Hall County
All-Hazards Mitigation Plan

Completed by
Nebraska Department of Natural Resources
U.S. Army Corps of Engineers
2008

Revised by
Grand Island-Hall County Emergency Management
November 2013

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Chapter 1 – Introduction

I. Purpose of this Plan

The purpose of this plan is to fulfill local multi-jurisdictional Hazard Mitigation Plan requirements. The plan will identify hazards, establish community goals and objectives, and select mitigation activities that are appropriate for Hall County.

The Disaster Mitigation Act of 2000 (DMA2000), Section 322 (a-d) requires that local governments, as a condition of receiving federal disaster mitigation funds, have a mitigation plan that describes the process of identifying hazards, risks and vulnerabilities, identify and prioritize mitigation actions, encourage the development of local mitigation, and provide technical support for those efforts.

In addition, this plan has fulfilled the requirements of the National Flood Insurance Reform Act of 1994 (NFIRA). With this Act, Congress authorized the establishment of a Federal grant program to provide financial assistance to States and communities for flood mitigation planning and activities. The Federal Emergency Management Agency (FEMA) has designated this the Flood Mitigation Assistance (FMA) program.

Under the FMA program, FEMA provides assistance to states and communities for activities that will reduce the risk of flood damages to structures insurance under the National Flood Insurance Program (NFIP). FMA is a State-administered cost-share program through which states and communities can receive grants for flood mitigation planning, technical assistance, and mitigation projects.

Only projects for mitigation activities specified in an approved Flood Mitigation Plan are eligible for FMA project grants. These activities include elevation, acquisition, and relocation of flood-prone insurable structures.

The purpose of this plan is to produce a program of activities that will best tackle Hall County's hazard and flood problems and meet other, community-specific needs. Consistent with FEMA planning process guidelines, the purpose of this plan is to accomplish the following objectives:

- Ensure that all possible activities are reviewed and implemented so that disaster related hazards are addressed by the most appropriate and efficient solution;
- Link hazard management policies to specific activities;
- Educate residents about potential hazards that threaten the community, including but not limited to floods, extreme weather events, tornadoes and high wind events, earthquakes, and human-made events;
- Build public and political support for projects that prevent new problems from known hazards and reduce future losses;
- Fulfill planning requirements for future hazard mitigation project grants, and;
- Facilitate implementation of hazard mitigation management activities through an action plan.

II. Methodology

The methodology used for the development and updating of the Hall County Hazard Mitigation Plan, consisted of the following tasks:

1. Public Involvement
2. Coordination with other agencies or organizations
3. Hazard area inventory
4. Problem identification
5. Review and analysis of possible mitigation activities
6. Local adoption following a public hearing
7. Periodic review and update

This hazard mitigation plan contains a list of potential projects and a brief rationale or explanation of how each project or group of projects contributes to the overall mitigation strategy outlined in the plan.

This plan summarizes the activities outlined above to assess the effects of the hazards to which Hall County residents deemed they were most vulnerable, and recommends mitigation solutions.

The Mitigation Plan will be evaluated and updated every five years. In addition, the plan will be updated as appropriate when a disaster occurs that significantly affects the County, whether or not it receives a Presidential Declaration. The update will be completed as soon as possible, but no later than 12 months following the date of the disaster event.

Routine maintenance of the plan will include adding projects as new funding sources become available, or removing projects as they are completed.

<u>People involved in the updated planning process</u>:

Jon Rosenlund – Hall County Emergency Management
Chad Nabity – Hall County Regional Planning Commission

<u>Elected officials and/or personnel involved in this multi-jurisdictional planning process</u>:

Hall, County of
- John Amick, Citizen, Regional Planning Commission member
- Mark Haskins, Citizen, Regional Planning Commission member
- Patrick O'Neill, Commissioner, Citizen, Regional Planning Commission member
- Debra Reynolds, Citizen, Regional Planning Commission member

Alda, Village of
- Dave Harders, Alda Village Board
- Ron Miles, Alda Village Board
- Leslie Ruge, Citizen, Regional Planning Commission member

Cairo, Village of
- Terry Gallagher, Cairo Emergency Management Director

Doniphan, Village of

Bill Hayes, Citizen, Regional Planning Commission member
Grand Island, City of
Mitchell Nickerson, Grand Island City Council
Rose Rhoads, City of Grand Island
Dan Petsch, Grand Island Public Schools
Rick Ressel, Grand Island Public Schools
John Collins, Grand Island City Engineer/Public Works Department
Dennis McCarty, Citizen, Regional Planning Commission member
Karen Bredthauer, Citizen, Regional Planning Commission member
Scott Erickson, Citizen, Regional Planning Commission member
Julie Connelly, Citizen, Regional Planning Commission member
Tom Oshlo, Citizen, Stuhr Museum
Wood River, City of
Eric Nielsen, Wood River City Council
Don Snodgrass, Citizen, Regional Planning Commission member
Hall County Emergency Management Agency
Jon Rosenlund, Director
Larry J. Smith, Deputy Director
Mindy Osterman , Coordinator

Other plans/documents used in the development of this mitigation plan:

- The flood portion of this plan was largely completed by the US Army Corps of Engineers, which has a different flood document library.
- *Flood Insurance Study* was used to supplement the information from the Corps of Engineers with additional information about specific flood history. FIS information was obtained for Grand Island and Wood River.
- Community Comprehensive Plans were used to identify future growth areas and objectives.
- Proprietary NDNR spreadsheet of significant historic flood events in Nebraska.

Public Participation

The initial public meeting was held on June 5, 2013. During this meeting, citizens and officials of Hall County identified three main goals of this mitigation planning effort:

1) Reduce or prevent future damage from natural hazard events,
2) Increase public safety, and
3) Increase public education about natural hazard events in their community.

Sign-in sheets and other public participation documentation is provided in this report as **Appendix C**.

III. Organization of Plan

Chapter 1 – presents the purpose and goals of the plan, methodology used, organization of the plan, and a background study of Hall County.

Chapter 2 – by section, known hazards in Hall County are identified. For each hazard, a background, list of historical events, hazard assessment, vulnerability assessment, and possible mitigation actions is also given.

Chapter 3 – outlines the public participation process undertaken during the planning process, for prioritizing projects, and for updating the plan.

Chapter 4 – addresses implementation procedures and a process for updating the plan.

IV. Hall County – Background

Hall County

Hall County was created by an act of the Nebraska Territory Legislature on November 4, 1858. Its boundaries were redefined on February 1, 1864, and again March 1, 1871. It was named in honor of Augustus Hall (1814-1861), chief justice of the Nebraska Territory, and former congressman from Iowa. Today, there are five incorporated communities in Hall County – the cities of Grand Island and Wood River, and the Villages of Alda, Cairo, and Doniphan. The location of Hall County and these communities is shown on the next page as **Figure 1**.

Grand Island

In 1857, a group of settlers from Davenport, Iowa, supported by banking interests set out to find and start a settlement located within an area named by French fur traders as "La Grande Isle", an island in the Platte River. The group of settlers arrived at their destination and began their settlement on July 4, 1857. In the spring of 1866, the Union Pacific surveyors laid out and platted a town called Grand Island on the north side of the Platte River, but decided to keep the name of Grand Island as a place name. Around this time, Grand Island had a population of 500. By July of 1868, the Union Pacific Railroad had extended west to Grand Island. This railroad and the Overland Route contributed to significant growth for Grand Island. At that time, gold had been discovered at Pike's Peak in Colorado. Thousands of people traveled to Western states in seek of great fortune. Everything that Grand Island sold was offered at high prices, bringing financial gain for its merchants. By 1870, the census reported that Grand Island's population had grown to 1,057 people. Grand Island was later incorporated as the County's first city on November 28, 1872.

Wood River

After the Union Pacific rails were laid in 1866, a depot and boarding house called "Wood River Station" was constructed, named for the Wood River valley in which it is located. It was first laid out in 1869, but in an effort to centralize their depots, Union Pacific moved the Wood River Station two miles east where the City of Wood River is located today.

Alda

In 1858, a stage station and post office called "Pawnee" were established just south of what is now Alda. In 1871, because of confusion with the town of "Pawnee City" in southeastern Nebraska, the post office for a different name. "Alda" was chosen since it was the name of the first child born at this location. In 1873, the railroad decided to centralize their stations to accommodate homesteaders hauling their grain to market. The little settlement of Alda was

obliged to re-locate to a site eight miles southwest of Grand Island. It was incorporated as a Village in 1916.

Cairo

In 1886, the Burlington & Missouri River Railroad built a line from Grand Island to Billings, Montana, to penetrate the Sandhills ranching country and the lumber regions of Montana. Water stops were placed eight to ten miles apart and were used as freight centers for the farmer's crops and, as a result, became towns. Also in 1886, the Lincoln Land Company bought a farmstead for the platting and incorporated the community and called it Cairo because it reminded them of a desert in Egypt. In keeping with that theme, many of the town's roads have Egyptian names such as Thebe, Alexandria, Medina, Nubia, Suez, Mecca, and Nile. One year later, Cairo boasted a booming population of 200.

Doniphan

The Union Pacific Railroad crossed Nebraska in the 1860s and opened the area to settlement. In 1879, a line which became part of the St. Joseph & Western Railroad was built. It was inevitable that a town should grow between Grand Island and Hastings. This town was named in honor of Colonel John Doniphan of Saint Joseph, Missouri, who was then attorney for the railroad on which it is located. The town was surveyed in 1879, and the Village of Doniphan was incorporated on January 9, 1884.

Chapter 2 – Risk Assessment Review and Re-assessment

Hall County 2013	Dam Failure	Earth-quake	Drought	Flood	Summer Storm	Land slide	Winter Storm	Tornado/ Wind	Wildfire	Crime/ Terror	Hazmat
Probability	Unlikely	Unlikely	Likely	Likely	Likely	Unlikely	Likely	Likely	Likely	Likely	Likely
Risk	Low	Low	Low	Med	High	Low	High	High	Low	Low	Med
Impact	1	0	2	3	4	0	4	5	Yes	2	3

Criteria	**Definition**
Probability	Based on history, what is the likelihood this type of event will happen again?
	None, Low, Medium, or High
Risk	What is Risk of Damage/Injuries, Etc?
	High, Medium, Low
Impact	The severity level to which the event will impact residents of the County.
	(5=Full, 0=None)

The above table shows the cumulative input from the initial public meeting and subsequent survey and is not necessarily representative of individual communities. Community-specific information is provided in the sections in this plan for each participating community in **Appendix D**. The County adoption and each community's adoption resolution is provided in **Appendix E**.

In the initial public meeting for the development of this hazard mitigation plan, representatives from Hall County's communities were asked to rate their community's risk and vulnerability for a list of hazards. The tabulation of the responses is included with the public meeting documentation in **Appendix C**. In order from highest likelihood to lowest, meeting attendees ranked their community most vulnerable to the hazard types of: severe winter and summer storm, tornado, flood, drought, wildfire, and dam failure. Hazards receiving zero votes were earthquake and landslide.

In the following sections of this plan, only the hazard types which have a significant likelihood of occurring or have a reason to potentially occur are listed. These types are: severe weather (summer and winter), tornado, flood, drought, and dam failure. Earthquake will not be considered in this plan because of the lack of recognized underlying geological features and because of no past instances of a damaging earthquake. Landslide will not be considered because there is little topographic relief in most of Hall County and because the University of Nebraska's Center for Advanced Land Management Information Technologies (CALMIT) does not have any landslide hazard mapped in the County. The wildfire hazard will not be addressed in this plan because the threat and associated risk is not high enough and there are no realistic or feasible mitigation action which can be taken to reduce the level of risk there is in Hall County.

Also, for obvious geographical and geological reasons, the following hazard types were not considered due to there being no likelihood of occurring in Nebraska: volcanic eruptions, avalanches, hurricanes, tidal surges, and tsunamis. Any additional hazards not listed here which do occur will be added to the mitigation plan through future updates.

Hall County Vulnerability Assessment – Review Assessment amounts
With a financial vulnerability perspective, the Nebraska Department of Property Assessment and Taxation keeps records for counties. The entire taxable value of assets in Hall County for 2013 was $4,258,409,140. Broken out by property class, the total assessment valuation and percentage of total is:

Residential real property:	$ 1,907,260,700	(44.8%)
Commercial real property:	$ 865,176,004	(20.3%)
Agricultural Land and homes/outbuildings:	$ 995,023,454	(23.4%)
Commercial/Industrial personal property:	$ 204,994,084	(4.8%)
Public service corporation real and personal:	$ 32,715,553	(0.8%)
Railroad real and personal property:	$ 119,497,056	(2.8%)
Industrial real property:	$ 67,350,949	(1.6%)
Agricultural personal property:	$ 65,863,010	(1.5%)
Recreational real property:	$ 528,330	(.01%)

Realistically, the entire building stock within the whole County will not all be impacted by one disaster event. However, each structure in the County is at the same vulnerability to disaster types like severe weather and tornadoes.

For smaller communities, the NDNR completed fieldwork which determined the number of structures by main structure type (residential, commercial, public, non-profit, and out buildings). For the larger community of Grand Island, the computer vulnerability assessment program HAZUS® was used to assist with the vulnerability assessment since it would not be possible to drive every street in the community.

2.10 SEVERE WEATHER

2.11 Background

Severe weather can be separated into severe winter storms and severe summer storms. Weather hazards for **severe summer storms** include the qualities of a storm which make it officially classified as severe by the National Weather Service: winds exceeding 58 mph, hail in excess of 1.00 inch diameter, or a tornado. For the purposes of this plan, severe summer weather will also include intense rainfall, frequent lightning, and non-storm-related intense heat. Weather hazards for **severe winter storms** are not defined, but usually include many of the following: extreme cold, heavy snowfall (defined as 4 inches in 12 hours or 6 inches in 24 hours), ice, and strong winds which push the wind chill well below zero degrees.

Severe Summer Storms

In the warm season months, thunderstorms and supercell thunderstorms produce lightning, and severe storms can produce hail. Lightning is one of the most consistent causes of death for natural hazards in Nebraska because it can kill people who are outside when a thunderstorm is overhead or nearby. Although hail has the potential to kill people, the primary risk is to property like windows, roofs, siding, trees, and cars. In Nebraska, hail can also cause total losses in agricultural fields across extensive areas. Strong winds down tree limbs and power lines, in addition to having the potential for causing significant property damage and community interruption. Property owners can obtain insurance to cover themselves financially, but there may be ways to prevent tree and power line damage from occurring through property urban tree management.

Periods of extreme heat are common in all parts of Nebraska during the warmest months. The problem is made worse when the high temperature is accompanied by high humidity. The main risk for intense heat is to persons who may become isolated in an unventilated area. Recorded deaths in Nebraska that are associated with extreme heat are largely a result of outdoor exercise or work during this kind of weather condition. The very young and very old are at additional risk because they tend to have weaker respiratory systems.

Severe Winter Storms

For severe winter storms, heavy snow can bring a community to a standstill by inhibiting transportation (like whiteout conditions), knocking down utility lines, and by causing structural collapse in buildings not designed to withstand the weight of the snow. Repair and snow removal costs can be significant. Ice buildup can collapse utility lines and communication towers, as well as make transportation difficult and hazardous. Ice can also become a problem on roadways if the air temperature is high enough so that precipitation falls as freezing rain rather than snow.

Extreme cold can lead to hypothermia and frostbite in people who are exposed to the weather without adequate clothing protection. Cold causes fuel to congeal in storage tanks and supply lines, stopping electric generators. Cold temperatures can also overpower a building's heating system and cause water and sewer pipes to freeze and rupture. Extreme cold increases the likelihood for ice jams on flat rivers or streams. When combined with high winds, extreme cold becomes a very dangerous wind chill, which is hazardous to health and safety.

2.12 Severe Weather History

Through its National Climate Data Center (NCDC), the National Oceanic and Atmospheric Administration (NOAA) compiles a list of recorded storm events. These records go back to 1950; however, reports were given by county only, and community-specific information was not started until 1994.

Hail

According to NCDC, from 2007-2012, there were 61 recorded significant hail events impacting Hall County – this averages out to slightly more than 10 events per year. The largest recorded hail in Hall County was 5 inches in diameter and fell on April 7, 1978. Four-inch diameter hail

fell in July of 1975. The average of the 61 hail events for hail diameters was approximately 1.25 inches. Based on more than 50 years of history, five-inch hail should be the largest hail to expect; however, the current national record size for a hailstone is seven inches, which fell near Aurora in neighboring Hamilton County in 2003.

The National Weather Service uses a guide to equate common items with an approximate hail diameter. Often, hail is reported based on the size comparison to these items and is not directly measured with a measuring device. The relationship is as follows:

Approximate Hail Size

Appearance	Approximate Size (in.)
Pea	0.25-0.50 inch
Penny	0.75
Nickel	0.88
Quarter	1.00
Half dollar	1.25
Walnut/Ping Pong ball	1.50
Golf ball	1.75
Hen egg	2.00
Tennis ball	2.50
Baseball	2.75
Tea cup	3.00
Grapefruit	4.00
Softball	4.50

Aug. 5, 1995: Grand Island – $1.5 million in property damage caused by 2-inch hail
June 15, 1997: Cairo – $100,000 damage caused by ¾-inch hail
Alda – $50,000 damage caused by 1-inch hail
Aug. 21, 1997: Grand Island – $150,000 damage caused by 2-inch hail
May 5, 2002: Doniphan – $1 million damage caused by 2¾-inch hail
Grand Island – $2 million damage caused by 3-inch hail
May 4, 2003: Cairo – $200,000 damage caused by 2¾-inch hail
Grand Island – $250,000 damage caused by 1¾-inch hail
May 10, 2005: Cairo – $100,000 damage caused by baseball sized hail
Grand Island – $100,000 damage caused by 1¾-inch hail
June 16, 2006: Wood River – $200,000 damage caused by 1¾-inch hail
Sept. 15, 2006: Grand Island – $100,000 damage caused by 2¾-inch hail

Location	Date	Time	Type	Mag.	Death	Injuries	Property Damage (K)	Crop Damage (K)
GRAND IS	5/14/2007	1550	Hail	1.00 in.	0	0	10.00	75.00
GRAND IS	5/23/2008	1508	Hail	1.00 in.	0	0	2.00	
CAMERON	5/29/2008	1700	Hail	1.75 in.	0	0	2.00	300.00
WOOD RIVER	5/29/2008	1702	Hail	1.00 in.	0	0	2.00	100.00
GRAND IS	6/3/2008	203	Hail	1.75 in.	0	0	75.00	
GRAND IS	6/4/2008	1714	Hail	1.00 in.	0	0	5.00	50.00
CAMERON	6/4/2008	1716	Hail	1.75 in.	0	0	10.00	250.00

CAMERON	6/4/2008	1726	Hail	1.75 in.	0	0	5.00	250.00
GRAND IS	6/4/2008	1740	Hail	1.75 in.	0	0	50.00	
WOOD RIVER	6/4/2008	1935	Hail	1.00 in.	0	0	2.00	50.00
GRAND IS	6/4/2008	1959	Hail	1.25 in.	0	0	5.00	75.00
GRAND IS	6/7/2008	1952	Hail	1.75 in.	0	0	50.00	
ROSEDALE	6/7/2008	2044	Hail	1.00 in.	0	0	2.00	100.00
DONIPHAN	6/7/2008	2316	Hail	2.75 in.	0	0	50.00	1,000.00
GRAND IS	6/7/2008	2329	Hail	1.75 in.	0	0	75.00	
ABBOTT	6/19/2008	1720	Hail	1.00 in.	0	0	5.00	100.00
GRAND IS	6/19/2008	1742	Hail	1.75 in.	0	0	75.00	100.00
CAMERON	6/21/2008	1647	Hail	0.75 in.	0	0	10.00	100.00
ALDA	6/21/2008	1651	Hail	1.75 in.	0	0	5.00	250.00
DONIPHAN	6/21/2008	1703	Hail	1.00 in.	0	0	10.00	100.00
WOOD RIVER	6/5/2009	2206	Hail	1.75 in.	0	0	150.00	8,000.00
DONIPHAN	6/5/2009	2225	Hail	1.00 in.	0	0	5.00	50.00
CAMERON	6/17/2009	1826	Hail	1.00 in.	0	0		75.00
BURKETT	6/17/2009	1922	Hail	1.75 in.	0	0	40.00	
GRAND IS	6/19/2009	0	Hail	1.00 in.	0	0	50.00	
CAIRO	7/24/2009	1749	Hail	1.25 in.	0	0		100.00
GRAND IS	7/24/2009	1822	Hail	1.00 in.	0	0	10.00	
BURKETT	7/24/2009	1850	Hail	1.75 in.	0	0	100.00	
CAMERON	7/24/2009	2021	Hail	1.75 in.	0	0		150.00
ROSEDALE	9/3/2009	1640	Hail	1.00 in.	0	0		50.00
HALL	6/20/2011	1548	Hail	1.75 in.	0	0	25.00	250.00
GRAND IS	5/23/2012	2345	Hail	1.00 in.	0	0	25.00	500.00
TOTAL							857.00	12,125.00

Source: http://www.ncdc.noaa.gov/stormevents/

From 2006 to 2012, hail has caused $12,982,000.00 damage to property in Hall County. Over this eleven year period, that averages approximately $705,000 in property damage every year. In this same period, there have not been any years which have not witnessed a significant hail event somewhere in the County. Therefore, it would be safe to assume that damaging hail storms occur somewhere in Hall County at least one time per year.

Severe Summer Storms:

From 2007-2012, severe storms caused $1,552,000 in property damage – this averages $258,000 in damage per year. There have been two injuries caused by severe storms since 1950 – both were from impacts caused by high winds: one was on July 9, 1986, and the other on August 2, 1992. Since both events occurred before community-specific reporting started in 1994, it is not possible to tell where or how the injuries occurred. Although unofficial wind gusts have been estimated over 90 mph, the highest measured wind speed was 85 mph (74 knots) recorded on June 25, 1990, at an unknown location in Hall County. In neighboring counties, wind speeds have been recorded as high as 90 mph near Central City in 2004 and in June of 2003, gusts of 90 mph were recorded near Axtell and 107 mph in Dawson County. This means that winds up to 70 mph should be expected from severe thunderstorms, gusts up to 80 mph are certainly not unusual, and gusts over 100 mph are possible in the County.

It is safe to say that at least one severe summer storm will occur every year, and a detailed history of these events would be too extensive to chronicle. According to the NCDC statistics since 2000, Hall County experienced this many severe thunderstorms (in parenthesis) in each year:

2008 (6) 2009 (3) 2010 (5) 2011 (9) 2012 (1)

Noteworthy severe summer storms and weather events are:

August 17, 1999: The area received 2-3 inches of rain in an hour and intense straight-line winds damaged five homes west of Doniphan. Property damage was set at $125,000.

May 26, 2002: 80 mph winds developed and roared through Cairo. Windows were blown out of cars, and roofs were blown off a few businesses. Property damage was set at $150,000.

May 13, 2003: Property damage was set at $100,000 in Grand Island after a strong thunderstorm rolled through and destroyed a sign, and caused damage to trees and sheds.

June 23, 2003: With a top wind gust measured at 78 mph, a total of $725,000 in damage across five counties was sustained from strong thunderstorms.

July 6/7, 2003: A storm of similar strength followed the same path as the June storms. Extremely high winds over 70 mph were reported north of Grand Island, and across several counties, the total damage estimate was $1.3 million.

May 10, 2005: 70 mph winds destroyed a construction trailer at the Grand Island Airport and caused minor damage southeast of town. Total damage was estimated at $100,000.

April 6, 2006: Wind gusts over 60 mph winds blew over a semi trailer on Interstate 80 south of Grand Island and caused property damage of $75,000 north and east of Doniphan.

June 16, 2006: 65 mph winds took down large tree limbs and power poles, causing approximately $10,000 in property damage.

September 15, 2006: 60 mph winds blew down trees and caused property damage of about $10,000 in Wood River.

May-June 2008: Flooding throughout Grand Island, Presidential Declaration (FEMA-1770?); Damage to lift stations, Eagle Scout Lake, Jack Rabbit Run Golf Course.

May 30, 2011**,** Wind gusts estimated near 80 MPH destroyed a show home when it rolled, siding and window damage to a number of homes and recreational vehicles, and vehicle and roof damage at a local manufacturing plant. Tree damage and downed power lines was reported across town. Near the intersection of Highways 30 and 281, a personal storage facility was destroyed and a power pole was snapped and fell on a business. West of town, pivots were overturned and a number of train cars were derailed.

July 10, 2011: Wood River: Tree damage was reported across Wood River, and $5 Million in crop damage north of town.

May 27, 2012: Wood River: Numerous irrigation pivots were overturned along an approximately 6 mile long path from Wood River south to near Interstate 80. In Wood River, large trees were damaged or destroyed and power poles were knocked down. Heavy rain from these thunderstorms resulted in the intersection of 140th and Holling Roads, just south of town, being covered in water.

Lightning:

Since 1950, there were no reported lightning strike damages for Hall County.

Severe Winter Storm

With its location on the prairie, Hall County has been visited frequently by severe winter storms throughout its history. One of the most spectacular and harrowing events in the history of the Great Plains was the Blizzard of January 12, 1888. Other storms had produced colder temperatures and greater amounts of snow, but it was the combination of gale winds, blinding snow, and rapidly falling temperatures that made the 1888 blizzard so dangerous. No accurate count of the total deaths from the storm is possible, but estimates for Nebraska have ranged from 40 to 100.

The worst natural disaster on record was an ice storm which occurred in late December, 2006. Called the "New Year's Ice Storm," this disaster caused an estimated $240 million in damage, largely to the State's public power electricity infrastructure system. At the height of the storm, the Nebraska Public Power District (NPPD) and its public power utility wholesale customers lost service to more than 40,000 customers, primarily in Central Nebraska, including some in Hall County. Service was restored to all customers by January 19th. NPPD sustained damage to 18 substations and a total of 37 transmission line segments totaling 1,053 miles. A total of 1,137 of NPPD's transmission line structures were damaged as well as 301 miles of transmission line conductor (wire). Between 200 and 300 contract workers assisted in the reconstruction effort. Total expenses for restoration and reconstruction were $123.7 million, with approximately $74 million of this amount expected to be reimbursed by post-disaster Public Assistance the Federal Emergency Management Agency. The remaining amount will be financed through long-term debt and paid over 20 to 25 years.

The impacts of this ice storm were not only felt with power outages. Due to the loss of transmission capability from the Gerald Gentleman Station, which is situated west of the impacted area. NPPD and Lincoln Electric System were forced to purchase replacement power on the open energy market. NPPD paid $34 million. NPPD is using $22 million of existing District funds in a Rate Stabilization Account to partially off-set the $34 million in increased energy costs. The remaining balance of $12 million is being recovered over a 12-month period through a Production Cost Adjustment charge. Lincoln Electric System paid $9.77 million for replacement power and was able to recoup this added expense by October 19th by placing a 5.5% surcharge on all electric bills.

The Christmas 2009 Blizzard featured northeast winds of 40-60 mph and 4-8 inches of snow. The combination of snow and wind resulted in white-out conditions as roads throughout the county became impassible. Major roads closed included Interstate 80 from Grand Island east to the Missouri River.

Like severe summer storms, it is a virtual certainty that Hall County will experience a severe winter storm every year. Since 2000, the County has experienced the following number (in parenthesis) of severe winter storms each year:
2000 (5); 2001 (5); 2002 (2); 2003 (1); 2004 (4); 2005 (3); 2006 (4); 2007 (2) 2008 (1) 2009 (4) 2010 (1) 2011 (6) 2012 (1)[1]

[1] NWS Hastings

Temperature extremes:
Although extreme heat and extreme cold are not common, they are also not rare. What makes these events truly dangerous is when extreme heat is combined with high humidity and when extreme cold combines with high winds to produce dangerous windchills.

Instances of Heat: 2009 (1), 2011 (1) [2]
Instances of Cold: 1996 (1), 1997 (12), 1998 (1)

Extreme cold temperatures can get down to –10 or –20 degrees. When combined with high winds, recorded extreme wind chills are most commonly –30 to –60 degrees.

Extremely cold temperatures and a stiff northwest breeze combined to drop the wind chill factor to –60 degrees on January 9, 1997. A week later, bitterly cold wind chills returned aboard strong north winds. Temperatures dropped sharply to single-digits – in turn, the wind chill dropped to between –35 to -50 degrees.

- On December 20, 1998, a deepening arctic air mass settled in and dropped the air temperature down to –17 degrees as wind chill readings ranged from –20 to –45 degrees.
- On January 3, 1999, a Cairo man died from hypothermia after being exposed to the sub-zero temperatures on a walk home after a wedding celebration. The growing season officially ended a bit early in 2000 when, on October 8 and 9, consecutive morning low temperature records were broken. In Grand Island, the thermometer dropped to 17 degrees.

Previous County Severe Weather Mitigation Actions
Hall County was a Project Impact community in 2000. As a function of this designation, the City distributed 4,500 NOAA weather radios for $15 each, and these were available to any resident in the County. Grand Island has also been a Tree City USA since 1987 and Doniphan since 1995. Meeting the requirements to be declared a Tree City USA community means there is a reduced damage potential resulting from falling trees and limbs from tornadoes, high wind, and ice events.

Severe weather preparedness, response, and mitigation are primarily responsibilities of the Hall County Emergency Management Agency (HCEMA). HCEMA participates in Severe Weather Awareness Week each year by placing articles in the local paper and running information over the City's local government television channel. HCEMA also participates during the test warning day by using all of our normal procedures like in an actual event. HCEMA also participates in National Preparedness Month, Severe Weather Awareness Week, Winter Awareness Week and by hosting training meetings, providing public presentations, media interviews and placing articles in the local newspaper. Each spring, HCEMA also completes grade school tours, talking to 500-600 kids about severe weather and what to do for severe weather.

Grand Island and Cairo are StormReady® communities through the National Weather Service (NWS). To be a StormReady community, communities prepare an action plan which helps them respond to all types of severe weather. There are six main guidelines: Communication, NWS

[2] http://www.ncdc.noaa.gov/stormevents/

Information Reception, Hydrometeorological Monitoring, Local Warning Dissemination, Community Preparedness, and Administrative. The guidelines for successful participation are based on population, which are separated into four population ranges. Grand Island is in the top population range (more than 40,000) while Cairo is in the lowest population range (less than 2,500). The higher the population range, the more activities the communities need to do in order to receive a StormReady certification. For more information about the StormReady program, visit: http://www.stormready.noaa.gov/.

Hall County manages 40 outdoor warning devices in each of the cities and villages. Over time, many of these sirens have suffered mechanical failures and needed replacement. Two separate Hazard Mitigation Grant Program (HMGP) awards have been received to replace six (6) older sirens as well as expand into two (2) new areas of outdoor recreation near the Mormon Island Recreation Area and the Grand Island Eagle Scout Lake.

2.13 Probability of Severe Weather Events

It is certain that Hall County will continue to be impacted by severe summer storms and severe winter storms, along with the various dangerous and damaging components which accompany both.

2.14 Vulnerability Assessment of the Severe Weather Hazard

Every structure in the entire County is at equal risk to hail damage or being impacted by other severe weather events. According to the Nebraska Department of Property Assessment and Taxation, this represents approximately $4,258,409,140 See the community-specific section for a more structural inventory and financial damage potential for each city.

2.15 Potential Severe Weather Mitigation Measures

Like tornadoes, there is little one can do to mitigate severe weather events – just be prepared.

GOALS: 1) Reduce or prevent future damage from natural hazard events,
2) Increase public safety

Objective 1.1 Ensure continued operation of critical facilities, utilities, and the local transportation system.

- Action 1.1.1: Obtain emergency generators to be used as backup power in case of complete power outage – as seen from ice storm of December, 2006.
- Action 1.1.2: Work with owners of critical facilities to ensure they are adequately protected against extreme winter conditions and have an uninterruptible power supply.
- Action 1.1.3: Work with schools and other critical facilities to ensure that they receive severe weather warnings – perhaps have them purchase weather radios.
- Action 1.1.4: Develop a snow route plan for the community that takes major streets and critical facilities into account. Post "Emergency Snow Route" signs along this route and educate the public to keep their vehicles off of these routes during heavy snow events, or risk being towed. Publish this route in the local telephone books or other

locations which could be referenced by residents. This option would be most useful for larger populations concentrations like Grand Island.

- Action 1.1.5: Require all new development, where appropriate, to bury all electric lines.
- Action 1.1.6: Work with local property owners in developed areas to bury power lines in areas which experience power outages due to downed lines.

Objective 1.2: Reduce tree-related damage to property and utilities

- Action 1.2.1: Develop an urban tree management plan. As a free service, the Nebraska Forest Service offers advice on proper "urban forest" planning, tree selection, planting, and tree care. This service should be utilized in areas of the city which experience more tree-related problems. The Nebraska Forest Service performs a free "Tree inventory" and offers technical advice for communities. Communities can then use this information to develop or change their local tree programs.
- Action 1.2.2: Bury overhead power lines and service lines in areas where tree problems exist.
- Action 1.2.3: Communities can provide information about proper tree selection (especially in power line rights-of-way) and maintenance to residents.
- Action 1.2.4: Communities should consider becoming a "Tree City USA". This program is offered through the National Arbor Day Foundation, and through it communities receive direction, technical assistance, public attention, and national recognition for their urban and community forestry programs through the Nebraska Forest Service and USDA Forest Service.
- Action 1.2.5: Educate homeowners about how to maintain trees on their property since it is their liability if a tree on their property damages someone else's personal property.
- Action 1.2.6: Have available information to educate homeowners about types of desired trees for planting on private property. Information should include: insect susceptibility, potential disease problems, blossom or seed characteristics, cold weather hardiness, and other items.

Goal 3: Increase Public Education

Objective 1.3: Increase severe weather awareness

- Action 1.3.1: Continue to promote severe weather awareness, education, and safety tips through local media outlets. Such a campaign should include practical tips like staying indoors when lightning is around and recommended behavior during extreme temperatures. This could be combined with awareness campaigns from other disasters.
- Action 1.3.2: Communities could develop a more detailed Severe Weather Preparedness Week and Winter Awareness Week outreach programs to educate children and/or the public about the nature of different disaster types, where to watch for storm warnings, what to do, where to go during a severe weather warning, and others.
- Action 1.3.3 Utilize Social Media including but not limited to Facebook and Twitter to distribute outreach programs and information regarding severe weather and severe weather mitigation and preparedness.

2.20 FLOOD

2.21 Background

The majority of Hall County is situated in the Platte River valley, which means that there is very little vertical relief (See **Figure 2**), even from watershed to watershed. The drainage system of Hall County is dominated by the Platte River, which flows from southwest to northeast (See **Figure 3**). Only in the extreme northwest corner of the county is there the relief required for upland streams. The communities of Hall County developed where they did due to the proximity to water sources and railroad As the reliance on proximity to surface water has declined over time, this has left many Hall County communities with significant water issues – not only flooding, but also related to a high water table.

Other than the Platte River, significant water courses in Hall County are: Wood River, Prairie Creek, Moores Creek, Silver Creek, and Dry Creek. Platte River is the controlling drainage for most of the County, which means that all of the water courses listed above either parallel or drain into the Platte. A small portion of Hall County south and east of Doniphan is at the upper reaches of the Big Blue River watershed.

Hall County's largest population center, Grand Island, has an extensive floodplain that is associated with the Prairie/Moores/Silver Creeks. They are often mentioned together as one flood source because they all drain areas parallel to each other and because a large enough rain will allow water to cascade from one of the creeks into the others.

Due to the shallow depth of the Platte River channel, ice jams are possible during winter and early spring months. However, the primary flood risk is to flash floods from intense warm-month rainfall events and from slower moving riverine floods on the Platte River, which result from rapid snowmelt, excessive and sustained rainfall upstream, or both.

<u>Repetitive Loss Properties in Hall County</u>

A repetitive loss property is defined as any structure which has had two or more flood insurance claims filed for it in any ten-year period since 1978. The Federal Emergency Management Agency (FEMA) has started targeting mitigation efforts for these repetitive loss properties because of the significant drain they represent to the flood insurance pool of the National Flood Insurance Program. Mitigation of these properties in Nebraska has been slow because of the regulation which requires the jurisdictions the properties are in to have an adopted and approved all-hazards mitigation plan as a condition of eligibility for federal mitigation assistance. Once all-hazards mitigation plans like this one are approved, Nebraska will be in a better situation to mitigate some of these repetitive loss properties.

According to the 2013 Repetitive Loss list provided by FEMA, the following communities have this many repetitive loss properties: update with FEMA

Hall County: 1 (Doniphan address)
Alda: 0
Cairo: 0
Doniphan: 0
Grand Island: 2
Wood River: 0
HALL COUNTY TOTAL: 3

2.22 Flood History

Historic Flood Events

Since floods impact communities and not areas, a more detailed and extensive list of flood records have been placed in the community-specific section in **Appendix D**.

Official flood reports for watercourses other than the Platte River are difficult to find because there is a lack of good and consistent river gauge data for Hall County. The primary gauge in the County which is currently operating full-time is the Platte River gauge at Grand Island, which is located approximately 2.5 miles southeast of the City on the Highway 34 bridge on the Hall County/Hamilton County line. A second gauge is located at the Wood River Diversion project on US Highway 281 south of Grand Island.

Other gauges on different water courses were operated as follows:

Gage	Dates of Operation	Agency
Wood River near Alda	1953 to 1994	USGS
Wood River near Alda	1994 to 2002	NDNR
Platte River S. Channel near Gr. Island	1983 to 1989	USGS
Dry Creek at Cairo	1949 to 1953	USGS
Silver Creek at Ovina	1991 to 1995	USGS
Silver Creek near Ovina	1991 to 1999	USGS

Most communities in Hall County were incorporated in the late 1800s, and the first flood reports on the Platte River date to that era. Little is known about the "Great Flood of 1883" because there was so little population in Hall County at the time. However, the sketchy reports that do exist point to flood damage in Kearney and Ashland; therefore, the Platte was also flooding in Hall County. Hydrological journals of the day only reference this flood by saying there was a major inflow into the Missouri River somewhere between the established towns of Sioux City, Iowa, and Kansas City, Missouri.

The most extensive flood event to impact Hall County occurred from a long period of excessive rainfall in May and June of 1967. The total damage from the Platte River flood of 1967 was $49,309,015 – of which $40.8 million was private damage ($23 million in agricultural damage, $12 million in transportation damage, and $5 million was classified as "urban" damage) and $8.5 million was public damage. The Wood River was on the rampage in Grand Island, where three people were killed, 1800 buildings were flooded, and 11,000 of the City's 28,600 residents were directly impacted. Total damage in Grand Island was set at $6.25 million ($43.8 million in 2013 dollars).

On May 11 and 12, 2005, portions of Hall County received more than seven inches of rain in a 24-hour period, causing between $12 and 15 million in damage in the County, and damaged

2769 homes and businesses. Hall County was later declared a federal disaster area (FEMA-1590-NE-DR) by President Bush on June 23.

In May and June of 2008, the Prairie and Silver Creeks flooded north and northwest of Grand Island, including the northwest corner of the City itself following several inches of rain. Heavy winds and rains caused damage to trees and run off in the City that resulted damage to public infrastructure, the failure of sanitary sewer lift stations in Grand Island and water damage was reported in over 100 homes. Hall County was later declared a federal disaster area (FEMA-1770-NE-DR).

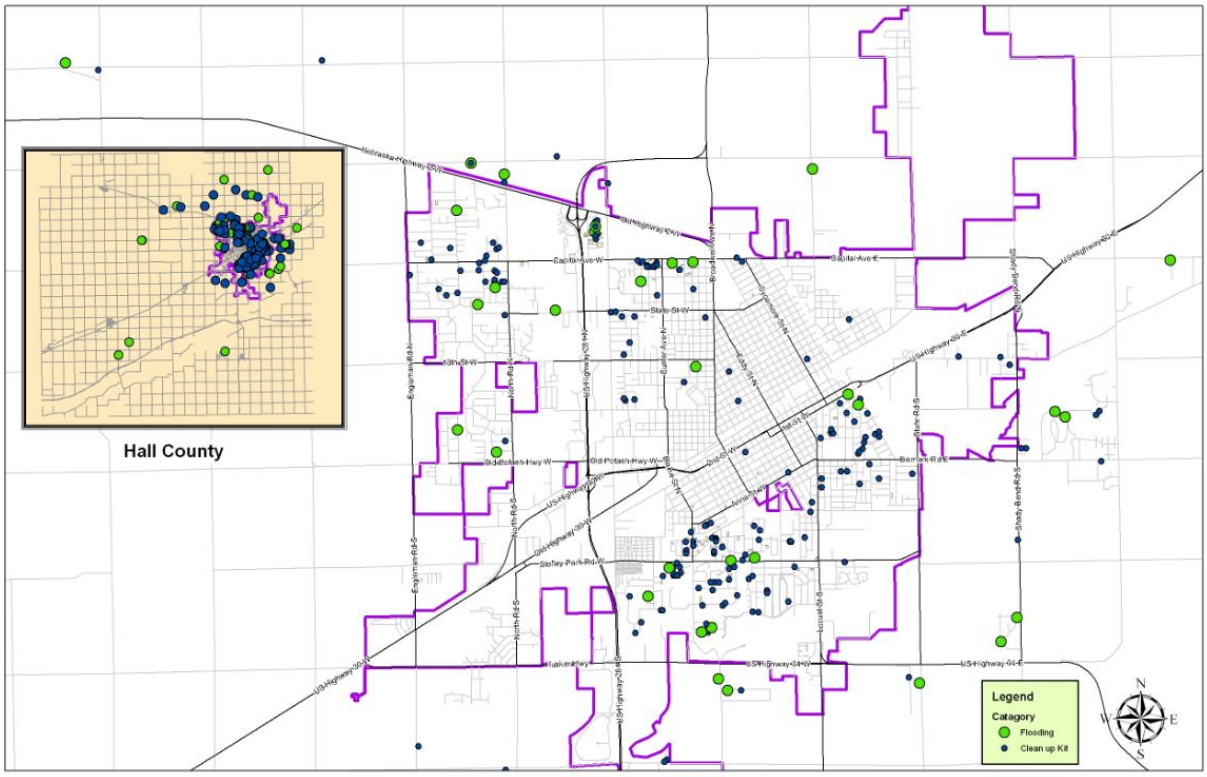


Figure 1: Flooding and Water Reports, FEMA 1770-NE-DR

Previous Hall County Flood Mitigation Actions

Hall County is situated in the Central Platte Natural Resources District (CPNRD). Natural resources districts were created along major watershed boundaries in the 1970s with the intent to steward the area's natural resources. In addition to the having an authority for flood control, the CPNRD also operates a rain gage reporting network called NeRAIN and undertakes information and outreach programs for the NRDs population.

In combination with the CPNRD, Hall County has undertaken several major flood reduction projects.

Wood River Flood Control Project

After 30 years of planning, the Wood River Flood Control Project was dedicated in spring of 2004. The 300-foot wide diversion channel diverts excess water from the Wood River and

Warm Slough to the east and into the Platte River. This project provides flood control protection for 1500 homes and businesses. The project was tested by a flood event one year later on May 11, 2005, when 7.21 inches of rain fell in a 24-hour period. From a hydrological standpoint, this event would have resulted in a flood similar to the devastating 1967 flood; however, the Project functioned as designed, and flood damages were minimal for the protected area. The Central Platte Natural Resources District estimated that the $17 million project paid for itself in this event, less than one year after dedication. The project was sponsored by CPNRD and was funded 42.5% by CPNRD, 35% by City of Grand Island, 11.25% Hall County, and 11.25% Merrick County. The project was constructed by the US Army Corps of Engineers, and the Natural Resources Development Fund (administered by the Nebraska Department of Natural Resources) provided the 60% of the non-federal share of the planning.

Prairie/Silver/Moores Creek Flood Control Project: Project Update

In May of 2000, the CPNRD and City of Grand Island contracted out to perform a detailed hydrologic analysis of northern and western Grand Island. The analysis was also to evaluate options for reducing flood damages and to present the preferred alternative. An engineering firm was selected in September of 2005 to provide engineering services for the design and oversight of the flood control project. The flood control project is designed in three phases, expecting to be completed in 2015. Construction of Phase 1 began in January of 2007. The phases are:

Phase 1 – Silver Creek Low Land Stormwater Detention Cells

The first phase of the project is the construction of four large floodwater detention cells along the Silver Creek channel with a total excavation near 4.5 million cubic yards of earth. The cell design includes the lowering and re-grading of Silver Creek for more then two miles. The detention cells will detain stormwater runoff in excess of the 2-year storm. A 3' x 3' concrete box culvert will be used as the outlet and will release the water from the cells at a rate equal to the 2-year storm. A second 3' x 6' gated box culvert will be used for rapid draw down of the cells. A berm is being placed around the cells, approximately 2 foot above existing ground, to provide sufficient capacity to detain runoff from the 100-year storm with a 1-foot freeboard.

Phase 2 – Basin Divide and Silver/Moores Creek Diversion Channel

A diversion channel that will connect Silver Creek to Moores Creek and a levee that will prevent flood water from flowing from one basin the adjacent basin. The stormwater released from the cells when combined with runoff excess, flows from the Prairie Creek and will cause flooding within the city of Grand Island. This levee will be designed to meet the requirements set forth by FEMA. A diversion channel will be constructed to divert water from Silver Creek to the Moores Creek floodway.

Phase 3 – Upland Dams and Prairie/Silver Creek Channel

A series of upland detention dams and an overflow channel from Prairie Creek to Silver Creek. The exact locations of the detention sites will be finalized in the final design phase of this project. Several sites are available and will be evaluated after geological investigations have been completed. The channel between Prairie and Silver Creek will serve to carry excess flows from Prairie Creek to Silver Creek.

Prairie Creek Clearing: Update

Although the Prairie Creek Flood Control Project had a local effect, damages could be reduced on Prairie Creek by keeping the channel clear. Projects have been completed from the mouth of

Prairie Creek in Merrick County to the Hall-Buffalo county line. Annual maintenance cost to CPNRD is $10,000.

Dry Creek Clearing: Project Update

After a windstorm/tornado in 1998, landowners requested CPNRD to clear a channel northeast of Cairo. The project was completed in 1998, however, area landowners petitioned the NRD to clear an additional 21,000 feet. That project will be completed the winter of 2007/08. Maintenance is done by the NRD.

Lower Warm Slough Prairie

In 2002, CPNRD spent $110,000 to complete snagging and clearing from Grand Island to Central City.

Moores Creek Flood Control Project: Update

Project sponsors of the feasibility study for the flood control on Moores Creek include CPNRD, the City of Grand Island, Merrick County and Hall County. The three-phase project consisted of channel improvements, construction of three detention/retention and wildlife habitat enhancement cells, and construction of waterways and bridges to enable storm runoff. Annual maintenance cost is estimated at $20,000.

2.23 Probability of Future Flood Events

It is certain that the Hall County area will continue to be impacted by flash flood and riverine flood events while ice jam floods may be less common.

2.24 Vulnerability Assessment of the Flood Hazard

The US Army Corps of Engineers completed the vulnerability assessment portion of this report. Community-specific flood vulnerability information is given for each community in **Appendix D**. As shown in **Appendix A**, the Corps was able to find 1478 (398 Zone A, 69 Floodway, and 1011 Zone AE) structures in the floodplain in Hall County and was able to determine assessed valuations for many of them, which have a total of $126,100,206. The table below shows the number of structures that the Corps of Engineers found in a regulated floodplain by community.

Community	Floodplain Structures	Value
Hall County	408	$29,961,679
Alda	7	$518,285
Cairo	13	$650,447
Doniphan	0	$0
Grand Island	1045	$94,872,642
Wood River	5	$97,153
Totals	**1478**	**$126,100,206**

For the 408 structures in the floodplain in unincorporated areas of Hall County, 294 are in Zone A, 23 are in a floodway, and 91 are in Zone AE.

Critical facilities and valuations in the floodplain in unincorporated Hall County are:
Eight Interstate 80 interchanges (no value)

Note that these numbers are slightly different from NDNR's floodplain structure counts (see community-specific counts in Appendix D) because NDNR did not look outside of a community's corporate limits and did not count insignificant out buildings.

2.25 Potential Flood Mitigation Measures

Objective 2.1: Determine valuation information for the remaining structures in the vulnerability assessment in order to have a more complete concept of the County's true total flood risk.

GOALS: 1) Reduce or prevent future damage from natural hazard events,
2) Increase public safety

Objective 2.2: Maintain good standing in the National Flood Insurance Program
Action 2.2.1: Continue to regulate development in floodplain areas
Action 2.2.2: Continue to provide floodplain management technical assistance under the County's authority

Objective 2.3: Mitigate Hall County's repetitive loss properties.
- Action 2.3.1: Make application to one of FEMA's mitigation programs. Hall County, City of Grand Island, Central Platte NRD, other source can provide the non-federal match.
-Action 2.3.2 If possible purchase of repetitive loss properties for open space, utility or other public use with minimal impacts within the flood plain.

Objective 2.4: Undertake flood control projects under the NRD's authority
- Action 2.4.1: Continue to utilize existing programs for the NRD's various flood control programs. Proposed sites will need to go through a rigorous process to determine project feasibility and benefit before they are constructed.

Objective 2.5: Mitigate losses for floodprone buildings not on FEMA's repetitive loss list
- Action 2.5.1: Operate as non-federal cost-share partner for FEMA-funded or other sponsored nonstructural mitigation projects such as buyout/removal and elevation. All communities and jurisdictions will be considered if there is need; however, higher priority will be given to structures in an identified floodway.
Action 2.5.2: Regulate building within identified flood plains to minimize the number and type of structures constructed and the risk to those structures.

GOALS: 3) Increase Public Education

Objective 2.6: Increase awareness of citizens in Hall County about their flood risk and what can be done to reduce vulnerability to flooding
- Action 2.6.1: Continue to use existing NRD education and outreach programs to educate and inform the public about natural hazard mitigation options and what the NRD is doing in this area.

- Action 2.6.2: Explore options of working with the Hall County Emergency Management Agency to expand non-flood natural disaster educational opportunities.

2.30 TORNADO

2.31 Background

Tornadoes and high winds have been a way of life in Nebraska since the time of pioneers in the late 1800s. With its location at the frequent convergence area for Canadian, Gulf of Mexico, and Pacific air masses, Nebraska is located in a part of the United States where tornadoes are a common occurrence. Nebraska is ranked fifth in the nation for the number of tornadoes, but 23rd in number of tornado fatalities and 24th in tornado injuries. Nebraska averages 57 tornadoes per year, with the most recorded tornadoes being 102 in 1999. All 93 counties in Nebraska have had tornadoes since 1950. The peak month for tornadoes is June, and 78% of all Nebraska tornadoes have occurred in traditional tornado season of May through July. In terms of timing, 71% of all Nebraska tornadoes have occurred between 3:00 and 9:00 pm, and 53% of all Nebraska tornadoes between 4:00 and 8:00 pm.

The "Fujita Scale" was used to classify and compare both the actual tornadoes and the damage caused by tornadoes and was used from 1971 until 2007. On February 1, 2007, the Enhanced Fujita Scale, or EF Scale, was implemented as its replacement. The Scale was revised to reflect better examinations of tornado damage surveys, so as to align wind speeds more closely with associated storm damage. The rating system is as follows:

- **EF0: Light damage** (29% of all tornadoes). Wind up to 85 mph. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
- **EF1: Moderate damage** (40%). Wind 86 to 110 mph. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
- **EF2: Considerable damage** (24%). Wind 111 to 135 mph. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
- **EF3: Severe damage** (6%). Wind 136 to 165 mph. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
- **EF4: Devastating damage** (2%). Wind 166 to 200 mph. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
- **EF-5: Incredible damage** (less than 1%). Wind above 200 mph. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters; high-rise buildings have significant structural deformation; incredible phenomena will occur.

Tornadoes are further classified as follows:

EF0 and EF1: Weak EF2 and EF3: Strong EF4 and EF5: Violent

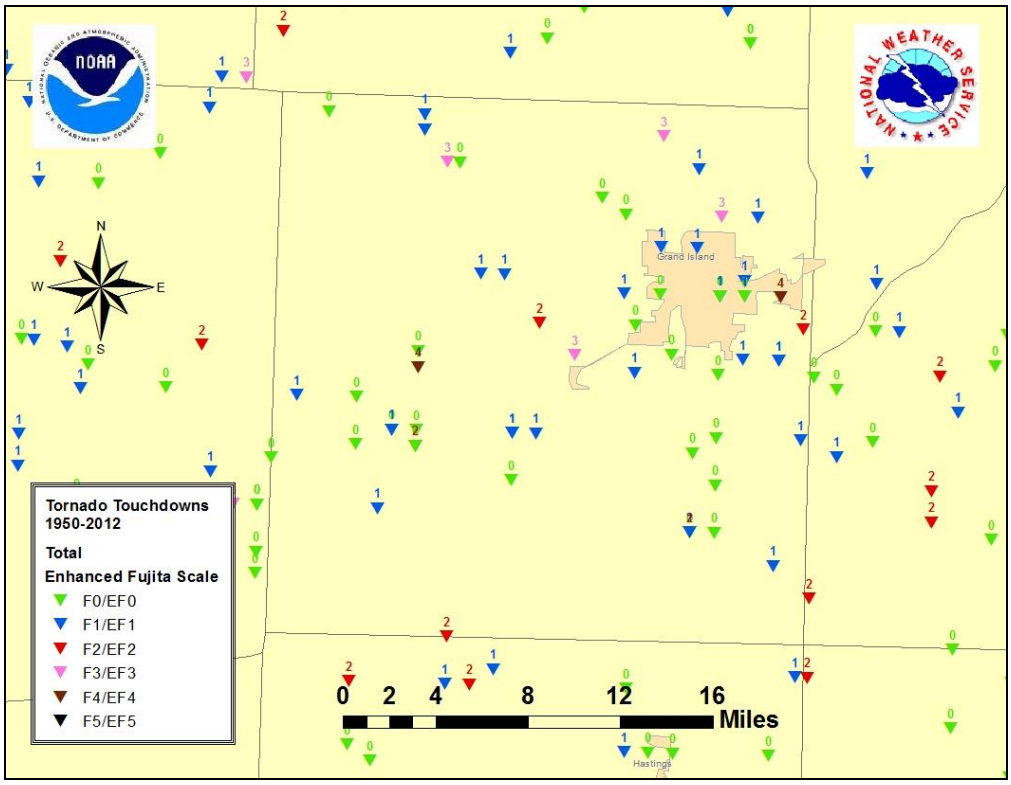
Although EF0 and EF1 tornadoes are classified as "weak," the 85 mph upper-end rating of an EF0 tornado would be considered very severe if associated with a severe thunderstorm, and there is potential for extensive damage.

2.32 Tornado History

The discussion of tornadoes in Hall County starts with the tornado outbreak of June 3, 1980, which devastated entire sections of Grand Island – especially the City's northwest and north central residential areas, and the southern business district. The tornadoes killed five people, injured more than 400, caused $300 million in damage. The destruction covered more than 150 city blocks, including losses to 357 homes, 33 mobile homes, 85 apartments, and 49 businesses. This event has been turned into book and a television movie (*"Night of the Twisters"*), and was studied by a special team of research scientists, including Professor T. Theodore Fujita himself. This tornado outbreak captivated scientists because the storm included both cyclonic and anticyclonic tornadoes.

According to the High Plains Regional Climate Center, Hall County has seen 60 tornadoes from 1953 to 2009, which places the County fifth in the State for number of twisters. However, on a density basis which factors in the area of county, Hall County has the highest density of tornadoes at 128.2 tornadoes per 1000 square miles. Second on the list is Thayer County at 97.4[3]. It must be noted that these figures could be dramatically changed if the 1980 tornado outbreak were considered one event rather than seven separate tornadoes.

[3] http://stormhorizon.org/nebraska-county-tornadoes-ranked-density.html (1950-2008)



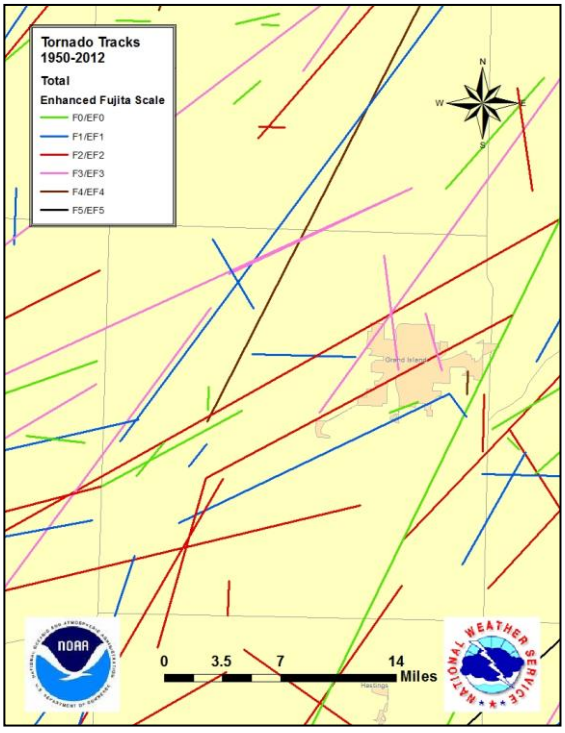
Tornado Touchdowns, 1950-2012 (Source NWS-Hastings)

According to the National Climatic Data Center, there have been 75 tornadoes in Hall County since 1950. The table below shows the details for 60 of these tornadoes, having stripped out the recorded tornadoes (except for 1980) which are most likely duplicate records of the same storm. Note that community-specific records did not begin until 1993. Also, when a community is listed in the first column, it usually means that it was the closest community – not that a tornado hit that community directly.

Location or County	Date	Time	Magnitude	Deaths	Injured	Property Damage
1 HALL	05/29/1953	2130	F1	0	0	0K
2 HALL	06/20/1954	2300	F1	0	0	3K
3 HALL	07/09/1955	2300	F1	0	0	3K
4 HALL	05/20/1957	1700	F2	0	0	0K
5 HALL	05/04/1959	1500	F1	0	0	3K
7 HALL	05/28/1959	1720	F0	0	0	3K
8 HALL	06/17/1960	2320	F1	0	0	0K
9 HALL	08/23/1960	1500	F1	0	0	25K
10 HALL	05/13/1961	1920	F1	0	0	25K
11 HALL	06/05/1961	1753	F	0	0	0K

12 HALL	05/23/1964	2000	F1	0	0	3K
13 HALL	06/14/1964	0135	F0	0	0	0K
14 HALL	05/08/1965	1730	F4	0	0	25.0M
15 HALL	05/25/1965	1732	F	0	0	0K
16 HALL	06/13/1967	2000	F1	0	0	0K
17 HALL	05/13/1968	1710	F1	0	0	25K
18 HALL	06/23/1968	2102	F1	0	0	0K
19 HALL	06/04/1971	2015	F0	0	0	25K
20 HALL	06/06/1971	1615	F0	0	0	3K
21 HALL	07/03/1973	2010	F1	0	0	2.5M
22 HALL	09/02/1973	1730	F0	0	0	25K
23 HALL	10/09/1973	1730	F2	0	5	250K
24 HALL	05/16/1977	1930	F	0	0	25K
25 HALL	05/19/1977	1515	F2	0	0	275K
26 HALL	09/01/1977	2045	F	0	0	250K
27 HALL	06/03/1980	1945	F3	1	25	2.5M
28 HALL	06/03/1980	2000	F1	0	5	25K
29 HALL	06/03/1980	2005	F3	1	40	25.0M
30 HALL	06/03/1980	2046	F1	0	0	25K
31 HALL	06/03/1980	2116	F4	3	110	250.0M
32 HALL	06/03/1980	2125	F2	0	18	2.5M
33 HALL	06/03/1980	2200	F1	0	2	2.5M
34 HALL	08/10/1980	2135	F1	0	0	250K
35 HALL	10/16/1980	0130	F1	0	0	2.5M
36 HALL	05/10/1982	1603	F1	0	0	3K
37 HALL	06/24/1982	1605	F1	0	0	3K
38 HALL	06/04/1984	1911	F0	0	0	0K
39 HALL	06/11/1984	2020	F3	0	0	2.5M
40 HALL	08/05/1985	1950	F0	0	0	0K
41 HALL	09/04/1985	2154	F1	0	0	25K
42 HALL	04/13/1986	1635	F1	0	0	25K
43 HALL	07/11/1986	2110	F1	0	0	250K
44 HALL	07/24/1986	1500	F1	0	0	3K
45 HALL	08/17/1987	1910	F1	0	0	2.5M

46 HALL	03/13/1990	1720	F3	0	0	2.5M
47 HALL	03/13/1990	1744	F3	0	0	2.5M
48 HALL	07/25/1990	1625	F0	0	0	0K
49 HALL	05/29/1991	2142	F0	0	0	0K
50 HALL	06/15/1992	1820	F1	0	0	25K
51 Upland to Wood River	05/07/1993	1752	F2	0	0	5.0M
52 Grand Island	08/05/1995	1422	F0	0	0	2K
53 Grand Island	08/04/1996	07:00 PM	F0	0	0	0
54 Cairo	06/11/1997	07:25 PM	F1	0	0	750K
55 Doniphan	06/11/1997	07:50 PM	F0	0	0	0
56 Wood River	05/02/1999	06:17 PM	F1	0	0	100K
57 Wood River	05/07/2005	05:30 PM	F0	0	0	0
58 Wood River	05/11/2005	09:05 PM	F0	0	0	125K
59 Wood River	05/29/2009	1702	EF0	**0**	**0**	**25.00K**
60 Grand Island	6/17/2009	1938	EF0	**0**	**0**	**5.00**
				5	**205**	**$ 360.054**



The adjacent figure is taken from a program called Severe Plot, which is provided by the National Weather Service. It shows the tracks of tornadoes across Hall County. The predominant track is from southwest to northeast, which happens because of the way that fronts and the summer monsoonal flow interact across Nebraska during tornado season.

Previous Hall County Tornado Mitigation Actions
In Grand Island, West Park Plaza Trailer Park on West Highway 30 has a tornado shelter. Additionally, many businesses will welcome people during a tornado if they are open for business at the time; however these buildings may not be structures built to FEMA-recognized standards for a tornado shelter.

Tornado preparedness, response, and mitigation are primarily responsibilities of the Hall County Emergency Management Agency (HCEMA). HCEMA owns and maintains the sirens for all of Hall County, and is working with the city/county joint board on a system of funding annual improvements or expansion to the warning system. The following are activities that HCEMA undertakes for regular education and outreach:

- Participates in the annual Severe Weather Awareness Week by hosting local spotter training, presentations to the public and local radio/TV media, placing articles in the local paper and airing information on the City's local government television station
- Conducts test warning days by using all of their normal procedures as if there were an actual event, including setting off the warning sirens
- Completes annual education programs to grade schools each year, reaching approximately 500 to 600 kids. At these programs, they discuss severe weather, and where to go and what to do if there is a tornado warning.
- To maintain their StormReady® certification, Grand Island and Cairo are required to continue their activities related to communication, warning dissemination, and monitoring.

2.33 Probability of Tornado Events

Although they do not necessarily occur every year, history shows that tornadoes in Hall County are common and should be expected.

2.34 Vulnerability Assessment of the Tornado Hazard

Every structure in Hall County is at risk to tornadoes. According to the Nebraska Department of Property Assessment and Taxation, this represents a value of $4,258,409,140 **Appendix D** includes the structural inventories and vulnerability information for the communities in Hall County.

2.35 Potential Tornado Mitigation Measures

Unlike floods, tornadoes and high winds do not occur in a defined area – the entire community is vulnerable. Therefore, instead of mitigation, the primary focus should be on warning, preparedness, and response. But there are projects that the city and homeowners can undertake to reduce the damage from these events.

Goal 1: Reduce or prevent future damage from natural hazard events
Goal 2: Increase Public Safety from Tornadoes

The locations of tornado sirens in the communities participating in this plan are given in **Appendix D**. On these maps, a series of buffer zones (1/2 mile, 1 mile, 1.5 miles) is provided to

show different distances from these sirens. A half-mile area is a very conservative estimate for adequate audible distance. However, tornado sirens are meant for outdoor warning only and are not designed to wake up people while they are sleeping or to alert motorists or people who are in noisy environments. In addition, the weather that is necessary for these sirens to function may have loud wind and thunder noise which may affect how the sirens are heard. The decibel level of the existing sirens should be identified and a maximum range of the sirens should be determined to see if there is adequate coverage of the entire city. New sirens should be added as new development takes place which is outside or on the edge of the existing tornado siren coverage.

The same is true for tornado shelters. There is usually a concentration of potential public buildings which could be used as shelters in the downtown area of a community. However, for homes without basements, mobile homes, and businesses, there is usually no recognized shelter. Major employers may have designated tornado safe rooms for their workers, but all businesses and high-density residential concentrations would benefit from designating and publicizing a shelter or other existing structure which meets tornado safe room specifications. An engineering consultant may be required to complete this sort of assessment.

Objective 3.1: Increase public safety

- Action 3.1.1: Pursue a federal grant to retrofit public school buildings or other public facilities with a tornado shelter or with higher-designed windows and doors. These designs could also be incorporated into new public buildings. FEMA publication #361 should be used for constructing public shelters.

Objective 3.2: Increase safety of the general public in the business district and in parts of communities with few shelter options

- Action 3.2.1: Identify and designate tornado shelters, publicize the locations of all public tornado shelters to increase public awareness – perhaps with a sign on the building.
- Action 3.2.2: Construct tornado shelters for mobile home concentrations or in other locations with vulnerable construction such as slab-on-grade.
- Action 3.2.3: In areas especially prone to damaging high winds, "hurricane straps" and better-designed windows and doors can be used to attach the roof rafters to the ceiling supports of the highest floor. This would need to be done as a building retrofit and would not be expensive. New construction can use this building technique very cheaply.
- Action 3.2.4: Offer information to home owners about tornado safe rooms to be constructed as a part of their homes.

Objective 3.3: Ensure adequate outdoor warning siren coverage

- Action 3.3.1: Perform assessment of the tornado siren coverage for communities, add sirens if found to be deficient.
- Action 3.3.2: Codify regulations that require additional tornado sirens as development occurs outside of current coverage areas.

Objective 3.4: Oversee adequate indoor warning coverage

- Action 3.4.1: Purchase NOAA weather radios for critical facilities (i.e., public schools)
- Action 3.4.2: Purchase or encourage non-public critical facilities (i.e., nursing homes) to purchase weather radios.

- Action 3.4.3: Educate a community's businesses about purchasing additional warning systems, especially in manufacturing facilities where it may not be possible to hear the outdoor sirens.

Goal 3: Increase Public Education

There is a natural decline in risk perception in communities which have not seen a tornado or high wind event in recent history. In addition, persons relocating to Hall County may not be aware of the danger that severe weather and tornadoes presents, and they may not know what to do in case of a warning. The same three-related objectives in the severe weather section apply for tornadoes.

Objective 3.5: Help residents know what to do in case of a tornado warning

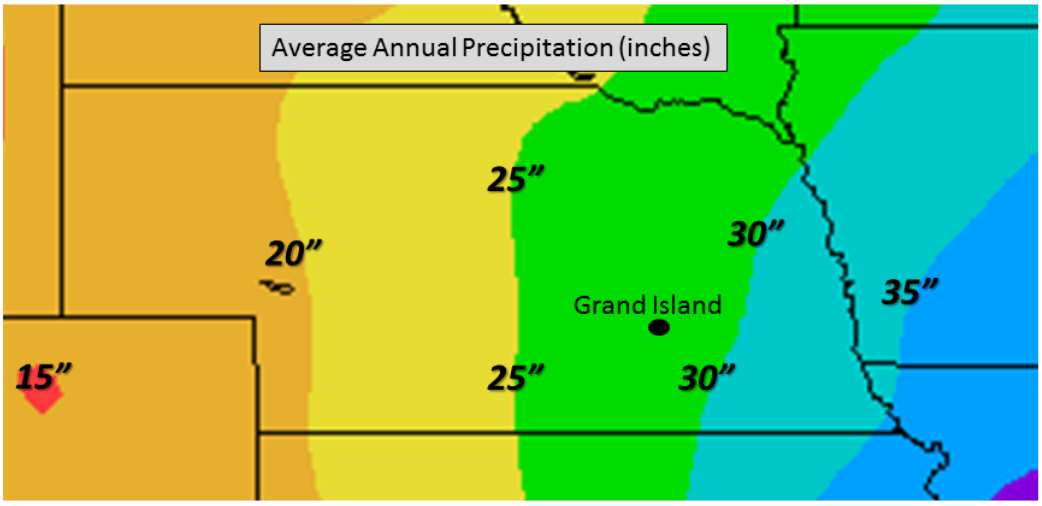
- Action 3.5.1: Residents should be made aware that tornadoes are possible in their community. They should know where to go in the event of a tornado (i.e., to a shelter or internal room/basement in their houses).
- Action 3.5.2: Educate homeowners about how to maintain trees on their property since it is their liability if a tree on their property damages someone else's personal property.
- Action 3.5.3: Have available information to educate homeowners about types of desired trees for planting on private property. Information should include: insect susceptibility, potential disease problems, blossom or seed characteristics, cold weather hardiness, and other items.

2.40 DROUGHT

2.41 Background

Figure 4 below is the isohyet map of the State of Nebraska which shows the average rainfall across the State. In an average year, Hall County will receive approximately 24-25 inches of precipitation per year. In average years, this represents enough rainfall to prevent drought; however, it is during successive years of below-average rainfall that droughts do have an impact.

Figure 4 – Nebraska Isohyet Map
(Average Annual Rainfall in Inches – NWS Hastings)



Confounding the discussion of drought is the fact that there are different definitions of drought: meteorological drought, agricultural drought, and hydrological drought. Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some "normal" or average amount) and the duration of the dry period. A meteorological drought must be considered as region-specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable from region to region. For example, some definitions of meteorological drought identify periods of drought on the basis of the number of days with precipitation less than some specified threshold.

Hydrological drought is associated with the effects of periods of precipitation (including snowfall) shortfalls on surface or subsurface water supply (i.e., streamflow, reservoir and lake levels, ground water). The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Hydrological droughts are usually out of phase with or lag the occurrence of meteorological and agricultural droughts. It takes longer for precipitation deficiencies to show up in components of the hydrological system such as soil moisture, streamflow, and ground water and reservoir levels. As a result, these impacts are out of phase with impacts in other economic sectors.

Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced ground water or reservoir levels, and so forth. Plant water demand depends on prevailing weather conditions, biological characteristics of the specific plant, its stage of growth, and the physical and biological properties of the soil. Deficient topsoil moisture at planting may hinder germination, leading to low plant populations per hectare and a reduction of final yield. However, if topsoil moisture is sufficient for early growth requirements, deficiencies in subsoil moisture at this early stage may not affect final yield if subsoil moisture is replenished as the growing season progresses or if rainfall meets plant water needs.

The three different definitions all represent significant things in Nebraska. A meteorological drought is the easiest to determine based on rainfall data and is an easier drought to monitor from rain gauges and reports. An agricultural drought represents difficulty for Nebraska's agricultural-based economy and is also relatively easy to monitor based on crop viabilities for different regions. A hydrological drought means that stream and river levels are low, which also has an impact for surface water and ground water irrigators. In addition, in-stream discharges that fall below a pre-required level also place the State in a regulatory difficulty with US Fish and Wildlife and with neighboring states over cross-border flowage rights. Hydrologic drought is somewhat more difficult to monitor since it requires some field verification of stream levels.

Nebraska is fortunate to have the National Drought Mitigation Center on the campus of the University of Nebraska in Lincoln. The NDMC provides drought monitoring and technical assistance to all areas of the world.

NDMC's website is found at: http://www.drought.unl.edu/.

Specific drought impacts by county are recorded at: http://droughtreporter.unl.edu/.

The impacts of drought can be categorized as economic, environmental, or social. Many economic impacts occur in agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to obvious losses in yields in both crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and diseases to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn places both human and wildlife populations at higher levels of risk. Income loss is another indicator used in assessing the impacts of drought because so many sectors are affected.

Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects. Environmental losses are the result of damages to plant and animal species, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity of the landscape.

Social impacts mainly involve public safety, health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Many of the impacts specified as economic and environmental have social components as well.

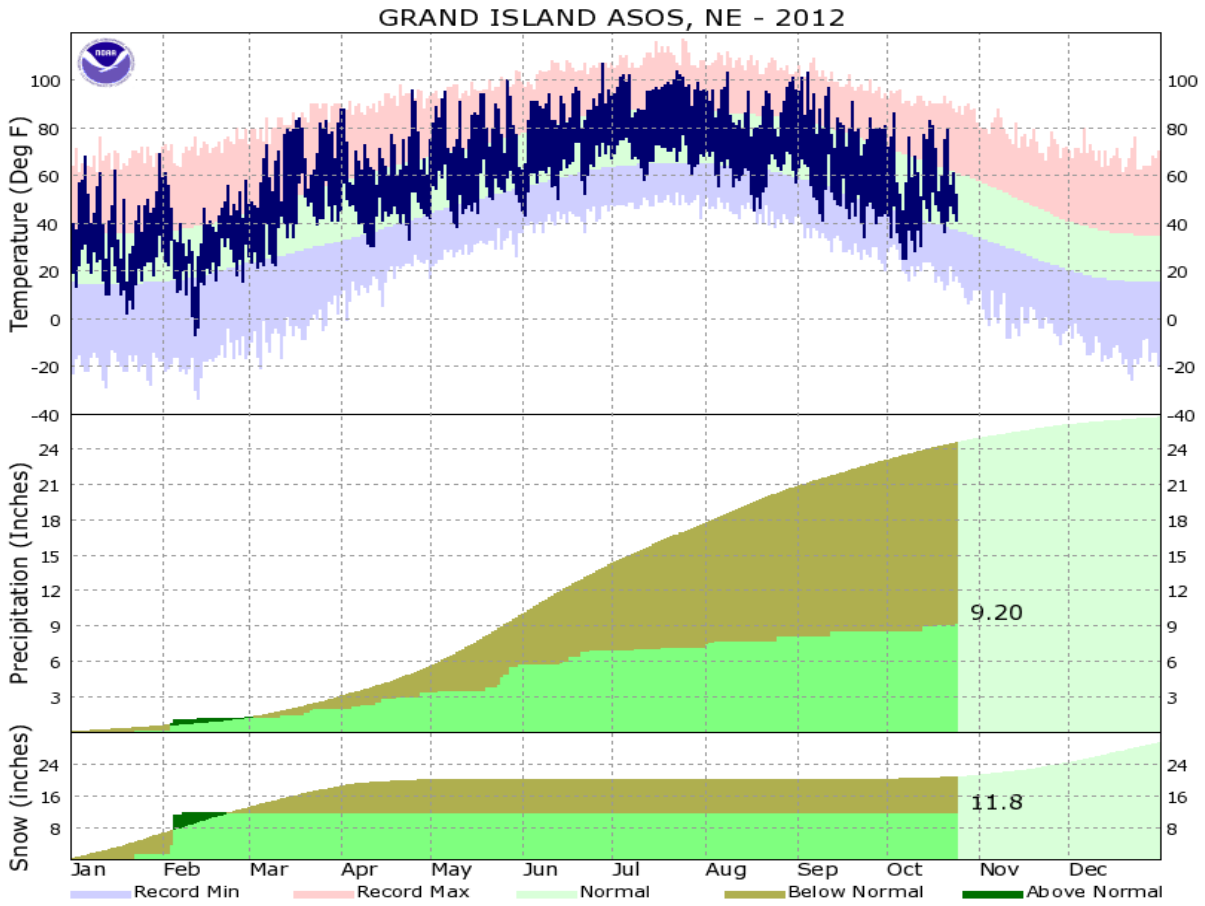
2.42 Drought History

In addition to differing definitions, there is also some debate about whether or not an area has experienced or is currently experiencing a drought. Certainly, Hall County has experienced times when certain water usages had to be voluntarily curtailed in order to maintain an adequate water reserve. However, although these periods may have witnessed below-average rainfall, the impacts were not felt much further than an inconvenience to homeowners. A significant portion of Hall County – especially in the Grand Island area – has a high water table, which reduces the impact of a drought. In certain areas, there can be standing water even if there has been no rain for weeks. In Hall County, there have been no instances of drought which have caused drastic impacts to the extent that land use regulations or emergency actions have had to be used.

Going back to 1993, the National Climatic Data Center shows two droughts: in 2000 and 2002. Drought reporting is completed by regions instead of counties, so it is not possible to break out a damage estimate for Hall County. For the drought of 2000, Governor Nelson estimated that the total agricultural effect on the Nebraska economy was around $1 billion with direct agricultural losses estimated at $240 million. Two regions of the State were particularly hard hit: near the Kansas border by Superior and from the area north of Grand Island to north of York. In 2002, The prolonged drought across central and south-central Nebraska was occasionally classified

into the “Extreme” to “Exceptional” category in the summer and fall. Most dry land crops were near a total loss and there was some decreased yield with irrigated crops. Total directagricultural losses was estimated at $480 million.

Update information for 2012 drought.



Previous Hall County Drought Mitigation Actions

Other than monitoring, there is precious little that can be done to mitigate a drought. As a result, extensive drought monitoring networks have been established. The purpose of monitoring is to see that a drought is indeed happening so that planners are then able to take appropriate actions to stem the impacts before they reach crisis level.

The Central Platte NRD participates in programs which help with drought monitoring. The NRD administers the Nebraska Rainfall Assessment and Information Network (NeRAIN) by supplying individual cooperators with rain gauges. These volunteers read the amount of rainfall daily and enter their observations into an internet-based reporting system. This network allows personnel at all levels of government – primarily local and State – to evaluate emergency operations needs while and to capture hydrologic data for future use. The data will also provide important daily decision-making information for agriculture, industry, home water use, utility providers, insurance companies, resource managers, and educators.

2.43 Probably of Drought Events

It is probable that a drought will impact Hall County in the future.

2.44 Vulnerability Assessment of the Drought Hazard

Due to the nature of a drought and the uncertainty about when it begins and ends, a vulnerability assessment is equally difficult to ascertain. One of the biggest drought impacts that could happen would be to a community's water system intake being rendered useless by declining water levels in a hydrological drought. The entire population in Hall County is theoretically at risk for a drought. However, there is an unequal spread of risk between rural and urban areas. Most urban areas have a water system in place which allows for adequate distribution of water, even in times when drought conditions prevail. Rural areas are more dependent on single-site water wells. In addition, since water is the economic lifeblood of agriculture in these areas, there is a much greater economic vulnerability to these areas. Since relevant drought impacts are more community-specific than area-based, any drought issues are saved for the community-specific reports found in **Appendix D**. There is also a general lack of funding for drought mitigation projects. Most projects that are completed are based on crisis need, so federal grants with application periods are not frequently used. Cost would vary greatly depending on scope and type of project.

2.45 Potential Drought Mitigation Measures

The main drought mitigation measures can be grouped into five main categories: legislation/public policy, water supply augmentation, demand reduction/water conservation programs, emergency response programs, and drought contingency plans.

Goal 1: Reduce or prevent future damage from natural hazard events
Goal 2: Increase Public Safety from Drought

Objective 4.1: Reduce drought impacts through legislation/public policy

- Action 4.1.1: Prepare position papers for legislature on public policy issues
- Action 4.1.2: Examine statutes governing water rights for possible modification during water shortages
- Action 4.1.3: Pass legislation to protect in-stream flows
- Action 4.1.4: Pass legislation providing guaranteed low-interest loans to farmers
- Action 4.1.5: Impose limits on urban development
- Action 4.1.6: Provide incentives to grow drought tolerant crops
- Action 4.1.7: Change crop insurance and incentive payment policies to support more drought tolerant crops

Objective 4.2: Reduce drought impacts through water supply augmentation

- Action 4.2.1: Issue emergency permits for water use
- Action 4.2.2: Provide pumps and pipes for distribution
- Action 4.2.3: Propose and implemented program to rehabilitate reservoirs to operate at design capacity
- Action 4.2.4: Undertake water supply vulnerability assessments
- Action 4.2.5: Inventory self-supplied industrial water users for possible use of their supplies for emergency public water supplies

- Action 4.2.6: Inventory and reviewed reservoir operation plans

Objective 4.3: Reduce drought impacts through demand reduction/water conservation programs
- Action 4.3.1: Establish stronger economic incentives for private investment in water conservation
- Action 4.3.2: Encourage voluntary water conservation
- Action 4.3.3: Improve water use and conveyance efficiencies
- Action 4.3.4: Implement water metering and leak detection programs

Objective 4.4: Reduce drought impacts through emergency response programs
- Action 4.4.1: Establish alert procedures for water quality problems
- Action 4.4.2: Stockpile pumps, pipes, water filters, and other equipment
- Action 4.4.3: Establish water hauling programs for livestock
- Action 4.4.4: List livestock watering locations
- Action 4.4.5: Establish hay hotline
- Action 4.4.6: Fund water system improvements, new systems, and new wells
- Action 4.4.7: Fund drought recovery programs
- Action 4.4.8: Lower well intakes on reservoirs for rural water supplies
- Action 4.4.9: Extend boat ramps and docks in recreational areas
- Action 4.4.10: Issue emergency irrigation permits for using state waters for irrigation
- Action 4.4.11: Create low-interest loan and aid programs for agricultural sector
- Action 4.4.12: Create drought property tax credit program for farmers
- Action 4.4.13: Establish a tuition assistance program for farmers to enroll in farm management classes

Objective 4.5: Reduce drought impacts through drought contingency plans
- Action 4.5.1: Establish statewide contingency plan
- Action 4.5.2: Recommend that water suppliers develop drought plans
- Action 4.5.3: Evaluate worst-case drought scenarios for possible further actions
- Action 4.5.4: Establish natural hazard mitigation council

Goal 3: Increase Public Education

There are no explicit objectives or actions for this goal; however, there is an implicit action related to this goal for above actions which will require public participation – for example, the voluntary water conservation.

2.50 DAM FAILURE

2.51 Background

Many of Nebraska's communities were founded due to their proximity to water resources. Often, these streams or rivers later needed a dam for flood control or a reservoir for a constant water release. The Nebraska Department of Natural Resources performs annual inspections on all high-hazard dams in the State. A high-hazard dam is one where a large discharge and/or breach of the dam could potentially lead to downstream loss of life. High-hazard dams are

designed to the Probable Maximum Precipitation event, which is typically three or four times the rainfall expected from a 500-year event.

In Hall County, the flat topography in combination with the high water table make dams for flood control largely infeasible. There are only two dams in Hall County, and both are classified as low-hazard dams. The information of both of the dams in the County are given below.

County	Dam Name	Stream	Classification	Closest Community	Year Completed
Hall	Benton & Still Dam	Dry Creek	Low	Abbott – 10 miles	1952
Hall	Prairie Creek #4	Prairie Creek	Low	Abbott – 15 miles	1977

Abbott, Nebraska, is an unincorporated area a half-mile north of Highway 2 between Cairo and Grand Island.

The only way that Hall County will be impacted by a dam failure would be from a failure of Kingsley Dam, which holds back Lake McConaughy in Keith County. The dam is on the North Platte River, which meets the South Platte River immediately east of the City of North Platte. According to the Emergency Action Plan for Kingsley Dam, the only community which would be impacted by a failure of Kingsley Dam would be the southern portion of Grand Island. Flow released from a Kingsley Dam failure would travel the approximately 190 river miles to the Highway 34 & 281 bridge in slightly more than 48 hours.

2.52 Dam Failure History

In the development of this mitigation plan, no record could be found of a dam failure in Hall County in the last 40 years.

Previous Hall County Dam Failure Mitigation Actions

Since there are only two low-hazard dams in Hall County, there has been no dam failure mitigation actions undertaken to date. Both dams are regularly inspected and are kept properly maintained.

2.53 Probability of Dam Failures

The likelihood of a Kingsley Dam failure is exceedingly small. Both of the dams in Hall County are regularly inspected. In addition, since both dams are classified as low-hazard, even if an intense rain event were to breach them, there would be little to no damage downstream.

2.54 Vulnerability Assessment of the Dam Failure Hazard

Dam breach-routing inundation paper maps have been completed for the Emergency Action Plan required for Kingsley Dam. The maps are kept on-file at the Dam Safety Division of the Nebraska Department of Natural Resources. For security reasons, these maps are not made readily available to the public; however, a general description of the impacts of a dam failure can be provided here.

According to the Emergency Action Plan, the maximum depth of flooding would be 8.1 feet at the Highway 34 & 281 bridge. The maximum depth is for the area closest to the Platte River. Everything south of a general line from Highway 30 & Plum Street on the east to Highway 281

& Webb Road on the west side of town would be inundated to a certain extent. Properties closer to the Platte River would be inundated to a deeper level.

2.55 Potential Dam Failure Mitigation Measures

Given the lack of risk and the routine inspections and maintenance requirements for existing dams, it is believed that all mitigation measures are being performed that can be performed.

2.60 LEVEE FAILURE

2.61 Background

Following the levee-related devastation in New Orleans caused by Hurricane Katrina, the nation has increased the scrutiny of levees, and especially on development behind them. With routine maintenance, most levees will not offer a problem. However, even if a levee is perfectly maintained, the development behind a levee is subject to flooding – and in some cases high velocity flows – if a levee is breached or overtopped by a flood exceeding the levee's design.

In Hall County there is only one levee, and that is associated with the Wood River Diversion project completed by the Corps of Engineers in 2005. As designed, the Diversion is essentially a two-sided levee which alters the flow of a 100-year flood to take it around south Grand Island. A Letter of Map Revision (LOMR) was completed for this project on October 19, 2004, and extensive areas of ponding flooding mapped floodplain were removed across flood map panels 0010, 0015, and 0020 (they are too extensive to put in this report). An additional LOMR was published on September 28, 2007, for the western part of the Diversion project between Highway 281 and the actual diversion point.

2.62 Levee Failure History

Since its completion in 2005, the Wood River Diversion has not failed over been overtopped. On the contrary – in a major flood event in May of 2005, the Diversion performed as designed, saving southern Grand Island from a repeat of the 1967 flood. The Corps of Engineers estimated that the completed project essentially paid for itself from this event.

2.63 Probability of Levee Failures

It is extremely unlikely that the Wood River Diversion will fail. The more likely scenario would be an overtopping from a major rainfall event in excess of the project design. The Corps of Engineers, Central Platte NRD, and the City of Grand Island will ensure that the Diversion project is maintained.

2.64 Vulnerability Assessment of the Levee Failure Hazard

According to the structural inventory completed by the Corps of Engineers, 209 structures are protected by the Wood River Diversion project. This represents 0.9% of the total structures in Grand Island. The Corps of Engineers has determined the valuation of structures protected by the Diversion as $40,860,840, or 2.2% of the City's valuation.

2.65 Potential Levee Failure Mitigation Measures

Given the lack of risk and the routine inspections and maintenance requirements for existing dams, it is believed that all mitigation measures are being performed that can be performed.

2.70 FUTURE DEVELOPMENT AND HAZARD VULNERABILITY

Future development is a matter better reserved for the specific communities, as given in **Appendix D**.

Chapter 3 – Public Participation on Plan Revision

The Hall County Emergency Management is lead agency in the planning issues. All of the meetings were open to the public and properly noticed according to the Open Meetings Act of the State of Nebraska (NEB. REV. STAT. §§ 84-1407 TO 84-1414).

Present at the initial public meeting on June 5, 2013, were representatives from the Hall County Emergency Management Agency, Regional Planning Commission, community elected officials, school districts and citizens. See the sign-in sheet and newspaper article in **Appendix C** for documentation.

In place of a second public meeting, this plan used the public input system available at the local level through the public hearing process. The Hall County Regional Planning Commission heard discussion of the plan's findings and recommended that the mitigation plan be adopted. Local governments were notified by letter from NDNR of the projects identified by their community representatives in the initial public meeting. A letter was also sent to the Hall County Emergency Management Agency for additional review. In the letter, communities and reviewers were asked if the projects listed were still an adequate representation of their hazard mitigation goals. In addition, local governments were also requested to prioritize their projects. The adoption by each participating community took place after the respective city councils or village boards had worked through the public hearing process.

To fulfill the adjacent jurisdictions review requirement, the initial draft of the Hall County plan was sent to the Central Platte Natural Resources District for comments. Hall County is surrounded by counties in the same NRD.

Jon Rosenlund, Director of Emergency Management for the City of Grand Island and Hall County, revised this plan following its development by the NDNR in 2007. The plan was originally adopted by the various Hall County jurisdictions through 2008.

Prior to submitting the final draft of the plan for comments, NDNR submitted the draft to FEMA for a "Conditional Approval Pending Adoption" determination. Once received, this plan revision was adopted by the Hall County Regional Planning Commission [insert date]. Documentation showing the adoption at the County level is given as the first page of this report. Local community adoption of their sections of the plan took place after NDNR received and made the comments requested from each community. The local adoptions took place on different dates. Local adoption resolutions are given as the last page for each community in the community-specific portion of the plan in **Appendix D**.

Subsequent evaluations and updating of the plan will involve public display advertisements in the local newspaper or other public notices. The plan will be reviewed and revised as necessary every five years or after a Federally-declared disaster.

Plans and Other Information Used in the Development of this Plan

City of Grand Island Comprehensive Plan

Information: Future development areas

City of Grand Island Flood Insurance Study, FEMA. September 2, 1982.
Information: Flood history, boundary, and statistics

City of Wood River Flood Insurance Study, FEMA. June 3, 1986.
Information: Flood history, boundary, and statistics

High Plains Regional Climate Center: http://www.hprcc.unl.edu

National Arbor Day Foundation – Tree City USA website located at:
http://www.arborday.org/programs/treeCityUSA.cfm
Information: Tree City USA information

National Climate Data Center searchable severe weather database located at:
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
Information: All-hazard statistics

Nebraska Department of Property and Taxation: http://pat.nol.org

Nebraska flood data, Nebraska Department of Natural Resources spreadsheet.
Information: Historic flood events in Nebraska

Our Town Nebraska ----- "Nebraska…Our Towns" Taylor Publishing, Dallas, TX. 1990.
Also: http://casde.unl.edu/history/
Information: Historic community information

Population statistics from:
- http://factfinder.census.gov
- http://www.dnr.state.ne.us/databank/census/Ne00-90Villagerank.pdf

Chapter 4 – Implementation

Hall County will implement this plan by the methods outlined in this chapter. In addition to a positive benefit-cost ratio, projects will be prioritized and selected for implementation based on community goals, planning objectives, funding availability, environmental concerns, and public support. Projects sponsored for implementation by the County or by a participating community will follow a public process.

Determining which projects should be submitted for funding will be based on a FEMA-approved cost-benefit method. This means that proposed projects would need to be reviewed for cost effectiveness with the assistance of state emergency management or floodplain management personnel. In addition to a positive cost-benefit ratio, projects will be prioritized and selected for implementation based on community goals, planning objectives, funding availability, environmental concerns, and public support.

At its discretion, the County may choose to not implement any of the proposed mitigation projects at this time with the realization that future events may change this stance as well as the prioritization of projects.

The Hall County Regional Planning Commission reviewed the following projects for a recommendation on which projects should receive the highest priority. The County is responsible for making the final decision on which projects are submitted to the appropriate funding agency/program for funding. Unless otherwise decided for specific projects, the County will be the agency responsible for project administration. These projects are those which the County would like to undertake if funding becomes available. Community-specific projects are separate (but which may have the County as a sponsor) and are listed in their specific-community sections in **Appendix D**.

In the plan, several potential mitigation projects are identified. This plan is not designed to have an all-inclusive list of projects, so the plan should be revised and updated as new projects are identified and prioritized by the County or its participating communities. During the planning process, the County heard the range of potential mitigation options available to them, and identified and prioritized the projects listed below. All mitigation options were considered and no options were thrown out – instead, they were ranked into three groups: a higher-priority, medium-priority, and lower-priority. The public had the opportunity to comment on priorities in the public hearing in September 3, 2008. Within each category, the projects are not further prioritized from highest-to-lowest priority because it was believed that all projects within each category were equally important.

Recommendations & Project Update

HIGHER PRIORITY PROJECTS

Emergency Backup Power Inventory for Critical Facilities

Many of the critical facilities in Hall County have emergency backup power capability. However, an inventory is needed to determine which emergency shelters, emergency responder facilities, vulnerable populations, and other critical facilities are in need of emergency backup capability.

Potential funding sources: Hall County Emergency Management Agency – staff time.

PROJECT UPDATE – COMPLETE: A detailed list of critical facilities in Hall County has been assembled which includes information regarding emergency backup power for each facility.

Emergency Backup Power

As witnessed in the major ice storm disaster of December, 2006, entire communities can be left without power for weeks. When a severe winter storm knocks out power, this is also a time when people – especially vulnerable populations – need access to heat and when critical facilities like hospitals need to be able to meet any critical care needs. Large emergency generators can be used to supply power directly to a community's electric grid until outside power can be restored. Also, critical facilities should have emergency backup power capability of their own, not only to be ensure they are able to operate as intended, but also to function as emergency warming centers in extreme cases.

Potential funding sources: The Hazard Mitigation Grant Program (HMGP) is a post-disaster funding program from FEMA. Projects must be identified in this mitigation plan, and these funds will supply up to 75% of the total project cost.

PROJECT UPDATE – IN PROGRESS: A number of critical facilities have installed or upgraded emergency backup power. Progress will be determined by the availability of funds both at the local level and through grant resources.

Drainage Improvements

Stormwater problems are common in the flat portions of Hall County, especially in the developed areas of Grand Island. The City and Central Platte NRD have been working to reduce the stormwater problems by constructing detention basins west of the City. The flooding dynamics will continue to change as additional construction occurs around the fringes of existing development.

Potential funding sources:

1. Community Development Block Grant (CDBG) funds are available through the Nebraska Department of Economic Development for planning. Drainage studies and improvements are eligible for funding as long as the City meets low-to-moderate income requirements. Applications are always open, but there are two funding cycles each year.

2. The Central Platte Natural Resources District has funded drainage improvements in the County.
3. The Flood Mitigation Assistance (FMA) program and Pre-Disaster Mitigation program through the Federal Emergency Management Agency (FEMA) receives annual allocations for projects. The Hazard Mitigation Grant Program (HMGP) is a post-disaster funding program, also from FEMA. For all of these programs, projects must be identified in this mitigation plan, and these funds will supply up to 75% of the total project cost.

PROJECT UPDATE – IN PROGRESS: Talk to Nabity, Sekutera and CPNRD.

Floodplain Management

Although not commonly viewed as mitigation, effective floodplain management is the most powerful tool in preventing unwise development in floodprone areas. Every community in Hall County – including Hall County – already participates in the National Flood Insurance Program. These communities will continue to participate and will be able to turn to the Nebraska Department of Natural Resources for technical assistance with specific problems and issues. The main responsibility for the administration of the local floodplain management ordinance has to do with the various aspects of reviewing and issuing floodplain development permits. If there is no or very little floodplain area in a community's jurisdiction or if there is no or very little growth, a community's administration responsibilities in the NFIP will be extremely easy.

Also in the floodplain management category, downstream zoning of dams is idea whose time has come. As a result of the Safety of Dams and Reservoirs Act passed by the Nebraska Unicameral in 2005, zoning of areas downstream of low and significant hazards dams is now possible. The intent is to allow development to be regulated and restricted in these areas since population moving in below a low hazard dam will cause it to be reclassified as a high hazard dam. When this happens, the dam owner would be responsible to undertake costly construction actions to raise the height of the dam, improve the dam to high-hazard specifications, and to ensure regular maintenance and inspections.

Potential funding sources: There is no expense to communities to participate in the NFIP program other than personnel time to administer the program at the local level. Communities are also encouraged to pass zoning regulations for areas downstream of low-hazard and significant-hazard dams.

PROJECT UPDATE – CONTINUING: Hall County and all its municipalities continue to participate in the NFIP through the Regional Planning Department.

Flood Control

Flood control and flood damage reduction is one of the primary responsibilities of the Central Platte NRD. Since the NRD was created in 1972, it has constructed numerous flood damage reduction projects in the Hall County. As the population of the County – especially in and around Grand Island – continues to increase and the area of development expands, the need for flood damage reduction measures also increases. The Wood River Diversion project is an

example of a completed flood control project and the Prairie/Moores/Silver Creek project is one currently being worked on.

Potential funding sources: Corps of Engineers, Central Platte Natural Resources District, Natural Resources Development Fund through the Nebraska Department of Natural Resources.

PROJECT UPDATE – IN PROGRESS: Prairie/Moore/Silver update

Reverse 9-1-1 or New Technology for Warning Dissemination
Reverse 9-1-1 is a system which allows a central location like the 9-1-1 call center or Emergency Operations Center to automatically dial a pre-set list of telephone numbers and issue a recorded warning message. In addition, new technologies are being developed which allow this type of reverse warning system to be put in place with cellular telephones customers, targeted personnel, and geographically targeted populations. These types of warning systems have being implemented on many university and college campuses in light of shootings. In these reverse warning situations, students were informed not to come to the campus or to stay where they were until the situation had been resolved. Essentially, these warning systems would be used when there is an immediate need for a warning when there is not enough time for people to get to a television or radio.

Potential funding sources: US Department of Homeland Security, Hazard Mitigation Grant Program set-aside funds, Hall County Emergency Management Agency, private through telephone companies.

PROJECT UPDATE – COMPLETED: The Emergency Management Department has contracted with the Nebraska OCIO for emergency telephone notification. The GI-Hall Alert system provides voice, text and email notifications using a combination of public sign ups (cellular phones/emails) and the 911 landline database. The system has been used on several occasions to warn and inform the public with positive results.

Purchase NOAA Weather Radio for Critical Facilities
Weather radios are inexpensive enough that communities could purchase them for public critical facilities, such as schools and hospitals. Communities can encourage local businesses to purchase radios, especially elderly care facilities and noisy manufacturing plants which either need to be sure to receive warnings or may not be able to hear outdoor warning sirens.

Potential funding sources: A brief online search of sites which offer NOAA Weather Radios for sale show several options with the average price being about $30-50. Depending on how many radios communities would need for critical public facilities, they might be able to purchase them. Some of Nebraska's emergency management agencies have acquired weather radios at a discounted cost and have distributed them in interested communities. The Hall County Emergency Management Agency could perform a similar service. They are also eligible for FEMA's Hazard Mitigation Grant Program set-aside funds if they are purchased for critical facilities.

PROJECT UPDATE – COMPLETED: The Emergency Management Department has purchased and installed NOAA radios in City and County buildings and ensured their proper operation during installation. Maintenance of these NOAA radios is the responsibility of each specific department.

NOAA Weather Radio Public Education
The public may not be aware that weather warnings are available to them by purchasing an inexpensive weather radio. The cost for new radios is about $30 and they have the capability to weed out warnings for unneeded counties. The Hall County Emergency Management Agency can educate the public about these radios in their educational/outreach programs. Grand Island was a Project Impact community in the late 1990s, and they used those grant funds to purchase and hand out several thousand weather radios.

Potential funding sources: Hall County Emergency Management, no cost for education. Homeowners.

PROJECT UPDATE – CONTINUING: The Emergency Management Department provides information and educational material regarding NOAA weather radios through pamphlets, handouts, online resources, local media releases and interviews, and at various public events.

Public Tornado Shelters
Given Hall County's history with tornadoes, public tornado shelters should be considered. They are fundable under FEMA's non-flood mitigation programs, and most states in FEMA Region VII (Nebraska, Iowa, Missouri, Kansas) have successfully implemented them. However, Nebraska currently has only funded one public tornado shelter: a community building in Cortland after the devastating Hallam Tornado of 2004. Shelters can be built in as new construction or as a retrofit – retrofits are more expensive. The most popular public shelters have been public schools and in areas of large concentrations of population in the summer months such as fairgrounds and parks.

Potential funding sources: The Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) programs from FEMA. The Community Development Block Grant (CDBG) program can also be used to assist with the funding of public tornado shelters if the community meets certain federal income guidelines.

PROJECT UPDATE – CONTINUING:

Information about Tornado Safe Rooms
Tornado safe rooms are areas built into existing or new construction which offer safety from severe weather events. The information about these safe rooms exists and is available, so it would be a matter of educating the availability of this information and encouraging property owners and construction firms to consider building or retrofitting a safe room in their developments.

Potential funding sources: Federal Emergency Management Agency (publications), Hall County Emergency Management Agency, property owners – no cost for education.

PROJECT UPDATE – CONTINUING: The Emergency Management Department provides information and educational material regarding Tornado Saferooms through pamphlets, handouts, online resources, local media releases and interviews, and at various public events. A full-scale model of a tornado saferoom was constructed by members of the Hall County LEPC and has been demonstrated at various public events.

Tornado Shelter Assessment
Identify and designate tornado shelters. Any shelters that are identified should be entered into a GIS coverage for spatial analysis of shelter distribution and needs. Publicize the locations of all public tornado shelters to increase public awareness – perhaps with a sign on the building. The Hall County Emergency Management Agency should be the project leader for this activity.

Potential funding sources: Hall County Emergency Management Agency, consultants

PROJECT UPDATE – MINOR: The County does not maintain public tornado shelters. However, each business and home is instructed on proper techniques to selecting shelter in a tornado or other high wind event. This information is provided in a variety of media.

Requiring Power Line Burial
Communities can require new developments to bury power lines. Most communities already currently have this as standard building code.

Potential funding sources: No cost to implement, but staff training and enforcement

PROJECT UPDATE – MINOR: Get comments by Utilities.

Power Line Burial Projects
For stretches of exposed transmission, distribution, and service lines which routinely experience problems – whether by ice, wind, or other natural hazard – line burial is an option. Burying power line is more expensive up-front, but essentially eliminates the potential for future line outages.

Potential funding sources: FEMA's non-flood mitigation programs, Southern Public Power District, City of Grand Island, homeowners

PROJECT UPDATE – MINOR: Get comments by Utilities.

Warning Siren for New Development
As development takes place, it can be easy to forget about the need for warning siren coverage. Communities should explore options available to them to increase warning siren coverage as they expand.

Potential funding sources: Hall County Emergency Management Agency, communities, Hazard Mitigation Grant Program set-aside funds.

PROJECT UPDATE – IN PROGRESS: Using HMGP grants and local funds, the Emergency Management Department has replaced or extended emergency outdoor warnings sirens in 10 locations throughout the county. New sirens feature a 70dB radius of 6200 feet, nearly double the previous siren models.

Urban Tree Management Plan

For all communities in Hall County, it would be beneficial to develop a comprehensive urban forest management plan, especially for public areas and in areas of communities which experience tree-related problems. Smaller communities should request a tree inventory from the Nebraska Forest Service which would give recommended actions to local tree boards. A common misconception is that a tree management plan will mean that the community is liable for damages if they do not take action based on the inventory's findings. In reality, each community is already liable for tree-related damages on public property. An inventory can be completed which stipulates that only trees in public areas will be assessed. Outside of an inventory or urban forest plan, homeowners should also know how to maintain trees on their property since they are responsible for them.

Potential funding sources: Instead of assessing the need for financial assistance, interested communities should send a letter to the Nebraska Forest Service, requesting a community tree inventory. Tree inventories are a free service from the NFS and are beneficial in determining tree-related activities which should be taken immediately or in the near future. Even in communities that have had a tree inventory completed in the last ten years, an updated inventory would be beneficial for local tree boards or other tree-related groups to assess required actions to reduce vulnerability.

PROJECT UPDATE – MINOR: Get comments by Utilities.

Severe Weather Awareness Education

For awareness, severe weather safety tips could be made public by newspaper or other media outlets. Such a campaign should include practical tips like staying indoors when lightning is around and could be combined with awareness campaigns from other disasters, and could take place during Severe Weather Awareness week every March.

Potential funding sources: This is another activity which would not need to require financial resources other than staff time. Severe weather awareness campaigns can be done through various media, in cooperation with the National Weather Service, Hall County Emergency Management Agency, Central Platte Natural Resources District, Nebraska Emergency Management Agency, Nebraska Department of Natural Resources, Federal Emergency Management Agency, U.S. Army Corps of Engineers, and other agencies at all levels.

PROJECT UPDATE – CONTINUING: The Emergency Management Department provides severe weather awareness education through a variety of methods, including partnerships with the NWS Hastings for annual Storm Spotter courses, public news releases during events such as Severe Weather Awareness Week, Winter Weather Awareness Day, etc. The County participates in the annual Tornado Test Drill and uses social media to collect feedback from the community regarding the activation of local warning systems. Severe weather education has

been delivered to the public directly through lectures, volunteer training, public events, media interviews, online through the Department website, social media, and presentations to community and youth groups.

Flood Awareness Education
A flood awareness program would require the commitment of staff time from each interested community. Agencies such as the Central Platte NRD, Nebraska Department of Natural Resources, Nebraska Emergency Management Agency, Federal Emergency Management Agency, and US Army Corps of Engineers could provide assistance and educational materials. An on-going flood awareness education program might attract interested members of the public to assist as volunteers.

Potential funding sources:
Most education and outreach programs would not require funding. The only commitment would be staff time, time and money spent advertising meetings, and the cost of printing materials.

PROJECT UPDATE – CONTINUING: Similar to Severe Weather Awareness Education, the Emergency Management Department provides flood awareness education through a variety of methods, including partnerships with the NWS Hastings for annual Storm Spotter courses, public news releases during events such as Severe Weather Awareness Week. Flood education and information has been delivered to the public directly through lectures, volunteer training, public events, media interviews, online through the Department website, social media, and presentations to community and youth groups.

MEDIUM PRIORITY PROJECTS
Since these projects are not of a high priority, potential funding sources are not as important to identify at this stage.

Provide Tree Planting/Selection Information to Citizens
This information is already available from multiple sources. It would be a question of having communities receive the informational brochures and to have the information available in an accessible location.

PROJECT UPDATE – CONTINUING: Get comments by Extension Office

Water Supply Augmentation
The Village of Alda and Village of Wood River both have water supply issues which could make their citizens more vulnerable to drought than communities which have an adequate water supply. The State has some revolving loan programs which could be tapped to expand their water supply.

PROJECT UPDATE – IN PROGRESS?: Get comments by Utilities

Local Demand Reduction/Conservation Programs

When communities face a water shortage, it is important to reduce the demand on the limited water supply. These programs could be as simple as restricting lawn watering or could get more drastic depending on need. No matter what, a pipeline for disseminating the restrictions is needed.

PROJECT UPDATE – MINOR: Get comments by Utilities

LOWER PRIORITY PROJECTS

Since these projects are not of a high priority, potential funding sources are not as important to identify at this stage.

Acquisition and Demolition of Floodprone Structures
Some natural resources districts in Nebraska have existing floodway acquisition programs. The Central Platte NRD could initiate a similar program. One of the benefits of a countywide hazard mitigation plan is that all properties in the County will be eligible for FEMA funding from its annually-funded mitigation programs. The City of Grand Island would be an excellent sponsor for the repetitive loss property within its jurisdiction. This alternative was put in the "Lower" category due to the low number of targetable buyout candidates in Hall County.

Specific areas targeted for acquisition projects are:
- Repetitive loss properties listed for Grand Island and Hall County
- All floodprone areas in the County will be considered for buyouts, as requested

Emergency Backup Power for Critical Facilities
This was rated in the Lower category not because it is not needed, but because an inventory should first be completed to know where there a need.

Become a Tree City USA
Grand Island and Doniphan are already Tree City USA communities. Other communities in Hall County can receive the benefits of becoming a Tree City USA.

PROJECT UPDATE – MINOR: Get comments by Parks

Hail Education
Some of the most damaging natural hazards events in Hall County have been severe hail storms. There is not a lot that can be done to prevent hail damage to existing homes, but there are things that can be done to reduce future damage to new homes and to vehicles. For new homes, building options would be metal roofs instead of wood shake or traditional asphalt shingles. Another building improvement would be metal siding instead of vinyl or wood, which can be destroyed by hail strikes. Improved warning times would allow owners to move their vehicles to a protected location.

PROJECT UPDATE – CONTINUING: Similar to Severe Weather Awareness Education, the Emergency Management Department provides hail awareness education through a variety of methods, including partnerships with the NWS Hastings for annual Storm Spotter courses, public

news releases during events such as Severe Weather Awareness Week. Hail education and information has been delivered to the public directly through lectures, volunteer training, public events, media interviews, online through the Department website, social media, and presentations to community and youth groups.

Secure At-Risk Development like Manufactured Homes
Mobile home tie-downs are an easy way to prevent them from rolling during high winds. However, implementing a mitigation project for these types of buildings is problematic since they are often rented and the owners lack the financial capability to install them. Under the Project Impact program in the late 1990s, Grand Island offered these tie-downs as a project and received no takers.

PROJECT UPDATE – MINOR: Get comments

Flood Insurance Education for Homeowners
Information on how to obtain flood insurance should be provided to private property owners – it would be at their discretion to actually purchase the insurance coverage. Since the passage of the National Flood Insurance Reform Act of 1994, lenders have been required to determine if the property to be insured is in a floodplain. If it is, lenders will require flood insurance as a condition of protecting their loan. This is only for loans which are federally-backed such as mortgages or home improvements. For this potential project, "education" could mean something as easy as having FEMA flood insurance brochures available at city/village halls and public libraries to inform the public.

PROJECT UPDATE – CONTINUING: Recent changes in the program due to the Biggert-Waters Act is creating a number of concerns among home owners. The primary concern is the increased cost of flood insurance for pre-FIRM structures. It appears that these increased costs are resulting in more people attempting to have their property amended out of the flood plain using the LOMA process or people paying off mortgages to avoid the increased cost of insurance. If they are removed from the flood plain this does not create any major concerns as their known risk is minimized and validated. If they pay off their loan to avoid the higher premiums this represents an increased risk the economic vitality of the region. Not only are we still at risk for flooding, we are at risk for the increased economic loss that results from the combination of a hazard and an uninsured property. Self-insuring places value of the entire asset at risk. The end result of the passage of Biggert-Waters in its current form may not achieve the desired results.

Emergency Snow Route Development and Signage
The City of Grand Island already has this in place, which is the highest priority based on population concentration, and the State takes care of clearing highways. Other communities have a general snow removal plan, but do not have a route identified.

PROJECT UPDATE – COMPLETE:

Water Supply Emergency Response Programs/Drought Contingency Plans

Develop contingency plans, including worst case scenarios, in case of an emergency water supply shortfall which cannot be met by voluntary restrictions to reduce demand.

PROJECT UPDATE – ???: ???

Plan Evaluation

Future plan monitoring, evaluating, and updating will follow this process:

1. Unless otherwise designated by the Hall County Board, Hall County Regional Planning Commission (HCRPC) staff will oversee the plan evaluation and revision process. Alternate staff could be from the Hall County Emergency Management Agency.
2. To assist with the monitoring of the plan, as a recommended project is completed, a detailed timeline of how that project was completed will be written and attached to the plan in a format selected by HCRPC staff. Items to be included will be: timelines, agencies involved, area(s) benefited, total funding (if complete), etc.
3. At the discretion of the HCRPC, a local task force may be used to review the original draft of the mitigation plan and to recommend changes.
4. The persons overseeing the evaluation process will review the goals and objectives of the previous plan and evaluate them to see that they are still pertinent and current. Among other questions, they may want to ask themselves:
    - Do the goals and objective address current and expected conditions?
    - If any of the recommended projects have been completed, did they have the desired impact on the goal for which they were identified? If not, what was the reason it was not successful (lack of funds/resources, lack of political/popular support, underestimation of the amount of time needed, etc.)?
    - Have the nature, magnitude, and/or type of risks changed?
    - Have there been implementation problems?
    - Are current resources appropriate to implement the plan?
    - Were the outcomes as expected?
    - Are there other agencies which should be included in the revision process?
5. Any projects that have been completed since the previous plan will be noted in a "Previous Mitigation Projects" section and removed from further consideration for new projects.
6. If no further action has been made on the recommended projects of the previous version of the plan, HCRPC staff will document this fact.
7. Before incorporating the changes to the plan that are identified as necessary as a part of the monitoring and evaluating portions, the public will be invited to comment through the same process used in the development of the original plan: public notification through newspaper article/public notice, public meetings, and by letter of invitation to relevant stakeholders.
8. At its discretion, the HCRPC may opt to use the plan evaluation, update, and revision worksheets given in this plan in **Appendix B.**

For future reviews, the following <u>minimum</u> procedures must be followed:

Task A: Evaluate the effectiveness of the planning process.

1. Reconvene a Planning Team
2. Review your Planning Process
   Items to Discuss:
    a. Building the Planning Team
    b. Engaging the Public
    c. Data Gathering and Analysis
    d. Coordinating with other Agencies

Task B: Evaluate the effectiveness of your actions.

1. What were the results of the implemented action? Did the results achieve the goals/objectives outlined in the plan? Did the actions have the intended results?
2. Were the actions cost-effective? Did (or would) the project result in the reduction of potential losses?
3. Document actions that were slow to get started or not implemented

Task C: Determine why the actions worked (or did not work)

1. Lack of available resources
2. The political or popular support for or against the action
3. The availability of funds
4. The workloads of the responsible parties
5. The actual time necessary to implement the actions

Incorporation into Existing Planning Mechanisms

There is a lack of regional planning documents into which this countywide plan could be incorporated. At the discretion of the participating communities, this plan could be incorporated into the comprehensive plans of these communities. This would ensure that the mitigation component of the comprehensive plan would be consistently revisited and reviewed. However, care must taken so that this mitigation plan is reviewed and updated every five years.

Upon the local adoption of the mitigation plan, each participating community will make sure that it adopts, and is enforcing, the minimum standards established in the building code used in the State of Nebraska in the manner required by the State of Nebraska. This is to ensure that life/safety criteria are met for new construction.

Any capital improvement planning that occurs in the future will also contribute to the goals in this hazard mitigation plan. This is another item which may be administered at the local level and is not necessarily overseen by the County. However, the County may be able to work with capital improvement planners to secure high-hazard areas for low risk uses.

Appendix A
Corps of Engineers Structural Inventory

APPENDIX B – SAMPLE PLAN UPDATE WORKSHEETS

Worksheet # 1: Progress Report

Progress Report Period: _____ (Date) to _____ (Date)

Project Title: _____ Project ID#: _____

Responsible Agency: _____

Address: _____

City/County: _____

Contact Person: _____ Title: _____

Phone #(s): _____ e-mail address: _____

List Supporting Agencies and Contacts: _____

_____

Total Project Cost: $ _____ Anticipated Cost Overrun/Under run: _____

Date of Project Approval: _____ Start date of the project: _____

Anticipated completion date: _____

Description of the Project (include a description of each phase, if applicable, and the time frame for completing each phase).

_____
_____
_____
_____
_____

Milestones	Complete	Projected Date of Completion

Plan Goal(s)/Objective(s) Addressed:

Goal: _____

Objective: _____

Indicator of Success (e.g., losses avoided as a result of the acquisition program):
In most cases, you will list losses avoided as the indicator. In cases where it is difficult to quantify the benefits in dollar amounts, you will use other indicators, such as the number of people who now know about mitigation or who are taking mitigation actions to reduce their vulnerability to hazards.

_____
_____
_____

Status *(Please checks pertinent information and provide explanations for items with an asterisk. For completed or canceled projects, see Worksheet #2 — to complete a project evaluation):*

Project Status	Project Cost Status
(1) ☐ Project on schedule	(1) ☐ Cost unchanged
(2) ☐ Project completed	(2) ☐ Cost overrun* *explain: _____ _____
(3) ☐ Project delayed* *explain: _____ _____	(3) ☐ Cost under run* *explain: _____ _____
(4) ☐ Project canceled	

Summary of progress on project for this report:

A. What was accomplished during this reporting period?

B. What obstacles, problems, or delays did you encounter, if any?

C. How was each problem resolved?

Next Steps: What is/are the next step(s) to be accomplished over the next reporting period?

Other comments:

Worksheet #2: Evaluating Your Planning Team

When gearing up for the plan evaluation, the planning team should reassess its composition and ask the following questions:

	YES	NO
Have there been local staffing changes that would warrant inviting different members to the planning team? **Comments/Proposed Action:**		
Are there organizations that have been invaluable to the planning process or to project implementation that should be represented on the planning team? **Comments/Proposed Action:**		
Are there any representatives of essential organizations who have not fully participated in the planning and implementation of actions? If so, can someone else from this organization commit to the planning team? **Comments/Proposed Action:**		
Are there procedures (e.g., signing of MOAs, commenting on submitted progress reports, distributing meeting minutes, etc.) that can be done more efficiently? **Comments/Proposed Action:**		
Are there ways to gain more diverse and widespread cooperation? **Comments/Proposed Action:**		
Are there different or additional resources (financial, technical, and human) that are now available for mitigation planning? **Comments/Proposed Action:**		

If the planning team determines the answer to any of these questions is "yes," some changes may be necessary.

Worksheet #3: Evaluate Your Project Results

Project Name and Number:

Project Budget:

Project Description:

Associated Goal and Objective (s):

Indicator of Success (e.g., losses avoided):

Insert location map

include before and after photos if appropriate

Was the action implemented?

IF YES ↓

What were the results of the implemented action?

IF NO ↓

Why not?

Was there political support for the action?	**YES**	**NO**
Were enough funds available?	**YES**	**NO**
Were workloads equitably or realistically distributed?	**YES**	**NO**
Was new information discovered about the risks or community that made implementation difficult or no longer sensible?	**YES**	**NO**
Was the estimated time of implementation reasonable?	**YES**	**NO**
Were sufficient resources (for example staff and technical assistance) available?	**YES**	**NO**

Were the outcomes as expected? **YES** **NO** **Additional comments or other outcomes:**
If No, please explain:

Did the results achieve the goal and objective (s)? **YES** **NO**
Explain how:

↓

Was the action cost-effective? **YES** **NO**
Explain how or how not:

What were the losses avoided after having completed the project?

If it was a structural project, how did it change the hazard profile?

Date _____

Prepared by: _____

Worksheet #4: Revisit Your Risk Assessment

Risk Assessment Steps	Questions	YES	NO	COMMENTS
Identify hazards	Are there new hazards that can affect your community?			
Profile hazard events	Are new historical records available?			
	Are additional maps or new hazard studies available?			
	Have chances of future events (along with their magnitude, extent, etc.) changed?			
	Have recent and future development in the community been checked for their effect on hazard areas?			
Inventory assets	Have inventories of existing structures in hazard areas been updated?			
	Are future developments foreseen and accounted for in the inventories?			
	Are there any new special high-risk populations?			
Estimate losses	Have loss estimates been updated to account for recent changes?			

If you answered "Yes" to any of the above questions, review your data and update your risk assessment information accordingly.

Worksheet #5: Revise the Plan

Prepare to update the plan.

When preparing to update the plan:	Check the box when addressed ✓
1. Gather information, including project evaluation worksheets, progress reports, studies, related plans, etc. **Comments:**	☐
2. Reconvene the planning team, making changes to the team composition as necessary (see results from *Worksheet #2*). **Comments:**	☐

Consider the results of the evaluation and new strategies for the future.

When examining the community consider:	Check the box when addressed ✓
1. The results of the planning and outreach efforts. **Comments:**	☐
2. The results of the mitigation efforts. **Comments:**	☐
3. Shifts in development trends. **Comments:**	☐
4. Areas affected by recent disasters. **Comments:**	☐
5. The recent magnitude, location, and type of the most recent hazard or disaster. **Comments:**	☐
6. New studies or technologies. **Comments:**	☐

7. Changes in local, state, or federal laws, policies, plans, priorities, or funding. ☐

8. Changes in the socioeconomic fabric of the community. ☐

Comments:

9. Other changing conditions. ☐

Comments:

Incorporate your findings into the plan.

When examining the plan: **Check the box when addressed ✓**

1. Revisit the risk assessment. ☐

Comments:

2. Update your goals and strategies. ☐

Comments:

3. Recalculate benefit-cost analyses of projects to prioritize action items. ☐

Comments:

Use the following criteria to evaluate the plan:

Criteria	**YES**	**NO**	**Solution**
Are the goals still applicable?			
Have any changes in the state or community made the goals obsolete or irrelevant?			
Do existing actions need to be reprioritized for implementation?			
Do the plan's priorities correspond with state priorities?			
Can actions be implemented with available resources?			

Comments:

APPENDIX C

Compendium of Public Meeting Documentation

APPENDIX D

Community-Specific Mitigation Planning Information

This section contains mitigation planning information specific to each participating community. Communities are listed in alphabetical order. More detailed information for each community, including: disaster history for each hazard type, structural inventory, and desired mitigation alternatives – listed in order of highest priority to lowest. Local adoption documentation is provided in **Appendix E**.

Alda

Alda 2013	Dam Failure	Earth-quake	Drought	Flood	Summer Storm	Land slide	Winter Storm	Tornado/ Wind	Wildfire	Crime/ Terror	Hazmat
Probability	Unlikely	Unlikely	Likely	Unlikely	Likely	Unlikely	Likely	Likely	Unlikely	Likely	Unlikely
Risk	Low	Low	Low	Low	Med	Low	Med	High	Med	Med	Low
Impact	0	0	2	1	4	0	4	5	1	2	1

Probability: Based on history, what is the likelihood this type of event will happen again?
- None, Low, Medium, or High

Extent – If this event were to happen, how extensive could the damage be?
- Zero, Limited, Severe, Full, or Unknown

Previous Occurrence: Is there an historic record of this type of hazard in the community?

The above table shows the input provided at the initial public meeting. Due to the geographical proximity, the following hazard types were not considered due to there being no likelihood of occurring in Nebraska: volcanic eruptions, avalanches, hurricanes, tidal surges, and tsunamis.

In the following sections, only the hazard types which have a significant likelihood of occurring or have a reason to potentially occur are listed. These types are: severe weather (summer and winter), tornado, flood, and drought. Although there is a small risk for earthquakes, wildfires, and landslides, the threat and associated risk for these hazards is not high enough and there are no realistic or feasible mitigation action which can be taken to reduce the level of risk. The only dam failure which has any potential of impacting Alda is Kingsley Dam, which holds back Lake McConaughy in western Nebraska. The breach route inundation maps for Kingsley Dam show that Alda would not be inundated in the unlikely event that this dam fails; therefore, dam failure is not further considered for Alda. The National Climatic Data Center lists no records of wildfire for Hall County. Additionally, the citizens did not rank these hazards high enough to warrant detailed discussion in this plan. This may change in future updates.

Disaster History

Because of its proximity between the larger communities of Wood River and Grand Island, the Village of Alda is often lost in the details of hazard events reporting. Since natural hazards are where people and weather interact, it should be expected that the larger communities will have more events recorded. This means that even if there are damaging hazard events, if damage occurred in the larger communities, it will be reported as happening there while there may be no reports for Alda.

Flood

The National Weather Service's Advanced Hydrologic Prediction Service gives the following flood categories for Wood River at the Alda gage and their impacts:

Major Flood Stage	12.2 feet	Record flooding, Highway 30 upstream of gage site acts as a constriction to flood crests
Moderate Flood Stage	11 feet	The left bank (north side) overflows, water floods lowlands and county roads
Flood Stage	10 feet	Minor lowland flooding occurs in pastures and farmlands
Action Stage	9 feet	

Torrential rainfall of 5 to 11 inches on May 11 and 12, 2005, led to widespread flash flooding throughout Hall County. This event was declared a federal disaster area by President Bush. Wood River near Alda, which had been dry for three years, tied a record with a crest of 12.2 feet early on the 12th. Records also indicate that Wood River flooded in 1967, 1968, and 1969, although no damage estimates are available – if there was any. Flood crest data indicates that the June 1968 flood was 11.7 feet and the March 1969 event was 12 feet. The National Climatic Data Center reported a flood event for Alda on February 20, 2007. No additional information was available – including no description of the event or damage estimate.

Severe Weather

On July 29, 1996, 1¾-inch diameter hail caused $2,000 in property damage and $20,000 in crop damage around town. On June 15, 1997, golf ball-sized up to tennis ball-sized hail propelled by 60 mph winds severely damaged wide areas of western Hall County. Crop and tree damage was extensive. In Alda, the magnitude of the hail was one inch, property damage was estimated at $150,000, and area crop damage was set at $1 million. On May 21, 1998, 2-inch hail caused $15,000 in property damage and an estimated $250,000 in crop damage. On May 21, 2004, 1¾-inch caused $25,000 in property damage. On June 16, 2006, thunderstorm winds of 57 mph caused property and crop damage two miles north of Alda.

On the severe winter weather side, Alda was without power as a result of the New Years Ice Storm, which hit in late December, 2006.

Tornado

There are no records which indicate that Alda has been directly impacted by a tornado in its history.

Drought

NCDC reports three drought events since 1950 for Hall County: in 2000, 2002 and 2012. Both of these droughts appear to have been agricultural droughts with the most impact to growing crops. Although Alda is situated in an area which has been directly impacted by a drought, there are no indications that the Village has ever been materially impacted by a drought.

Likelihood of Future Hazard Events

It is certain that Alda will continue to be impacted by severe weather – perhaps as often as each year. In these events, it should be expected to witness large hail, high winds, and intense rain in the summer, and large snowfalls, ice, and bitter windchills in the winter. It is less likely – but still possible – that Alda will be impacted by flooding from Wood River or by intense warm season rain events. It is also less likely, but possible, that Alda will be impacted by a tornado.

Past Hazard Mitigation Efforts

The Village of Alda participates and is in good standing in the National Flood Insurance Program (NFIP). The initial identification for Alda's floodplain map was completed on June 25, 1976 with the Village participation in the NFIP becoming effective on June 20, 1978. The floodplain map was rescinded on August 4, 1987, which means that it was later determined that the low level of flood risk did not warrant the administrative cost to maintain the maps by the Federal Emergency Management Agency. Flood mapping for insurance rating purposes has been completed by FEMA and included with the package of maps available for Hall County (Map Number 31079C) effective September 26, 2008. Alda continues to participate as is in good standing in the National Flood Insurance Program.

As defined by FEMA's repetitive loss list, there are no repetitive flood loss properties in Alda.

Vulnerability Assessment

According to an assessment completed by the Nebraska Department of Natural Resources in March of 2013, there are 303 total structures in Alda. **Figure 1** shows the structures broken out by type, and the count is:

259 residences
26 businesses
14 (at least) out buildings large enough to be seen on aerial photographs
3 publicly-owned structures: the municipal building and school
1 church/non-profit buildings

According to the Nebraska Department of Property Assessment and Taxation, the total assessed taxable value for Alda in 2013 was $23,179,164. Broken out by significant property types, this is:

Residential real property:	$	13,376,114	(57.7%)
Commercial real property:	$	3,732,122	(16.1%)
Agricultural Land and homes/outbuildings:	$	-0-	(0.0%)
Commercial/Industrial personal property:	$	1,194,596	(5.2%)
Public service corporation real and personal:	$	101,336	(0.4%)
Railroad real and personal property:	$	1,217,490	(5.3%)
Industrial real property:	$	3,557,506	(15.3%)
Agricultural personal property:	$	-0-	(0.0%)
Recreational real property:	$	-0-	(.00%)

The entire structure stock is vulnerable to the severe weather, tornado, and drought hazard. This means that, as of 2013, there is $23,179,164 in at-risk assets for these hazard types.

In the structural inventory completed by the Corps of Engineers, seven properties were found to be located in a regulated floodplain in Alda's extraterritorial zoning jurisdiction. NDNR's inventory in the corporate limits found no properties in a regulated floodplain. The valuation of the seven floodplain properties found by the Corps of Engineers is $579,479, or 2.5% of the total valuation of Alda and its zoning jurisdiction.

Figure 2 shows the critical facilities, as identified by the Village and supplemented with various federal databases. Critical facilities are those structures which will be essential for returning the Village functions to normal after a disaster ("Civic") and are vital for disaster response and sheltering ("Shelter"). Critical facilities can also be economic ("Financial") because the loss of a major employer or the loss of the Village's main source(s) of revenue will greatly hinder recovery. The critical facilities identified are:

Civic: Village Hall/Community Center, fire hall
Sheltering: Alda Public School, United Methodist Church

Critical facilities in a floodplain: None

Figure 3 shows the potential ranges of the tornado warning sirens in Alda, with the yellow shading being a half-mile from the siren and red one mile from the siren. As shown by the figure, the entire development in the Alda corporate limits is in the yellow shaded area. It must be recognized, however, that these are outdoor warning sirens which are designed to alert residents who are outside and in close proximity to the sirens. They are not designed to warn persons indoors at-distance, traveling in vehicles, or in noisy environments. In addition, a warning system works best if there are operational redundancies – meaning that it is always safer to have additional sirens in a network in case a siren malfunctions or is destroyed. An additional consideration is that periods during which warning sirens are needed are often noisy in themselves with high wind, intense rain, and hail which all act to reduce peoples' ability to hear the sirens. It is easier to hear a warning for people who are downwind of the siren.

Figure 4 shows the areas of new development which is most likely to occur in the next five to ten years. No new development area is shown because the Village is currently landlocked by agricultural uses with no foreseeable plans for this to change. The vulnerability of all development for severe winter storms, severe summer storms, and tornadoes is the same now and will be the same in the future. The only hazard which is able to be modified by human behavior or activity is flooding. Since Alda is situated outside of a regulated floodplain, it is unlikely that new development will take place in a floodplain area. However, since Alda is in good standing in the National Flood Insurance Program, future development which does take place in a regulated floodplain will be completed in compliance with the Village's floodplain management ordinance.

Mitigation Alternatives

Alda's planning goals are the same as the goals for the county portion of the plan.

GOALS: 1) Reduce or prevent future damage from natural hazard events,
2) Increase public safety

To address these goals, mitigation alternatives were suggested in the public meeting and prioritized by the Alda Village Board.

Prioritization
Alda prioritized the mitigation alternatives according to the "STAPLE(E)" procedure (Social acceptability, Technical feasibility, Administrative capability of local government, Political

acceptability, Legal authority to implement, Economic justification, and Environmental acceptability). In addition, alternatives were prioritized based on the community's goals and planning objectives.
At its discretion, Alda officials may choose to not implement any of the proposed mitigation projects at this time with the realization that future events may change this stance as well as the prioritization of projects. Projects sponsored for implementation will follow a public process.

1) Maintain good standing in the National Flood Insurance Program
   Objective 1: Continue to regulate development in floodplain areas.
   Funding sources and potential cost: No funding needed, no cost.

2) Reduce impacts of stormwater problems
   Objective 2: Complete a drainage study
   - Action 2.1: Given the extremely flat topography in the area, drainage will always be a problem – especially for intense warm weather rainfall events. A drainage study is needed in Alda to help the Village make wise land use decisions, to identify where existing drainage infrastructure is weak, and to identify ways to address these weaknesses. A drainage study has the potential to also identify good flood mitigation projects which could be funded using FEMA's mitigation programs.

   Funding sources and potential cost: Central Platte NRD, Community Development Block Grant, Village – cost varies widely on scope and community size

3) Increase public safety for tornadoes
   Objective 3: Provide emergency shelter(s) to which local residents would evacuate in the event of a tornado warning, especially those who live in vulnerable housing
   - Action 3.1: Perform an assessment of existing structures to determine their capability to be used as tornado shelters
   - Action 3.2: Create public shelters by retrofitting or new construction. FEMA has retrofitted schools and constructed all-new shelters in several places in the Midwest. However, most tornadoes occur in late-afternoon to early evening when a school might be closed for the day. Furthermore, it has been reported that public tornado shelters that are left open to the public are not used properly, with problems of vandalism and use by vagrants. At-risk structure types include mobile homes and slab-on-grade residential construction which has no basement.

   Funding sources and potential cost: FEMA's Pre-Disaster Mitigation program or Hazard Mitigation Grant Program – cost uncertain and highly variable by scope

4) Increase public safety by having emergency backup power capacity
   Objective 4: The New Years Ice Storm of December 2006 demonstrated that the redundancy in Nebraska's public power system is not adequate for major ice storm events. As a result of this event, several communities in central Nebraska were without power for over a week. When it became clear that getting power restored to these communities would take longer than expected, emergency power generators were brought in. Situations like this represent obvious public safety concerns from the inability to heat structures and critical facilities, inconvenience for residents, and the loss of property and contents from the spoiling of food, for example. Emergency generators could also be used in the

aftermath of other disasters to power the critical facilities being used to guide post-disaster operations.
- Action 4.1: Purchase emergency backup generators

Funding sources and potential cost: Generators are eligible under Hazard Mitigation Grant Program 5% set-aside funds. Under the Pre-Disaster Mitigation program, generators are not an eligible project unless they are a part of a tornado shelter or another part of the eligible activity.

5) Prevent the potential injury or loss of life in manufactured homes from high winds

Objective 5: Use tie downs to secure manufactured homes to a stable foundation, preventing the potential for rolling.
- Action 5.1: The Village could pass an ordinance requiring all manufactured homes or all new manufactured homes to be securely anchored to their foundations
- Action 5.2: A non-regulatory option would be to have the Village educate the owners of these properties on the availability of techniques to make their dwelling safer.

6) Reduce the need for snow clearing in Village boundary streets

Objective 6: By installing snow fences along the corporate limits on the north and west sides of the Village, some of the wind-driven snow will be trapped and will not need to be plowed away. The less snow in town, the quicker all Village residents will be able to have access to emergency treatment. Since the corporate limit boundary may be the rear of residential property, the Village would need to obtain approval from property owners. An alternative would be to acquire an easement between the corporate limits and adjacent agricultural land.
- Action 6.1: Purchase and install a snow fence.
- Action 6.2: Acquire easement on which to build a snow fence or to plant a 'living fence' of pine trees or other shelterbelt-type of tree.

Goal: 3) Increase Public Education

There are no explicit objectives or actions for this goal; however, there is an implicit action related to this goal for above actions which will require public participation. Activities for this goal are found in the County portion of this document since the likely lead or assisting agency will be the Hall County Emergency Management Agency.

Implementation

To start implementation, determining which projects should be submitted for funding will be based on a FEMA-approved cost-benefit method. This means that proposed projects would need to be reviewed for cost effectiveness with the assistance of state emergency management or floodplain management personnel. Unless otherwise delegated, the Village Clerk will be the person responsible for project administration of any project selected for implementation. FEMA has the authority to approve or deny mitigation projects applied for under their agency's mitigation programs.

Evaluation

In this plan, several potential mitigation projects are identified; however, it is not designed to have an all-inclusive list of projects. It is designed to be a living document which can be adapted to the landscape as conditions change. This means that this plan should be revised and updated as new projects are identified and prioritized and participating communities. There is a requirement to review and update this plan every five years. To do this, communities will follow the same procedure that Hall County will utilize in its mitigation plan updates, which is detailed starting on page 46 of the County portion of this report. There are also evaluation, update, and revision worksheets which have been included in this plan as **Appendix B** to assist with this process.

Cairo

Cairo 2013	Dam Failure	Earth-quake	Drought	Flood	Summer Storm	Land slide	Winter Storm	Tornado/ Wind	Wildfire	Crime/ Terror	Hazmat
Probability	Unlikely	Unlikely	Likely	Likely	Likely	Unlikely	Likely	Likely	Unlikely	Likely	Likely
Risk	Low	Low	Low	Med	High	Low	Med	High	Med	Low	Low
Impact	0	0	2	1	5	0	5	5	2	1	1

Probability: Based on history, what is the likelihood this type of event will happen again?
- None, Low, Medium, or High

Extent – If this event were to happen, how extensive could the damage be?
- Zero, Limited, Severe, Full, or Unknown

Previous Occurrence: Is there an historic record of this type of hazard in the community?

The above table shows the input provided at the initial public meeting. Due to the geographical proximity, the following hazard types were not considered due to there being no likelihood of occurring in Nebraska: volcanic eruptions, avalanches, hurricanes, tidal surges, and tsunamis.

Although there is a small risk for earthquakes, wildfires, and landslides, the threat and associated risk for these hazards is not high enough and there are no realistic or feasible mitigation action which can be taken to reduce the level of risk. According to the database of dams maintained by the Nebraska Department of Natural Resources, there are no dams upstream of Cairo; therefore, dam failure is not considered further for Cairo. The National Climatic Data Center lists no records of wildfire for Hall County. Additionally, the citizens did not rank these hazards high enough to warrant detailed discussion in this plan. This may change in future updates.

Disaster History

Severe Weather

July 22, 1995: 1¾-inch hail caused $50,000 in property damage and $2.2 million in crop damage in and east of Cairo.

July 7, 1996: 92 mph (80 knots, as recorded) wind gusts in and around Cairo caused $40,000 in property damage and $1 million in crop damage.

June 15, 1997: 70 mph winds caused $30,000 in property damage and $150,000 crop damage in and around Cairo. The same event contained large hail (¾-inch), and propelled by the high winds caused $100,000 in property damage and $1 million in crop damage in, south, and west of Cairo.

June 20, 1997: 75 mph winds caused $40,000 in property damage in town, especially related to falling trees and limbs.

May 26, 2002: Very strong winds developed northwest of Grand Island and roared at nearly 80 mph through the Village of Cairo. Windows were blown out of several cars and roofs were blown off a couple of businesses. Property damage was placed at $150,000 with an additional $100,000 in surrounding crop damage.

June 19, 2002: 12 to 15 large trees were pushed over by winds of about 60 mph.

May 4, 2003: 2¾-inch hail blown by strong winds caused and estimate $200,000 in property damage in Cairo. Severe damage was noted at the golf course and to nearby houses and vehicles.

May 10, 2005: 1¾-inch hail propelled by wind gusts over 60 mph was reported north of Cairo. Baseball sized hail was reported near Centura High School. Property damage was estimated at $100,000.

Tornado

On June 11, 1997, severe thunderstorms developed in central Nebraska and moved south. These storms dropped hail up to the size of tennis balls and produced winds up to 80 mph. Damage to crops and property extended from near Ord to near Doniphan. Brief weak tornadoes were reported near Rockville and near Doniphan. A stronger F1 tornado set down near Cairo and moved southeast. A farmhouse was severely damaged. All told, property damage for these tornadoes was placed at $750,000 with an additional $100,000 in crop damage.

Flood

The Nebraska Department of Natural Resources maintains a record of historic flood events. The only flood record which lists Cairo occurred on June 25, 1968. In this event, the only available information is that Prairie Creek crested at 9.7 feet at Highway 2 east of Cairo. The current floodplain map for Cairo also shows the Village's only regulated floodplain for Dry Creek north of Highway 2 and north of Kansas Street.

As defined by FEMA's repetitive loss list, there are no repetitive flood loss properties in Cairo.

Drought

NCDC reports three drought events since 1950 for Hall County: in 2000, 2002 and 2012. Both of these droughts appear to have been agricultural droughts with the most impact to growing crops. Although Alda is situated in an area which has been directly impacted by a drought, there are no indications that the Village has ever been materially impacted by a drought.

Likelihood of Future Hazard Events

It is certain that Cairo will continue to be impacted by severe weather – perhaps as often as each year. In these events, it should be expected to witness large hail, high winds, and intense rain in the summer, and large snowfalls, ice, and bitter windchills in the winter. Although it is certainly possible, it is less likely that Cairo will be impacted by a tornado. Given the lack of floodplain for the main population center of the town, flood damage is less likely; however, intense warm season rainfall events can cause stormwater-related problems due to the flat topography of the area.

Past Hazard Mitigation Efforts

The Village of Cairo participates and is in good standing in the National Flood Insurance Program (NFIP). The initial identification for Cairo's floodplain map was completed on May 24, 1974. The Village became eligible for the Emergency Phase of the NFIP on July 24, 1975 and received its first map on December 12, 1975. The Village entered the Regular Phase of the NFIP on June 20, 1978. Revised flood mapping for insurance rating purposes has been completed by FEMA and included with the package of maps available for Hall County (Map Number 31079C)

effective September 26, 2008. A new outdoor warning siren was installed in downtown Cairo in 2010.

Vulnerability Assessment

According to an assessment completed by the Nebraska Department of Natural Resources in March of 2013, there are 375 total structures in Cairo. **Figure 1** shows the structures broken out by type, and the count is:

322 residences
30 businesses
14 (at least) out buildings large enough to be seen on aerial photographs
5 publicly-owned structures: the municipal building and school
4 church/non-profit building

According to the Nebraska Department of Property Assessment and Taxation, the total assessed taxable value for Cairo in 2013 was $33,650,698. Broken out by significant property types, this is:

Residential real property:	$	27,301,936	(81.1%)
Commercial real property:	$	3,629,543	(10.8%)
Agricultural Land and homes/outbuildings:	$	35,499	(0.1%)
Commercial/Industrial personal property:	$	412,093	(1.2%)
Public service corporation real and personal:	$	217,178	(0.7%)
Railroad real and personal property:	$	2,054,449	(6.1%)
Industrial real property:	$	-0-	(0.0%)
Agricultural personal property:	$	-0-	(0.0%)
Recreational real property:	$	-0-	(.00%)

The entire structure stock is vulnerable to the severe weather, tornado, and drought hazard. This means that, as of 2013, there is $33,650,698 in at-risk assets for these hazard types.

In the structural inventory completed by the Corps of Engineers, 13 properties were found to be located in a regulated floodplain in Cairo's extraterritorial zoning jurisdiction. NDNR's inventory in the corporate limits found five properties in a regulated floodplain. The valuation of the 13 floodplain properties found by the Corps of Engineers is $706,665, or 2.1% of the total valuation of Cairo and its zoning jurisdiction.

Figure 2 shows the floodplain of Dry Creek, as shown on the current effective floodplain maps. Using the structural inventory from Figure 1, it can be demonstrated that there are four out buildings and one business (Centura Hills Golf Course club house). Using an average valuation for the different structure types, it is estimated that the total assets vulnerable to flooding in Cairo is:

	Average Per structure	Number	Value	Approximate Damage Value
Commercial:	$ 113,000	1	$ 113,000	$ 29,380
Out buildings:	$ 30,000	4	$ 120,000	$ 124,800
TOTAL			**$ 220,000**	**$ 154,180**

For the out buildings estimate, an average value was determined based on the quality of structure and size. For the residential and apartment estimate, the City assessed value average per-structure was used. Commercial valuation is an approximation based on the size and quality of the structure. After the total at-risk value of the structures was determined, the estimated damage value was determined by taking that value and multiplying it by 20%. Then a 30% damage to contents value was added to each figure. Both percentages are taken from the National Flood Insurance Program depth-damage curves for two-foot depth of flooding, which would be the maximum depth of flooding expected for most structures in the floodplain.

Figure 3 shows the critical facilities, as identified by the Village and supplemented with various federal databases. Critical facilities are those structures which will be essential for returning the Village functions to normal after a disaster ("Civic"), are vital for disaster response and sheltering ("Shelter"), and are essential for public health and safety ("Lifeline Utility"). Critical facilities can also be economic ("Financial") because the loss of a major employer or the loss of the Village's main source(s) of revenue will greatly hinder recovery. The critical facilities identified are:

Civic: Fire & Rescue/Village Hall building

Sheltering: Christ Lutheran Church, First Baptist Church, Cairo Community Center, Centura Public School (Howard County).

Financial: Pump & Pantry, Pathway Bank

Lifeline Utility: Water tower

Critical facilities in a floodplain: None

Figure 4 shows the potential ranges of the tornado warning sirens in Cairo, with the yellow shading being a half-mile from the siren and red one mile from the siren. As shown by the figure, the main town of Cairo is in the yellow shaded area. The development north of the golf course is approximately ¾ mile in a directly line from the siren. It must be recognized that these are outdoor warning sirens which are designed to alert residents who are outside and in close proximity to the sirens. They are not designed to warn persons indoors at-distance, traveling in vehicles, or in noisy environments. In addition, a warning system works best if there are operational redundancies – meaning that it is always safer to have additional sirens in a network in case a siren malfunctions or is destroyed. An additional consideration is that periods during which warning sirens are needed are often noisy in themselves with high wind, intense rain, and hail which all act to reduce peoples' ability to hear the sirens. It is easier to hear a warning for people who are downwind of the siren.

Figure 5 shows the areas of new development which is most likely to occur in the next five to ten years. The vulnerability of all development for severe winter storms, severe summer storms, and tornadoes is the same now and will be the same in the future. The only hazard which is able to be modified by human behavior or activity is flooding. Since the majority of Cairo is situated outside of a regulated floodplain, it is unlikely that new development will take place in a floodplain area. However, since Cairo is in good standing in the Regular Phase of the National Flood Insurance Program, future development which does take place in a regulated floodplain will be completed in compliance with the Village's floodplain management ordinance.

Mitigation Alternatives

Cairo's planning goals are the same as the goals for the county portion of the plan.

GOALS: 1) Reduce or prevent future damage from natural hazard events,
2) Increase public safety

To address these goals, mitigation alternatives were suggested in the public meeting and prioritized by the Cairo Village Board.

Prioritization
Cairo prioritized the mitigation alternatives according to the "STAPLE(E)" procedure (Social acceptability, Technical feasibility, Administrative capability of local government, Political acceptability, Legal authority to implement, Economic justification, and Environmental acceptability). In addition, alternatives were prioritized based on the community's goals and planning objectives.

At its discretion, Cairo may choose to not implement any of the proposed mitigation projects at this time with the realization that future events may change this stance as well as the prioritization of projects. Projects sponsored for implementation will follow a public process.

1) Maintain good standing in the National Flood Insurance Program
Objective 1: Continue to regulate development in floodplain areas and adopt the Hall County floodplain maps when they become effective.
Funding sources and potential cost: No funding needed, no cost.

2) Reduce impacts of stormwater problems
Objective 2: Complete a drainage study
- Action 2.1: Given the flat topography in the area, drainage will always be a problem – especially for intense warm weather rainfall events. A drainage study is needed in Alda to help the Village make wise land use decisions, to identify where existing drainage infrastructure is weak, and to identify ways to address these weaknesses. A drainage study has the potential to also identify good flood mitigation projects which could be funded using FEMA's mitigation programs.

Funding sources and potential cost: Central Platte NRD, Community Development Block Grant, Village – cost varies widely on scope and community size

3) Reduce damages caused by downed tree limbs
Objective 3: Reduce the duration or eliminate power outages from severe weather. Overhead power lines are vulnerable to collapse from icing in the cold weather months and from high winds or tree limbs falling on power lines in warm weather months.
- Action 3.1: Initiate a power line burying project.

Funding sources and potential cost: FEMA's Hazard Mitigation Grant Program or Pre-Disaster Mitigation Program could provide up to 75% of the project cost. The remaining cost might be shared with the Public Power District, Village, or property owners.

- Action 3.2: Write to the Nebraska Forest Service and request a tree inventory. An inventory is especially helpful in mitigation planning for communities which experience regular tree-related damages. An inventory can identify problem trees and recommend changes to the way a community administer a local tree management program (i.e., through a Tree Board or Park Board). Problematic areas of tree limbs with power lines could be addressed as a priority.

Funding sources and potential cost: Free

- Action 3.3: The Village Board could create a regulation requiring underground utilities for all new development.

Funding sources and potential cost: No funding needed, no cost.

4) Ensure adequate severe weather notifications to critical facilities

Objective 4: Purchasing or education of a weather radio

- Action 4.1: For Village-owned critical facilities, the Village should consider purchasing a weather radio to be used in each facility for the rapid dissemination of a severe weather warning.
- Action 4.2: If the Village has noisy manufacturing facilities which may not hear tornado sirens, the Village could inform the owners of these facilities of the option that they could purchase a weather radio.

Funding sources and potential cost: Village of Cairo, local businesses. Approximate cost about $30 per radio.

Goal: 3) Increase Public Education

There are no explicit objectives or actions for this goal; however, there is an implicit action related to this goal for above actions which will require public participation. Activities for this goal are found in the County portion of this document since the likely lead or assisting agency will be the Hall County Emergency Management Agency.

Implementation

To start implementation, determining which projects should be submitted for funding will be based on a FEMA-approved cost-benefit method. This means that proposed projects would need to be reviewed for cost effectiveness with the assistance of state emergency management or floodplain management personnel. Unless otherwise delegated, the Village Clerk will be the person responsible for project administration of any project selected for implementation. FEMA has the authority to approve or deny mitigation projects applied for under their agency's mitigation programs.

Evaluation

In this plan, several potential mitigation projects are identified; however, it is not designed to have an all-inclusive list of projects. It is designed to be a living document which can be adapted to the landscape as conditions change. This means that this plan should be revised and updated as new projects are identified and prioritized and participating communities. There is a requirement to review and update this plan every five years. To do this, communities will follow the same procedure that Hall County will utilize in its mitigation plan updates, which is detailed

starting on page 46 of the County portion of this report. There are also evaluation, update, and revision worksheets which have been included in this plan as **Appendix B** to assist with this process.

Doniphan

Doniphan 2013	Dam Failure	Earth-quake	Drought	Flood	Summer Storm	Land slide	Winter Storm	Tornado/ Wind	Wildfire	Crime/ Terror	Hazmat
Probability	Unlikely	Unlikely	Likely	Unlikely	Likely	Unlikely	Likely	Likely	Unlikely	Likely	Unlikely
Risk	Low	Low	Low	Low	High	Low	Med	High	Low	Low	Low
Impact	0	0	2	1	5	0	5	5	2	3	0

Probability: Based on history, what is the likelihood this type of event will happen again?
- None, Low, Medium, or High

Extent – If this event were to happen, how extensive could the damage be?
- Zero, Limited, Severe, Full, or Unknown

Previous Occurrence: Is there an historic record of this type of hazard in the community?

The above table shows the input provided at the initial public meeting. Due to the geographical proximity, the following hazard types were not considered due to there being no likelihood of occurring in Nebraska: volcanic eruptions, avalanches, hurricanes, tidal surges, and tsunamis.

In the following sections, only the hazard types which have a significant likelihood of occurring or have a reason to potentially occur are listed. These types are: severe weather (summer and winter), tornado, flood, and drought. Doniphan is situated at the drainage divide for the Platte River and Blue River systems; therefore, there are no upstream dams which could fail and impact the Village. Although there is a small risk for earthquakes, wildfires, and landslides, the threat and associated risk for these hazards is not high enough and there are no realistic or feasible mitigation action which can be taken to reduce the level of risk. The National Climatic Data Center lists no records of wildfire for Hall County. Additionally, the citizens did not rank these hazards high enough to warrant detailed discussion in this plan. This may change in future updates.

Disaster History

Flood

There is no floodplain in Doniphan given its location on a drainage divide between major Nebraska river systems. The only concerns for flooding would be from stormwater problems caused by intense rain events.

As defined by FEMA's repetitive loss list, there are no repetitive flood loss properties in Doniphan.

Severe Weather

May 16, 1996: Winds of 55 mph caused $1000 in undisclosed property damage.
June 21, 1996: Hail of ¾ inch diameter caused $5000 in property damage in Doniphan.
August 17, 1999: Severe thunderstorms packing high winds and some hail ripped across Hall County. Most of the region received 2-3 inches of rain in less than one hour. Intense

straight-line winds over 65 mph damaged homes five miles west of Doniphan, tossing grain bins and out buildings like toys.

May 7, 2000: Walnut sized hail (1½ inch) fell near Doniphan.

May 5, 2002: Severe thunderstorms produced large hail of up to 2¾ inch diameter, causing significant and widespread damage from Doniphan to east of Grand Island. Dozens of roofs and windows were heavily damaged just west of Doniphan as tennis ball sized hail lasted ten minutes. Total property damage from this event was estimated at $1 million.

March 30, 2006: Walnut sized hail blown by 75 mph wind gusts was reported northeast of Doniphan.

April 6, 2006: Hail of up to 1 inch diameter was blown by 65 mph winds northeast of Doniphan

May 23, 2006: 1-inch hail fell in Doniphan, and the same storm brought 80 mph winds

December 30, 2006: The "New Years Ice Storm" left thousands without power. As a result of this event, the Village hooked up a generator to the Village's Maintenance Shop and offered people without electricity a place to congregate, stay warm, and eat.

Tornado

No tornadoes have been found to have directly-impacted Doniphan; however, tornadoes are common in Hall County, and they have been seen near Doniphan.

June 11, 1997: An outbreak of weak F0 tornadoes in Hall County caused $50,000 in crop damage from Ord to near Doniphan. The closest one to Doniphan was 4 miles north of town.

October 29, 2000: A funnel cloud spotted one mile north of Doniphan was a part of a system which spawned an F3 tornado that destroyed farmsteads in Merrick and Nance County.

Drought

NCDC reports three drought events since 1950 for Hall County: in 2000, 2002 and 2012. Both of these droughts appear to have been agricultural droughts with the most impact to growing crops. Although Doniphan is situated in an area which has been directly impacted by a drought, there are no indications that the Village has ever been materially impacted by a drought.

Likelihood of Future Hazard Events

It is certain that Doniphan will be impacted by severe weather – perhaps as often as each year. In these events, it should be expected to witness large hail, high winds, and intense rain in the summer, and large snowfalls, ice, and bitter windchills in the winter. Although it is certainly possible, it is less likely that Doniphan will be directly impacted by a tornado.

Past Hazard Mitigation Efforts

The Village of Doniphan participates and is in good standing in the National Flood Insurance Program (NFIP). The initial floodplain map for Doniphan went effective on January 24, 1975 and the Village joined the Emergency Phase of the NFIP on January 14, 1976. Participation in the Regular Phase of the NFIP occurred on August 8, 1978. Doniphan's floodplain map was rescinded on August 4, 1987, which means that it was later determined that the low level of flood risk did warrant the administrative cost to maintain the maps by the Federal Emergency Management Agency. Flood mapping for insurance rating purposes has been completed by FEMA and included with the package of maps available for Hall County (Map Number 31079C) effective September 26, 2008. Doniphan continues to participate as is in good standing in the National Flood Insurance Program. These maps show an area of floodplain which enters town

from the southwest at Pine Street and Highway 281, then turns north to flow just west of 6th Street, then north between the Caterpillar plant and the residential development before continuing north to the Platte River.

Doniphan has also been a Tree City USA community since 1995.

Vulnerability Assessment

According to an assessment completed by the Nebraska Department of Natural Resources in March of 2013, there are 348 total structures in Doniphan. **Figure 1** shows the structures broken out by type, and the count is:

294 residences
34 businesses
9 (at least) out buildings large enough to be seen on aerial photographs
8 publicly-owned structures, including the municipal building, school, library
3 church or non-profit buildings

According to the Nebraska Department of Property Assessment and Taxation, the total assessed taxable value for Doniphan in 2013 was $39,237,524. Broken out by significant property types, this is:

Residential real property:	$	28,490,948	(72.6%)
Commercial real property:	$	6,551,223	(16.7%)
Agricultural Land and homes/outbuildings:	$	-0-	(0.0%)
Commercial/Industrial personal property:	$	1,821,936	(4.6%)
Public service corporation real and personal:	$	504,660	(1.3%)
Railroad real and personal property:	$	-0-	(0.0%)
Industrial real property:	$	1,868,757	(4.8%)
Agricultural personal property:	$	-0-	(0.0%)
Recreational real property:	$	-0-	(0.0%)

The entire structure stock is vulnerable to the severe weather, tornado, and drought hazard. This means that, as of 2013, there is $39,237,524in at-risk assets for these hazard types.

In the structural inventory completed by the Corps of Engineers, zero properties were found to be located in a regulated floodplain in Doniphan's extraterritorial zoning jurisdiction. NDNR's inventory in the corporate limits found no properties in a regulated floodplain.

Figure 2 shows the critical facilities, as identified by the Village and supplemented with various federal databases. Critical facilities are those structures which will be essential for returning the Village functions to normal after a disaster ("Civic"), are vital for disaster response and sheltering ("Shelter"), and are essential for public health and safety ("Lifeline Utility"). Critical facilities can also be economic ("Financial") because the loss of a major employer or the loss of the Village's main source(s) of revenue will greatly hinder recovery. The critical facilities identified are:

Civic: Fire & Rescue, Village Hall building, Village Maintenance Shop
Sheltering: Doniphan-Trumbull Public School, St. Ann's Catholic Church, United Methodist Church, St. Paul Lutheran Church

Financial: Prairie Winds Assisted Living Center, Nebraska Machinery
Lifeline Utility: water tower

Figure 3 shows the potential ranges of the tornado warning sirens in Doniphan, with the yellow shading being a half-mile from each siren and red one mile from each siren. As shown by the figure, the majority of current development within the Doniphan corporate limits is in the yellow shaded area. It must be recognized, however, that these are outdoor warning sirens which are designed to alert residents who are outside and in close proximity to the sirens. They are not designed to warn persons indoors at-distance, traveling in vehicles, or in noisy environments. In addition, a warning system works best if there are operational redundancies – meaning that it is always safer to have additional sirens in a network in case a siren malfunctions or is destroyed. An additional consideration is that periods during which warning sirens are needed are often noisy in themselves with high wind, intense rain, and hail which all act to reduce peoples' ability to hear the sirens. It is easier to hear a warning for people who are downwind of the siren.

Figure 4 shows the areas of new development which is most likely to occur in the next five to ten years. New residential development is already taking place in the blue highlighted area with road and sewer infrastructure in place. The two commercial areas in red are 80 acres (north) and 70 acres (west). The vulnerability of all development – existing or future – is the same now and will be the same in the future for severe winter storms, severe summer storms, and tornadoes. The only hazard which is able to be modified by human behavior or activity is flooding. However, since there is very little developable area in or near Doniphan which is in a floodplain and since Doniphan is in good standing in the Regular Phase of the National Flood Insurance Program, any future floodplain development will be completed in compliance with the Village's floodplain management ordinance.

Mitigation Alternatives

Doniphan's planning goals are the same as the goals for the county portion of the plan.

GOALS: 1) Reduce or prevent future damage from natural hazard events,
2) Increase public safety

To address these goals, mitigation alternatives were suggested in the public meeting and prioritized by the Doniphan Village Board.

Prioritization
Doniphan prioritized the mitigation alternatives according to the "STAPLE(E)" procedure (Social acceptability, Technical feasibility, Administrative capability of local government, Political acceptability, Legal authority to implement, Economic justification, and Environmental acceptability). In addition, alternatives were prioritized based on the community's goals and planning objectives.

At its discretion, Doniphan officials may choose to not implement any of the proposed mitigation projects at this time with the realization that future events may change this stance as well as the prioritization of projects. Projects sponsored for implementation will follow a public process.

1) Maintain good standing in the National Flood Insurance Program
   Objective 1: Continue to regulate development in floodplain areas and adopt the Hall County floodplain maps when they become effective.
   Funding sources and potential cost: No funding needed, no cost.

2) Identify and designate additional tornado shelters, publicize the locations of all public tornado shelters to increase public awareness – perhaps with a sign on the building.
   Objective 2: Provide emergency shelter(s) to which students or local residents would evacuate in the event of a tornado warning, especially those who live in vulnerable housing
   - Action 2.1: Create public shelters by retrofitting or new construction. FEMA has retrofitted schools and constructed all-new shelters in several places in the Midwest. However, most tornadoes occur in late-afternoon to early evening when a school might be closed for the day. Furthermore, it has been reported that public tornado shelters that are left open to the public are not used properly, with vandalism and use by vagrants as problems. At-risk structure types include mobile homes and slab-on-grade construction which has no basement.
   - Action 2.2: Consider constructing tornado shelters for vulnerable construction like manufactured home concentrations.

   Funding sources and potential cost: FEMA's Pre-Disaster Mitigation program or Hazard Mitigation Grant Program for construction only– cost varies widely based on scope and design

3) Reduce damages caused by downed tree limbs
   Objective 3: Reduce the duration or eliminate power outages from severe weather. Overhead power lines are vulnerable to collapse from icing in the cold weather months and from high winds or tree limbs falling on power lines in warm weather months.
   - Action 3.1: Initiate a power line burying project.

   Funding sources and potential cost: FEMA's Hazard Mitigation Grant Program or Pre-Disaster Mitigation Program could provide up to 75% of the project cost. The remaining cost might be shared with the Public Power District, City, or property owners.
   - Action 3.2: Write to the Nebraska Forest Service and request a tree inventory. An inventory is especially helpful in mitigation planning for communities which experience regular tree-related damages. An inventory can identify problem trees and recommend changes to the way a community administer a local tree management program (i.e., through a Tree Board or Park Board). Problematic areas of tree limbs with power lines could be addressed as a priority.

   Funding sources and potential cost: Free

4) Ensure adequate severe weather notifications to critical facilities
   Objective 4: Purchasing or education of a weather radio
   - Action 4.1: For public critical facilities, the Village should consider purchasing a weather radio to be used in each facility for the rapid dissemination of a severe weather warning.
   - Action 4.2: If the Village has noisy manufacturing facilities which may not hear tornado sirens, the Village could inform the owners of these facilities of the option that they could purchase a weather radio.

Funding sources and potential cost: Village of Doniphan, local businesses. Approximate cost about $30 per radio.

Goal: 3) Increase Public Education

There are no explicit objectives or actions for this goal; however, there is an implicit action related to this goal for above actions which will require public participation. Activities for this goal are found in the County portion of this document since the likely lead or assisting agency will be the Hall County Emergency Management Agency.

Implementation

To start implementation, determining which projects should be submitted for funding will be based on a FEMA-approved cost-benefit method. This means that proposed projects would need to be reviewed for cost effectiveness with the assistance of state emergency management or floodplain management personnel. Unless otherwise delegated, the Village Clerk will be the person responsible for project administration of any project selected for implementation. FEMA has the authority to approve or deny mitigation projects applied for under their agency's mitigation programs.

Evaluation

In this plan, several potential mitigation projects are identified; however, it is not designed to have an all-inclusive list of projects. It is designed to be a living document which can be adapted to the landscape as conditions change. This means that this plan should be revised and updated as new projects are identified and prioritized and participating communities. There is a requirement to review and update this plan every five years. To do this, communities will follow the same procedure that Hall County will utilize in its mitigation plan updates, which is detailed starting on page 46 of the County portion of this report. There are also evaluation, update, and revision worksheets which have been included in this plan as **Appendix B** to assist with this process.

Grand Island

Grand Island 2013	Dam Failure	Earth-quake	Drought	Flood	Summer Storm	Land slide	Winter Storm	Tornado/ Wind	Wildfire	Crime/ Terror	Hazmat
Probability	Unlikely	Unlikely	Likely	Likely	Likely	Unlikely	Likely	Likely	Unlikely	Likely	Unlikely
Risk	Low	Low	Low	Med	High	Low	High	High	Med	Low	Med
Impact	2	0	2	3	4	0	4	5	2	3	2

Probability: Based on history, what is the likelihood this type of event will happen again?
- None, Low, Medium, or High

Extent – If this event were to happen, how extensive could the damage be?
- Zero, Limited, Severe, Full, or Unknown

Previous Occurrence: Is there an historic record of this type of hazard in the community?

The above table shows the input provided at the initial public meeting. Due to the geographical proximity, the following hazard types were not considered due to there being no likelihood of occurring in Nebraska: volcanic eruptions, avalanches, hurricanes, tidal surges, and tsunamis.

In the following sections, only the hazard types which have a significant likelihood of occurring or have a reason to potentially occur are listed. These types are: severe weather (summer and winter), tornado, flood, and drought. Although there is a small risk for earthquakes, wildfires, and landslides, the threat and associated risk for these hazards is not high enough and there are no realistic or feasible mitigation action which can be taken to reduce the level of risk. The National Climatic Data Center lists no records of wildfire for Hall County. Additionally, the citizens did not rank these hazards high enough to warrant detailed discussion in this plan. This may change in future updates.

Disaster History

Flood

On June 20, 1947, Wood River came up and flooded Stolley State Park. Water was over Highway 2 for one mile. Damage was estimated at $5,000.

On June 10, 1949, $219,000 was caused by Wood River flooding. Woodland and Riverside golf courses recorded significant damage.

The most extensive flood event to impact Hall County, resulting from a long period of excessive rainfall in May and June of 1967. From June 7 to 15, more than 10 inches fell, but the main culprit for the flooding was the 3.2 inches which fell on June 13th. The Wood River crested at six feet (3.5 foot flood stage) and was flowing at 25,000 cubic feet per second. Three people were killed, 1800 buildings were flooded, and 11,000 of the City's 28,600 residents were directly impacted. Prairie Creek, Silver Creek, and Moores Creek flooded 62 residences and 7 businesses on the north side of the City. Total damage in Grand Island was set at $6.25 million ($38.2 million in 2006 dollars). This flood event was a part of the larger Platte River valley

flood, which saw total damage at $49,309,015 – of which $40.8 million was private damage ($23 million agricultural damage, $12 million transportation damage, and $5 million classified as "urban" damage), and $8.5 million was public damage.

On May 11 and 12, 2005, 7.21 inches of rain fell in a 24-hour period with 7.16 inches of the total falling from 4pm on the 11th to 4am on the 12th. These rainfall totals eclipsed the previous 25-hour rainfall record of 5.88 inches and the previous 12-hour rainfall record of 5.65 inches. Officials from the High Plains Regional Climate Center claimed that this intense rain event was equal to a 100-year storm. An incredible 6.38 inches of rain fell in the six-hour period from 7pm to 1 am. Thirty-six homes were evacuated in Grand Island as flooding was rampant over the west and north part of the city. The city's sewer system handled about 75 million gallons of water, or about 6 times the normal amount during the storm. Many parts of the business and residential districts sustained flood damage as the Prairie, Silver, and Moores Creeks flooded. On the southern end of town, the newly-completed Wood River Diversion project prevented the vast majority of the damage. Without the project, it was estimated that the extent of the 2005 flood would have equaled the 1967 flood.

On July 10, 2006, afternoon and evening thunderstorms produced heavy rains, which caused urban flooding. Property damage was estimated at $20,000.

On July 29, 2007, thunderstorms 5.07 inches of rain on Grand Island. This caused flooding in the northwest part of Grand Island with total property damage set at $75,000.

On August 22, 2007, flooding on the south side of town washed a car off the road into a ditch. In addition to the heavy rain, 80 mph wind gusts, hail, and brief small tornadoes occurred in south central Nebraska. Damage estimate for Grand Island was placed at $50,000.

June 2008 Flood from above

As defined by FEMA's repetitive loss list, there are two repetitive flood loss properties with Grand Island addresses although one of those addresses does not appear to be a valid Grand Island address.

Severe Weather

There have been so many instances of severe weather events impacting Grand Island that only the ones with significant damage or unusual weather phenomena are listed below.

August 5, 1995: 80 mph winds caused $100,000 in undisclosed property damage. Hail of 2 inches in diameter also caused more than $1.5 million in property damage.

June 20, 1997: A thunderstorm developed north of Kearney and moved east through Grand Island. Strong winds, over 75 mph, caused property damage in the area set at $40,000.

July 7, 1997: 1-inch hail along with very heavy rain and high winds caused $150,000 in damage.

August 21, 1997: 1-inch hail broke windows and damage numerous cars. Damage: $100,000.

August 15, 1999: Severe thunderstorms early in the evening left a narrow path of wind damage from south of Kearney to the Grand Island area. Wind gusts of 60 to 80 mph damaged buildings, trees and downed several power lines. In Grand Island, a couple of garages were

damaged, trees uprooted and about 5,000 people were left without electricity for a short time. Total property damage was estimated at $50,000.

April 22, 2001: a microburst near the mall in Grand Island damaged several trees, signs and knocked over one light post. Damage was estimated at $10,000.

May 5, 2002: 3-inch hail devastated an area from Doniphan to east of Grand Island. Total property damage was established as $2 million; however, it is unclear how much of that damage occurred in Grand Island.

June 19, 2002: 70 mph winds tore the roof off the gymnasium at the R-1 school five miles north of Grand Island. Damage estimate: $16,000.

May 4, 2003: Golf ball sized hail in Grand Island caused $250,000 in property damage.

May 13, 2003: Severe thunderstorms formed northwest of Grand Island during the afternoon and evening hours. A sign was destroyed, minor tree damage was reported, and some small sheds were damaged. Damage estimate: $100,000.

April 18, 2004: 60 mph winds broke a light pole at an auto dealership and damaged four vehicles as it fell to the ground. Damage to the vehicles along was estimated at $14,000.

May 16, 2004: 70 mph winds caused $30,000 to trees and power infrastructure.

May 21, 2004: Golf ball sized hail in Grand Island caused $25,000 damage.

May 10, 2005: 70 mph winds near the airport destroyed a construction trailer. Minor damage was reported southeast of town. Damage: $25,000. 1¾ inch hail caused an additional $100,000 in property damage.

May 11/12, 2005: In addition to the intense rain and flooding, the severe storms also brought large hail driven by high winds. Officials estimated that 2800 homes and businesses had damage in Grand Island.

June 15, 2006: There were numerous reports of trees down blocking roads and knocking out power. Some of the trees fell on homes. Damage: $20,000.

June 24, 2006: Penny to golf ball sized hail fell in and around Grand Island, causing $30,000 in property damage.

Tornado

Grand Island has the unfortunate distinction of having been hit with one of Nebraska's worst tornado outbreaks. The outbreak took place on June 3, 1980, and the twisters devastated entire sections of Grand Island – especially the City's northwest and north central residential areas, as well as the southern business district. Depending on the accounts, between 5 and 15 tornadoes between 7:45pm on the 3rd to 1:30am on the 4th. The National Climatic Data Center reports 13 tornadoes with four of them rated as F1, three as F2, three as F3, and three as F4. The tornadoes killed five people, injured more than 400, and caused $300 million in damage. The destruction covered more than 150 city blocks, including losses to 357 homes, 33 mobile homes, 85 apartments, and 49 businesses. This event has been turned into book and a television movie (*"Night of the Twisters"*), and was studied by a special team of research scientists, including Professor T. Theodore Fujita himself. This tornado outbreak captivated scientists because the storm included both cyclonic and anticyclonic tornadoes.

On August 5, 1995, an F0 tornado came within five miles west of Grand Island.

On August 4, 1996, a severe thunderstorm produced a brief tornado touchdown southwest of Grand Island. Funnel clouds were also observed just south and east of town.

On May 13, 2003, funnel clouds were reported in the Grand Island area, but no tornado was confirmed.

Drought

NCDC reports three drought events since 1950 for Hall County: in 2000, 2002 and 2012. Both of these droughts appear to have been agricultural droughts with the most impact to growing crops. Although Grand Island is situated in an area which has been directly impacted by a drought, there are no indications that the City has ever been materially impacted by a drought.

Drought 2012 Information from above

Likelihood of Future Hazard Events

It is certain that Grand Island will be impacted by severe weather – perhaps as often as each year. In these events, it should be expected to witness large hail, high winds, and intense rain in the summer, and large snowfalls, ice, and bitter windchills in the winter. Although it is certainly possible, it is less likely that Grand Island will be directly impacted by a tornado.

Past Hazard Mitigation Efforts

National Flood Insurance Program

The City of Grand Island participates and is in good standing in the National Flood Insurance Program (NFIP). The initial identification for the floodplain map for Grand Island was completed on April 5, 1974 and the City became eligible for the Emergency Phase of the NFIP on March 14, 1975. Flood Hazard Boundary Map revisions were incorporated onto the map dated September 3, 1976. The boundary map was converted to a Flood Insurance Rate Map on March 2, 1983, which was also the date that Grand Island became eligible for the Regular Phase of the NFIIP. Revised flood mapping for insurance rating purposes has been completed by FEMA and included with the package of maps available for Hall County (Map Number 31079C) effective September 26, 2008 this package contains all of the updates due to the Wood River Diversion Project. Wood River Diversion

The Wood River Flood Control Project was dedicated in spring of 2004. The 300-foot wide diversion channel diverts excess water from the Wood River and Warm Slough to the east and into the Platte River. This project provides flood control protection for 1500 homes and businesses. The project was tested by the May 11 and 12, 2005, flood event, when 7.21 inches of rain fell in a 24-hour period. From a hydrological standpoint, this event would have resulted in a flood similar to the devastating 1967 flood; however, the Project functioned as designed, and flood damages were minimal for the protected area. The Central Platte Natural Resources District estimated that the $17 million project paid for itself in this event, less than one year after dedication. The project was sponsored by CPNRD and was funded 42.5% by CPNRD, 35% by City of Grand Island, 11.25% Hall County, and 11.25% Merrick County. The project was constructed by the US Army Corps of Engineers, and the Natural Resources Development Fund (administered by the Nebraska Department of Natural Resources) provided the 60% of the non-federal share of the planning.

Prairie/Silver/Moores Creek Flood Control Project

In May of 2000, the CPNRD and City of Grand Island contracted out to perform a detailed hydrologic analysis of northern and western Grand Island. The analysis also included an evaluation of options for reducing flood damages and to present a preferred alternative. An engineering firm was selected in September of 2005 to provide engineering services for the design and oversight of the flood control project. The flood control project is designed in three phases, expecting to be completed in 2017. Construction of Phase 1 began in January of 2007.

The phases are:

Phase 1 – Silver Creek Low Land Stormwater Detention Cells

The first phase of the project is the construction of four large floodwater detention cells along the Silver Creek channel with a total excavation near 4.5 million cubic yards of earth. The cell design includes the lowering and re-grading of Silver Creek for more then two miles. The detention cells will detain stormwater runoff in excess of the 2-year storm. A 3' x 3' concrete box culvert will be used as the outlet and will release the water from the cells at a rate equal to the 2-year storm. A second 3' x 6' gated box culvert will be used for rapid draw down of the cells. A berm is being placed around the cells, approximately 2 foot above existing ground, to provide sufficient capacity to detain runoff from the 100-year storm with a 1-foot freeboard.

Phase 2 – Basin Divide and Silver/Moores Creek Diversion Channel

A diversion channel that will connect Silver Creek to Moores Creek and a levee that will prevent flood water from flowing from one basin the adjacent basin. The stormwater released from the cells when combined with runoff excess, flows from the Prairie Creek and will cause flooding within the city of Grand Island. This levee will be designed to meet the requirements set forth by FEMA. A diversion channel will be constructed to divert water from Silver Creek to the Moores Creek floodway.

Phase 3 – Upland Dams and Prairie/Silver Creek Channel

A series of upland detention dams and an overflow channel from Prairie Creek to Silver Creek. The exact locations of the detention sites will be finalized in the final design phase of this project. Several sites are available and will be evaluated after geological investigations have been completed. The channel between Prairie and Silver Creek will serve to carry excess flows from Prairie Creek to Silver Creek.

Floodplain Buyouts

The City of Grand Island has acquired and demolished two floodprone properties near the Platte Generating Station.

Prairie Creek Clearing

Although the Prairie Creek Flood Control Project had a local effect, damages could be reduced on Prairie Creek by keeping the channel clear. Projects have been completed from the mouth of Prairie Creek in Merrick County to the Hall-Buffalo county line. Annual maintenance cost to CPNRD is $10,000.

Moores Creek Flood Control Project

Project sponsors of the feasibility study for the flood control on Moores Creek include CPNRD, the City of Grand Island, Merrick County and Hall County. The three-phase project consisted of

channel improvements, construction of three detention/retention and wildlife habitat enhancement cells, and construction of waterways and bridges to enable storm runoff. Annual maintenance cost is estimated at $20,000.

Emergency Snow Route

Grand Island has instituted emergency snow routes, which allows the City to remove the snow more quickly and efficiently following a significant snow event. This improves public safety since access to medical care is often needed more frequently as a result of the snowfall. The snow removal plan and maps are available in the local telephone book and online at the City's website.

Tree City USA

Grand Island has been a Tree City USA community since 1987. Being a Tree City USA allows a community to reduce its exposure to falling trees and limbs from high wind, tornado, and ice events. Grand Island also offers a cost sharing program for homeowners who purchase the best types of trees for their boulevard areas and yards.

Vulnerability Assessment

According to the Nebraska Department of Property Assessment and Taxation, the total assessed taxable value for Grand Island in 2013 was $2,574,553,789. Broken out by significant property types, this is:

Residential real property:	$	1,486,879,074	(57.8%)
Commercial real property:	$	801,297,653	(31.1%)
Agricultural Land and homes/outbuildings:	$	7,358,151	(0.3%)
Commercial/Industrial personal property:	$	159,349,367	(6.2%)
Public service corporation real and personal:	$	21,885,061	(0.8%)
Railroad real and personal property:	$	36,874,651	(1.4%)
Industrial real property:	$	60,760,979	(2.4%)
Agricultural personal property:	$	148,853	(0.0%)
Recreational real property:	$	0	(.00%)

The entire structure stock is vulnerable to the severe weather, tornado, and drought hazard. This means that, as of 2007 there is $2,574,553,789 in at-risk assets for these hazard types.

For the flood assessment, a software program called HAZUS-MH® was used. HAZUS-MH stands for "Hazards U.S. – Multi-Hazard", and uses default census information to estimate the amount of damage from a flood. In so doing, it generates a basic estimation of the number of structures in the study area and the amount of potential damage. The printout result of the flood model is included at the end of the Grand Island report. There are important disclaimers for using this information as it is generated by computer using data that is not improved from the basic census information – these concerns are outlined below after the flood model summary.

As shown in the report, HAZUS calculates:

Number of Buildings in Grand Island:	20,396
Residential Buildings	18,808

Non-Residential Buildings 1,588

General Building Stock Damage

HAZUS estimates that about 140 buildings will be at least moderately damaged by a flood of a magnitude which inundates the modeled floodplain – this is 6.8% of the total number of buildings in the case study. Of the 140 buildings, 13 will be completely destroyed. More detailed damage figures by occupancy and by building type are given in Table 3 and Table 4 in the HAZUS report at the end of the Grand Island section.

Essential facility damage

HAZUS estimates that there are five fire stations, two hospitals, two police stations, and 25 schools in the study region. Of these 34 essential facilities, four schools are estimated to receive at least moderate damage – with two of these schools losing function.

Debris Generation

HAZUS estimates that 4,337 tons of debris will be generated by a flood. Of this amount, "Finishes" (defined as dry wall, insulation, etc) comprised 81% of the total while "Structural" (wood, brick, etc) comprised 6% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 173 truckloads (at 25 tons/truck) to remove the debris generated by the flood.

Shelter Requirements

HAZUS estimates that 2,359 households will be displaced by the flood. Of these, 6,158 people will seek temporary shelter in public shelters.

Economic Loss

The total economic loss for the flood is $76.61 million, which represents 8.72% of the total replacement value of the buildings in the scenario. The building losses are broken into direct building losses and business interruption losses. HAZUS calculates that direct building losses to be $73.25 million while the remaining $3.36 million is for business interruption. Of the $73.25 million on direct building losses, $20.24 million is for residential and $44.10 million is for commercial as the two largest categories (see Table 6 of printout).

Corps of Engineers Structural Inventory

In the structural inventory completed by the Corps of Engineers, 1045 properties were found to be located in a regulated floodplain in Grand Island's extraterritorial zoning jurisdiction. Of these, 88 were in a Zone A, 42 in a floodway, and 915 in Zone AE. The valuation of these 1045 floodplain properties found by the Corps of Engineers is $133,876,797, or 5.2% of the total valuation of Grand Island and its zoning jurisdiction.

Figure 1 shows the Grand Island census tracts in Hall County which were used in the flood assessment. **Figure 2** shows the floodplain which HAZUS automatically models as a part of its assessment – the darker the shade of blue, the deeper the modeled floodplain.

HAZUS report disclaimers: As shown on HAZUS Figure 2, the Wood River Diversion is not shown as eliminating the floodplain on the south end of town. The above analysis was

completed using default data, which uses statistical averages for variables across census tracts. Also, there are uncertainties inherent in any loss estimation technique. Therefore, there may be a significant difference between modeled results contained in this report and the actual social and economic losses following a flood. More precise results could be completed by inputting user-defined values for the census tracts or the analysis could be run by census blocks, which would reduce – but not eliminate – the estimates used in the model.

Figure 3 shows the critical facilities, as identified by the City. Critical facilities are those structures which will be essential for returning the Village functions to normal after a disaster ("Civic"), are vital for disaster response and sheltering ("Shelter"), and are essential for public health and safety ("Lifeline Utility"). In Grand Island, the 90 critical facilities identified are:

52 emergency shelters
24 schools
5 fire stations
2 police stations
2 medical facilities
1 hospital
1 power plant
1 treatment plant
1 airport
1 bus terminal

The Corps of Engineers structural inventory found the following critical facilities in the floodplain:

Cedar Hollow Public School
Veterans Administration Medical Center
Berean Bible Church
Grand Island Wastewater Treatment Plant
Grand Island Senior High School
Seventh Day Adventist Church
First United Methodist Church
Community Bible Church
Church of Christ
Platte Generation Station

Figure 4 shows the potential ranges of the tornado warning sirens in Grand Island, with the yellow shading being a half-mile from each siren and red one mile from each siren. As shown by the figure, the majority of current development within the Grand Island corporate limits is in the yellow shaded area. It must be recognized, however, that these are outdoor warning sirens which are designed to alert residents who are outside and in close proximity to the sirens. They are not designed to warn persons indoors at-distance, traveling in vehicles, or in noisy environments. In addition, a warning system works best if there are operational redundancies – meaning that it is always safer to have additional sirens in a network in case a siren malfunctions or is destroyed. An additional consideration is that periods during which warning sirens are needed are often noisy in themselves with high wind, intense rain, and hail which all act to

reduce peoples' ability to hear the sirens. It is easier to hear a warning for people who are downwind of the siren.

Figure 5 is an aerial photography of the Grand Island area meant to show the community. New development areas are currently in-filling currently undeveloped areas, especially in the red box residential development currently taking place in the northwest portion of the city. The vulnerability of all development – existing or future – is the same now and will be the same in the future for severe winter storms, severe summer storms, and tornadoes. The only hazard which is able to be modified by human behavior or activity is flooding. However, since there Grand Island is in good standing in the Regular Phase of the National Flood Insurance Program, any future floodplain development will be completed in compliance with the City's floodplain management ordinance.

Mitigation Alternatives

Grand Island's planning goals are the same as the goals for the county portion of the plan.

GOALS: 1) Reduce or prevent future damage from natural hazard events,
2) Increase public safety

To address these goals, mitigation alternatives were suggested in the public meeting and prioritized by the Grand Island City Council.

Prioritization
Grand Island prioritized the mitigation alternatives according to the "STAPLE(E)" procedure (Social acceptability, Technical feasibility, Administrative capability of local government, Political acceptability, Legal authority to implement, Economic justification, and Environmental acceptability). In addition, alternatives were prioritized based on the community's goals and planning objectives.

At its discretion, Grand Island officials may choose to not implement any of the proposed mitigation projects at this time with the realization that future events may change this stance as well as the prioritization of projects. Projects sponsored for implementation will follow a public process.

1) Maintain good standing in the National Flood Insurance Program
Objective 1: Continue to regulate development in floodplain areas and adopt the Hall County floodplain maps when they become effective.
Funding sources and potential cost: No funding needed, no cost.

2) Mitigate repetitive loss properties
Objective 2: Reduce future flood insurance payments and reduce flood losses by mitigating repetitive loss properties through acquisition, elevation, or other techniques. Acquisition should be first priority.
Funding sources and potential cost: FEMA's mitigation programs – cost will vary by structure and by mitigation technique used.

3) Reduce flood damages

Objective 3: Reduce impacts of flood and stormwater problems

- Action 3.1: Complete a drainage study. Given the extremely flat topography in the area, drainage will always be a problem – especially for intense warm weather rainfall events. A drainage study is needed in Grand Island to help the City make wise land use decisions, to identify where existing drainage infrastructure is weak, and to identify ways to address these weaknesses. A drainage study has the potential to also identify good flood mitigation projects which could be funded using FEMA's mitigation programs.

Funding sources and potential cost: Central Platte NRD, Community Development Block Grant, City – average cost varies widely on scope and community size

- Action 3.2: The City Council should consider passing a stormwater management ordinance. Such an ordinance would be designed to hold back stormwater on-site from large developments and to reduce erosion. The City of Lincoln has passed a stormwater management ordinance which could be used as a model or guide.

Funding sources and potential cost: Could be implemented using existing City resources.

- Action 3.3: Upgrade culverts which are found to restrict flows from rain events. A drainage study can show which culverts and bridges are undersized and need to be replaced with larger openings. However, a drainage study is not necessary to know there is a problem. A drainageway which drains properly will not have flow impediments which back up water on to adjacent property. However, flow impediments can be placed in the flow path on purpose to direct the flow of water toward a specific area designed to retain excess water during periods of high flows. It must be noted that culvert upgrades may not have a lasting impact if upstream stormwater is not somehow managed.

Funding sources and potential cost: City, NRD, Natural Resources Development Fund. Cost varies greatly by design and scope.

- Action 3.4: Clear ditches to improve channel conveyance capacity to allow flows to move unimpeded to the Platte River.

Funding sources and potential cost: City, CPNRD

- Action 3.5: Create a maintenance plan for the drainage system. If improvements are made to Grand Island's drainage system, it will be important to protect the "current condition" of the drainage so that it does not revert back to problem areas.

Funding sources and potential cost: City. Cost to create a maintenance plan would be none to little; however, the City may need to devote financial resources toward it.

- Action 3.6: Floodproof any critical facility which is prone to flooding.

Funding sources and potential cost: FEMA's mitigation programs, cost would vary by scope and design. 25% non-federal match requirement would be needed – most likely from City.

4) Identify and designate tornado shelters, publicize the locations of all public tornado shelters to increase public awareness with a sign on the building.

Objective 4: Provide emergency shelter(s) to which students or local residents would evacuate in the event of a tornado warning, especially those who live in vulnerable housing.

- Action 4.1: Study existing public buildings to see if they offer adequate tornado shelter. If buildings are found, they should be identified with proper signage so that citizens know where they can go during a tornado warning.

Funding sources: Unknown

- Action 4.2: Create public shelters by retrofitting or new construction. FEMA has retrofitted schools and constructed all-new shelters in several places in the Midwest. However, most tornadoes occur in late-afternoon to early evening when a school might be closed for the day. Furthermore, it has been reported that public tornado shelters that are left open to the public are not used properly, with vandalism and use by vagrants as problems. At-risk structure types include mobile homes and slab-on-grade construction which has no basement.
- Action 4.3: Consider constructing tornado shelters for vulnerable construction like manufactured home concentrations.

Funding sources and potential cost: FEMA's Pre-Disaster Mitigation program or Hazard Mitigation Grant Program for construction only– cost varies widely based on scope and design

5) Ensure adequate outdoor severe weather warning coverage

Objective 5: Replace the existing tornado sirens which are outdated.

In Hall County, the warning sirens are owned by the communities. There is no funding assistance available from the County for new sirens; however, if the community purchases a warning siren, Hall County Emergency Management can help coordinate the warning system through the central siren warning system located in Grand Island.

There have been significant advances in warning siren technology since the time that many sirens were erected as a result of the Cold War scare in the 1950s and 60s. The old style of warning siren is manual and operates using at least 110 volts – possibly as much as 220 or 240 volts. In addition, these sirens also have no battery backup since it is not economically feasible to purchase backup systems for manual sirens. In the event that severe weather is approaching, a power outage – which is common in severe weather – means that no warning will be sounded. As a result, there could be higher loss of life since a warning would have alerted people within earshot to seek shelter. Newer sirens operate using 12 volts, which makes battery backup possible – in fact, these sirens typically have a backup system already built in. This means that the only option for having a tornado siren with battery backup is the actual purchase of a new siren.

- Action 5.1: Purchase new tornado sirens to replace the older models.

Funding sources and potential cost: City. Estimated cost: $25,000 to $50,000 .

6) Reduce damages caused by downed tree limbs

Objective 6: Reduce the duration or eliminate power outages from severe weather. Overhead power lines are vulnerable to collapse from icing in the cold weather months and from high winds or tree limbs falling on power lines in warm weather months.

- Action 6.1: Initiate a power line burying project.

Funding sources and potential cost: FEMA's Hazard Mitigation Grant Program or Pre-Disaster Mitigation Program could provide up to 75% of the project cost. The remaining cost might be shared with the Public Power District, City, or property owners.

- Action 6.2: Write to the Nebraska Forest Service and request a tree inventory. An inventory is especially helpful in mitigation planning for communities which experience regular tree-related damages. An inventory can identify problem trees and recommend changes to the way a community administer a local tree management program (i.e., through

a Tree Board or Park Board). Problematic areas of tree limbs with power lines could be addressed as a priority.

Funding sources and potential cost: Free

7) Ensure adequate severe weather notifications to citizens and critical facilities

Objective 7: Purchasing or education of a weather radio

- Action 7.1: Work with the local cable television company to create a cable television interrupt warning system. Such a system would remove the concern over which television or radio station to turn to for weather information and would be a way to inform the majority of the public of impending severe weather.
- Action 7.2: For public critical facilities, the City should consider purchasing a weather radio to be used in each facility for the rapid dissemination of a severe weather warning.
- Action 7.3: In noisy manufacturing facilities which may not hear tornado sirens, the City could inform the owners of these facilities of the option that they could purchase a weather radio.
- Action 7.4: Encourage critical facilities like senior care facilities and hospitals to develop and practice their own emergency sheltering plans.

Funding sources and potential cost: City of Grand Island, local businesses. Approximate cost about $30 per radio. Plan development would carry no cost other than staff time.

8) Improve the City's capability to communicate in a post-disaster scenario

Objective 8: Acquire a comprehensive communication system. The current system of cellular telephones depends on having a cell tower network and being able to connect with other emergency responders when cellular traffic will be very high.

- Action 8.1: Assess the types of communication systems that are available, being used by other counties or communities, and which would fit into the budget. Options might include something like a satellite telephone network with handheld units.
- Action 8.2: The City and County could have a Ham radio network on standby in case of communication failure.

Funding sources and potential cost: The most likely funding source for this objective would be Hazard Mitigation Grant Program "set-aside" funds made available to states after a federally-declared disaster. Other funding sources are unknown. Potential cost would vary widely based on system needs, and is therefore also unknown at this time.

9) Prevent or reduce the duration of power outages

Objective 9: Increase the capability for the City's electric infrastructure to withstand severe weather. Whether for public safety or public welfare, having a function electric system has clear benefits in a post-disaster scenario. These actions would be more effective for more rural transmission and distribution lines which have a longer space between poles than in urban areas.

- Action 9.1: Install "T2" line, which prevents ice buildup
- Action 9.2: Periodically in a segment of power line, strengthen a power pole. This will prevent any "cascading" effect of pole failures, which will reduce the time necessary for repairs.
- Action 9.3: Instead of T2 line, automatic disconnects could be installed on the lines at the poles to prevent the weight of the line from pulling down the poles.

Funding sources and potential cost: The most likely funding source for this objective would be Hazard Mitigation Grant Program "set-aside" funds made available to states after a federally-declared disaster. Other funding sources are unknown. Potential cost would vary widely based on system needs, and is therefore also unknown at this time.

GOAL: 3) Increase Public Education

10) Educate the public about natural hazards, preparedness, and mitigation

Objective 10: Initiate or continue natural hazard awareness and education programs

- Action 10.1: Hall County Emergency Management Agency (HCEMA) will continue its current educational programs. HCEMA also completes annual education programs to grade schools each year, reaching approximately 500 to 600 kids. They discuss severe weather and where to go and what to do if there is a tornado warning.
- Action 10.2: HCEMA also participates in the annual Severe Weather Awareness Week by placing articles in the local paper and airing information on the City's local government television station. Educational outreach programs could be expanded to include all hazards and a severe winter weather preparedness program for the fall.
- Action 10.3: HCEMA also participates during the test warning day by using all of our normal procedures as if there were an actual event, including setting off the warning sirens.
- Action 10.4: The City and HCEMA can make educational materials available to the public in the public library and website. Education would include, but not be limited to, how to protect yourself and your property from tornadoes and severe weather, their potential risks to different disaster types, preparedness procedures for their home, more wind-resistant construction design, and hardier types of trees to plant in areas close to homes, power lines, and streets. Free brochures are available through the National Weather Service and American Red Cross.

Funding sources and potential cost: Funding sources are not applicable, cost is free except for work time.

Implementation

To start implementation, determining which projects should be submitted for funding will be based on a FEMA-approved cost-benefit method. This means that proposed projects would need to be reviewed for cost effectiveness with the assistance of state emergency management or floodplain management personnel. Unless otherwise delegated, the Hall County Regional Planning Director will be the person responsible for project administration of any project selected for implementation. FEMA has the authority to approve or deny mitigation projects applied for under their agency's mitigation programs.

Evaluation

In this plan, several potential mitigation projects are identified; however, it is not designed to have an all-inclusive list of projects. It is designed to be a living document which can be adapted to the landscape as conditions change. This means that this plan should be revised and updated as new projects are identified and prioritized and participating communities. There is a requirement to review and update this plan every five years. To do this, communities will follow the same procedure that Hall County will utilize in its mitigation plan updates, which is detailed starting on page 46 of the County portion of this report. There are also evaluation, update, and

revision worksheets which have been included in this plan as **Appendix B** to assist with this process.

Wood River

Wood River 2013	Dam Failure	Earth-quake	Drought	Flood	Summer Storm	Land slide	Winter Storm	Tornado/ Wind	Wildfire	Crime/ Terror	Hazmat
Probability	Unlikely	Unlikely	Likely	Likely	Likely	Unlikely	Likely	Likely	Likely	Likely	Likely
Risk	Low	Low	Low	Med	High	Low	Med	Med	Med	Low	High
Impact	2	2	2	4	5	0	5	5	3	2	5

Probability: Based on history, what is the likelihood this type of event will happen again?
- None, Low, Medium, or High

Extent – If this event were to happen, how extensive could the damage be?
- Zero, Limited, Severe, Full, or Unknown

Previous Occurrence: Is there an historic record of this type of hazard in the community?

The above table shows the input provided at the initial public meeting. Due to the geographical proximity, the following hazard types were not considered due to there being no likelihood of occurring in Nebraska: volcanic eruptions, avalanches, hurricanes, tidal surges, and tsunamis.

In the following sections, only the hazard types which have a significant likelihood of occurring or have a reason to potentially occur are listed. These types are: severe weather (summer and winter), tornado, flood, and drought. According to the database of dams maintained by the Nebraska Department of Natural Resources, there are no dams upstream of Wood River; therefore, dam failure is not considered further for Wood River. Although there is a small risk for earthquakes, wildfires, and landslides, the threat and associated risk for these hazards is not high enough and there are no realistic or feasible mitigation action which can be taken to reduce the level of risk. The National Climatic Data Center lists no records of wildfire for Hall County. Additionally, the citizens did not rank these hazards high enough to warrant detailed discussion in this plan. This may change in future updates.

Disaster History

Flood

At the town of Wood River, the Wood River has a "nested channel," which means that the banks are higher than the surrounding floodplain. This prevents rainfall from naturally draining overland directly into the river. This means that rain which falls between the river and Highway 30 through town cannot naturally drain to the river, which presents some stormwater concerns. Similarly, in a very large flood event, water which escapes from Wood River and is unable to get back into the channel after the water recedes. Instead, water flows east until it can join enter the Wood River about three miles northeast of town. In the process, it is possible that the business district of Wood River along Highway 30 will be flooded. According to the current floodplain map, water from Wood River cannot inundate development in the city unless it is a 500-year flood event. However, a flood of this magnitude would inundate all development north of the Union Pacific Railroad tracks, including Highway 30 (see **Figure 2**). Wood River High School is situated on the high ground closer to the river, with the building footprint out of the floodplain.

As defined by FEMA's repetitive loss list, there are no repetitive flood loss properties in Wood River.

On May 11 and 12, 2005: 12 people were evacuated due to rising water. The Wood River crested at 9 feet, flooding most streets in town. The river tied a record crest of 12.2 feet at Alda after it had been dry for three years prior to the storm.

Severe Weather

June 4, 1995: 1¾ inch hail caused $10,000 in undisclosed property damage.

May 11 and 12, 2005: Thunderstorms ravaged a large part of south-central Nebraska starting the night of the 11th and continuing through the day on the 12th. Wood River recorded over 11 inches of rain in this timeframe, which is well in excess of the 100-year storm. It was estimated every structure in Wood River sustained some sort of storm damage as wave after wave of severe thunderstorms pounded the town with high winds and hail up to 1¾ inches in diameter. Twelve homes sustained severe damage. Hall County was declared a federal disaster area as the storm caused significant damage in most Hall County communities.

May 23, 2006: Severe thunderstorms brought 80 mph winds, causing damage across 16 counties. Property damage in Wood River was only $5,000.

June 16, 2006: A severe thunderstorm came in from the west, producing 60 mph wind gusts in and golf ball sized hail in Wood River. Total property damage was set at $10,000.

September 15, 2006: Severe thunderstorms developed across south-central Nebraska, bringing baseball-sized hail and strong winds to the region. Wood River did not report as much property damage as Grand Island, Hastings, and Holdrege; however, $10,000 in property damage was recorded.

Tornado

May 7, 1993: A F2 tornado touched down four miles southwest of Upland, moved northeast across Kearney County, crossed the Platte River east of Kearney, and was last seen 1½ miles east of Wood River. Total property damage from this long tornado was set at $5 million.

May 2, 1999: A short-lived F1 tornado was observed just northwest of Wood River. The tornado damaged grain bins, a grain dryer, and a house nearby. Total damage was set at $100,000.

May 7, 2005: The first major outbreak of severe weather for the year brought several tornadoes to central Nebraska. One of these tornadoes was a brief F0 tornado which was spotted five miles north of Wood River, but caused no damage.

May 11, 2005: Just four days later, a F0 tornado clipped the south side of Wood River as a part of extremely severe weather which hit the area, bringing high wind, hail, intense rain, and flooding. Total property damage from this tornado was set at $125,000.

Drought

NCDC reports three drought events since 1950 for Hall County: in 2000, 2002 and 2012. Both of these droughts appear to have been agricultural droughts with the most impact to growing crops. Although Wood River is situated in an area which has been directly impacted by a drought, there are no indications that the City has ever been materially impacted by a drought.

Likelihood of Future Hazard Events
It is certain that Wood River will be impacted by severe weather – perhaps as often as each year. In these events, it should be expected to witness large hail, high winds, and intense rain in the summer, and large snowfalls, ice, and bitter windchills in the winter. Although it is certainly possible, it is less likely that Wood River will be directly impacted by a tornado.

Past Hazard Mitigation Efforts
The City of Wood River participates and is in good standing in the National Flood Insurance Program (NFIP). The initial identification for the Wood River's floodplain map took place on May 31, 1974, and the City joined the Emergency Phase of the NFIP on September 6th of that year. Participation in the Regular Phase of the NFIP occurred on December 1, 1978. A Flood Insurance Study and new detailed mapping was adopted by Wood River with an effective date of June 3, 1986. . Flood mapping for insurance rating purposes has been completed by FEMA and included with the package of maps available for Hall County (Map Number 31079C) effective September 26, 2008. Wood River continues to participate as is in good standing in the National Flood Insurance Program. A new outdoor warning siren was installed in downtown Wood River in 2011.

Vulnerability Assessment
According to an assessment completed by the Nebraska Department of Natural Resources in March of 2007, there are 536 total structures in Wood River. **Figure 1** shows the structures broken out by type, and the count is:

478 residences
29 businesses
17 (at least) out buildings large enough to be seen on aerial photographs
8 publicly-owned structures, including the municipal building, school, library
4 church or non-profit buildings

According to the Nebraska Department of Property Assessment and Taxation, the total assessed taxable value for Wood River in 2013 was $63,180,401. Broken out by significant property types, this is:

Residential real property:	$	35,168,425	(55.7%)
Commercial real property:	$	7,363,346	(11.6%)
Agricultural Land and homes/outbuildings:	$	70,486	(0.1%)
Commercial/Industrial personal property:	$	17,731,387	(28.1%)
Public service corporation real and personal:	$	539,934	(0.9%)
Railroad real and personal property:	$	2,306,823	(3.6%)
Industrial real property:	$	-0-	(0.0%)
Agricultural personal property:	$	-0-	(0.0%)
Recreational real property:	$	-0-	(0.0%)

The entire structure stock is vulnerable to the severe weather, tornado, and drought hazard. This means that, as of 2013, there is $63,180,401in at-risk assets for these hazard types.

In the structural inventory completed by the Corps of Engineers, five properties were found to be located in a regulated floodplain in Wood River's extraterritorial zoning jurisdiction. Of these, 1

is in a Zone A and 4 are in a floodway. The valuation of these five floodplain properties found by the Corps of Engineers is $126,361, or 0.2% of the total valuation of Wood River and its zoning jurisdiction.

Figure 2 shows the current effective floodplain overlay with the structure count. The 100-year, or regulated, floodplain is shown in light blue while the 500-year floodplain is shown in orange. 451 of the 536 tagged structures (84%) are in the 500-year floodplain. Assuming an equitable valuation between structures in that floodplain with those not in the floodplain, this represents a total valuation of $ 35,482,174 in the 500-year floodplain in Wood River.

Figure 3 shows the critical facilities, as identified by the City and supplemented with various federal databases. Critical facilities are those structures which will be essential for returning the Village functions to normal after a disaster ("Civic"), are vital for disaster response and sheltering ("Shelter"), and are essential for public health and safety ("Lifeline Utility"). Critical facilities can also be economic because the loss of a major employer or the loss of the City's main source(s) of revenue will greatly hinder recovery. In Wood River, the critical facilities identified are:

Civic/Response: City Hall, Fire & Rescue Building, Police Department
Sheltering: Wood River Elementary School, Wood River Rural High School, St. Mary's Catholic Church, United Methodist, Grace Lutheran Church, First Presbyterian Church
Vulnerable population: Good Samaritan Center
Financial: Cargill/Wood River ethanol plant
Lifeline Utility: Water tower

Figure 4 shows the potential ranges of the tornado warning sirens in Wood River, with the yellow shading being a half-mile the siren, with red the one mile distance. As shown by the figure, the majority of current development within the Wood River corporate limits is in the yellow shaded area. It must be recognized, however, that these are outdoor warning sirens which are designed to alert residents who are outside and in close proximity to the sirens. They are not designed to warn persons indoors at-distance, traveling in vehicles, or in noisy environments. In addition, a warning system works best if there are operational redundancies – meaning that it is always safer to have additional sirens in a network in case a siren malfunctions or is destroyed. An additional consideration is that periods during which warning sirens are needed are often noisy in themselves with high wind, intense rain, and hail which all act to reduce peoples' ability to hear the sirens. It is easier to hear a warning for people who are downwind of the siren.

Figure 5 shows the areas of new development which is most likely to occur in the next five to ten years. The vulnerability of all development – existing or future – is the same now and will be the same in the future for severe winter storms, severe summer storms, and tornadoes. The only hazard which is able to be modified by human behavior or activity is flooding. However, since there is very little developable area in Wood River which is in a regulated floodplain and since Wood River is in good standing in the Regular Phase of the National Flood Insurance Program, any future floodplain development will be completed in compliance with the City's floodplain management ordinance.

Mitigation Alternatives

Wood River's planning goals are the same as the goals for the county portion of the plan.

GOALS: 1) Reduce or prevent future damage from natural hazard events,
2) Increase public safety

To address these goals, mitigation alternatives were suggested in the public meeting and prioritized by the Wood River City Council.

Prioritization
Wood River prioritized the mitigation alternatives according to the "STAPLE(E)" procedure (Social acceptability, Technical feasibility, Administrative capability of local government, Political acceptability, Legal authority to implement, Economic justification, and Environmental acceptability). In addition, alternatives were prioritized based on the community's goals and planning objectives.

At its discretion, Wood River officials may choose to not implement any of the proposed mitigation projects at this time with the realization that future events may change this stance as well as the prioritization of projects. Projects sponsored for implementation will follow a public process.

1) Maintain good standing in the National Flood Insurance Program
   Objective 1: Continue to regulate development in floodplain areas and adopt the Hall County floodplain maps when they become effective.
   Funding sources and potential cost: No funding needed, no cost.

2) Identify and designate tornado shelters, publicize the locations of all public tornado shelters to increase public awareness – perhaps with a sign on the building.
   Objective 2: Provide emergency shelter(s) to which students or local residents would evacuate in the event of a tornado warning, especially those who live in vulnerable housing
   - Action 2.1: Create public shelters by retrofitting or new construction. FEMA has retrofitted schools and constructed all-new shelters in several places in the Midwest. However, most tornadoes occur in late-afternoon to early evening when a school might be closed for the day. Furthermore, it has been reported that public tornado shelters that are left open to the public are not used properly, with vandalism and use by vagrants as problems. At-risk structure types include mobile homes and slab-on-grade construction which has no basement.
   - Action 2.2: Consider constructing tornado shelters for vulnerable construction like manufactured home concentrations.

   Funding sources and potential cost: FEMA's Pre-Disaster Mitigation program or Hazard Mitigation Grant Program for construction only– cost varies widely based on scope and design

3) Reduce damages caused by downed tree limbs

Objective 3: Reduce the duration or eliminate power outages from severe weather. Overhead power lines are vulnerable to collapse from icing in the cold weather months and from high winds or tree limbs falling on power lines in warm weather months.

- Action 3.1: Initiate a power line burying project.

Funding sources and potential cost: FEMA's Hazard Mitigation Grant Program or Pre-Disaster Mitigation Program could provide up to 75% of the project cost. The remaining cost might be shared with the Public Power District, City, or property owners.

- Action 3.2: Write to the Nebraska Forest Service and request a tree inventory. An inventory is especially helpful in mitigation planning for communities which experience regular tree-related damages. An inventory can identify problem trees and recommend changes to the way a community administer a local tree management program (i.e., through a Tree Board or Park Board). Problematic areas of tree limbs with power lines could be addressed as a priority.

Funding sources and potential cost: Free

4) Ensure adequate severe weather notifications to critical facilities

Objective 4: Purchasing or education of a weather radio

- Action 4.1: For public critical facilities, the City should consider purchasing a weather radio to be used in each facility for the rapid dissemination of a severe weather warning.
- Action 4.2: If the City has noisy manufacturing facilities which may not hear tornado sirens, the City could inform the owners of these facilities of the option that they could purchase a weather radio.

Funding sources and potential cost: City of Wood River, local businesses. Approximate cost about $30 per radio.

5) Ensure adequate water supply for health and safety

Objective 5: Determine ways to secure Wood River's water supply during drought

- Action 5.1: Work with the Nebraska Department of Health and Human Services to secure revolving loan funding for supplementing Wood River's water supply with an additional source.
- Action 5.2: Determine a method to have citizens from Wood River voluntarily reduce demand for water during times of drought. This may involve instituting a moratorium on unnecessary water usage and implementing a fine/penalty system for those found in violation.

Goal: 3) Increase Public Education

There are no explicit objectives or actions for this goal; however, there is an implicit action related to this goal for above actions which will require public participation. Activities for this goal are found in the County portion of this document since the likely lead or assisting agency will be the Hall County Emergency Management Agency.

Implementation

To start implementation, determining which projects should be submitted for funding will be based on a FEMA-approved cost-benefit method. This means that proposed projects would need to be reviewed for cost effectiveness with the assistance of state emergency management or

floodplain management personnel. Unless otherwise delegated, the City Clerk will be the person responsible for project administration of any project selected for implementation. FEMA has the authority to approve or deny mitigation projects applied for under their agency's mitigation programs.

Evaluation

In this plan, several potential mitigation projects are identified; however, it is not designed to have an all-inclusive list of projects. It is designed to be a living document which can be adapted to the landscape as conditions change. This means that this plan should be revised and updated as new projects are identified and prioritized and participating communities. There is a requirement to review and update this plan every five years. To do this, communities will follow the same procedure that Hall County will utilize in its mitigation plan updates, which is detailed starting on page 46 of the County portion of this report. There are also evaluation, update, and revision worksheets which have been included in this plan as **Appendix B** to assist with this process.

APPENDIX E

Adoption Documentation