
- Waterspouts are tornadoes that form over warm water. Water spouts can move onshore and cause damage to coastal areas.

Tornadoes are Nature's Most Violent Storms

North Dakota has on average 23 *reported* tornadoes a year (1950 through 2015). The numbers range from only two in 1950, 1951 and 1961 to as many as 61 in 1999. Most tornadoes in the state occur from 3 PM to 11 PM local time in the months of June, July and August.

Development Phase

Mature Stage

Dissipation Stage

Source: National Weather Service Weather Forecast Office, Bismarck, ND website

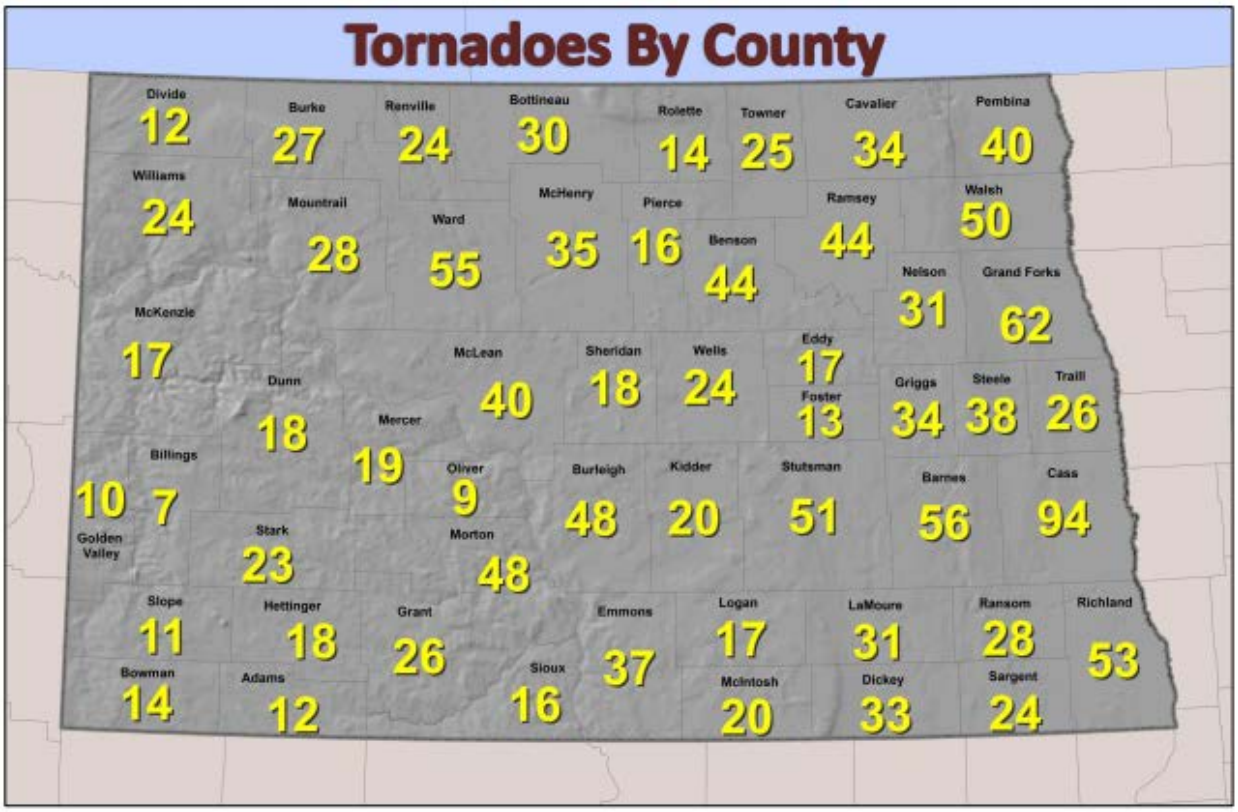
.

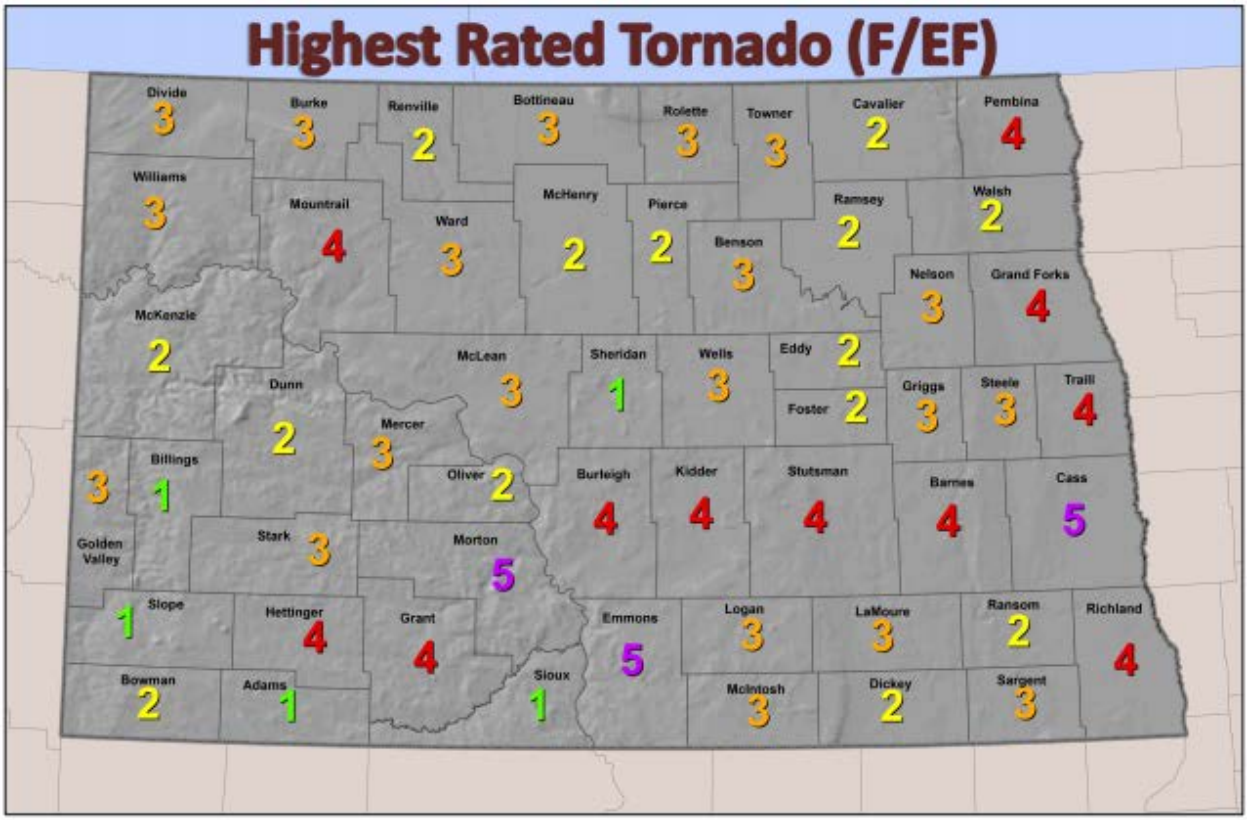
Tornado Scales

FUJITA SCALE			DERIVED EF SCALE		**OPERATIONAL EF SCALE**	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	**EF Number**	**3 Second Gust (mph)**
0	40-72	45-78	0	65-85	**0**	**65-85**
1	73-112	79-117	1	86-109	**1**	**86-110**
2	113-157	118-161	2	110-137	**2**	**111-135**
3	158-207	162-209	3	138-167	**3**	**136-165**
4	208-260	210-261	4	168-199	**4**	**166-200**
5	261-318	262-317	5	200-234	**5**	**Over 200**

Source: http://www.spc.noaa.gov/faq/tornado/ef-scale.html

1950-2015





Source: National Weather Service Weather Forecast Office, Bismarck, ND website

Identified Impacts

- Blocked Roads
- Building Collapse
- Business Interruptions
- Delayed Emergency Response
- Downed Power Lines
- Downed Trees
- Evacuation (Localized)
- Explosion
- Flooding (Street)
- Flooding (Structure)
- HAZMAT Release
- Increased Fire Potential
- Increased Public Safety Runs
- Livestock Injury/Death
- Loss of Economy
- Loss/Overcrowded Medical Facilities
- Loss of Potable Water
- Loss of Power
- Mass Casualties
- Property Damage
- School Closure
- Sewer Backup

History

Funnel Cloud

Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
NAPOLEON	7/29/2016	Funnel Cloud		0	0	$0	$0

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

Hail

Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
NAPOLEON	7/9/2016	Hail	0.88 in.	0	0	$0	$0
NAPOLEON	7/9/2016	Hail	0.88 in.	0	0	$0	$0
LEHR	6/22/2016	Hail	1.00 in.	0	0	$0	$0
NAPOLEON	6/22/2016	Hail	1.75 in.	0	0	$10,000	$0
FREDONIA	5/25/2016	Hail	0.88 in.	0	0	$0	$0
FREDONIA	5/25/2016	Hail	0.88 in.	0	0	$0	$0
BURNSTAD	7/9/2013	Hail	0.75 in.	0	0	$0	$0
LEHR	7/9/2013	Hail	2.50 in.	0	0	$0	$0
LEHR	6/20/2013	Hail	1.00 in.	0	0	$0	$0
NAPOLEON	6/17/2013	Hail	0.88 in.	0	0	$0	$0
NAPOLEON	5/26/2012	Hail	0.75 in.	0	0	$0	$0
NAPOLEON	5/2/2012	Hail	0.75 in.	0	0	$0	$0
NAPOLEON	5/2/2012	Hail	0.75 in.	0	0	$0	$0
LEHR	4/2/2012	Hail	0.75 in.	0	0	$0	$0
NAPOLEON	7/30/2011	Hail	1.75 in.	0	0	$0	$0
GACKLE	7/14/2010	Hail	1.00 in.	0	0	$0	$0
BURNSTAD	7/14/2010	Hail	1.75 in.	0	0	$25,000	$100,000
NAPOLEON	7/14/2010	Hail	2.75 in.	0	0	$45,000	$200,000
NAPOLEON	7/14/2010	Hail	2.75 in.	0	0	$1,500,000	$1,000,000
NAPOLEON	8/27/2007	Hail	1.00 in.	0	0	$0	$0
GACKLE	8/26/2007	Hail	0.88 in.	0	0	$0	$0
NAPOLEON	8/26/2007	Hail	3.50 in.	0	0	$250,000	$500,000
NAPOLEON	8/10/2007	Hail	2.50 in.	0	0	$60,000	$0
GACKLE	5/28/2007	Hail	1.00 in.	0	0	$0	$0
NAPOLEON	8/22/2006	Hail	1.75 in.	0	0	$150,000	$40,000
GACKLE	8/20/2006	Hail	1.00 in.	0	0	$0	$0
GACKLE	8/16/2006	Hail	1.75 in.	0	0	$0	$0
GACKLE	8/16/2006	Hail	0.88 in.	0	0	$0	$0
GACKLE	8/9/2006	Hail	0.88 in.	0	0	$0	$0
BURNSTAD	6/30/2006	Hail	0.75 in.	0	0	$0	$0
GACKLE	6/23/2006	Hail	1.75 in.	0	0	$0	$0
GACKLE	6/15/2006	Hail	0.88 in.	0	0	$0	$0
NAPOLEON	6/15/2006	Hail	1.00 in.	0	0	$0	$0
NAPOLEON	6/15/2006	Hail	0.88 in.	0	0	$0	$0
NAPOLEON	6/14/2006	Hail	0.75 in.	0	0	$0	$0
BURNSTAD	6/14/2006	Hail	1.50 in.	0	0	$0	$0

Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
GACKLE	5/29/2006	Hail	1.75 in.	0	0	$1,000	$0
NAPOLEON	5/26/2006	Hail	1.00 in.	0	0	$0	$0
GACKLE	8/17/2005	Hail	0.75 in.	0	0	$0	$0
NAPOLEON	6/20/2005	Hail	0.75 in.	0	0	$0	$0
LEHR	6/7/2005	Hail	0.88 in.	0	0	$0	$0
BURNSTAD	6/7/2005	Hail	0.75 in.	0	0	$0	$0
BURNSTAD	7/20/2004	Hail	1.75 in.	0	0	$0	$0
NAPOLEON	7/18/2004	Hail	1.75 in.	0	0	$0	$0
LEHR	3/27/2004	Hail	0.88 in.	0	0	$0	$0
BURNSTAD	6/11/2003	Hail	0.75 in.	0	0	$0	$0
NAPOLEON	8/11/2002	Hail	0.88 in.	0	0	$0	$0
LEHR	7/18/2001	Hail	1.75 in.	0	0	$0	$0
NAPOLEON	6/20/2001	Hail	0.75 in.	0	0	$0	$0
NAPOLEON	6/9/2001	Hail	0.75 in.	0	0	$0	$0
GACKLE	7/11/2000	Hail	1.50 in.	0	0	$0	$0
GACKLE	7/4/2000	Hail	0.88 in.	0	0	$0	$0
LEHR	6/10/2000	Hail	0.75 in.	0	0	$0	$0
GACKLE	7/22/1999	Hail	2.75 in.	0	0	$0	$0
NAPOLEON	6/29/1999	Hail	0.75 in.	0	0	$0	$0
NAPOLEON	6/21/1999	Hail	0.75 in.	0	0	$0	$0
NAPOLEON	6/21/1999	Hail	1.25 in.	0	0	$0	$0
BURNSTAD	6/21/1999	Hail	1.00 in.	0	0	$0	$0
GACKLE	6/24/1998	Hail	3.00 in.	0	1	$20,000	$0
NAPOLEON	8/18/1996	Hail	0.75 in.	0	0	$0	$0
NAPOLEON	7/28/1996	Hail	0.75 in.	0	0	$0	$150,000
Streeter	7/18/1994	Hail	1.00 in.	0	0	$0	$0
Napolean	5/21/1994	Hail	0.75 in.	0	0	$5,000	$0
LOGAN CO.	7/6/1991	Hail	0.75 in.	0	0	$0	$0
LOGAN CO.	8/27/1989	Hail	0.75 in.	0	0	$0	$0
LOGAN CO.	8/13/1989	Hail	2.50 in.	0	0	$0	$0
LOGAN CO.	6/12/1988	Hail	0.75 in.	0	0	$0	$0
LOGAN CO.	7/26/1986	Hail	0.75 in.	0	0	$0	$0
LOGAN CO.	7/20/1982	Hail	1.75 in.	0	0	$0	$0
LOGAN CO.	7/20/1982	Hail	1.00 in.	0	0	$0	$0
LOGAN CO.	7/4/1982	Hail	3.00 in.	0	0	$0	$0
LOGAN CO.	6/27/1981	Hail	1.50 in.	0	0	$0	$0

Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
LOGAN CO.	8/29/1980	Hail	2.75 in.	0	0	$0	$0
LOGAN CO.	8/4/1979	Hail	1.75 in.	0	0	$0	$0
LOGAN CO.	7/4/1978	Hail	1.75 in.	0	0	$0	$0
LOGAN CO.	6/15/1978	Hail	2.75 in.	0	0	$0	$0
LOGAN CO.	7/4/1977	Hail	2.00 in.	0	0	$0	$0
LOGAN CO.	8/11/1970	Hail	1.50 in.	0	0	$0	$0
LOGAN CO.	6/29/1958	Hail	1.75 in.	0	0	$0	$0
LOGAN CO.	6/29/1958	Hail	1.75 in.	0	0	$0	$0
				0	1	$2,066,000	$1,990,000

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

High Wind

Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
LOGAN (ZONE)	2/7/2016	High Wind	52 kts. EG	0	0	$0	$0
LOGAN (ZONE)	11/18/2015	High Wind	50 kts. EG	0	0	$0	$0
LOGAN (ZONE)	10/11/2015	High Wind	50 kts. EG	0	0	$0	$0
LOGAN (ZONE)	1/15/2014	High Wind	50 kts. MG	0	0	$0	$0
LOGAN (ZONE)	10/17/2012	High Wind	35 kts. MS	0	0	$0	$0
LOGAN (ZONE)	10/7/2011	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	9/20/2011	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	5/31/2011	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	4/30/2011	High Wind	52 kts. EG	0	0	$0	$0
LOGAN (ZONE)	2/13/2011	High Wind	35 kts. ES	0	0	$20,000	$0
LOGAN (ZONE)	10/26/2010	High Wind	35 kts. MS	0	0	$0	$0
LOGAN (ZONE)	6/18/2010	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	1/31/2009	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	10/26/2008	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	7/12/2008	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	5/1/2008	High Wind	36 kts. ES	0	0	$0	$0
LOGAN (ZONE)	3/9/2005	High Wind	47 kts. ES	0	0	$0	$0
LOGAN (ZONE)	12/11/2004	High Wind	42 kts. ES	0	0	$0	$0
LOGAN (ZONE)	3/10/2004	High Wind	46 kts. ES	0	0	$0	$0
LOGAN (ZONE)	11/29/2002	High Wind	40 kts. E	0	0	$0	$0
LOGAN (ZONE)	11/1/2001	High Wind	38 kts. E	0	0	$0	$0
LOGAN (ZONE)	4/5/2000	High Wind	56 kts. E	0	0	$0	$0
LOGAN (ZONE)	11/1/1999	High Wind	54 kts.	0	0	$0	$0
LOGAN (ZONE)	2/10/1996	High Wind	50 kts.	0	0	$0	$0
				0	0	$20,000	$0

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

Lightning

Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
NAPOLEON	8/24/2006	Lightning		0	0	$0	$0
GACKLE	7/20/2006	Lightning		0	0	$4,000	$0
GACKLE	7/19/1997	Lightning		0	0	$50,000	$0
				0	0	$54,000	$0

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

Thunderstorm Wind

Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
BURNSTAD	6/22/2016	Thunderstorm Wind	87 kts. EG	0	0	$1,200,000	$50,000
NAPOLEON	7/10/2011	Thunderstorm Wind	74 kts. EG	0	0	$50,000	$0
NAPOLEON	6/3/2011	Thunderstorm Wind	74 kts. EG	0	0	$20,000	$0
BURNSTAD	7/14/2010	Thunderstorm Wind	52 kts. EG	0	0	$0	$0
GACKLE	7/14/2010	Thunderstorm Wind	65 kts. EG	0	0	$25,000	$0
FREDONIA	7/14/2010	Thunderstorm Wind	70 kts. EG	0	0	$35,000	$0
NAPOLEON	6/24/2010	Thunderstorm Wind	52 kts. EG	0	0	$0	$0
NAPOLEON	5/24/2010	Thunderstorm Wind	78 kts. EG	0	0	$500,000	$100,000
FREDONIA	7/27/2008	Thunderstorm Wind	52 kts. EG	0	0	$0	$0
LEHR	9/23/2007	Thunderstorm Wind	50 kts. MG	0	0	$0	$0
GACKLE	6/17/2007	Thunderstorm Wind	56 kts. EG	0	0	$9,000	$0
LEHR	6/17/2007	Thunderstorm Wind	52 kts. EG	0	0	$0	$0
BURNSTAD	8/22/2006	Thunderstorm Wind	52 kts. EG	0	0	$0	$0
BURNSTAD	6/7/2005	Thunderstorm Wind	57 kts. EG	0	0	$0	$0
NAPOLEON	6/7/2005	Thunderstorm Wind	52 kts. EG	0	0	$0	$0
NAPOLEON	7/3/2003	Thunderstorm Wind	70 kts. EG	0	0	$0	$0
LEHR	8/8/2002	Thunderstorm Wind	57 kts. E	0	0	$0	$0
NAPOLEON	7/24/2002	Thunderstorm Wind	52 kts. E	0	0	$0	$0
GACKLE	6/28/2002	Thunderstorm Wind	57 kts. M	0	0	$0	$0
BURNSTAD	6/28/2002	Thunderstorm Wind	55 kts. E	0	2	$0	$0
FREDONIA	7/31/2001	Thunderstorm Wind	57 kts. E	0	0	$0	$0
GACKLE	7/22/2001	Thunderstorm Wind	52 kts. E	0	0	$0	$0
NAPOLEON	6/12/2001	Thunderstorm Wind	70 kts. E	0	0	$45,000	$0
LEHR	6/9/2001	Thunderstorm Wind	65 kts. E	0	0	$0	$0
NAPOLEON	6/9/2001	Thunderstorm Wind	87 kts. E	0	0	$0	$0
GACKLE	7/22/1999	Thunderstorm Wind	50 kts.	0	0	$0	$0
NAPOLEON	6/25/1999	Thunderstorm Wind	61 kts.	0	0	$200,000	$0
GACKLE	8/18/1998	Thunderstorm Wind	50 kts.	0	0	$0	$0
NAPOLEON	10/11/1997	Thunderstorm Wind	75 kts.	0	0	$30,000	$0
NAPOLEON	8/29/1997	Thunderstorm Wind	65 kts.	0	0	$10,000	$0
Napoleon	7/9/1995	Thunderstorm Wind	55 kts.	0	0	$0	$0
Lehr	7/8/1995	Thunderstorm Wind	0 kts.	0	0	$0	$0
LOGAN CO.	8/25/1990	Thunderstorm Wind	0 kts.	0	0	$0	$0
LOGAN CO.	8/1/1988	Thunderstorm Wind	0 kts.	0	0	$0	$0
LOGAN CO.	6/22/1983	Thunderstorm Wind	0 kts.	0	0	$0	$0
LOGAN CO.	6/21/1983	Thunderstorm Wind	0 kts.	0	0	$0	$0
LOGAN CO.	7/13/1981	Thunderstorm Wind	0 kts.	0	0	$0	$0
LOGAN CO.	6/11/1976	Thunderstorm Wind	0 kts.	0	0	$0	$0
LOGAN CO.	9/6/1970	Thunderstorm Wind	0 kts.	0	0	$0	$0
LOGAN CO.	5/30/1969	Thunderstorm Wind	0 kts.	0	0	$0	$0

0	2	$2,124,000	$150,000

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

Tornado

Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
NAPOLEON	7/10/2011	Tornado	EF2	0	0	$450,000	$0
NAPOLEON	7/8/2011	Tornado	EF0	0	0	$0	$0
NAPOLEON	8/26/2007	Tornado	EF0	0	0	$0	$5,000
NAPOLEON	8/26/2007	Tornado	EF0	0	0	$0	$10,000
FREDONIA	8/17/2005	Tornado	F0	0	0	$0	$0
NAPOLEON	8/15/1999	Tornado	F1	0	0	$0	$0
NAPOLEON	6/10/1998	Tornado	F0	0	0	$0	$0
LOGAN CO.	7/16/1990	Tornado	F1	0	2	$250,000	$0
LOGAN CO.	8/22/1985	Tornado	F1	0	0	$2,500	$0
LOGAN CO.	5/27/1980	Tornado	F1	0	0	$25,000	$0
LOGAN CO.	6/15/1978	Tornado	F0	0	0	$2,500	$0
LOGAN CO.	8/19/1974	Tornado	F2	0	0	$0	$0
LOGAN CO.	8/19/1974	Tornado	F3	0	3	$0	$0
LOGAN CO.	8/19/1974	Tornado	F2	0	2	$0	$0
LOGAN CO.	5/22/1966	Tornado	F3	0	0	$25,000	$0
LOGAN CO.	5/22/1966	Tornado	F1	0	0	$25,000	$0
LOGAN CO.	6/19/1965	Tornado		0	0	$0	$0
				0	7	$780,000	$15,000

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

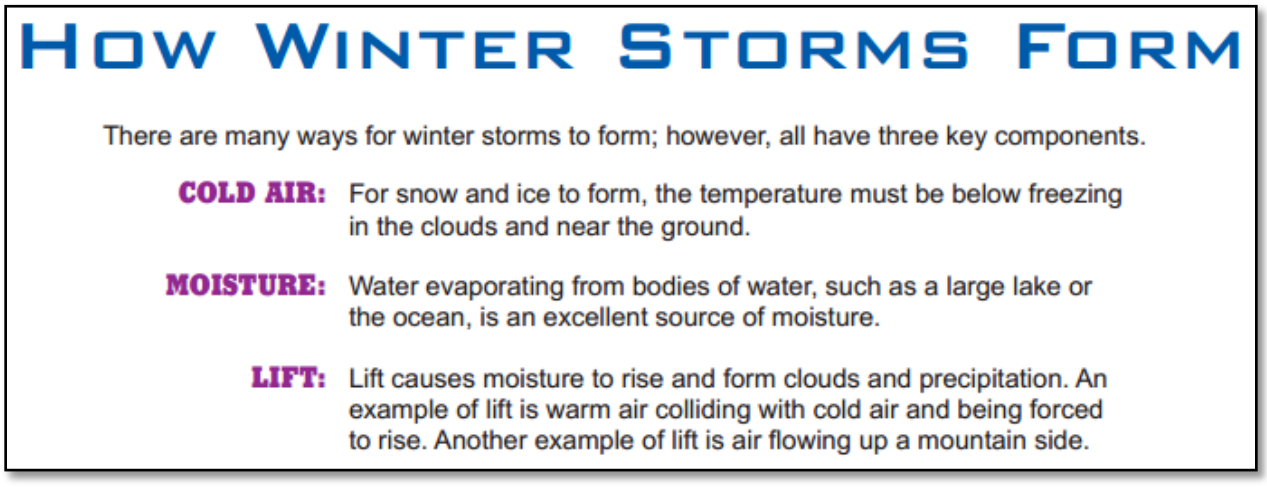
Severe Winter Weather

Frequency	Highly Likely (Nearly 100% probability in the next year)
Severity	Critical (25-50% of jurisdiction affected)
Risk Class	A
Seasonal Pattern	November to April
Duration	2 to 5 days
Speed of Onset	12 to 24 hours warning
Location	Countywide

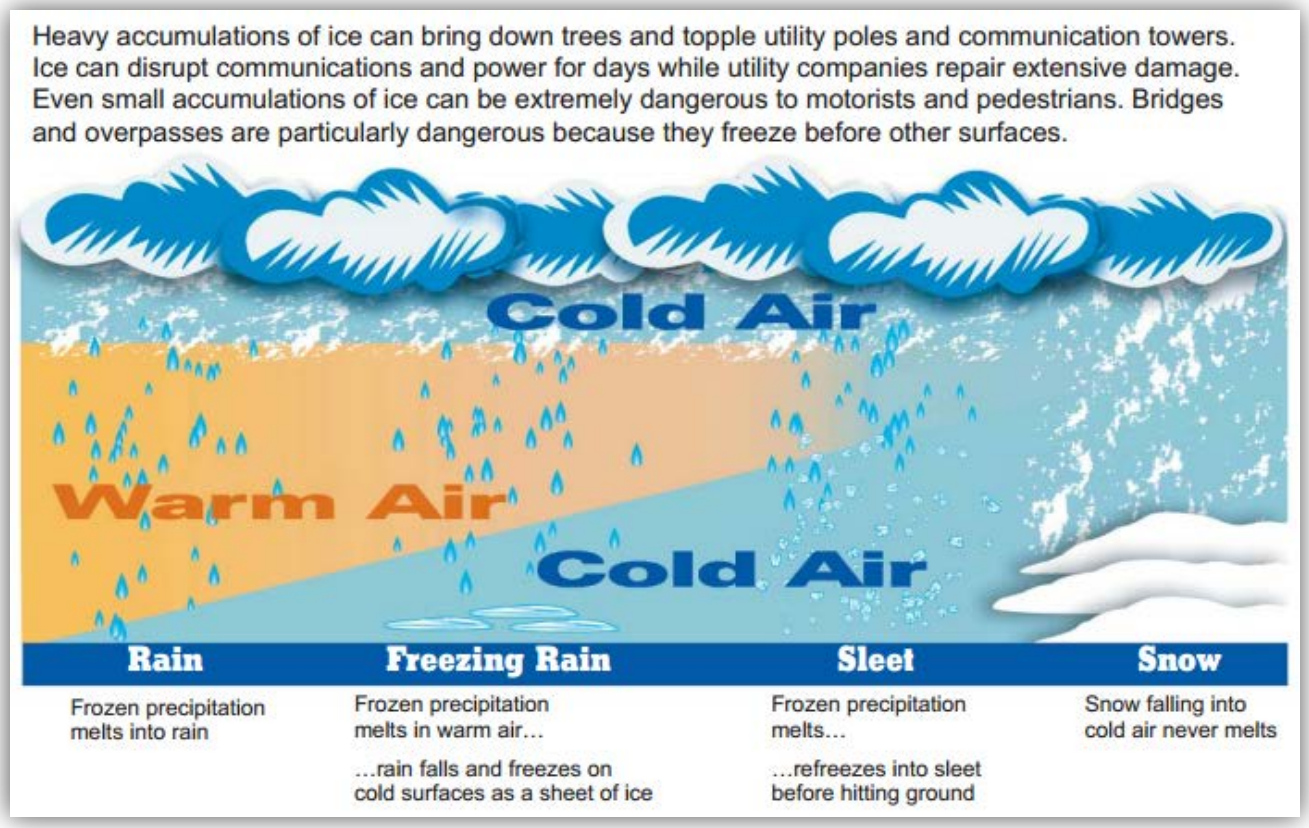
Description

Winter storms occur in many forms and vary significantly in size, strength, intensity, duration, and impact. The winter season can begin as early as September and last into May. Generally, a period from mid-November through early April provides the bulk of winter storms.

Heavy snow can paralyze a community by stranding travelers, stopping the flow commodities, and disrupting emergency services. The weight of snow can cause roofs to collapse and knock down trees and utility lines. Homes and farms may be isolated for days and unprotected livestock may die. The cost of snow removal, damage repair, and loss of business can have economic impacts on communities.



Source: Winter Storms, The Deceptive Killers, A Preparedness Guide, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, June 2008



Source: Winter Storms, The Deceptive Killers, A Preparedness Guide, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, June 2008

Key Terms

Blizzard: Sustained winds or frequent gusts of 35 mph or more with snow and blowing snow frequently reducing visibility to less than a quarter mile for 3 hours or more.

Blowing Snow: Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.

Freezing Rain: Rain that freezes when it hits the ground; creating a coating of ice on roads, walkways, trees and power lines.

Sleet: Rain that turns to ice pellets before reaching the ground. Sleet also causes moisture on roads to freeze and become slippery.

Snow Squalls: Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.

Snow Showers: Snow falling at varying intensities for brief periods of time. Some accumulation is possible.

Snow Flurries: Light snow falling for short durations with little or no accumulation.

Wind Chill: A measure of how cold people feel due to the combined effect of wind and cold temperatures; the Wind Chill Index is based on the rate of heat loss from exposed skin. Both cold temperatures and wind remove heat from the body; as the wind speed increases during cold conditions, a body loses heat more quickly. Eventually, the internal body temperature also falls and hypothermia can develop. Animals also feel the effects of wind chill; but inanimate objects, such as vehicles and buildings, do not. They will only cool to the actual air temperature, although much faster during windy conditions.

Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes | 10 minutes | 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph) *Effective 11/01/01*

Sources: Winter Storms, The Deceptive Killers, A Preparedness Guide, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, June 2008

National Weather Service, National Oceanic and Atmospheric Administration, Winter Storm Safety, website

Identified Impacts

- Blocked Roads
- Building Collapse
- Business Interruptions
- Delayed Emergency Response
- Downed Power Lines
- Downed Trees
- Evacuation (Localized)
- Flooding (Street)
- Flooding (Structure)
- HAZMAT Release
- Increased Fire Potential
- Increased Public Safety Runs
- Livestock Injury/Death
- Loss of Economy
- Loss/Overcrowded Medical Facilities
- Loss of Potable Water
- Loss of Power
- Property Damage
- School Closure
- Wind Chill

History:

Blizzard

Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
LOGAN (ZONE)	3/31/2014	Blizzard		0	0	$0	$0
LOGAN (ZONE)	1/26/2014	Blizzard		0	0	$0	$0
LOGAN (ZONE)	4/14/2013	Blizzard		0	0	$0	$0
LOGAN (ZONE)	2/10/2013	Blizzard		0	0	$0	$0
LOGAN (ZONE)	12/8/2012	Blizzard		0	0	$0	$0
LOGAN (ZONE)	3/11/2011	Blizzard		0	0	$0	$0
LOGAN (ZONE)	2/20/2011	Blizzard		0	0	$0	$0
LOGAN (ZONE)	1/1/2011	Blizzard		0	0	$0	$0
LOGAN (ZONE)	12/30/2010	Blizzard		0	0	$0	$0
LOGAN (ZONE)	10/26/2010	Blizzard		0	0	$0	$0
LOGAN (ZONE)	1/25/2010	Blizzard		0	0	$123,000	$0
LOGAN (ZONE)	12/25/2009	Blizzard		0	0	$0	$0
LOGAN (ZONE)	3/29/2009	Blizzard		0	0	$0	$0
LOGAN (ZONE)	1/11/2009	Blizzard		0	0	$0	$0
LOGAN (ZONE)	12/13/2008	Blizzard		0	0	$0	$0
LOGAN (ZONE)	11/6/2008	Blizzard		0	0	$0	$0
LOGAN (ZONE)	3/2/2007	Blizzard		0	0	$0	$0
LOGAN (ZONE)	2/10/2004	Blizzard		0	0	$0	$0
LOGAN (ZONE)	12/16/2000	Blizzard		0	0	$0	$0
LOGAN (ZONE)	4/1/1999	Blizzard		0	0	$0	$0
LOGAN (ZONE)	4/4/1997	Blizzard		0	0	$1,000,000	$0
LOGAN (ZONE)	1/21/1997	Blizzard		0	0	$790,000	$0
LOGAN (ZONE)	1/15/1997	Blizzard		2	0	$900,000	$0
LOGAN (ZONE)	1/9/1997	Blizzard		0	1	$1,530,000	$0
LOGAN (ZONE)	1/4/1997	Blizzard		0	0	$0	$0
LOGAN (ZONE)	1/4/1997	Blizzard		0	0	$250,000	$0
LOGAN (ZONE)	12/16/1996	Blizzard		0	0	$0	$0
LOGAN (ZONE)	2/26/1996	Blizzard		0	0	$0	$0
LOGAN (ZONE)	1/17/1996	Blizzard		0	0	$0	$0
				2	1	$4,593,000	$0

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

Cold/Wind Chill

Location	Date	Event Type	Deaths	Injuries	Property Damage	Crop Damage
LOGAN (ZONE)	3/1/2014	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	1/26/2014	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	1/22/2014	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	1/4/2014	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	12/28/2013	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	12/6/2013	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	2/19/2013	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	1/30/2013	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	1/20/2013	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	1/18/2012	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	2/8/2011	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	2/1/2011	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	1/7/2010	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	12/20/2008	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	12/14/2008	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	2/9/2008	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	1/29/2008	Extreme Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	2/16/2006	Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	1/13/2005	Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	1/27/2004	Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	1/4/2004	Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	12/25/1996	Cold/wind Chill	0	0	$0	$0
LOGAN (ZONE)	2/1/1996	Cold/wind Chill	0	0	$0	$0
			0	0	$0	$0

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

Heavy Snow

Location	Date	Event Type	Deaths	Injuries	Property Damage	Crop Damage
LOGAN (ZONE)	11/27/2016	Heavy Snow	0	0	$0	$0
LOGAN (ZONE)	12/15/2015	Heavy Snow	0	0	$0	$0
LOGAN (ZONE)	12/3/2013	Heavy Snow	0	0	$0	$0
LOGAN (ZONE)	1/11/2013	Heavy Snow	0	0	$0	$0
LOGAN (ZONE)	2/28/2012	Heavy Snow	0	0	$0	$0
LOGAN (ZONE)	4/14/2011	Heavy Snow	0	0	$0	$0
LOGAN (ZONE)	3/31/2009	Heavy Snow	0	0	$0	$0
LOGAN (ZONE)	3/10/2009	Heavy Snow	0	0	$0	$0
LOGAN (ZONE)	2/27/2009	Heavy Snow	0	0	$0	$0
LOGAN (ZONE)	12/29/2008	Heavy Snow	0	0	$0	$0
LOGAN (ZONE)	12/30/2006	Heavy Snow	0	0	$0	$0
LOGAN (ZONE)	11/9/1998	Heavy Snow	0	0	$0	$0
			0	0	$0	$0

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

Winter Storm/Winter Weather

Location	Date	Event Type	Deaths	Injuries	Property Damage	Crop Damage
LOGAN (ZONE)	4/14/2013	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	3/22/2011	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	5/6/2010	Winter Weather	0	0	$0	$0
LOGAN (ZONE)	1/22/2010	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	1/21/2010	Winter Weather	0	0	$0	$0
LOGAN (ZONE)	1/5/2010	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	12/23/2009	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	3/24/2009	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	1/16/2009	Winter Weather	0	0	$0	$0
LOGAN (ZONE)	3/1/2007	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	2/28/2007	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	12/29/2005	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	11/28/2005	Winter Weather	0	0	$0	$0
LOGAN (ZONE)	2/10/2004	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	1/24/2004	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	12/17/2002	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	11/7/2000	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	3/8/2000	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	2/26/2000	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	2/25/2000	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	4/3/1999	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	1/26/1999	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	1/1/1999	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	11/18/1998	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	3/12/1997	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	11/23/1996	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	11/19/1996	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	11/5/1996	Winter Storm	0	0	$0	$0
LOGAN (ZONE)	3/23/1996	Winter Storm	0	0	$0	$0
			0	0	$0	$0

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

Shortage or Outage of Critical Materials or Infrastructure

Frequency	Possible (1-10% probability in next year, or at least 1 chance in next 100 years)
Severity	Critical (25-50% of jurisdiction affected)
Risk Class	B
Seasonal Pattern	None
Duration	Days/Weeks
Speed of Onset	Little to no warning
Location	Countywide

Description

A shortage or outage of critical materials or infrastructure occurs when demand for a product exceeds supply. A shortage of critical materials may include a wide variety of resources. The potential for a shortage of energy products requires preparing provisions for providing electric power and fuels to support emergency and disaster response operations and for the normal functioning of business and industry throughout the county. Supplying energy related resources during a shortage involves the production/generation, refinement, and transportation/transmitting of such resources. It also includes the conservation of these resources and the construction and maintenance of the energy system and its components.

The sudden and devastating occurrence of a severe natural disaster to include an extended period of severe cold weather; the disruption of a supply system; an embargo, which could result from international global conflict; or other significant event can disrupt the availability of fuels and other critical energy products. Such occurrences could impact future energy supplies and place extreme pressure on existing supplies, threatening the health, safety, and well-being of the citizens.

Shortages of critical energy supplies can cause:

- Widespread and prolonged electrical power failure, which impacts both day-to-day and emergency communications capability.
- A lack of transportation fuels, causing surface movement gridlock and disruption of commerce.
- Diminished supplies of heating fuels during winter. This could cause severe economic impact on the general public, because they would be forced to seek alternate, possibly more costly, energy sources. Such energy shortages will also impact emergency public health and safety services.
- A lack of medical supplies, especially vaccines, antibiotics, and anti-viral medications, pose a public health and safety threat.
- Private hoarding, compounding a shortage problem.
- A lack of adequate food, water, and shelter.

Identified Impacts

- Business Interruptions
- Delayed Emergency Response
- Increased Public Safety Runs
- Livestock Injury/Death
- Loss of Economy
- Loss of Potable Water
- Loss of Power
- School Closure

History

There is no significant history of shortage or outage of critical materials or infrastructure within the County. Electrical outages in summer typically last from minutes to mere hours, while outages in the winter have lasted up to 2-3 days in rural areas. Some critical sites have backup generators. Water conservation during periods of drought or extreme temperature has always been voluntary as conditions have not warranted water bans.

Transportation Accident

Frequency	Possible (1-100% probability in the next year, or at least 1 chance in next 100 years.)
Severity	Negligible (Less than 10% of jurisdiction affected)
Risk Class	D
Seasonal Pattern	None
Duration	Hours
Speed of Onset	No warning
Location	Countywide

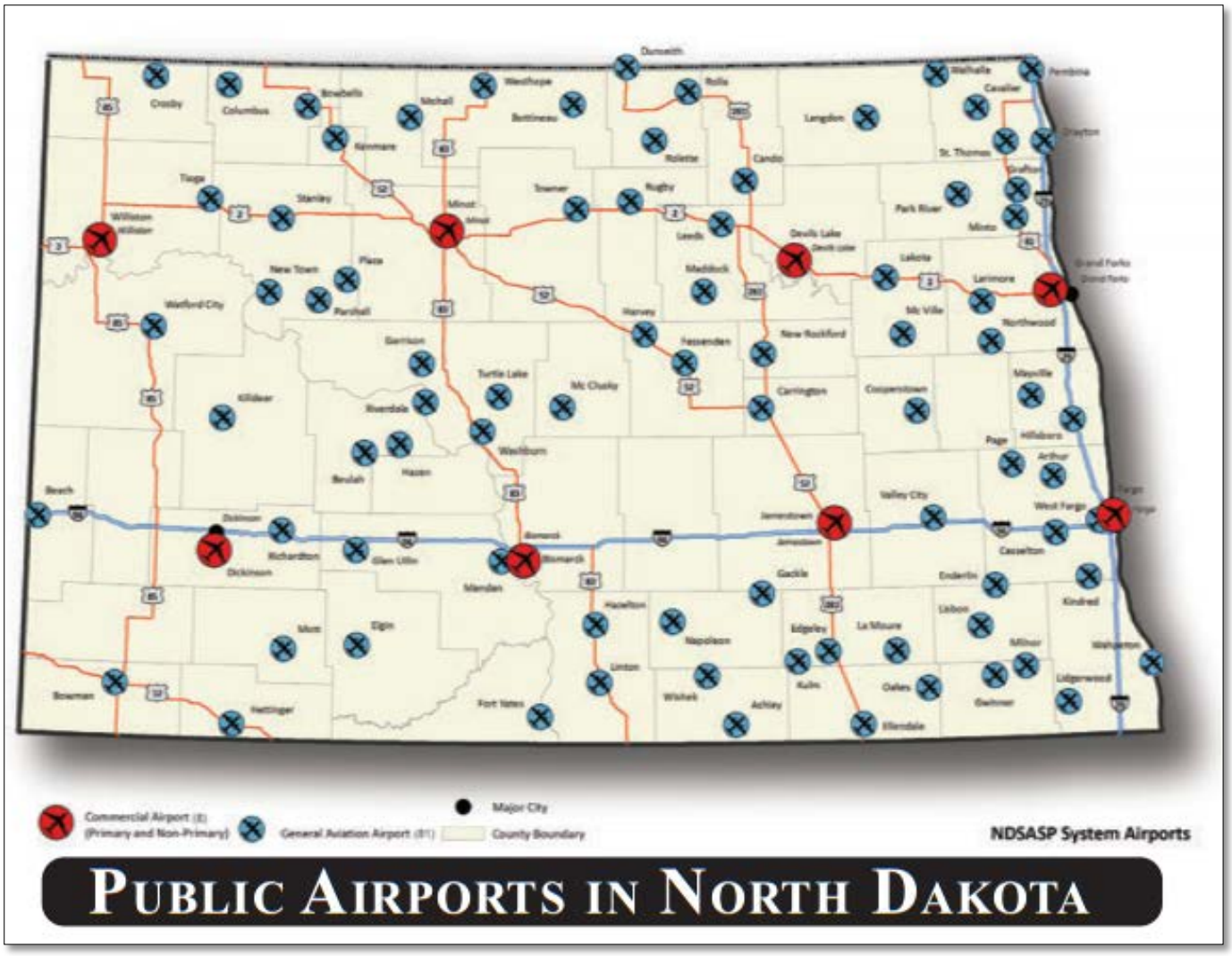
Description

A transportation accident is any large-scale aircraft, railroad, or vehicular accident involving mass casualties.

Logan County has two municipal airports, one railroad, and several county highways.

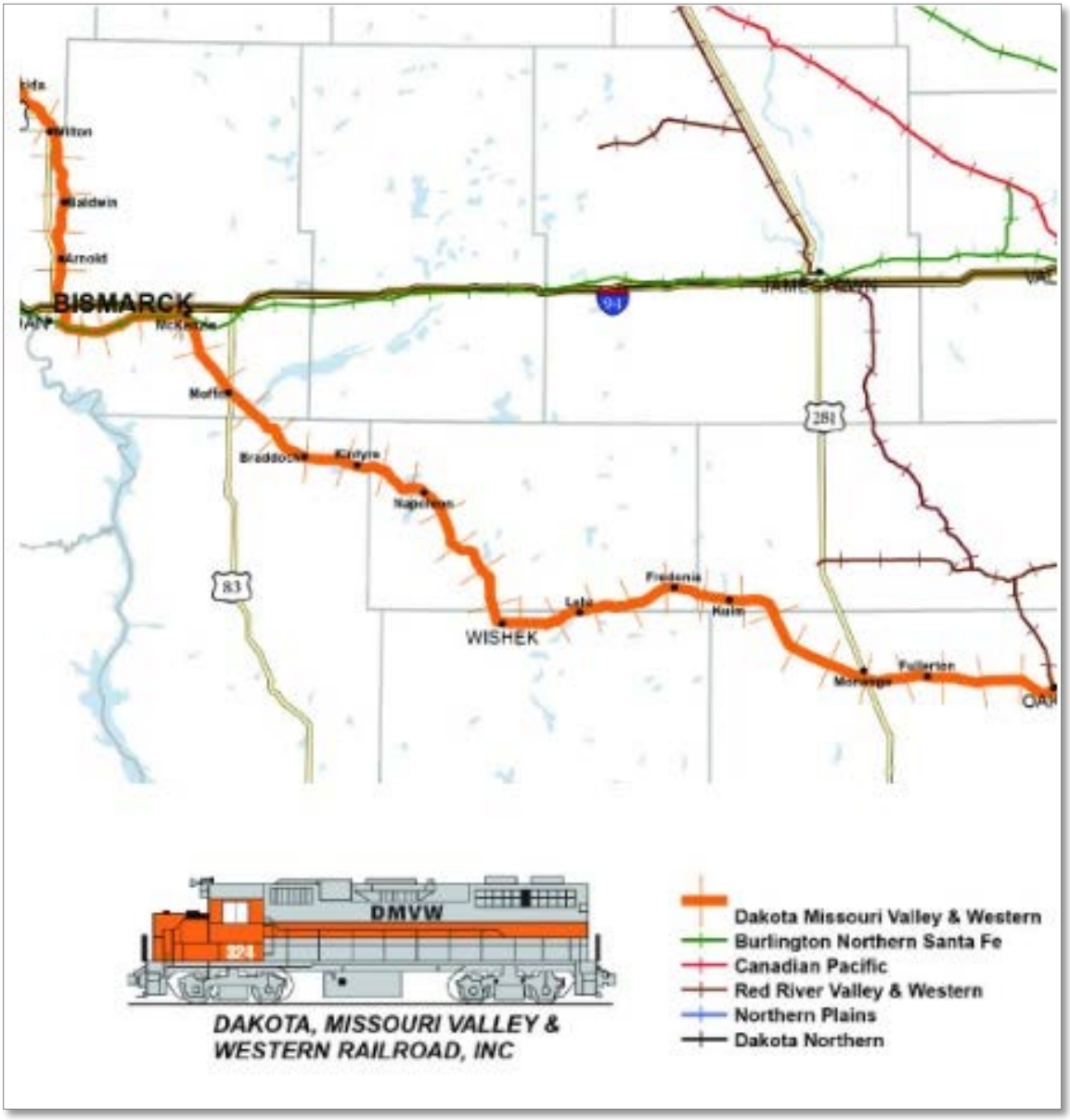
Airports

Logan County has two airport locations: Gackle and Napoleon. The nearest major airport is located in Bismarck (Burleigh County).



Source: ND Aeronautics Commission website

Railroad



Source: Dakota Missouri Valley & Western Railroad, Inc website

Date	Rail-road	Location	Physical Act	Event	Injury
08/11/2016	DMVWR	Main/ Branch	Spiking (installation/removal)	Repetitive motion - work processes	Sprain/strain, shoulder

Source: Federal Railroad Administration Office of Safety Analysis website

Identified Impacts

- Blocked Roads
- Business Interruptions
- Delayed Emergency Response
- Evacuation (Localized)
- Explosion
- HAZMAT Release
- Increased Public Safety Runs
- Loss/Overcrowded Medical Facilities
- Mass Casualties
- Property Damage

History

There is no history of mass casualty within Logan County.

Aviation

(Estimated) Report Publish Date(s)	Report(s)	Event Date	Location	Make/ Model	Regi-stration Number	NTSB No.	Event Severity	Type of Air Carrier Operation and Carrier Name (Doing Business As)
Factual 11/18/1996 Final 12/16/1996	Final Report (PDF) Synopsis (HTML) Data Summary (PDF)	7/28/1996	NAPOLEON, ND	Cessna 188	N5708G	CHI96LA257	Nonfatal	
Final 8/31/1993	Final Report (PDF) Synopsis (HTML) Data Summary (PDF)	7/4/1992	NAPOLEON, ND	LUSCOM BE 8E	N2264K	CHI92LA196	Fatal(2)	

Source: National Transportation Safety Board website

Vehicle

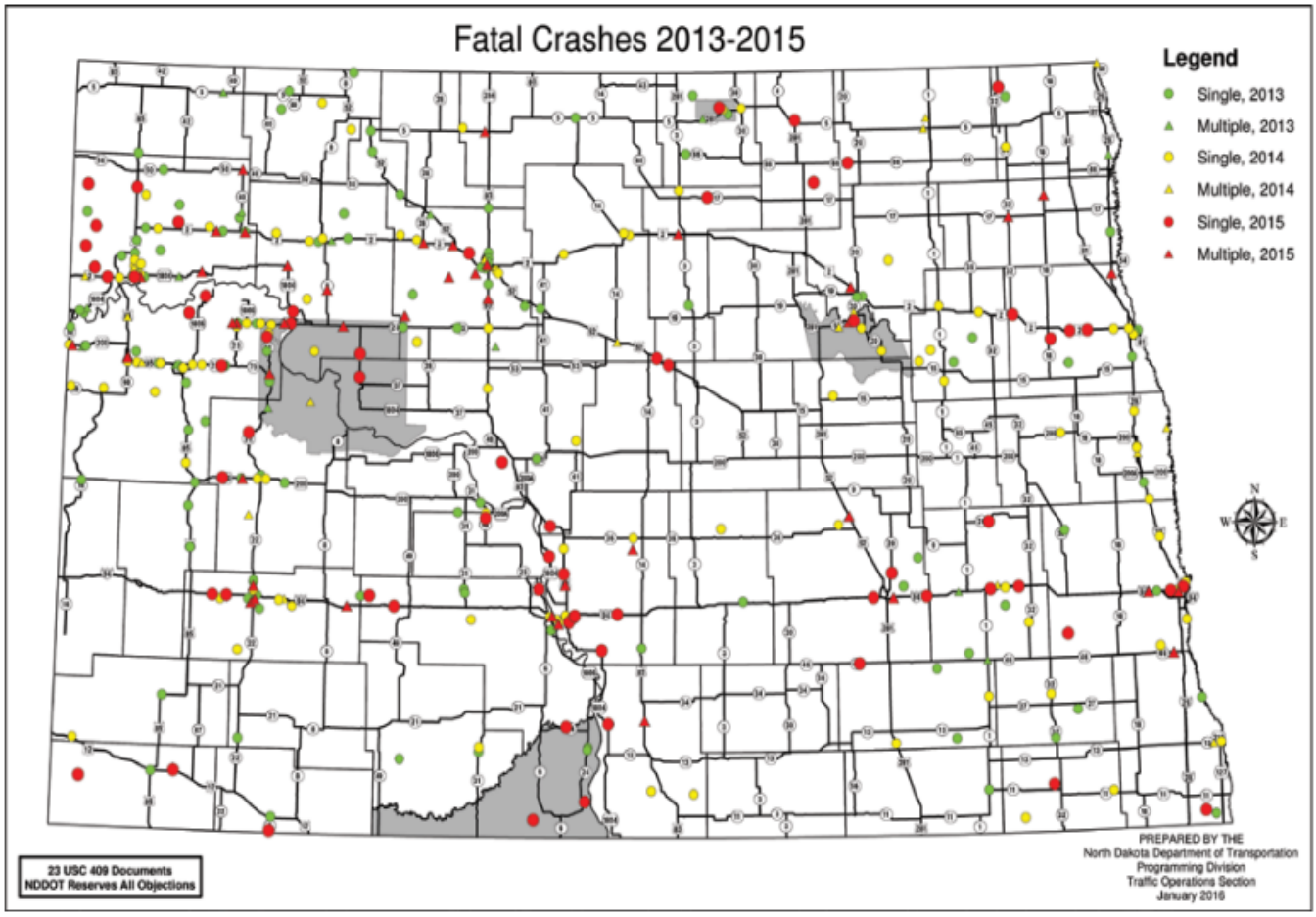
2015 Crashes by County

County	PDO Crashes	Injury Crashes	Total Injuries	Fatal Crashes	Total Fatalities	Total Crashes	Total Rate per MVMT	VMT by County
Adams	12	4	4	1	1	17	0.47	36,307,876
Barnes	134	47	72	3	3	184	0.80	231,206,715
Benson	20	10	15	2	2	32	0.30	105,429,983
Billings	20	15	20	0	0	35	0.33	104,814,108
Bottineau	49	26	35	1	1	76	0.70	108,256,387
Bowman	16	4	5	2	2	22	0.39	56,144,438
Burke	22	14	19	0	0	36	0.57	63,692,004
Burleigh	1,946	574	774	9	10	2,529	3.50	721,958,627
Cass	2,700	862	1,149	6	6	3,568	2.29	1,558,107,574
Cavalier	21	8	10	1	1	30	0.49	60,777,708
Dickey	40	10	12	0	0	50	0.92	54,231,153
Divide	30	11	13	0	0	41	0.47	87,747,628
Dunn	100	32	40	3	3	135	0.64	210,719,616
Eddy	9	5	5	0	0	14	0.45	30,824,974
Emmons	35	19	19	2	2	56	0.98	57,434,643
Foster	24	9	11	0	0	33	0.69	48,125,181
Golden Valley	24	6	7	0	0	30	0.59	51,175,535
Grand Forks	1,048	367	494	5	6	1,420	2.32	613,248,357
Grant	16	6	7	0	0	22	0.66	33,500,977
Griggs	6	4	4	0	0	10	0.33	29,962,938
Hettinger	19	4	5	0	0	23	0.54	42,427,972
Kidder	31	12	15	0	0	43	0.38	114,235,528
Lamoure	35	11	15	0	0	46	0.82	56,071,938
Logan	21	5	5	0	0	26	1.07	24,363,458

PDO = Property Damage Only
MVMT = Million Vehicle Miles Traveled
VMT = Vehicle Miles Traveles

Burleigh County continues to have the highest crash rate per million vehicle miles traveled with 3.50.

Williams County had the greatest number of fatal crashes with 13.



Source: 2015 North Dakota Crash Summary, North Dakota Department of Transportation

Urban Fire or Structure Collapse

Frequency	Possible (1-100% probability in the next year, or at least 1 chance in next 100 years.)
Severity	Negligible (Less than 10% of jurisdiction affected)
Risk Class	D
Seasonal Pattern	None
Duration	Hours
Speed of Onset	No warning
Location	Countywide

Description

The urban fire department is one of the oldest continuing institutions in America. Their profession and skill is to arrive at the fire as soon as possible, get all human life to safety, and to suppress the fire as quickly as possible. Primary factors that influence the potential for urban fire or structure collapse include: Electrical; incendiary-arson; smoking materials; heating devices; fuel systems; sparks; spills; spontaneous combustion and the levels of human activity in urban areas. Primary factors may also be secondary factors to another hazard such as tornado, wildfire, and severe winter storms.

The increasing cost of natural gas and fuel oil has caused families to rediscover alternate heating methods to heat their homes. As a result, the use of space heaters, fireplaces, and wood burning stoves can increase the fire hazard.

Many portable propane gas or kerosene heaters have self-continued fuel supplies and can be hazardous; even when used according to the manufacturer's instructions. The open flame provides a potential fire hazard, fuel leakage from the container could cause an explosion, and the fuel vapor is a source of indoor pollution.

Most people have limited experience with wood burners. As a result, a number of fires are caused by faulty installation of stoves and chimneys—wood heat has a poor safety record.

Identified Impacts

- Blocked Roads
- Building Collapse
- Business Interruptions
- Downed Power Lines
- Evacuation (Localized)
- Explosion
- HAZMAT Release
- Increased Fire Potential
- Increased Public Safety Runs
- Loss of Economy
- Loss/Overcrowded Medical Facilities
- Loss of Power
- Mass Casualties
- Property Damage
- School Closure

History

2016 Logan County Fires Reported to the ND Forest Service

2016 Local Incident ID	Fire Discovery Date	Incident Name	District	Latitude	Longitude	Statistical Cause Code	Ownership Code	Residence Threatened	Residence Destroyed	Other Structures Threatened	Other Structures Destroyed	Number Injuries	Number Fatalities
103	03/23/16	Dean Entzminger	Gackle VFD	46.62826	-99.145702	9	P	3	0	0	0	0	0
177	04/05/16	Jaford Burgad	Napoleon Rural Fire	46.30044	-99.460786	5	P	0	0	0	0	0	0
185	04/09/16	Jaford Burgad	Napoleon Rural Fire	46.30044	-99.460786	5	P	0	0	0	0	0	0
25	03/04/16	Ken Fettig	Napoleon Rural Fire	46.30044	-99.460786	2	P	0	0	0	0	0	0
313	05/21/16	aN D Hunting Block	Napoleon Rural Fire	46.30044	-99.460786	9	O	0	0	0	0	0	0
34	03/06/16	Mike Mann	Napoleon Rural Fire	46.30044	-99.460786	5	M	0	0	0	0	0	0
342	06/19/16	Pete Reis	Napoleon Rural Fire	46.30044	-99.460786	9	P	0	0	0	0	0	0
347	06/20/16	MDU Electric Lines	Napoleon Rural Fire	46.30044	-99.460786	1	O	0	0	0	0	0	0
365	06/22/16	MDU Power Lines	Napoleon Rural Fire	46.30044	-99.460786	9	O	0	0	0	0	0	0
384	06/28/16	Pete Reis	Napoleon Rural Fire	46.30044	-99.460786	9	P	0	0	0	0	0	0
398	07/02/16	Christine Hartze	Napoleon Rural Fire	46.30044	-99.460786	5	P	0	0	0	0	0	0
407	07/03/16	Pete Sperle	Napoleon Rural Fire	46.30044	-99	10	P	0	0	0	0	0	0
408	07/03/16	Frank Braun	Napoleon Rural Fire	46.30044	-99.31019	9	P	0	0	0	0	0	0
447	07/22/16	Albert Dewald	Napoleon Rural Fire	46.30044	-99.460786	9	P	0	0	0	0	0	0
471	08/02/16	Chuck Nord	Napoleon Rural Fire	46.30044	-99.460786	9	P	0	0	0	0	0	0
485	08/07/16	Norman E Miller	Gackle FD	-46.5872	-99.256099	2	P	0	0	0	0	0	0
489	08/08/16	Ross Kleingartner	Gackle VFD	46.60221	-99.162011	2	P	0	0	0	0	0	0
497	08/09/16	Construction Firm	Napoleon Rural Fire	46.30044	-99.31019	9	P	0	0	0	0	0	0
542	08/30/16	Tim Long	Napoleon Rural Fire	46.30044	-99.460786	9	P	0	0	0	0	0	0
545	08/30/16	wyatt rath	Wishek fire district	46.29552	-99.607489	2	P	0	0	0	0	0	0
592	10/19/16	MDU Power Lines	Napoleon Rural Fire	46.364	-99.4607	2	P	0	0	0	0	0	0
605	11/05/16	Jacque Reis	Napoleon Rural Fire	46.36404	-99.460786	2	P	0	0	0	0	0	0
610	11/09/16	Robert Liversage	Napoleon Rural Fire	46.36404	-99.460786	9	P	0	0	0	0	0	0
628	11/15/16	Reed Zimmerman	Napoleon Rural Fire	46.36404	-99.460786	9	P	0	0	0	0	0	0
8	02/14/16	David Labor	Napoleon Rural Fire	46.30044	-99.460786	9	P	0	0	0	0	0	0

Statistical Cause Code			
1	Lightning	7	Arson
2	Equipment Use	8	Children
3	Smoking	9	Miscellaneous
4	Campfire	10	Fireworks
5	Debris Burning	11	Powerline
6	Railroad	12	Structure

Ownership Code			
F	Federal	P	Private
S	State	O	Other
C	County	I	Industrial
M	City/Municipality		

2015 Logan County Fires Reported to the ND Forest Service

2015 Local Incident ID	Fire Discovery Date	Incident Name	District	Latitude	Longitude	Statistical Cause Code	Ownership Code	Residence Threatened	Residence Destroyed	Other Structures Threatened	Other Structures Destroyed	Number Injuries	Number Fatalities
17	04/13/15	Troy Jangula	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
69	04/17/15	Lee Piatz	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
80	04/21/15	Norman E Miller	Gackle Volunteer FD	46.6343	-99.3402	9	P	0	0	0	0	0	0
83	04/22/15	Ralph Rivinius	Gackle Volunteer FD	46.6343	-99.3402	9	P	0	0	0	0	0	0
162	05/24/15	Pete Reis	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
206	07/07/15	Margaret Wald	Napoleon Rural Fire	46.7055	-97.9998	5	P	0	0	0	0	0	0
207	07/07/15	Leland Vetter	Napoleon Rural Fire	46.7055	-97.9998	1	M	0	0	1	1	0	0
209	07/08/15	Phil Kambeitz	Napoleon Rural Fire	46.7055	-97.9998	1	P	0	0	0	0	0	0
286	08/12/15	Dallas Bakken	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
299	08/16/15	Darrell Becker	Napoleon Rural Fire	46.7055	-97.9998	1	P	0	0	0	0	0	0
308	08/20/15	Jody Homer	Napoleon Rural Fire	46.7055	-97.9998	3	P	0	0	0	0	0	0
309	08/20/15	Greg Wesmiller	Napoleon Rural Fire	46.7055	-97.9998	1	S	0	0	0	0	0	0
315	08/21/15	Lonnie Wentz	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
333	09/03/15	Russell Kleppe	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	1	1	0	0
366	09/23/15	Ron Aberle	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
377	09/28/15	Lee Piatz	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
381	09/28/15	Dan Bitz	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
382	09/28/15	Dakota Frontier Co	Napoleon Rural Fire	46.7055	-97.9998	2	O	0	0	0	0	0	0
391	10/01/15	Andy's Body Shop	Napoleon Rural Fire	46.7055	-97.9998	1	P	0	0	0	0	0	0
398	10/05/15	Pius Schmidt	Napoleon Rural Fire	46.7055	-97.9998	5	P	0	0	0	0	0	0
402	10/07/15	Pius Schmidt	Napoleon Rural Fire	46.7055	-97.9998	5	P	0	0	0	0	0	0
415	10/11/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	9	P	1	0	0	0	0	0
420	10/11/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	9	P	1	0	0	0	0	0
425	10/11/15	City of Napoleon	Napoleon Rural Fire	46.7055	-97.9998	9	C	0	0	0	0	0	0
427	10/11/15	Pius Schmidt	Napoleon Rural Fire	46.7055	-97.9998	5	P	0	0	0	0	0	0
428	10/11/15	Pius Schmidt	Napoleon Rural Fire	46.7055	-97.9998	5	P	0	0	0	0	0	0
429	10/12/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	9	P	1	0	0	0	0	0
430	10/12/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	9	P	1	0	0	0	0	0
431	10/12/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	9	P	1	0	1	0	0	0
436	10/12/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	9	P	1	0	0	0	0	0
439	10/13/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	5	P	0	0	0	0	0	0
535	12/19/15	Keith Lindberg	Napoleon Rural Fire	46.4636	-99.7686	2	P	0	0	0	0	0	0

Statistical Cause Code			
1	Lightning	7	Arson
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4	Campfire	10	Fireworks
5	Debris Burning	11	Powerline
6	Railroad	12	Structure

Ownership Code			
F	Federal	P	Private
S	State	O	Other
C	County	I	Industrial
M	City/Municipality		

Summary By Incident Type

Report Period: From 01/01/2011 to 12/31/2016

All Selected Fire Departments

Calls By Incident Type	Frequency	Percent Of Total Calls	Mutual Aid None	Mutual Aid Given	Mutual Aid Received	Other Aid Given	Invalid Aid Flag	Exposures	Total Incidents
FIRES									
Structure Fires (110-118, 120-123)	12	9.23 %	12	0	0	0	0	0	12
Vehicle Fires (130-138)	10	7.69 %	10	0	0	0	0	0	10
Other Fires (100, 140-173)	62	47.69 %	61	0	1	0	0	3	65
Total Fires	84	64.62 %	83	0	1	0	0	3	87
Pressure Ruptures, Explosion, Overheat (200-251)	3	2.31 %	3	0	0	0	0	0	3
RESCUE CALLS									
Emergency Medical Treatment (300-323)	12	9.23 %	7	0	0	5	0	0	12
All Others (331-381)	2	1.54 %	1	0	0	1	0	0	2
Total Rescue Calls	14	10.77 %	8	0	0	6	0	0	14
Hazardous Condition Calls (400-482)	6	4.62 %	6	0	0	0	0	0	6
Service Calls (500-571)	4	3.08 %	4	0	0	0	0	0	4
Good Intent Calls (600-671)	6	4.62 %	6	0	0	0	0	0	6
Severe Weather or Natural Disaster Calls (800-815)	0	0.00 %	0	0	0	0	0	0	0
Special Incident Calls (900-911)	5	3.85 %	5	0	0	0	0	0	5
Unknown Incident Type (UUU)	0	0.00 %	0	0	0	0	0	0	0
FALSE CALLS									
Malicious Calls (710-715, 751)	0	0.00 %	0	0	0	0	0	0	0
Other False Calls (700, 721-746)	8	6.15 %	8	0	0	0	0	0	8
Total False Calls	8	6.15 %	8	0	0	0	0	0	8
TOTAL CALLS	**130**	**100.00 %**	**123**	**0**	**1**	**6**	**0**	**3**	**133**

Total Incidents With Exposure Fires	3	Total Fire Dollar Loss	$ 1,371,735.00
Total Exposure Fires	3	Total Dollar Loss	$ 1,386,935.00

Casualty Summary	Civilian	Fire Service
Fire Related Injuries	0	0
Non-Fire Injuries	1	0
Fire Related Deaths	0	0
Non-Fire Deaths	3	1

Source: ND Fire Marshal's Office, NFIRS 5.0 National Reporting System

Wildland Fire

Frequency	Likely (10-100% probability in the next year, or at least 1 chance in next 10 years.)
Severity	Limited (10-25% of jurisdiction affected)
Risk Class	C
Seasonal Pattern	None
Duration	Hours/Days
Speed of Onset	No warning
Location	Countywide

Description

Logan County experiences wildland fires every year. Factors that influence the potential for wildland fires include: type, amounts and conditions of fuel supply (vegetation); temperatures; wind conditions; precipitation patterns; humidity levels; topography and the levels of human activity on the land. Fires in areas of heavy vegetation, if not quickly detected and suppressed can quickly flare out of control and cause major damage to habitat, crops, livestock, wildlife, people, and structural property.

Wildland fires can occur at any time of the year, although they seldom occur during winter months (cold and snow are excellent mitigating factors).

The main fire season normally begins about July 15th, when summer weather warms significantly and precipitation is usually limited to that resulting from thunderstorm activity. This longer and more dangerous season extends until about October 30th or until the first significant snow cover.

Most wildland fires result from acts of human carelessness during activities such as: controlled burns of sloughs, ditches, and fields by landowners; recreational activity such as camping, hunting, and other off-road vehicle travel; and use of fireworks preceding and immediately following the 4th of July.

Numerous fires are reported annually as a direct result from the use of farm machinery in fields and pastures, while some fires are caused by Mother Nature during lightning or thunderstorms.

Overall, the wildland urban interface risk is minimal as evidenced by the following statistics and low-density population.

Logan County Wildland Urban Interface

WWA Risk Summary Statistics – West Wide

Output	Description
INDICES	
Fire Risk Index	Measure of the overall wildfire risk. Calculated as the Fire Threat Index (FTI) times the Fire Effects Index (FEI).
Fire Threat Index	Measure of wildfire threat, related to the likelihood of an acre burning. The FTI integrates the probability of an acre igniting and the expected final fire size, based on the rate of spread in four weather percentile categories, into a single measure of wildfire threat.
Fire Effects Index	Identifies areas with important values effected by wildfire and/or that are costly to suppress. FEI is a weighted combination of the Values Impacted Rating (VIR) and Suppression Difficulty Rating (SDR) layers described below.

Index, rating, and score classes (color ramps)

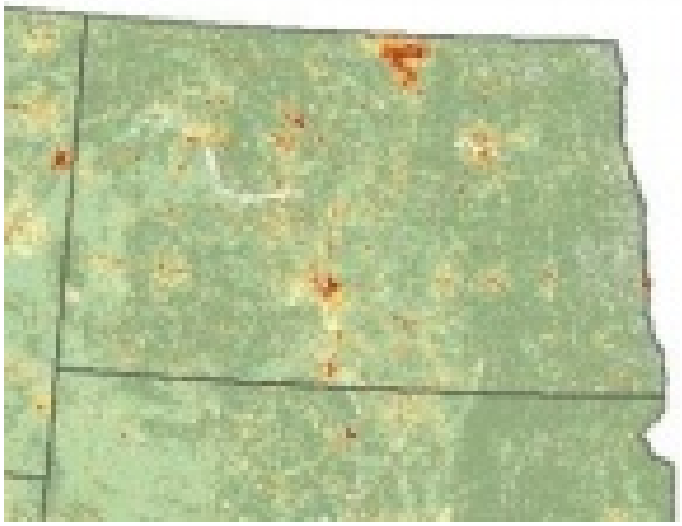
Output values are grouped in to nine (9) classes based on their distribution across burnable acres. The breakpoints between classes use a consistent target cumulative percentile value. By design, the categories were developed to display the highest rated 14.5% of the cells in categories 6-9 so the user will truly locate the differences within these highly rated cells.

Please note that the class values represent a West Wide distribution of acres.

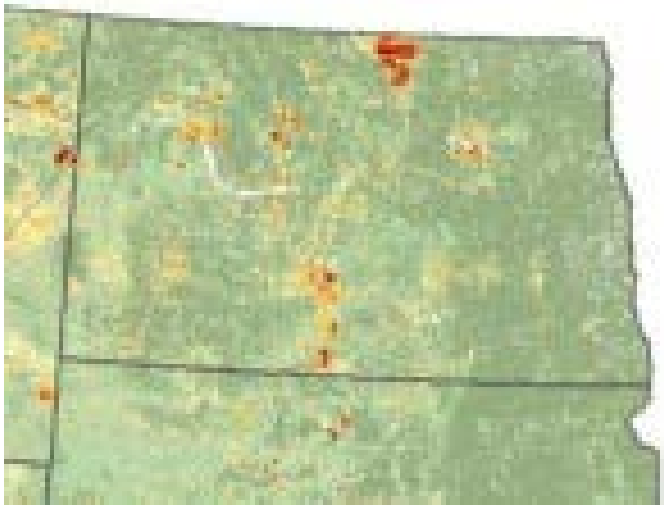
Class	Cumulative % Acres
1 (Lowest)	0.0 - 32.9%
2	33.0 - 63.5%
3	63.5 -70.0%
4	70.0 - 77.5%
5	77.5 - 85.5%
6	85.5 - 92.5%
7	92.5 - 96.5%
8	96.5 - 98.5%
9 (Highest)	98.5 - 100%

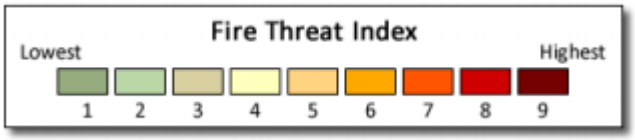
Source: West Wide Wildfire Risk Assessment Project, December 5, 2012

Fire Risk

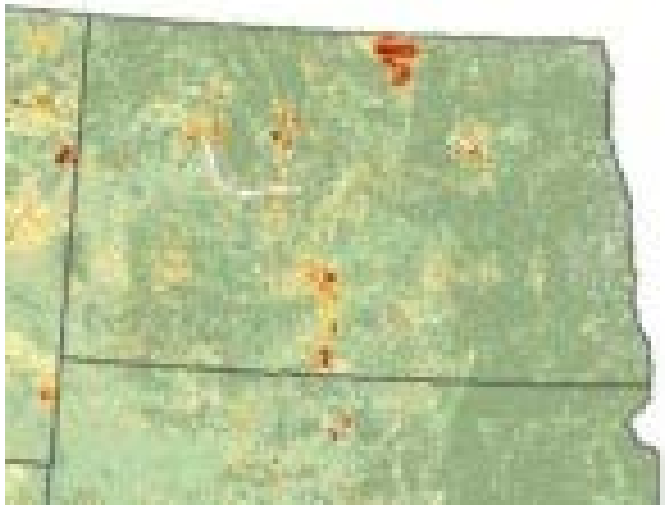


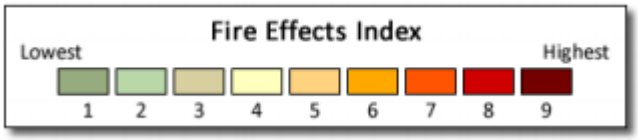
Fire Threat





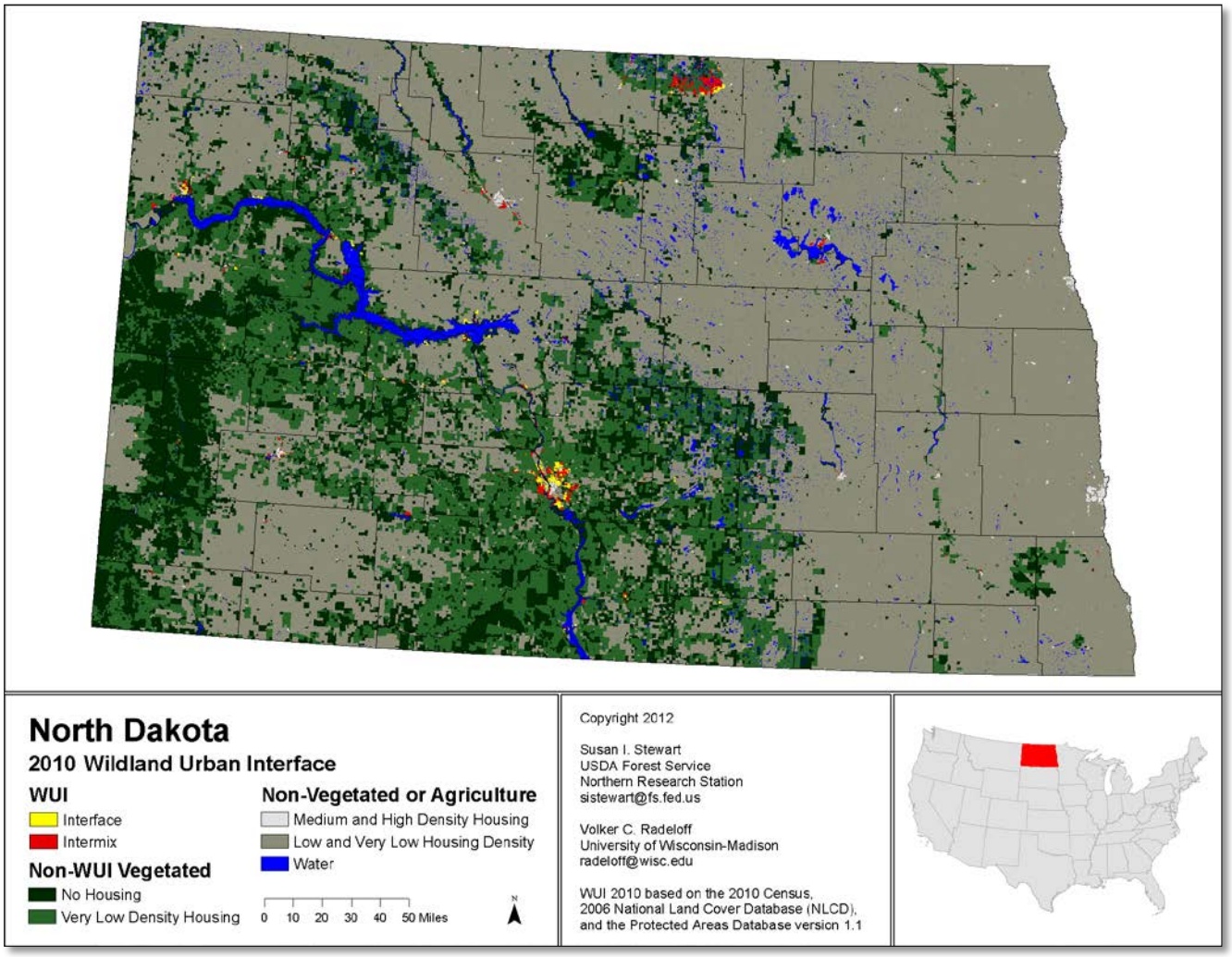
Fire Effects



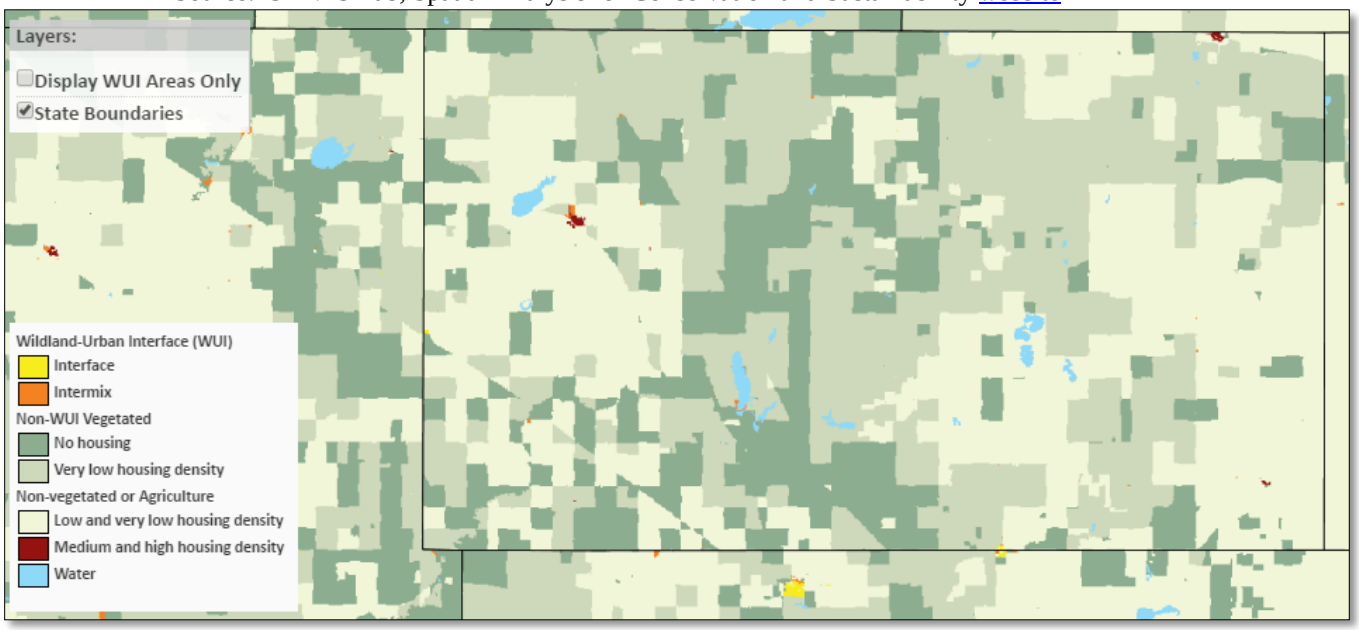


Source: [West Wide Wildfire Risk Assessment Project, December 5, 2012]

ND 2010 Wildland Urban Interface

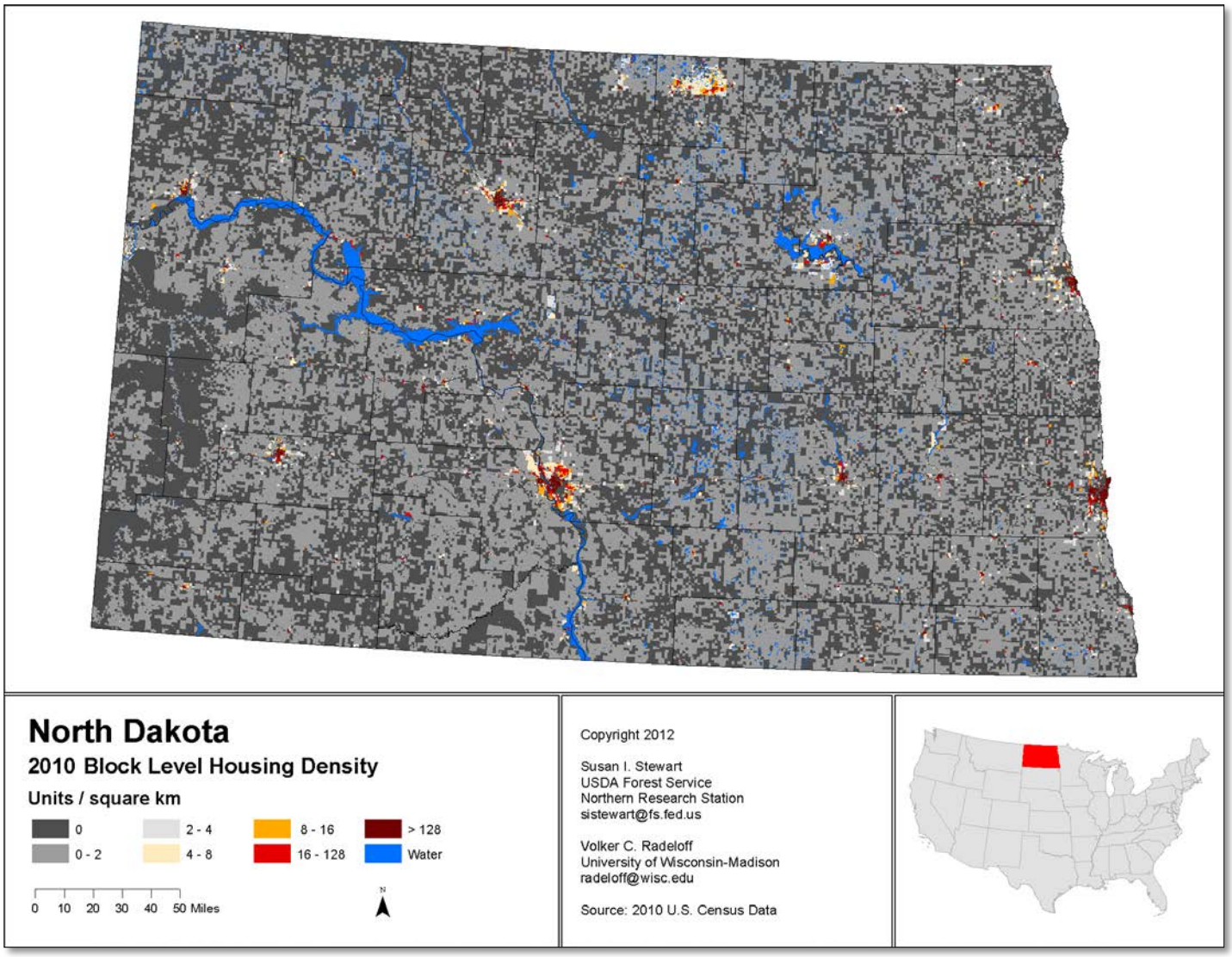


Source: SILVIS Lab, Spatial Analysis for Conservation and Sustainability website



Source: SILVIS Lab, Spatial Analysis for Conservation and Sustainability website

North Dakota 2010 Block Level Housing Density



Source: SILVIS Lab, Spatial Analysis for Conservation and Sustainability website

Identified Impacts

- Blocked Roads
- Business Interruptions
- Downed Power Lines
- Downed Trees
- Evacuation (Localized)
- Explosion
- HAZMAT Release
- Increased Fire Potential
- Livestock Injury/Death
- Loss of Economy
- Loss of Power
- Property Damage

History

2016 Logan County Fires Reported to the ND Forest Service

2016 Local Incident ID	Fire Discovery Date	Incident Name	District	Latitude	Longitude	Statistical Cause Code	Ownership Code	Residence Threatened	Residence Destroyed	Other Structures Threatened	Other Structures Destroyed	Number Injuries	Number Fatalities
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185	04/09/16	Jaford Burgad	Napoleon Rural Fire	46.30044	-99.460786	5	P	0	0	0	0	0	0
25	03/04/16	Ken Fettig	Napoleon Rural Fire	46.30044	-99.460786	2	P	0	0	0	0	0	0
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342	06/19/16	Pete Reis	Napoleon Rural Fire	46.30044	-99.460786	9	P	0	0	0	0	0	0
347	06/20/16	MDU Electric Lines	Napoleon Rural Fire	46.30044	-99.460786	1	O	0	0	0	0	0	0
365	06/22/16	MDU Power Lines	Napoleon Rural Fire	46.30044	-99.460786	9	O	0	0	0	0	0	0
384	06/28/16	Pete Reis	Napoleon Rural Fire	46.30044	-99.460786	9	P	0	0	0	0	0	0
398	07/02/16	Christine Hartze	Napoleon Rural Fire	46.30044	-99.460786	5	P	0	0	0	0	0	0
407	07/03/16	Pete Sperle	Napoleon Rural Fire	46.30044	-99	10	P	0	0	0	0	0	0
408	07/03/16	Frank Braun	Napoleon Rural Fire	46.30044	-99.31019	9	P	0	0	0	0	0	0
447	07/22/16	Albert Dewald	Napoleon Rural Fire	46.30044	-99.460786	9	P	0	0	0	0	0	0
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489	08/08/16	Ross Kleingartner	Gackle VFD	46.60221	-99.162011	2	P	0	0	0	0	0	0
497	08/09/16	Construction Firm	Napoleon Rural Fire	46.30044	-99.31019	9	P	0	0	0	0	0	0
542	08/30/16	Tim Long	Napoleon Rural Fire	46.30044	-99.460786	9	P	0	0	0	0	0	0
545	08/30/16	wyatt rath	Wishek fire district	46.29552	-99.607489	2	P	0	0	0	0	0	0
592	10/19/16	MDU Power Lines	Napoleon Rural Fire	46.364	-99.4607	2	P	0	0	0	0	0	0
605	11/05/16	Jacque Reis	Napoleon Rural Fire	46.36404	-99.460786	2	P	0	0	0	0	0	0
610	11/09/16	Robert Liversage	Napoleon Rural Fire	46.36404	-99.460786	9	P	0	0	0	0	0	0
628	11/15/16	Reed Zimmerman	Napoleon Rural Fire	46.36404	-99.460786	9	P	0	0	0	0	0	0
8	02/14/16	David Labor	Napoleon Rural Fire	46.30044	-99.460786	9	P	0	0	0	0	0	0

Statistical Cause Code			
1	Lightning	7	Arson
2	Equipment Use	8	Children
3	Smoking	9	Miscellaneous
4	Campfire	10	Fireworks
5	Debris Burning	11	Powerline
6	Railroad	12	Structure

Ownership Code			
F	Federal	P	Private
S	State	O	Other
C	County	I	Industrial
M	City/Municipality		

2015 Logan County Fires Reported to the ND Forest Service

2015 Local Incident ID	Fire Discovery Date	Incident Name	District	Latitude	Longitude	Statistical Cause Code	Ownership Code	Residence Threatened	Residence Destroyed	Other Structures Threatened	Other Structures Destroyed	Number Injuries	Number Fatalities
17	04/13/15	Troy Jangula	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
69	04/17/15	Lee Piatz	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
80	04/21/15	Norman E Miller	Gackle Volunteer FD	46.6343	-99.3402	9	P	0	0	0	0	0	0
83	04/22/15	Ralph Rivinius	Gackle Volunteer FD	46.6343	-99.3402	9	P	0	0	0	0	0	0
162	05/24/15	Pete Reis	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
206	07/07/15	Margaret Wald	Napoleon Rural Fire	46.7055	-97.9998	5	P	0	0	0	0	0	0
207	07/07/15	Leland Vetter	Napoleon Rural Fire	46.7055	-97.9998	1	M	0	0	1	1	0	0
209	07/08/15	Phil Kambeitz	Napoleon Rural Fire	46.7055	-97.9998	1	P	0	0	0	0	0	0
286	08/12/15	Dallas Bakken	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
299	08/16/15	Darrell Becker	Napoleon Rural Fire	46.7055	-97.9998	1	P	0	0	0	0	0	0
308	08/20/15	Jody Homer	Napoleon Rural Fire	46.7055	-97.9998	3	P	0	0	0	0	0	0
309	08/20/15	Greg Wesmiller	Napoleon Rural Fire	46.7055	-97.9998	1	S	0	0	0	0	0	0
315	08/21/15	Lonnie Wentz	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
333	09/03/15	Russell Kleppe	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	1	1	0	0
366	09/23/15	Ron Aberle	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
377	09/28/15	Lee Piatz	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
381	09/28/15	Dan Bitz	Napoleon Rural Fire	46.7055	-97.9998	2	P	0	0	0	0	0	0
382	09/28/15	Dakota Frontier Co	Napoleon Rural Fire	46.7055	-97.9998	2	O	0	0	0	0	0	0
391	10/01/15	Andy's Body Shop	Napoleon Rural Fire	46.7055	-97.9998	1	P	0	0	0	0	0	0
398	10/05/15	Pius Schmidt	Napoleon Rural Fire	46.7055	-97.9998	5	P	0	0	0	0	0	0
402	10/07/15	Pius Schmidt	Napoleon Rural Fire	46.7055	-97.9998	5	P	0	0	0	0	0	0
415	10/11/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	9	P	1	0	0	0	0	0
420	10/11/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	9	P	1	0	0	0	0	0
425	10/11/15	City of Napoleon	Napoleon Rural Fire	46.7055	-97.9998	9	C	0	0	0	0	0	0
427	10/11/15	Pius Schmidt	Napoleon Rural Fire	46.7055	-97.9998	5	P	0	0	0	0	0	0
428	10/11/15	Pius Schmidt	Napoleon Rural Fire	46.7055	-97.9998	5	P	0	0	0	0	0	0
429	10/12/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	9	P	1	0	0	0	0	0
430	10/12/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	9	P	1	0	0	0	0	0
431	10/12/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	9	P	1	0	1	0	0	0
436	10/12/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	9	P	1	0	0	0	0	0
439	10/13/15	Ken Bedette	Napoleon Rural Fire	46.7055	-97.9998	5	P	0	0	0	0	0	0
535	12/19/15	Keith Lindberg	Napoleon Rural Fire	46.4636	-99.7686	2	P	0	0	0	0	0	0

Statistical Cause Code			
1	Lightning	7	Arson
2	Equipment Use	8	Children
3	Smoking	9	Miscellaneous
4	Campfire	10	Fireworks
5	Debris Burning	11	Powerline
6	Railroad	12	Structure

Ownership Code			
F	Federal	P	Private
S	State	O	Other
C	County	I	Industrial
M	City/Municipality		

Summary By Incident Type

Report Period: From 01/01/2011 to 12/31/2016

All Selected Fire Departments

Calls By Incident Type	Frequency	Percent Of Total Calls	Mutual Aid None	Mutual Aid Given	Mutual Aid Received	Other Aid Given	Invalid Aid Flag	Exposures	Total Incidents
FIRES									
Structure Fires (110-118, 120-123)	12	9.23 %	12	0	0	0	0	0	12
Vehicle Fires (130-138)	10	7.69 %	10	0	0	0	0	0	10
Other Fires (100, 140-173)	62	47.69 %	61	0	1	0	0	3	65
Total Fires	84	64.62 %	83	0	1	0	0	3	87
Pressure Ruptures, Explosion, Overheat (200-251)	3	2.31 %	3	0	0	0	0	0	3
RESCUE CALLS									
Emergency Medical Treatment (300-323)	12	9.23 %	7	0	0	5	0	0	12
All Others (331-381)	2	1.54 %	1	0	0	1	0	0	2
Total Rescue Calls	14	10.77 %	8	0	0	6	0	0	14
Hazardous Condition Calls (400-482)	6	4.62 %	6	0	0	0	0	0	6
Service Calls (500-571)	4	3.08 %	4	0	0	0	0	0	4
Good Intent Calls (600-671)	6	4.62 %	6	0	0	0	0	0	6
Severe Weather or Natural Disaster Calls (800-815)	0	0.00 %	0	0	0	0	0	0	0
Special Incident Calls (900-911)	5	3.85 %	5	0	0	0	0	0	5
Unknown Incident Type (UUU)	0	0.00 %	0	0	0	0	0	0	0
FALSE CALLS									
Malicious Calls (710-715, 751)	0	0.00 %	0	0	0	0	0	0	0
Other False Calls (700, 721-746)	8	6.15 %	8	0	0	0	0	0	8
Total False Calls	8	6.15 %	8	0	0	0	0	0	8
TOTAL CALLS	**130**	**100.00 %**	**123**	**0**	**1**	**6**	**0**	**3**	**133**

Total Incidents With Exposure Fires	3	Total Fire Dollar Loss	$ 1,371,735.00
Total Exposure Fires	3	Total Dollar Loss	$ 1,386,935.00

Casualty Summary	Civilian	Fire Service
Fire Related Injuries	0	0
Non-Fire Injuries	1	0
Fire Related Deaths	0	0
Non-Fire Deaths	3	1

Source: ND Fire Marshal's Office, NFIRS 5.0 National Reporting System

Wildfire

Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
		Wildfire					
				0	0	$0	$0

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

Windstorm

Frequency	Highly Likely (Nearly 100% probability in the next year)
Severity	Critical (25-50% of jurisdiction affected)
Risk Class	A
Seasonal Pattern	None
Duration	Hours/Days
Speed of Onset	No warning
Location	Countywide

Description

The National Weather Service defines wind as:

> "The horizontal motion of the air past a given point. Winds begin with differences in air pressures. Pressure that's higher at one place than another sets up a force pushing from the high toward the low pressure. The greater the difference in pressures, the stronger the force. The distance between the area of high pressure and the area of low pressure also determines how fast the moving air is accelerated. Meteorologists refer to the force that starts the wind flowing as the "pressure gradient force." High and low pressure are relative. There's no set number that divides high and low pressure. Wind is used to describe the prevailing direction from which the wind is blowing with the speed given usually in miles per hour or knots." (Source: National Weather Service Glossary website)

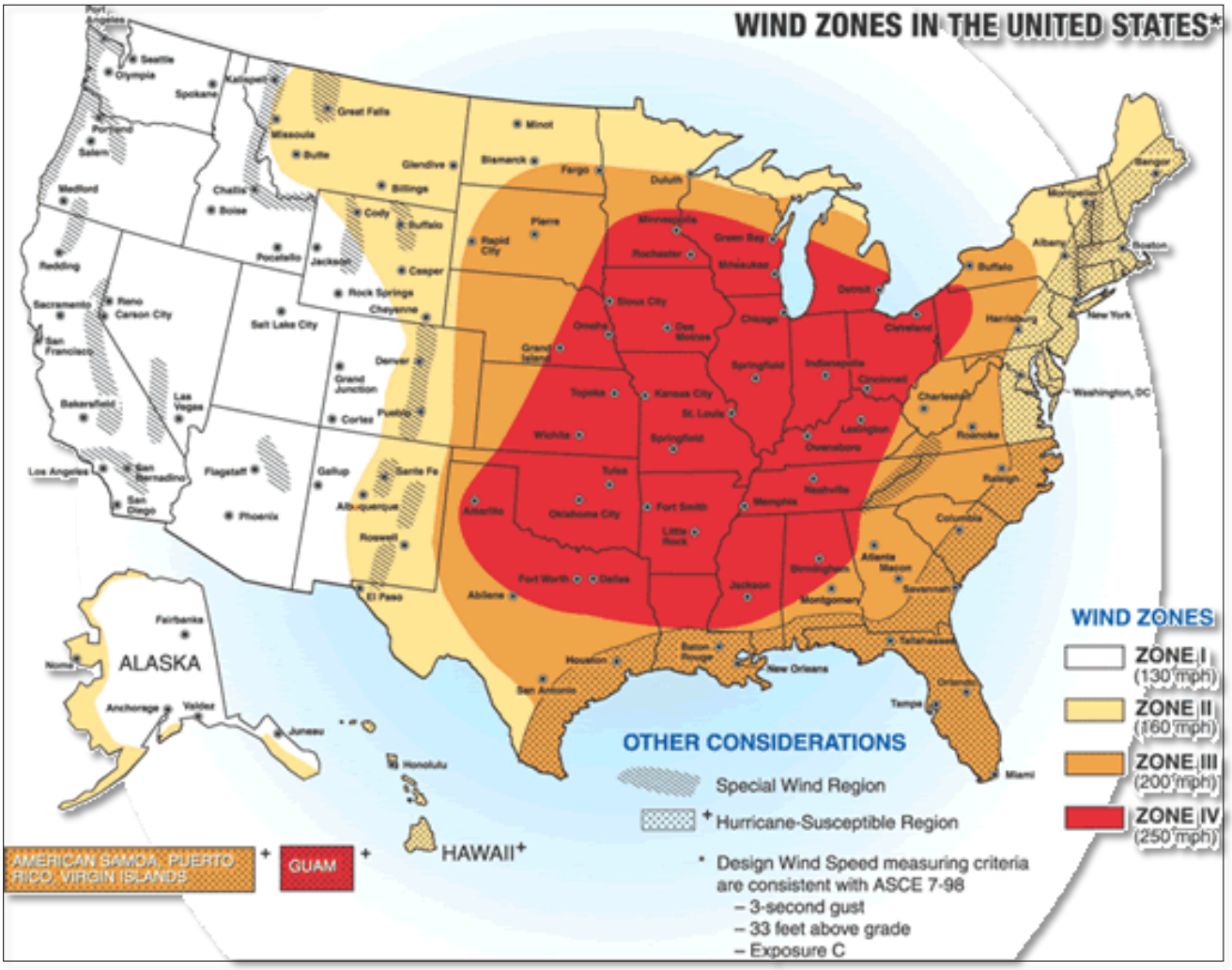
The Federal Emergency Management Agency recognizes Wind Zones in the United States. North Dakota is primarily in Zone II (160 mph) with a southeast portion in Zone III (200 mph). Logan County is within the Zone II designation.

Windstorm Vulnerability

County	Social Vuln. Rating	# of Events (2000-2003)	Property Damages	Annual Property Damages	Total Building Exposure ($000)	Pop. Density	Livestock Exposure	Crop Exposure	Crop Insurance Payments (2003-2012)	Crop Losses (2003-2012)	Annual Crop Losses	Vuln. Score	Overall Vulnerability Ranking
Logan	10	18	$20,000	$1,538	$265,260	2	$44,967,000	$39,574,000	$963,121	$1,082,158	$108,216	21	Low-Moderate

Source: State of North Dakota Multi-Hazard Mitigation Plan, February 2014

United States Wind Zones



Source: Federal Emergency Management Agency, Wind Zones website

Wind Zones	Areas Affected
Zone I (130 mph)	All of Washington, Oregon, California, Idaho, Utah, and Arizona. Western parts of Montana, Wyoming, Colorado and New Mexico. Most of Alaska except the east and south coastlines.
Zone II (160 mph)	Eastern parts of Montana, Wyoming, Colorado, New Mexico. Most of North Dakota. Northern parts of Minnesota, Wisconsin and Michigan. Western parts of South Dakota, Nebraska and Texas. All New England States. Eastern parts of New York, Pennsylvania, Maryland, and Virginia. Washington, DC.
Zone III (200 mph)	Areas of Minnesota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, Texas, Louisiana, Mississippi, Alabama, Georgia, Tennessee, Kentucky, Pennsylvania, New York, Michigan, and Wisconsin. Most or all of Florida, Georgia, South Carolina, North Carolina, Virginia, West Virginia. All of American Somoa, Puerto Rico, and Virgin Islands.
Zone IV (250 mph)	Mid US including all of Iowa, Missouri, Arkansas, Illinois, Indiana, and Ohio and parts of adjoining states of Minnesota, South Dakota, Nebraska, Kansas, Oklahoma, Texas, Louisiana, Mississippi, Alabama, Georgia, Tennessee, Kentucky, Pennsylvania, Michigan, and Wisconsin. Guam.
Special Wind Region	Isolated areas in the following states: Washington, Oregon, California, Idaho, Utah, Arizona, Montana, Wyoming, Colorado, New Mexico. The borders between Vermont and New Hampshire; between NewYork, Massachusetts and Connecticut; between Tennessee and North Carolina.
Hurricane Susceptible Region	Southern US coastline from Gulf Coast of Texas eastward to include entire state of Florida. East Coastline from Maine to Florida, including all of Massachusetts, Connecticut, Rhode Island, Delaware, and Washington DC. All of Hawaii, Guam, American Samoa, Puerto Rico and Virgin Islands.

Identified Impacts

- Blocked Roads
- Building Collapse
- Business Interruptions
- Delayed Emergency Response
- Downed Power Lines
- Downed Trees
- Evacuation (Localized)
- HAZMAT Release
- Increased Fire Potential
- Increased Public Safety Runs
- Livestock Injury/Death
- Loss of Economy
- Loss/Overcrowded Medical Facilities
- Loss of Potable Water
- Loss of Power
- Mass Casualties
- Property Damage
- School Closure
- Wind Chill

History

High Wind

Location	Date	Event Type	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
LOGAN (ZONE)	2/7/2016	High Wind	52 kts. EG	0	0	$0	$0
LOGAN (ZONE)	11/18/2015	High Wind	50 kts. EG	0	0	$0	$0
LOGAN (ZONE)	10/11/2015	High Wind	50 kts. EG	0	0	$0	$0
LOGAN (ZONE)	1/15/2014	High Wind	50 kts. MG	0	0	$0	$0
LOGAN (ZONE)	10/17/2012	High Wind	35 kts. MS	0	0	$0	$0
LOGAN (ZONE)	10/7/2011	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	9/20/2011	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	5/31/2011	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	4/30/2011	High Wind	52 kts. EG	0	0	$0	$0
LOGAN (ZONE)	2/13/2011	High Wind	35 kts. ES	0	0	$20,000	$0
LOGAN (ZONE)	10/26/2010	High Wind	35 kts. MS	0	0	$0	$0
LOGAN (ZONE)	6/18/2010	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	1/31/2009	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	10/26/2008	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	7/12/2008	High Wind	35 kts. ES	0	0	$0	$0
LOGAN (ZONE)	5/1/2008	High Wind	36 kts. ES	0	0	$0	$0
LOGAN (ZONE)	3/9/2005	High Wind	47 kts. ES	0	0	$0	$0
LOGAN (ZONE)	12/11/2004	High Wind	42 kts. ES	0	0	$0	$0
LOGAN (ZONE)	3/10/2004	High Wind	46 kts. ES	0	0	$0	$0
LOGAN (ZONE)	11/29/2002	High Wind	40 kts. E	0	0	$0	$0
LOGAN (ZONE)	11/1/2001	High Wind	38 kts. E	0	0	$0	$0
LOGAN (ZONE)	4/5/2000	High Wind	56 kts. E	0	0	$0	$0
LOGAN (ZONE)	11/1/1999	High Wind	54 kts.	0	0	$0	$0
LOGAN (ZONE)	2/10/1996	High Wind	50 kts.	0	0	$0	$0
				0	0	$20,000	$0

Source: National Oceanic and Atmospheric Administration, National Centers for Environmental Information Website (06/1950 to 11/2016)

ATTACHMENT 1: MITIGATION PROJECTS

Mitigation opportunities will be submitted on an equal basis except where urgent/special circumstances warrant high priority. The emphasis may be the cost benefit review of the proposed mitigation. Implementation and administration of the projects will be through the Logan County Emergency Management unless dictated by the unique specialty or level of expertise needed for the project.

Three goals were identified to provide the general guidance for mitigation activities:

- Protect public health and safety.
- Minimize damage to existing and future property.
- Minimize economic losses and disruption of essential community services.

Projects were prioritized (low, medium, high) during groups meetings, individual input, and group e-mails. Processes included looking at previous history as well as current and projected conditions.

Logan County

Mitigation Projects								
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Funding Source**	**Timeframe**	**Progress**	**Priority**
Logan County	All Hazards	Increase generator size at the County Courthouse to support primary functions during an outage.	Emergency Management, County Commission	$50,000	General fund and/or grant	2016: One Year	2017 estimated completion	Medium
Logan County	Dam Failure, Flood	National Flood Insurance Program: Continue compliance in the program.	Emergency Management, County Commission	Staff Time	Staff TIme	2017: Ongoing	Ongoing	Medium
Logan County	Dam Failure, Flood	National Flood Insurance Program: Promote public participation in the program	Emergency Management	Staff Time	Staff Time	2010: Ongoing	Ongoing	Medium
Logan County and All Cities	All Hazards	Community Outreach and Education: Timely, informational campaigns to inform and educate the public on hazards and emergency preparedness.	Emergency Management, Fire Departments, Public Health, Sheriff's Department	$0-$1,000	General fund and/or grant	2010: Ongoing	Ongoing	Medium
Logan County and All Cities	All Hazards	Multi-Hazard Mitigation Plan: Evaluate and update information in the currently plan on a yearly basis. Ensure the plan receives FEMA approval every five years.	Emergency Management	$0-$40,000	General fund and/or grant	2017: Yearly	Ongoing (Projected FEMA approval in 2017)	High
Logan County and All Cities	All Hazards	Vulnerable Population Registry: Identification of vulnerable populations for utilization in emergency/disaster situations. (Registry is available on the ND Department of Emergency Services' website.)	Emergency Management, Public Health	Staff Time	Staff Time	2017: Yearly	Ongoing	Medium
Logan County and All Cities	Communicable Disease	Awareness of methods for prevention of communicable diseases. Make public aware of risk of communicable diseases and methods for prevention in people; animals and crops for economic impact.	Public Health	Staff Time	Local, In-Kind Donations	2017 and ongoing	Ongoing	High

Mitigation Projects								
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Funding Source**	**Timeframe**	**Progress**	**Priority**
Logan County and All Cities	Drought	Water and Soil Conservation: Encourage the agricultural community to implement water and soil conservation practices	Extension Service	$1,000	General fund and/or grant	2017: Ongoing	Ongoing	Medium
Logan County and All Cities	Drought, Urban Fire, Wildland Fire	Fire Index/Drought Conditions: Inform community of fire danger index, burning regulations, and burn bans (when instituted)	Emergency Management, Fire Departments	$0-$500	General fund and/or grant	2010: Ongoing	Ongoing	Medium
Logan County and All Cities	Hazardous Materials	Hazmat Awareness: Community should understand the hazards and protective measures.	Emergency Management, Fire Department, Sheriff's Department	$500	LEPC	2010: Ongoing	Ongoing	Medium
Logan County and All Cities	Hazardous Material Release, Homeland Security Incident, Urban Fire/Structure Collapse, Wildland Fire	Tier II Reporting: Ensure agencies report required quantities and provide emergency personnel with data and mapping as provided.	Emergency Manager, Fire Departments	$0-$500	Staff Time	2017 and ongoing	Ongoing	High
Logan County and All Cities	Urban Fire, Wildland Fire	Defensible Space: Evaluate and/or create defensible space around structures to include removing debris accumulation. Promote Firewise Safety practices.	Fire Departments	Volunteer	Staff Time	2017: Ongoing	Ongoing	Medium
Logan County and All Cities	Severe Summer Weather	Use of media, workshops, exercises, and literature to inform the public of the hazards of a summer storm to include proper tornado drill procedures. Public awareness campaign.	Emergency Management	Staff Time	General fund and/or grant	2010: Ongoing	Ongoing	Medium
Logan County and All Cities	Severe Winter Weather	Use of media, workshops, exercises, and literature to inform the public of the hazards of a winter storm. Public awareness campaign.	Emergency Management	Staff Time	General fund and/or grant	2010: Ongoing	Ongoing	Medium

Mitigation Projects								
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Funding Source**	**Timeframe**	**Progress**	**Priority**
Logan County and All Cities	Severe Summer Weather, Severe Winter Weather, Windstorms	Living Snow Fences: Continue to promote living snow fences and shelterbelts to prevent snow drifting and protection from severe summer weather and windstorms.	Extension Service	$500	General fund and/or grant	2017: Ongoing	Ongoing	Medium

Fredonia

Mitigation Projects								
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Funding Source**	**Timeframe**	**Progress**	**Priority**
Fredonia	All Hazards	Community Outreach and Education: Timely, informational campaigns to inform and educate the public on hazards and emergency preparedness.	Emergency Management, Fire Departments, Public Health, Sheriff's Department	$0-$1,000	General fund and/or grant	2010: Ongoing	Ongoing	Medium
Fredonia	All Hazards	Multi-Hazard Mitigation Plan: Evaluate and update information in the currently plan on a yearly basis. Ensure the plan receives FEMA approval every five years.	Emergency Management	$0-$40,000	General fund and/or grant	2017: Yearly	Ongoing (Projected FEMA approval in 2017)	High
Fredonia	All Hazards	Vulnerable Population Registry: Identification of vulnerable populations for utilization in emergency/disaster situations. (Registry is available on the ND Department of Emergency Services' website.)	Emergency Management, Public Health	Staff Time	Staff Time	2017: Yearly	Ongoing	Medium
Fredonia	Communicable Disease	Awareness of methods for prevention of communicable diseases. Make public aware of risk of communicable diseases and methods for prevention in people; animals and crops for economic impact.	Public Health	Staff Time	Local, In-Kind Donations	2017 and ongoing	Ongoing	High
Fredonia	Dam Failure, Flood	National Flood Insurance Program: Encourage participation in the program.	Emergency Management, City Commission	Staff Time	Staff Time	2017: Ongoing	Ongoing	Medium
Fredonia	Drought	Water and Soil Conservation: Encourage the agricultural community to implement water and soil conservation practices	Extension Service	$1,000	General fund and/or grant	2017: Ongoing	Ongoing	Medium
Fredonia	Drought, Urban Fire, Wildland Fire	Fire Index/Drought Conditions: Inform community of fire danger index, burning regulations, and burn bans (when instituted)	Emergency Management, Fire Departments	$0-$500	General fund and/or grant	2010: Ongoing	Ongoing	Medium

Mitigation Projects								
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Funding Source**	**Timeframe**	**Progress**	**Priority**
Fredonia	Flood	Install new culverts to prevent spring and seasonal flooding.	Fredonia	$ 4,000	General fund and/or grant	2003: Ongoing	As needed and funding allows	Low
Fredonia	Hazardous Materials	Hazmat Awareness: Community should understand the hazards and protective measures.	Emergency Management, Fire Department, Sheriff's Department	$500	LEPC	2010: Ongoing	Ongoing	Medium
Fredonia	Hazardous Material Release, Homeland Security Incident, Urban Fire/Structure Collapse, Wildland Fire	Tier II Reporting: Ensure agencies report required quantities and provide emergency personnel with data and mapping as provided.	Emergency Manager, Fire Departments	$0-$500	Staff Time	2017 and ongoing	Ongoing	High
Fredonia	Urban Fire, Wildland Fire	Defensible Space: Evaluate and/or create defensible space around structures to include removing debris accumulation. Promote Firewise Safety practices.	Fire Departments	Volunteer	Staff Time	2017: Ongoing	Ongoing	Medium
Fredonia	Severe Summer Weather	Use of media, workshops, exercises, and literature to inform the public of the hazards of a summer storm to include proper tornado drill procedures. Public awareness campaign.	Emergency Management	Staff Time	General fund and/or grant	2010: Ongoing	Ongoing	Medium
Fredonia	Severe Winter Weather	Use of media, workshops, exercises, and literature to inform the public of the hazards of a winter storm. Public awareness campaign.	Emergency Management	Staff Time	General fund and/or grant	2010: Ongoing	Ongoing	Medium

Gackle

Mitigation Projects								
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Funding Source**	**Timeframe**	**Progress**	**Priority**
Gackle	All Hazards	Community Outreach and Education: Timely, informational campaigns to inform and educate the public on hazards and emergency preparedness.	Emergency Management, Fire Departments, Public Health, Sheriff's Department	$0-$1,000	General fund and/or grant	2010: Ongoing	Ongoing	Medium
Gackle	All Hazards	Multi-Hazard Mitigation Plan: Evaluate and update information in the currently plan on a yearly basis. Ensure the plan receives FEMA approval every five years.	Emergency Management	$0-$40,000	General fund and/or grant	2017: Yearly	Ongoing (Projected FEMA approval in 2017)	High
Gackle	All Hazards	Vulnerable Population Registry: Identification of vulnerable populations for utilization in emergency/disaster situations. (Registry is available on the ND Department of Emergency Services' website.)	Emergency Management, Public Health	Staff Time	Staff Time	2017: Yearly	Ongoing	Medium
Gackle	Communicable Disease	Awareness of methods for prevention of communicable diseases. Make public aware of risk of communicable diseases and methods for prevention in people; animals and crops for economic impact.	Public Health	Staff Time	Local, In-Kind Donations	2017 and ongoing	Ongoing	High
Gackle	Dam Failure, Flood	National Flood Insurance Program: Encourage participation in the program.	Emergency Management, City Commission	Staff Time	Staff Time	2017: Ongoing	Ongoing	Medium
Gackle	Drought	Water and Soil Conservation: Encourage the agricultural community to implement water and soil conservation practices	Extension Service	$1,000	General fund and/or grant	2017: Ongoing	Ongoing	Medium
Gackle	Drought, Urban Fire, Wildland Fire	Fire Index/Drought Conditions: Inform community of fire danger index, burning regulations, and burn bans (when instituted)	Emergency Management, Fire Departments	$0-$500	General fund and/or grant	2010: Ongoing	Ongoing	Medium

Mitigation Projects								
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Funding Source**	**Timeframe**	**Progress**	**Priority**
Gackle	Hazardous Materials	Hazmat Awareness: Community should understand the hazards and protective measures.	Emergency Management, Fire Department, Sheriff's Department	$500	LEPC	2010: Ongoing	Ongoing	Medium
Gackle	Hazardous Material Release, Homeland Security Incident, Urban Fire/Structure Collapse, Wildland Fire	Tier II Reporting: Ensure agencies report required quantities and provide emergency personnel with data and mapping as provided.	Emergency Manager, Fire Departments	$0-$500	Staff Time	2017 and ongoing	Ongoing	High
Gackle	Urban Fire, Wildland Fire	Defensible Space: Evaluate and/or create defensible space around structures to include removing debris accumulation. Promote Firewise Safety practices.	Fire Departments	Volunteer	Staff Time	2017: Ongoing	Ongoing	Medium
Gackle	Severe Summer Weather	Use of media, workshops, exercises, and literature to inform the public of the hazards of a summer storm to include proper tornado drill procedures. Public awareness campaign.	Emergency Management	Staff Time	General fund and/or grant	2010: Ongoing	Ongoing	Medium
Gackle	Severe Winter Weather	Use of media, workshops, exercises, and literature to inform the public of the hazards of a winter storm. Public awareness campaign.	Emergency Management	Staff Time	General fund and/or grant	2010: Ongoing	Ongoing	Medium

Lehr

Mitigation Projects								
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Funding Source**	**Timeframe**	**Progress**	**Priority**
Lehr	All Hazards	Community Outreach and Education: Timely, informational campaigns to inform and educate the public on hazards and emergency preparedness.	Emergency Management, Fire Departments, Public Health, Sheriff's Department	$0-$1,000	General fund and/or grant	2010: Ongoing	Ongoing	Medium
Lehr	All Hazards	Multi-Hazard Mitigation Plan: Evaluate and update information in the currently plan on a yearly basis. Ensure the plan receives FEMA approval every five years.	Emergency Management	$0-$40,000	General fund and/or grant	2017: Yearly	Ongoing (Projected FEMA approval in 2017)	High
Lehr	All Hazards	Vulnerable Population Registry: Identification of vulnerable populations for utilization in emergency/disaster situations. (Registry is available on the ND Department of Emergency Services' website.)	Emergency Management, Public Health	Staff Time	Staff Time	2017: Yearly	Ongoing	Medium
Lehr	Communicable Disease	Awareness of methods for prevention of communicable diseases. Make public aware of risk of communicable diseases and methods for prevention in people; animals and crops for economic impact.	Public Health	Staff Time	Local, In-Kind Donations	2017 and ongoing	Ongoing	High
Lehr	Dam Failure, Flood	National Flood Insurance Program: Encourage participation in the program.	Emergency Management, City Commission	Staff Time	Staff Time	2017: Ongoing	Ongoing	Medium
Lehr	Drought	Water and Soil Conservation: Encourage the agricultural community to implement water and soil conservation practices	Extension Service	$1,000	General fund and/or grant	2017: Ongoing	Ongoing	Medium
Lehr	Drought, Urban Fire, Wildland Fire	Fire Index/Drought Conditions: Inform community of fire danger index, burning regulations, and burn bans (when instituted)	Emergency Management, Fire Departments	$0-$500	General fund and/or grant	2010: Ongoing	Ongoing	Medium

Mitigation Projects								
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Funding Source**	**Timeframe**	**Progress**	**Priority**
Lehr	Hazardous Materials	Hazmat Awareness: Community should understand the hazards and protective measures.	Emergency Management, Fire Department, Sheriff's Department	$500	LEPC	2010: Ongoing	Ongoing	Medium
Lehr	Hazardous Material Release, Homeland Security Incident, Urban Fire/Structure Collapse, Wildland Fire	Tier II Reporting: Ensure agencies report required quantities and provide emergency personnel with data and mapping as provided.	Emergency Manager, Fire Departments	$0-$500	Staff Time	2017 and ongoing	Ongoing	High
Lehr	Urban Fire, Wildland Fire	Defensible Space: Evaluate and/or create defensible space around structures to include removing debris accumulation. Promote Firewise Safety practices.	Fire Departments	Volunteer	Staff Time	2017: Ongoing	Ongoing	Medium
Lehr	Severe Summer Weather	Use of media, workshops, exercises, and literature to inform the public of the hazards of a summer storm to include proper tornado drill procedures. Public awareness campaign.	Emergency Management	Staff Time	General fund and/or grant	2010: Ongoing	Ongoing	Medium
Lehr	Severe Winter Weather	Use of media, workshops, exercises, and literature to inform the public of the hazards of a winter storm. Public awareness campaign.	Emergency Management	Staff Time	General fund and/or grant	2010: Ongoing	Ongoing	Medium

Napoleon

Mitigation Projects								
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Funding Source**	**Timeframe**	**Progress**	**Priority**
Napoleon	All Hazards	Fixed generator for Napoleon City Hall	Napoleon	$35,000	General fund and/or grant	2017	Ongoing	High
Napoleon	All Hazards	Fixed generator for Fire/Ambulance	Napoleon	$35,000	General fund and/or grant	2017	Ongoing	Medium
Napoleon	All Hazards	Community Outreach and Education: Timely, informational campaigns to inform and educate the public on hazards and emergency preparedness.	Emergency Management, Fire Departments, Public Health, Sheriff's Department	$0-$1,000	General fund and/or grant	2010: Ongoing	Ongoing	Medium
Napoleon	All Hazards	Multi-Hazard Mitigation Plan: Evaluate and update information in the currently plan on a yearly basis. Ensure the plan receives FEMA approval every five years.	Emergency Management	$0-$40,000	General fund and/or grant	2017: Yearly	Ongoing (Projected FEMA approval in 2017)	High
Napoleon	All Hazards	Vulnerable Population Registry: Identification of vulnerable populations for utilization in emergency/disaster situations. (Registry is available on the ND Department of Emergency Services' website.)	Emergency Management, Public Health	Staff Time	Staff Time	2017: Yearly	Ongoing	Medium
Napoleon	Communicable Disease	Awareness of methods for prevention of communicable diseases. Make public aware of risk of communicable diseases and methods for prevention in people; animals and crops for economic impact.	Public Health	Staff Time	Local, In-Kind Donations	2017 and ongoing	Ongoing	High
Napoleon	Dam Failure, Flood	National Flood Insurance Program: Encourage participation in the program.	Emergency Management, City Commission	Staff Time	Staff Time	2017: Ongoing	Ongoing	Medium
Napoleon	Drought	Water and Soil Conservation: Encourage the agricultural community to implement water and soil conservation practices	Extension Service	$1,000	General fund and/or grant	2017: Ongoing	Ongoing	Medium

Mitigation Projects								
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Funding Source**	**Timeframe**	**Progress**	**Priority**
Napoleon	Drought, Urban Fire, Wildland Fire	Fire Index/Drought Conditions: Inform community of fire danger index, burning regulations, and burn bans (when instituted)	Emergency Management, Fire Departments	$0-$500	General fund and/or grant	2010: Ongoing	Ongoing	Medium
Napoleon	Hazardous Materials	Hazmat Awareness: Community should understand the hazards and protective measures.	Emergency Management, Fire Department, Sheriff's Department	$500	LEPC	2010: Ongoing	Ongoing	Medium
Napoleon	Hazardous Material Release, Homeland Security Incident, Urban Fire/Structure Collapse, Wildland Fire	Tier II Reporting: Ensure agencies report required quantities and provide emergency personnel with data and mapping as provided.	Emergency Manager, Fire Departments	$0-$500	Staff Time	2017 and ongoing	Ongoing	High
Napoleon	Urban Fire, Wildland Fire	Defensible Space: Evaluate and/or create defensible space around structures to include removing debris accumulation. Promote Firewise Safety practices.	Fire Departments	Volunteer	Staff Time	2017: Ongoing	Ongoing	Medium
Napoleon	Severe Summer Weather	Use of media, workshops, exercises, and literature to inform the public of the hazards of a summer storm to include proper tornado drill procedures. Public awareness campaign.	Emergency Management	Staff Time	General fund and/or grant	2010: Ongoing	Ongoing	Medium
Napoleon	Severe Winter Weather	Use of media, workshops, exercises, and literature to inform the public of the hazards of a winter storm. Public awareness campaign.	Emergency Management	Staff Time	General fund and/or grant	2010: Ongoing	Ongoing	Medium

ATTACHMENT 2: MITIGATION PROJECTS COMPLETED

Logan County

Mitigation Projects Completed						
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Timeframe**	**Progress**
Logan County	Flood	Natural Outlet to prevent washout of roads and culverts. North Lake north side of Highway 34, also north of and connecting to Lake McKenna which is the lake next to Napoleon	Logan County	$ 30,000	2003	Completed 1997
Logan County Finn Township Sec 6	Flood	Raise road and rip rap sides of road to reduce risk of high water on roads.	Finn Township	$3,000	2003 and Ongoing	Completed 2015
Logan County Finn Township	Flood	Raise road and rip rap sides of road to reduce risk of high water on roads.	Finn Township	$ 2,500	2003	Completed 2004
Logan County Janke Township	Flood	Raise roads in township to reduce risk of flooded roads.	Janke Township	$75 (per mile)	2003	Completed 2007
Logan County Red Lake Township	Flood	Add fill embankment on both sides of Hoberg Road to reduce high water risk.	Red Lake Township	$ 4,466	2003	Completed 2003
Logan County Red Lake Township	Flood	Add fill east side of Auch Road to reduce risk of washout.	Red Lake Township	$ 1,182	2003	Completed 2003
Logan County Red Lake Township	Flood	Replace culvert on Feist Road (old one has crushed end) to reduce risk of flooding.	Red Lake Township	$ 771	2009	Completed 2009
Logan County Red Lake Township	Flood	Replace Culverts on Fettig Road to prevent flooding of low creek area. Repetitive loss.	Red Lake Township	$6,580	2003	Completed 2005
Logan County Red Lake Township	Flood	Add culverts on Ibach Road to reduce risk of flooded roads. Repetitive loss.	Red Lake Township	$5,000	2003	Completed 2005
Logan County Red Lake Township	Flood	Add fill embankment on both sides of Haegele Road to reduce high water risk. Repetitive loss.	Red Lake Township	$2,742	2003	Completed 2005
Logan County Red Lake Township	Flood	Add cement wings, both on north and south sides of Gene Horner Road, to reduce risk of washout. Repetitive loss.	Red Lake Township	$2,500	2003	Completed 2005
Logan County Sealy Township	Flood	Build up road with gravel project 21/22. Reduce risk of road flooding. Repetitive loss.	Sealy Township	$20,000	2003	Completed 2005

Mitigation Projects Completed						
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Timeframe**	**Progress**
Logan County Sealy Township	Flood	Build up road with gravel project 30/31. Reduce risk of road flooding. Repetitive loss.	Sealy Township	$5,000	2003	Completed 2005
Logan County Sealy Township	Flood	Build up road with gravel project 16/21. Reduce risk of road flooding. Repetitive loss.	Sealy Township	$5,000	2003	Completed 2005
Logan County Sealy Township	Flood	Build up road with gravel project 4/35. Reduce risk of road flooding. Repetitive loss.	Sealy Township	$1,000	2003	Completed 2005
Logan County Sealy Township	Flood	Build up road with gravel project 17/18. Reduce risk of road flooding. Repetitive loss.	Sealy Township	$1,000	2003	Completed 2005
Logan County Sealy Township	Flood	Build up road with gravel project 3/4. Reduce risk of road flooding. Repetitive loss.	Sealy Township	$1,000	2003	Completed 2005
Logan County Bryant Township	Flood, Summer Storm, Winter Storm	Repair sinkholes with 8” of fill for a distance of 1000 ft. Raise roadbed 6” for a distance of 2,640 ft. Access road for emergency personnel to city.	Logan County	$ 45,000	2003	Completed November 2005
Logan County Blueball Township Sec 14-15	Flood, Summer Storm, Winter Storm	Install new culverts and build up road and rip rap to make road accessible. Repetitive loss.	Blueball Township	$10,000	2010: 2 months	Completed 2015
Logan County Blueball Township Sec 34-35	Flood, Summer Storm, Winter Storm	Build up road and rip rap to make road accessible. Repetitive loss.	Blueball Township	$5,000	2010: 2 months	Completed 2015

Mitigation Projects Completed						
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Timeframe**	**Progress**
Logan County Finn Township Sec 3-4	Flood, Summer Storm, Winter Storm	Build up road and rip rap to make road accessible. Repetitive loss.	Finn Township	$10,000	2010: 1 month	Completed 2015
Logan County Gutschmidt Township Sec 13-24	Flood, Summer Storm, Winter Storm	Construct road with culvert to make road accessible. Repetitive loss.	Gutschmidt Township	$10,000	2010: 1 week	Completed 2016
Logan County Haag Township Sec 14, 23 Site 6	Flood, Summer Storm, Winter Storm	Replace culvert 18 x 25 to reduce risk of washout.	Haag Township	$532	2010: 3-4 days	Completed 2014
Logan County Haag Township Sec 14, 23 Site 7	Flood, Summer Storm, Winter Storm	Fill with dirt, add culvert and rip rap to make road accessible. Repetitive loss.	Finn Township	$10,000	2010: 2 months	Completed 2015
Logan County Haag Township Sec 14,23 South side of city limits	Flood, Summer Storm, Winter Storm	Repair and gravel portion of road going beside city limits, gravel 1 ½ miles of road east of town to allow road to be used.	Haag Township	$5,000	2010: 7 days	Completed 2014
Logan County Haag Township Sec 2, 3, 10, 11 Site 2	Flood, Summer Storm, Winter Storm	Install 2 - 36” culverts and 1 – 30” culvert and lower ditches in 2 places to move water along west side of road. Gravel several spots. Allow access for emergency personnel.	Haag Township	$3,506 (plus labor)	2010: 2 days	Completed 2014

Mitigation Projects Completed						
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Timeframe**	**Progress**
Logan County Haag Township Sec 2, 3, 10, 11 Site 3	Flood, Summer Storm, Winter Storm	Install 18 x 30 culvert to allow access for emergency personnel.	Haag Township	$691	2010: 2 days	Completed 2014
Logan County Haag Township Sec 14, 23 Site 7	Flood, Summer Storm, Winter Storm	Add two loads of gravel to road to reduce risk of washout.	Haag Township	$350	2010: 3-4 days	Completed 2014
Logan County Ketterling Township Sec 6-7	Flood, Summer Storm, Winter Storm	Build up road and rip rap to make road accessible. Repetitive loss.	Ketterling Township	$8,000	2010: 3 months	Completed 2016
Logan County Bryant Township	Flood, Winter Storm	Cut away rims and right-of-way roadway dropoff using material to raise lower areas. Reduce risk of visibility and snow problems.	Logan County	$40,000	2003	Completed 2015
Logan County Haag Township Sec 2, 3, 10, 11 Site 4	Flood, Winter Storm	Add gravel ¾ mile road allow access for emergency personnel.	Haag Township	$3,000	2010: 2 days	Completed 2014
Logan County Haag Township Sec 13-14	Flood, Winter Storm	Rip rap both sides of road about 500 ft to allow road to be used.	Haag Township	$5,000	2010: 3-4 days	Completed 2014
Logan County Bryant Township	Winter Storm	Remove knoll on adjacent property. Eliminate snow barrier and moving material to raise roadway below rim of hill, cut down edge of hill and right of way on roadway creating greater visibility to traffic	Logan County	$20,000	2003	Completed 2015

Fredonia

Mitigation Projects Completed						
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Timeframe**	**Progress**
Fredonia	Flood, Summer Storm, Winter Storm	Install culverts at multiple locations in city, repair locations where roads are destroyed, gravel and repair roads. Prevent future street and road damage from water.	Fredonia	$ 10,000	2010: 1 year	Completed 2011
Fredonia	Flood, Winter Storm	Storm drainage management to reduce risk of flooding.	Fredonia	$ 10,000	2010: 6 months	Completed 2011

Gackle

Mitigation Projects Completed						
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Timeframe**	**Progress**
Gackle Moos Township Sec 21-28	Flood, Summer Storm, Winter Storm	Install culvert and fill washout to prevent road washout.	Moos Township	$ 3,000	2009	Completed 2009
Gackle	Communicable Disease, Flood, Summer Storm, Winter Storm	Construct new lagoon cell. Cells 1 and 2 of Lagoon are flooding and not repairable, prevent backup into homes and businesses.	Gackle	$674,372	2010: Ongoing	Completed 2015
Gackle Neudorf Township Sec 10-15	Flood, Summer Storm, Winter Storm	Build up road and rip rap to make road accessible. Repetitive loss.	Neudorf Township	$1,000	2010: 1 month	Completed 2015
Gackle Neudorf Township Sec 5-6	Flood, Summer Storm, Winter Storm	Rip rap and fill dirt to make road accessible. Repetitive loss.	Neudorf Township	$10,000	2010: 7 days	Completed 2015

Lehr

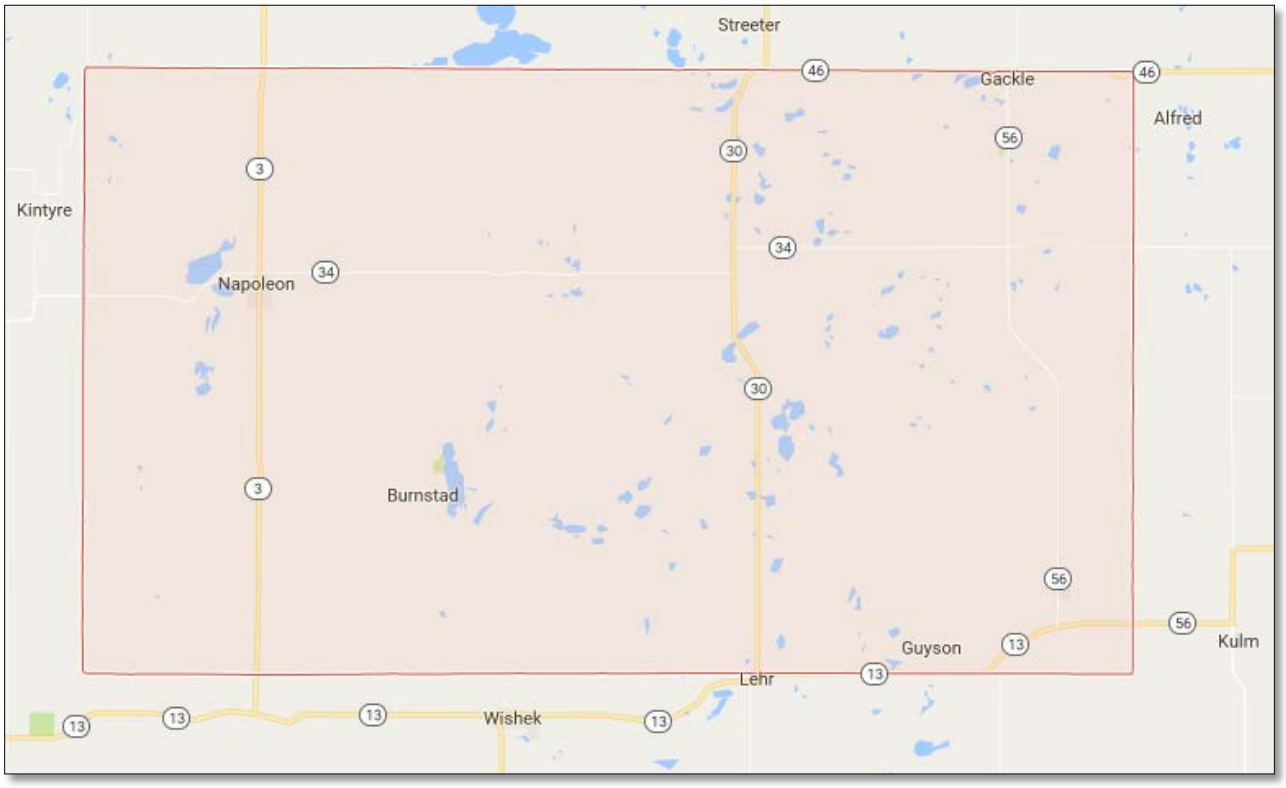
Mitigation Projects Completed						
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Timeframe**	**Progress**
Lehr	Drought, Hazardous Materials, Transportation Accident, Urban Fire	Replace pipes for water supply that provide water for fire departments and residents. Increase water flow for hydrants.	Lehr	$200,000	2010: 2 years	Completed 2015
Lehr	Flood, Summer Storm, Winter Storm	Sirens warning systems. Siren system out of date cannot reach residents.	Lehr	$12,000	2010: 1 year	Completed 2016

Napoleon

Mitigation Projects Completed						
Jurisdiction	**Hazard**	**Description**	**Lead Agency(s)**	**Cost**	**Timeframe**	**Progress**
Napoleon	Flood	Storm drainage management to reduce risk of flooding.	Napoleon	$75,000	2010: 1 year	Completed 2015-2016
Napoleon	Flood	Replace curbs and gutters approximately 30 x 20 ft on 4th street to the east and south corner by Wanglers and on the north and east corner approximately 10 x 10 ft by Flemmer to prevent flooding in homes.	Napoleon	$8,250	2003	Completed 2015
Napoleon	Flood	Replace curbs and gutter from Ave B to C on 4th St E (water sets, doesn't drain).	Napoleon	$7,000	2003	Completed 2015
Napoleon	Flood	Replace curb and gutter on Ave B between 3rd and 4th St E approximately 50 ft (water sets, doesn't drain).	Napoleon	$2,500	2003	Completed 2015
Napoleon Grenz Township Sec 17-18	Flood, Summer Storm, Winter Storm	Install culvert and fill washout to prevent road washout.	Logan County	$ 1,000	2009	Completed 2009
Napoleon German Township Sec 7	Flood, Summer Storm, Winter Storm	Build up road and rip rap to make road accessible. Repetitive loss.	German Township	$3,000	2010: 3 months	Completed 2015
Napoleon German Township Sec 8-9	Flood, Summer Storm, Winter Storm	Build up road and rip rap to make road accessible. Repetitive loss.	Grenz Township	$30,000	2010: 4 months	Completed 2015

ATTACHMENT 3: MAPS

Logan County



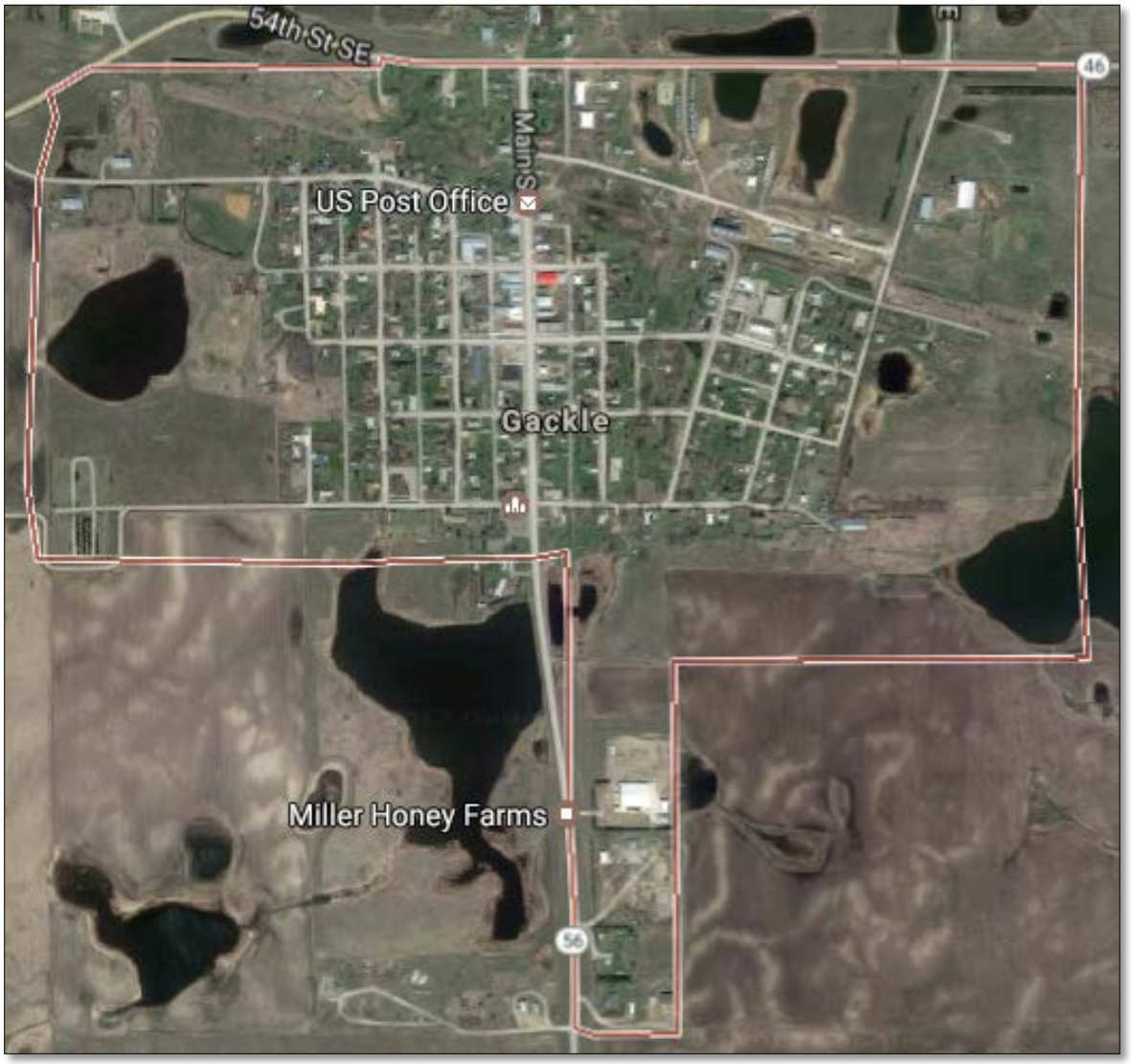
Source: Google Maps website

City of Fredonia

Source: Google Maps website

Source: Google Maps website

City of Gackle

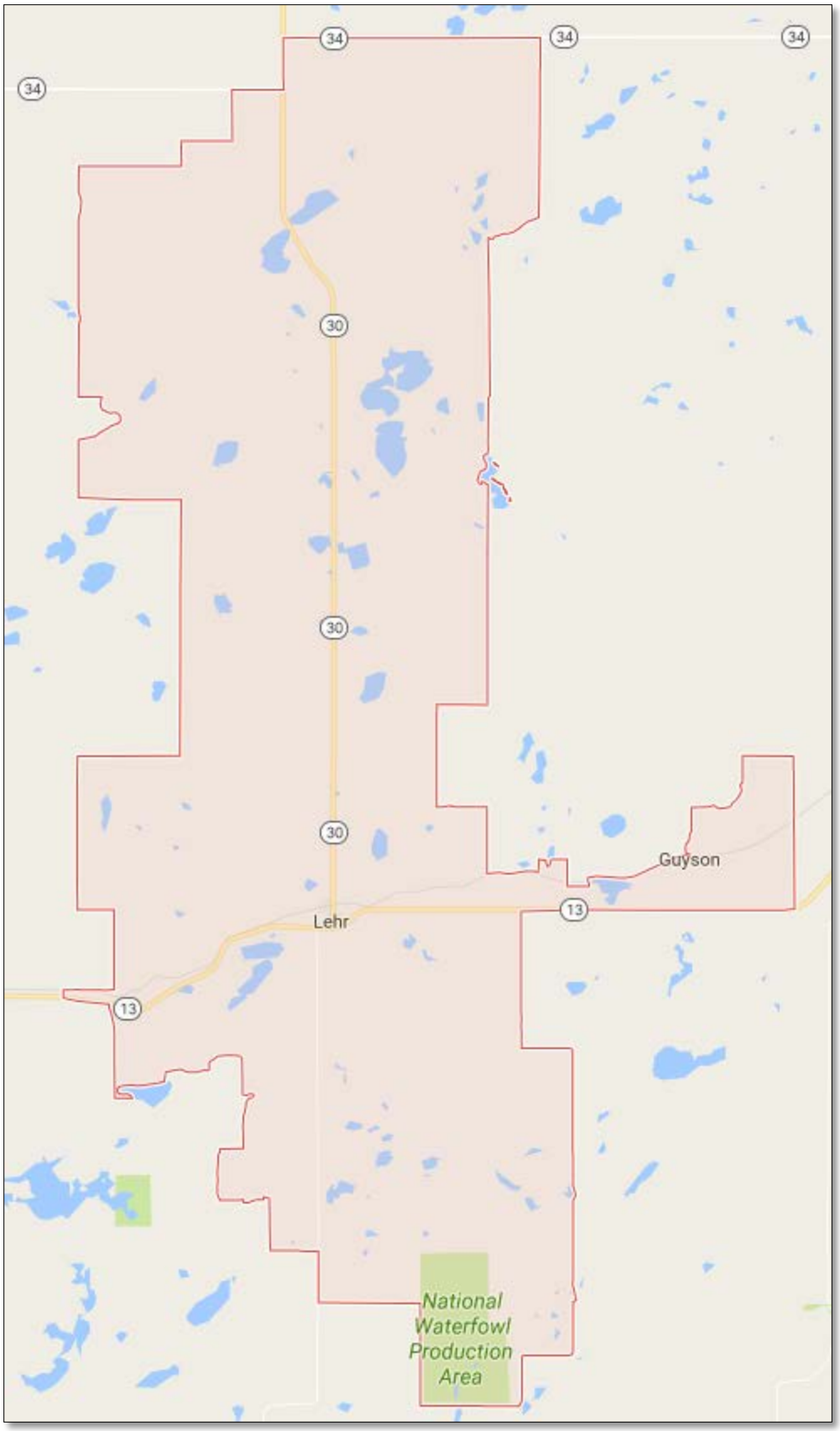


Source: Google Maps website

Source: Google Maps website

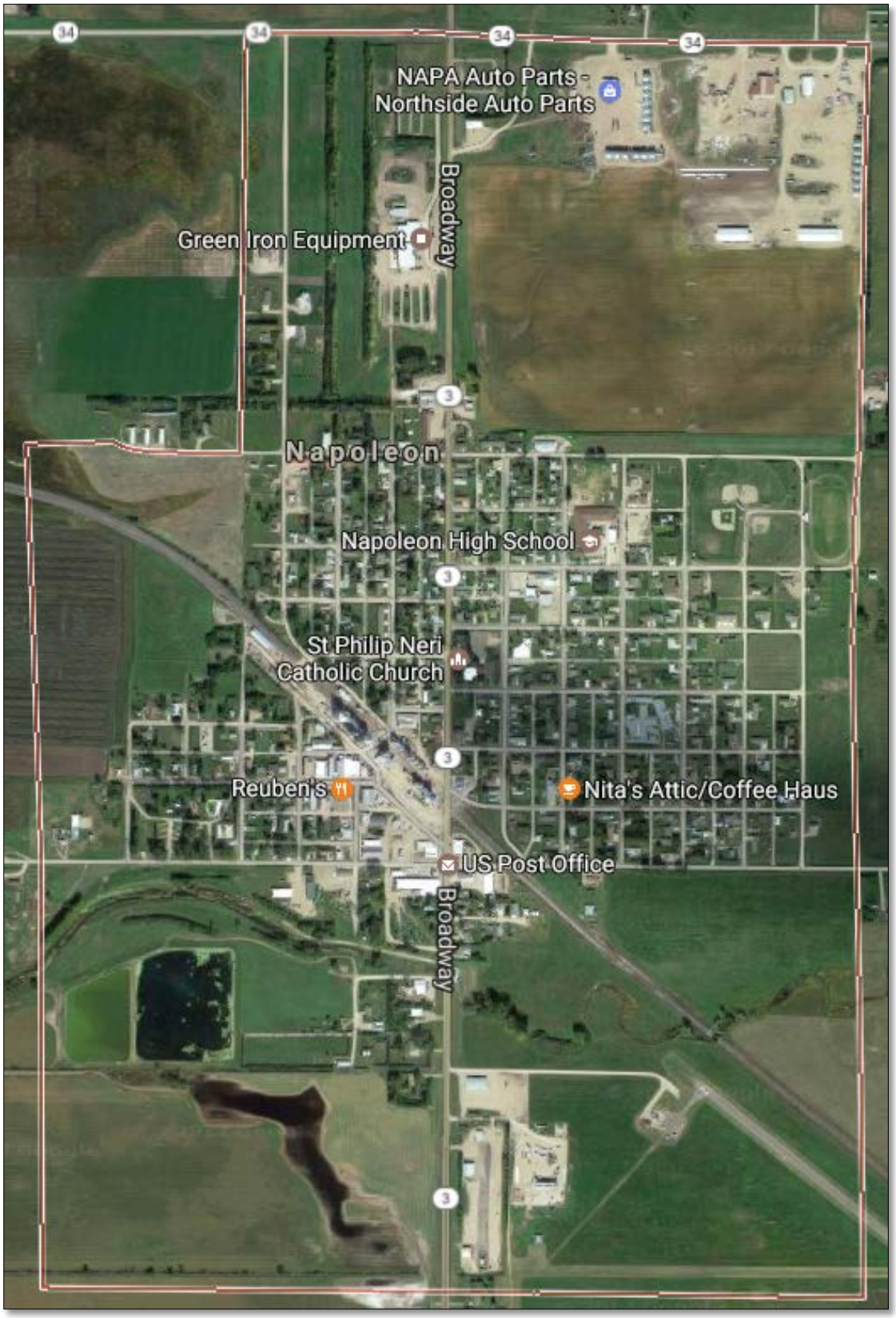
City of Lehr

Source: Google Maps website



Source: Google Maps website

City of Napoleon



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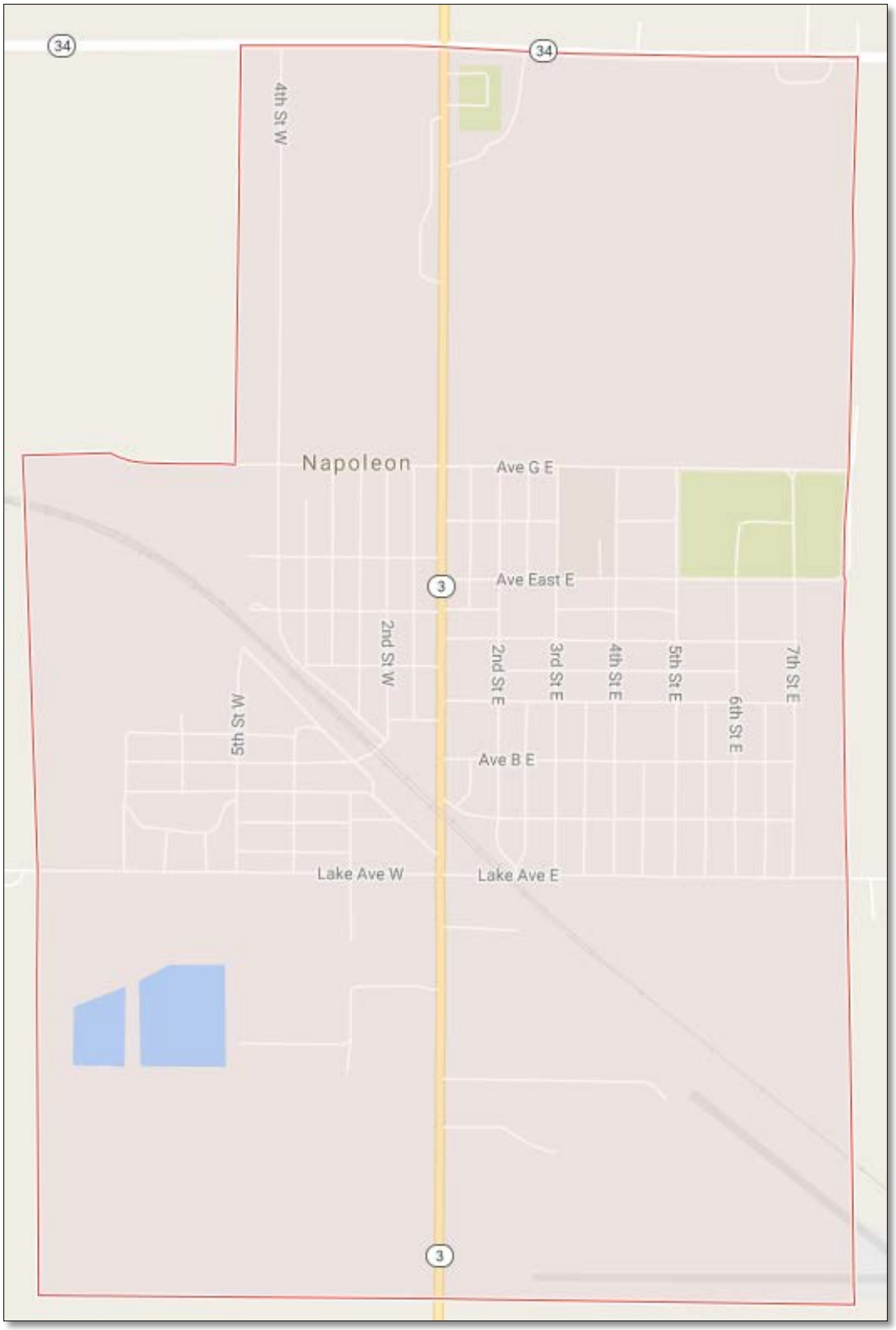

Source: Google Maps website

ATTACHMENT 4: MITIGATION CAPABILITIES

Logan County Fire Departments

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)
   a. Respond to fires in order to protect lives, limit injuries, and minimize damage to property and the environment.
   b. Respond to accidents in order to provide rescue assistance.
   c. Assist Emergency Medical Services in providing emergency assistance to sick and injured (first responders).
   d. Provide standard firefighting manpower and equipment.
   e. Respond to spills and releases of hazardous materials and assist in mitigating the detrimental human and environmental effects of these occurrences.
   f. Respond to emergencies resulting from natural occurrences such as storms, floods, etc., and assist in mitigating the detrimental results of these occurrences.
   g. Provide training for department members that enables them to effectively and efficiently carry out their respective duties and responsibilities.
   h. Develop and provide educational programs that promote the prevention of fires and encourage fire-safe and fire-smart activities.
   i. Assist in enforcement of fire ordinances.
   j. Fire investigation.
   k. Provide assistance to other jurisdictions, as department resources and commitments allow.
   l. Inspections and preplanning within the fire district to reduce hazards and aid in fire prevention.
   m. Assist with the County's Tier Two reporting for hazardous materials.
   n. In disaster situations, provide assistance in warning, rescue, evacuation, and situation updates.

2. Responsibility and authority in regulating, inspecting, or funding of projects:
   a. None

3. Leadership and coordination with other government agencies:
   a. Local Agencies: In efforts to decrease vulnerability to hazards, the Logan County Fire Departments coordinate with various local agencies. These agencies include Logan County Emergency Management, Logan County Sheriff's Department, Napoleon Police Department, Road Departments, and local Emergency Medical Services.
   b. Non-local Agencies: North Dakota State Fire Marshal and the Federal Emergency Management Agency.

4. General recommendations/Emergency Management concerns:
   a. None.

Central Valley Health

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)
   a. Deal with bona fide health hazards using cause and effect in those areas for both mitigation and risk reduction. If it is a hazard affecting any number of persons and within the scope of public health, Central Valley Health will mitigate or exercise risk reduction through several methods ranging from enforcement of statutes to immunization programs.
   b. Environmental Health has the knowledge and also access to the State Health Department for mitigation of incidents with hazardous or toxic wastes.
   c. Programs include: public health nursing, immunization programs, emergency preparedness, and tobacco cessation.

2. Responsibility and authority in the regulating, inspecting or funding of projects.
   a. Central Valley Health is a unit of state government that operates through agreements or Memorandums of Understanding with the North Dakota Department of Health to enforce state public health statutes within the five-county district. Tax levies provide funding. There are no funding programs for non-operational programs.

3. Leadership and coordination with other government agencies:
   a. Local Agencies: Within the scope of public health, Central Valley Health coordinates with the following local agencies: Logan County Emergency Management, local law enforcement agencies (city and county), local school boards, clinics, United States Postal Service, volunteer agencies, and planning and zoning agencies.
   b. Non-local Agencies: Within the scope of public health, Central Valley Health coordinates with the following agencies: North Dakota Department of Health and state and federal law enforcement agencies.

4. General recommendations/Emergency Management concerns:
   a. Public Health is normally underfunded and understaffed at all levels of government. Should Central Valley Health be called upon for expertise at a time of emergency or disaster, it normally does not have instrumentation for site level determinations of any kind without support from other agencies.
   b. Public health agencies should be included in equipment storage; e.g., FEMA equipment "stored" and used at public health agencies, rather than being stored at a warehouse. For example, radio equipment that belongs to FEMA is based at county emergency management offices; the same could be done with air sampling equipment or other instruments/kits etc., which could be used by public health agencies both for daily work and at a time of emergency or disaster.

Logan County Emergency Management

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)
   a. Coordinate emergency planning and response activities with numerous city and county agencies. Planning encompasses preparedness, response, recovery, and mitigation.
   b. Responsible for daily operations of the Emergency Operations Center.
   c. Update and exercise emergency operations and mitigation plans.
   d. Coordinate State-sponsored training for city and county agencies including; law enforcement, public health, social services, fire departments, emergency medical services, etc.
   e. Coordinate the County's Local Emergency Planning Committee.
   f. Coordinate the County's Tier II reporting for hazardous materials.
   g. Coordinate public awareness and educational programs via newspapers, radio, and schools to decrease vulnerability to hazards.
   h. Coordinate timely and effective public information releases during emergency situations.
   i. During a disaster declaration, emergency management will have all county resources at their disposal including manpower, communications, and equipment.
   j. With effective planning, training, and exercising, emergency management can help to mitigate potential hazards within the county.
   k. Assist in damage assessment and coordinate with state and federal agencies for recovery assistance.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:
   a. Assist with applications for federal and state funding such as the Hazard Mitigation Grant Program.

3. Leadership and coordination with other government agencies:
   a. Local Agencies: Logan County Emergency Management coordinates with appropriate local agencies to ensure preparedness, response, recovery, and mitigation. These agencies include: Logan County Commissioners, Central Valley Health, Logan County Road Department, Logan County Sheriff's Department, Napoleon Police Department, and various other fire and emergency medical agencies.
   b. Non-local Agencies: Logan County Emergency Management coordinates with numerous state and federal agencies. These agencies include the North Dakota Department of Emergency Services, North Dakota Highway Patrol, North Dakota Health Department, North Dakota Department of Transportation, and the Federal Emergency Management Agency.

4. General recommendations/Emergency Management concerns:
   a. A listing of eligible mitigation projects maintained for available grant funds.
   b. Logan County is constantly striving to improve planning and exercise activities and response capabilities; however, the threat of potential hazards is broad with an increase in chemical (hazardous materials) use thereby increasing the need for resources, training, and awareness.

Logan County Extension Service

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)
   a. The Logan County Extension Service is linked in a unique partnership with North Dakota State University and the United States Department of Agriculture to provide practical, research-based information and educational programs to address critical issues facing individuals, families, agricultural producers, business operators, and communities.
   b. County Extension Agents serve as subject-matter experts, educational planners, adult and youth teachers and community facilitators in several areas including agriculture and natural resources, horticulture, family and consumer sciences, 4-H and youth community development.
   c. Provide planning, designing, implementing, and evaluating of educational programs for livestock and forage clientele.
   d. Areas of responsibility include beef and dairy cattle, swine, other livestock, water quality, waste management, and forages.
   e. Provide programming for county citizens in the areas of family financial management, environmental concerns, housing, health and wellness, aging, foods and nutrition, parenting, and human development.
   f. Serve as an information resource in dealing with drought, winter storms, summer storms etc. in relation to agriculture, environment, water resources, etc.
   g. Assist with damage assessment related to agriculture.

2. Responsibility and authority in regulating, inspecting, or funding of projects:
   a. Authority is at federal level.

3. Leadership and coordination with other government agencies:
   a. Local Agencies: Logan County Emergency Management and Central Valley Health.
   b. Non-local Agencies: North Dakota State University, North Dakota State Health Department, United States Department of Agriculture, and Farm Service Agency.

4. General recommendations/Emergency Management concerns:
   a. None.

Logan County Road Department

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions)
   a. Design culverts and overflow sections. The County Road Department follows a very detailed list of design standards for all projects within the county.
   b. Continually working with the Department of Transportation on various projects since the DOT dispenses federal funding. While the DOT provides technical advice concerning guidelines and standards, they do not provide equipment, materials, or personnel.

2. Responsibility and authority in the regulating, inspecting or funding of projects:
   a. Responsible for and have authority to regulate and inspect all projects completed within the county.
   b. All projects funded by the state or federal government are designed by a professional engineer and meet the usual acceptable federal standards. Inspection of federal aid projects is the responsibility of the engineering staff and is overseen by the North Dakota Department of Transportation to ensure standards are met. Most county projects are designed with in-house expertise and engineers are consulted only if in-house schedules are overloaded or if problems arise.
   c. All funding in one way or another comes through the county, whether it is a certain percentage of the federal aid project or 100% of the county projects.

3. Leadership and coordination with other government agencies:
   a. Local Agencies: The County Highway Department interacts frequently with the Sheriff's Department and Police Department on road usage and speed zones. There is frequent contact with townships concerning safety, road repairs, road improvements, drainage, and signing. There is considerable interaction with planning and zoning concerning rural subdivision roadway development and zoning code enforcement. The County Road Department coordinates with various county agencies concerning right of way and right of way purchasing. The legal aspect of right of way purchasing is overseen by the States Attorney's Office. The land values are occasionally developed by the Tax Equalization office and approved by the County Commission.
   b. Non-local Agencies: The County Highway Department coordinates with various State and Federal agencies for technical assistance, permitting, environmental concerns, archeological sites, and cultural issues. These agencies include the North Dakota Department of Transportation, US Fish and Wildlife, Corp of Engineers, and the North Dakota Historical Society.

4. General recommendations/Emergency Management concerns:
   a. Logan County Road Department should assist local government with floodplain management and water development permitting.

Logan County Water Resource Board

1. Mitigation and Risk Reduction
    a. Assist with water damage assessment
    a. Provide maps
    b. Floodplain Administrator

2. Non-local agencies – State Water Commission

Logan County Sheriff's Department, Napoleon Police Department

1. Mitigation and Risk Reduction: (including agency's role, capabilities, and programs that support mitigation actions.)
   a. Responsible for law enforcement and criminal investigation in unincorporated areas of the county and in smaller towns that do not have police departments.
   b. Provide 911 emergency response through ND State Radio Dispatch.
   c. Provide standard law enforcement manpower and equipment.
   d. In disaster situations, provide; warning, rescue assistance, evacuation assistance, security, traffic control, and information assistance.
   e. Have mutual aid agreements with all surrounding counties and the North Dakota State Highway Patrol.

2. Responsibility and authority in the regulating, inspecting, or funding of projects:
   a. None

3. Leadership and coordination with other government agencies:
   a. Local Agencies: Within the scope of law enforcement, the Logan County Sheriff's Department and Napoleon Police Department coordinate with various local agencies. These agencies include Logan County Emergency Management and jurisdictional, elected officials.
   b. Non-local Agencies: Logan County Sheriff's Department and Napoleon Police Department coordinate with appropriate state and federal agencies including; North Dakota Highway Patrol, North Dakota Attorney Generals Office, Bureau of Criminal Investigation, North Dakota State Radio, North Dakota Department of Transportation, and Federal Bureau of Investigation.

4. General recommendations/Emergency Management concerns:
   a. None.

Other Agency Resources

BEK Communications: Provide emergency information via television as well as public safety announcement (awareness campaigns) information.

KEM Electric: Provide engineering expertise and damage assessment (utilities).

Logan County Social Services: Temporary assistance to needy families (TANF), food stamps, medical assistance, childcare assistance, child protection and family social work services, home and community-based services for the elderly and disabled.

Montana Dakota Utilities: Provide engineering expertise and damage assessment (utilities).

North Dakota Agriculture Department: Assists with situation and damage assessment; coordination with USDA; hazmat technical assistance; state land use program.

North Dakota Army Corps of Engineers: Water and dam management within the county. Provide technical expertise, sandbags, and heavy equipment.

North Dakota Fire Marshal: Hazmat route utilization; hazmat technical assistance; situation and damage assessment.

North Dakota Forestry Service: Debris removal from recreational facilities; technical assistance; situation and damage assessment.

North Dakota Game and Fish: Technical assistance; debris removal from recreational facilities; facility improvements; situation and damage assessment.

North Dakota Highway Patrol: Situation and damage assessment; provide transportation resources for movement of state personnel, supplies, and equipment to include air and ground reconnaissance; traffic control.

North Dakota Human Services: Insure liaison with private relief agencies for disaster victims.

North Dakota Job Service: Situation assessment and administration of disaster unemployment assistance programs.

North Dakota State Radio Communications: Exercise readiness of warning systems and communication support.