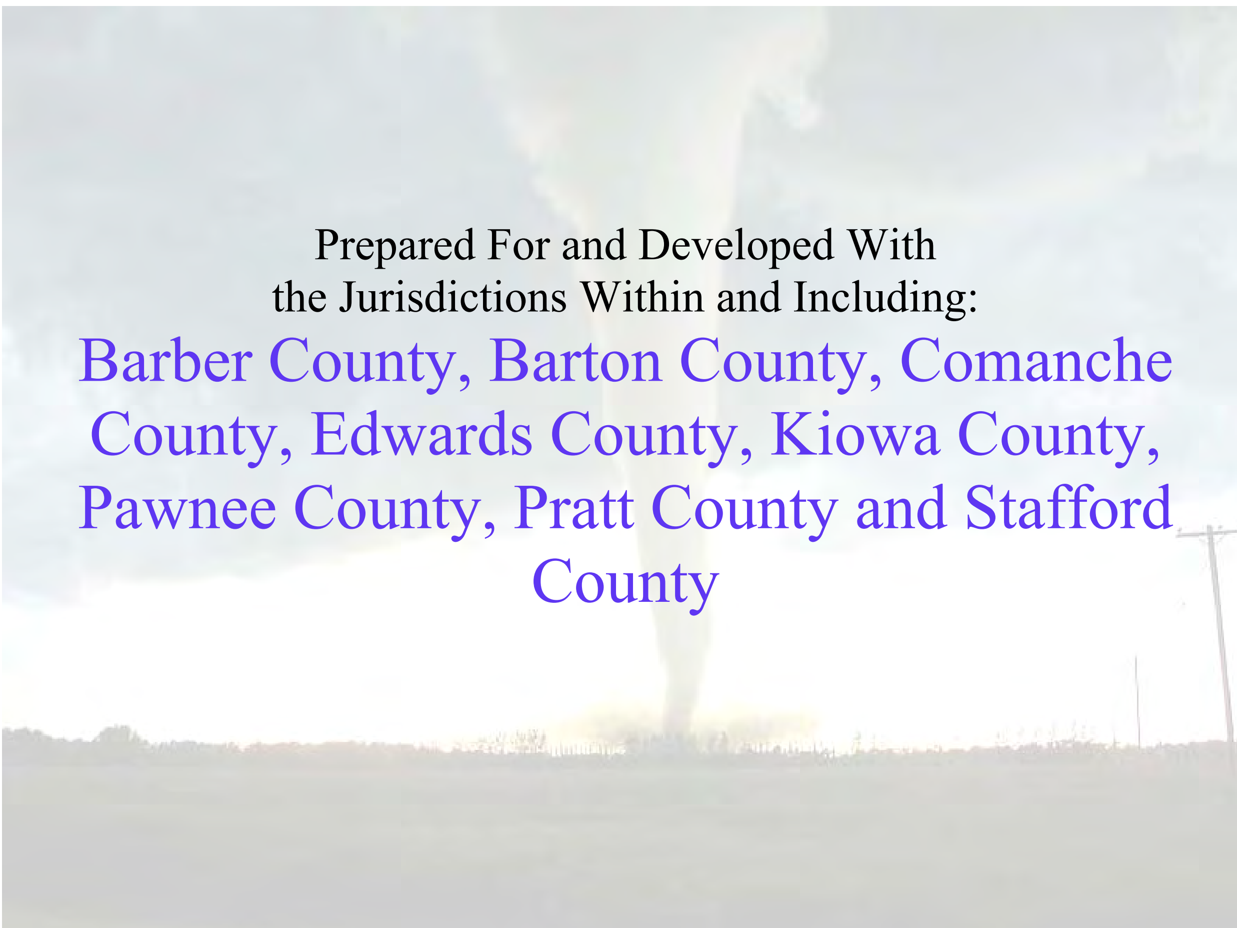
South Kansas
(Homeland Security Region E)
Multi-Hazard, Multi-Jurisdictional
Mitigation Plan



Prepared For and Developed With
the Jurisdictions Within and Including:

Barber County, Barton County, Comanche County, Edwards County, Kiowa County, Pawnee County, Pratt County and Stafford County

August, 2014

Prepared By:

Blue
Umbrella

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APPENDIX

List of Acronyms

Acronym	Meaning
ANFO	Ammonium Nitrate/Fuel Oil
BATF	Bureau of Alcohol, Tobacco and Firearms
BSE	Bovine Spongiform Encephalopathy
CAFO	Concentrated Animal Feeding Operation
CDBG	Community Development Block Grant
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
CPRI	Calculated Priority Risk Index
CRS	Community Rating System
CWPP	Community Wildfire Protection Plans
DASC	Data Access and Support Center
DFIRM	Digital Flood Insurance Rate Map
DWR	Division of Water Resources
EAP	Emergency Action Plan
EF	Enhanced Fujita
EMAP	Emergency Management Accreditation Program
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ºF	Fahrenheit
FIA	Flood Insurance Administration
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance
GIS	Geographic Information System
HFRA	Healthy Forests Restoration Act
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMPC	Hazard Mitigation Planning Committee
IPSR	Institute for Policy and Social Research
K.S.A	Kansas Statutes Annotated
KCC	Kansas Corporation Commission
KCP&L	Kansas City Power and Light
KDA	Kansas Department of Agriculture
KDEM	Kansas Division of Emergency Management
KDHE	Kansas Department of Health and Environment
KDOT	Kansas Department of Transportation
km	Kilometer

Acronym	Meaning
KWO	Kansas Water Office
LAMP	Levee Analysis Mapping Procedures
LEPC	Local Emergency Planning Committee
LSP	Levee Safety Program
MH 2.1	Multi Hazard version 2.1
MLI	Mid-Term Levee Inventory
MPH	Miles per Hour
NCDC	National Climatic Data Center
NFIP	National Flood Insurance Program
NFIRS	National Fire Incident Reporting System
NGO	Non-Governmental Organization
NLD	National Levee Database
NOAA	National Oceanic and Atmospheric Administration
NSFHA	No Special Flood Hazard Area
NWS	National Weather Service
ONA	Other Needs Assistance
PA	Public Assistance
PAL	Provisionally Accredited Levee
PDM	Pre-Disaster Mitigation
PDSI	Palmer Drought Severity Index
PIO	Public Information Officer
REC	Rural Electric Cooperative
RMP	Risk Management Plan
SBA	Small Business Administration
SHMO	State Hazard Mitigation Officer
SoVI	Social Vulnerability Index
SRL	Severe Repetitive Loss
STAPLEE	Social, Technical, Administrative, Political, Legal, Economic and Environmental
USACE	United States Army Corps of Engineers
USD	Unified School District
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WUI	Wildland Urban Interface

EXECUTIVE SUMMARY

Mitigation is commonly defined as sustained action taken to reduce or eliminate long-term risk to people and their property from hazards and their effects. Hazard mitigation planning provides communities with a roadmap to aid in the creation and revision of policies and procedures, and the use of available resources, to provide long-term, tangible benefits to the community. A well designed hazard mitigation plan provides communities with realistic actions that can be taken to reduce potential vulnerability and exposure to identified hazards.

In order to create an effective, realistic and useful plan, a methodical and thoughtful planning process that included regional and local stakeholders and followed Federal Emergency Management Agency (FEMA) Guidelines has been completed.

This is a multi-hazard, multi-jurisdictional mitigation plan combination and update covering Kansas Homeland Security Region E. Region E is comprised of eight participating counties and is located in the southern region of the State. This plan was prepared to meet the requirements of the Disaster Mitigation Act of 2000 (DMA 2000), as defined in regulations set forth by the Interim Final Rule (44 Code of Federal Regulation (CFR) Part 201.6).

A regional Hazard Mitigation Planning Committee (HMPC), formed by participating County Emergency Managers and State of Kansas Mitigation Planners, conducted a regional risk assessment that identified and characterized potential hazards, suggested incorporation of review elements from previous plans into new regional plan, conducted a regional vulnerability analysis, and proposed and explored potential mitigation actions. The outcome was a mitigation plan that combined each discrete county plan into one regional plan.

It is worth noting that all neighboring Kansas counties are undergoing a similar mitigation planning effort, and as part of this statewide process all county and state planners are working together toward common mitigation goals. During the creation and adoption of this plan communication channels were opened to facilitate the cross pollination of ideas, to incorporate neighboring regions concerns, and to ensure the overall preparedness of the State of Kansas.

The following table presents a list of participating jurisdictions, by county. A special welcome is afforded to Unified School District (USD) #474 - Haviland, a new participant to the Plan. Please note that many Unincorporated Townships and special districts are not included in the following list as they are covered under their home counties participation and adoption.

Barber County Participating Cities and Townships

Barber County
City of Hardtner
City of Hazelton
City of Isabel
City of Kiowa
City of Medicine Lodge
City of Sharon
City of Sun City

Barton County Participating Cities and Townships

Barton County
City of Albert
City of Claflin
City of Ellinwood
City of Galatia
City of Great Bend
City of Hoisington
City of Olmitz
City of Pawnee Rock
City of Susank

Comanche County Participating Cities and Townships

Comanche County
City of Coldwater
City of Protection
City of Wilmore

Edwards County Participating Cities and Townships

Edwards County
City of Belpre
City of Kinsley
City of Lewis
City of Offerle

Kiowa County Participating Cities and Townships

Kiowa County
City of Greensburg
City of Haviland
City of Mullinville

Pawnee County Participating Cities and Townships

Pawnee County
City of Burdett
City of Garfield
City of Larned
City of Rozel

Pratt County Participating Cities and Townships

Pratt County
City of Byers
City of Coats
City of Cullison
City of Iuka
City of Pratt
City of Preston
City of Sawyer

Stafford County Participating Cities and Townships

Stafford County
City of Hudson
City of Macksville
City of Radium
City of Seward
City of St. John
City of Stafford

The following table presents a list of participating colleges, universities and USDs. The information also presents the district covered, if applicable, and the county:

Participating Colleges, Universities, and USDs

School, College or University	District
Barber County	
USD #254	Barber County North
USD #255	South Barber County
Barton County	
USD #112	Claflin
USD #355	Ellinwood
USD #428	Great Bend
USD #431	Hoisington
Barton County Community College	-
Comanche County	
USD #300	Comanche County

Participating Colleges, Universities, and USDs, Continued

Edwards County	
USD #347	Kinsley / Offerle
USD #502	Lewis
Kiowa County	
USD #422	Kiowa County
USD #474	Haviland
Pawnee County	
USD #495	Fort Larned
USD #496	Pawnee Heights
Pratt County	
USD #382	Pratt
USD #438	Skyline Schools
Pratt County Community College	-
Stafford County	
USD #349	Stafford
USD #350	St. John / Hudson
USD #351	Macksville

In addition to the above noted jurisdictions, many special districts are covered under the participation and adoption by the overarching county. These entities include:

- Fire Districts
- Sewer Districts
- Water Districts
- Watershed Districts

Some of the above noted special districts went above and beyond and participated independently in the planning process. These entities are noted below.

Participating Special Districts

Barber County
Barber County Water Districts (all)
Barton County
Post Rock Rural Water District #1

It is important to note that while special districts are not required to individually adopt the mitigation plan, in doing so they retain the ability to control and oversee any grant funding received. In not adopting, the special districts may cede control to the overarching county.

Additionally, numerous private, non-profit and charitable organizations independently participated in this planning effort, including:

Private and Non-Profit Participating Stakeholders

Barber County
Alfalfa Rural Electrical Cooperative (REC)
Ninnescah REC
South Pioneer REC
Barton County
Arkansas Valley REC
Midwest Energy
Rolling Hills REC
Comanche County
CMS Electrical Cooperative
Edwards County
Midwest Energy
Pawnee County
Midwest Energy
Pratt County
Midwest Energy
Ninnescah REC
South Pioneer REC
American Red Cross
Stafford County
Arkansas Valley REC
Midwest Energy

All previously participating jurisdictions elected to participate in this planning process.

GOALS

Based upon the research conducted to complete this document, the HMPC identified goals and objectives to reduce potential risks associated with identified hazards. The goals and objectives of this multi-hazard mitigation plan are to:

- **Goal 1:** Reduce and/or eliminate the risk to the people and property of south Kansas from the identified hazards in this plan.
- **Goal 2:** Strive to protect all of the vulnerable populations, structures, and critical facilities in south Kansas from the impacts of the identified hazards.
- **Goal 3:** Improve public outreach initiatives to include education, awareness and partnerships with all willing entities in order to enhance understanding of the risks south Kansas faces due to the impacts of the identified hazards.
- **Goal 4:** Enhance communication and coordination among all agencies and between agencies and the public.

To accomplish the above identified goals, the HMPC has developed a series of robust and achievable mitigation actions. These actions are discussed in detail in Section 5 of this plan.

HAZARD MITIGATION PLANNING COMMITTEE

The following table presents the members of the south Kansas HMPC. Each planning committee member served as a point of contact for their county, assisting with the direction and dissemination of information concerning the planning effort. A special thanks is afforded to these people who made the successful completion and adoption of this plan possible.

Hazard Management Planning Committee

Participant	Title	Organization
Jerry McNamar	Emergency Manager	Barber County
Amy Miller	Emergency Manager	Barton County
John Lehman	Emergency Manager	Comanche County
Richard Neilson	Emergency Manager	Edwards County
Ray Stegman	Emergency Manager	Kiowa County
Mark Wagner	Emergency Manager	Pawnee County
Tim Branscom	Emergency Manager	Pratt County
Steve Moody	Emergency Manager	Stafford County
Jeanne Bunting	Mitigation Planner	Kansas Division of Emergency Management
Matt Eyer	Plan Author	Blue Umbrella Solutions

In addition to these HMPC members, representatives from each participating jurisdiction deserve a special thanks for assisting in this planning effort. Through their submission of data, participation in discussions and meetings, and feedback on plan revisions they assisted in making a robust plan.

RESOLUTIONS OF ADOPTION

44 CFR Requirement 201.6(c)(5): Documentation th at the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council) . For multi-jurisdi ctional plans, each ju risdiction requesting approval of the plan must document that it has been formally adopted.

Upon review and approved pending adoption status by FEMA Region VII adoption resolutions will be signed by the participating jurisdictions and added to the Appendix documents. Additionally, the following table will be completed noting adoption date for each participating jurisdiction and, if applicable, resolution number.

BARBER COUNTY

	Adoption Date	Resolution Number
Barber County		
City of Hardtner		
City of Hazelton		
City of Isabel		
City of Kiowa		
City of Medicine Lodge		
City of Sharon		
City of Sun City		
USD #254 - Barber County North		
USD #255 - South Barber County		

BARTON COUNTY

	Adoption Date	Resolution Number
Barton County		
City of Albert		
City of Claflin		
City of Ellinwood		
City of Galatia		
City of Great Bend		
City of Hoisington		
City of Olmitz		
City of Pawnee Rock		
City of Susank		
Barton County Community College		
USD #112 - Clafin		

	Adoption Date	Resolution Number
USD #355 Ellinwood		
USD #428 - Great Bend		
USD #431 - Hoisington		

COMANCHE COUNTY

	Adoption Date	Resolution Number
Comanche County		
City of Coldwater		
City of Protection		
City of Wilmore		
USD #300- Comanche County		

EDWARDS COUNTY

	Adoption Date	Resolution Number
Edwards County		
City of Belpre		
City of Kinsley		
City of Lewis		
City of Offerle		
USD #347 - Kinsley / Offerle		
USD #502 - Lewis		

KIOWA COUNTY

	Adoption Date	Resolution Number
Kiowa County		
City of Greensburg		
City of Haviland		
City of Mullinville		
USD #422 - Kiowa County		
USD #474 - Haviland		

PAWNEE COUNTY

	Adoption Date	Resolution Number
Pawnee County		
City of Burdett		
City of Garfield		
City of Larned		

	Adoption Date	Resolution Number
City of Rozel		
USD #495 - Fort Larned		
USD #449 - Pawnee Heights		

PRATT COUNTY

	Adoption Date	Resolution Number
Pratt County		
City of Byers		
City of Coats		
City of Cullison		
City of Iuka		
City of Pratt		
City of Preston		
City of Sawyer		
Pratt County Community College		
USD #382 - Pratt		
USD #438 - Skyline Schools		

STAFFORD COUNTY

	Adoption Date	Resolution Number
Stafford County		
City of Hudson		
City of Macksville		
City of Radium		
City of Seward		
City of St. John		
City of Stafford		
USD #349 - Stafford		
USD #350 - St. John / Hudson		
USD #351 - Macksville		

INDEPENDENTLY PARTICIPATING SPECIAL DISTRICTS

Unincorporated cities, townships, special districts and agencies that are part of a larger entity, such as a county health department or rural water district, will be considered as adopting when the umbrella county adopts the plan. It is important to note that these entities are not required to individually adopt the mitigation plan, in doing so they retain the ability to control and oversee any grant funding received. In not adopting, these entities may cede control to the overarching county.

	Adoption Date	Resolution Number
Barber County		
Barber County Water Districts		
Barton County		
Post Rock Rural Water District #1		

Independently Participating Stakeholders

While not required, private, non-profit and charitable organizations that independently participated in this planning effort are encourage to adopt the plan.

	Adoption Date	Resolution Number
Barber County		
Alfalfa REC		
Ninnescah REC		
South Pioneer REC		
Barton County		
Arkansas Valley REC		
Midwest Energy		
Rolling Hills REC		
Comanche County		
CMS Electrical Cooperative		
Edwards County		
Midwest Energy		
Pawnee County		
Midwest Energy		
Pratt County		
Midwest Energy		
Ninnescah REC		
South Pioneer REC		
American Red Cross		
Stafford County		
Arkansas Valley REC		
Midwest Energy		

Completed resolutions of adoption may be found in Appendix A.

Example Resolution of Adoption

The following presents an example resolution of adoption for participating jurisdictions to use as a template, if necessary.

Model Resolution

Resolution # _____: **Adopting the South Kansas (Region E) Multi-Hazard, Multi-Jurisdictional Hazard Mitigation Plan**

Whereas, the (Name of Government/District/Organization) recognizes the threat that natural hazards pose to people and property within our community; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property from future hazard occurrences; and

Whereas, the U.S. Congress passed the Disaster Mitigation Act of 2000 ("Disaster Mitigation Act") emphasizing the need for pre-disaster mitigation of potential hazards;

Whereas, the Disaster Mitigation Act made available hazard mitigation grants to state and local governments; and

Whereas, an adopted Multi-Hazard Mitigation Plan is required as a condition of future funding for mitigation projects under multiple Federal Emergency Management Agency (FEMA) pre- and post-disaster mitigation grant programs; and

Whereas, the (Name of Government/District/Organization) fully participated in the FEMA prescribed mitigation planning process to prepare this Multi-Hazard Mitigation Plan; and

Whereas, the Kansas Division of Emergency Management and FEMA Region VII officials have reviewed the South Kansas (Region E) Multi-Hazard, Multi-Jurisdictional Hazard Mitigation Plan, and approved it contingent upon this official adoption of the participating governing body; and

Whereas, the (Name of Government/District/Organization) desires to comply with the requirements of the Disaster Mitigation Act and to augment its emergency planning efforts by formally adopting the South Kansas (Region E) Multi-Hazard, Multi-Jurisdictional Hazard Mitigation Plan; and

Whereas, adoption by the governing body for the (Name of Government/District/Organization) demonstrates the jurisdictions' commitment to fulfilling the mitigation goals and objectives outlined in this plan, and

Whereas, adoption of this legitimizes the plan and authorizes responsible agencies to carry out their responsibilities under the plan.

Now, therefore, be it resolved, that the (Name of Government/District/Organization) adopts the South Kansas (Region E) Multi-Hazard, Multi-Jurisdictional Hazard Mitigation Plan as an official plan; and

Be it further resolved, the (Name of Government/District/Organization) will submit this Adoption Resolution to the Kansas Division of Emergency Management and FEMA Region VII officials to enable the plan's final approval.

__________ Passed

____________________ Certifying Official

1.0 Introduction and Planning Process

1.1 Introduction

Eight participating counties within the south Kansas region (Kansas Homeland Security Region E) prepared this Regional Multi-Hazard Mitigation Plan to provide sustained actions to eliminate or reduce risk to people and property from the effects of natural and man-made hazards. This Plan documents south Kansas's planning process and identifies applicable hazards, vulnerabilities, and hazard mitigation strategies. This plan will serve to direct available community and regional resources towards creating policies and actions that provide long-term benefits to the community. Local and regional officials can refer to the plan when making decisions regarding regulations and ordinances, granting permits, and in funding capital improvements and other community initiatives.

This plan was also developed to make participating jurisdictions with south Kansas eligible for applicable federal disaster assistance, including the FEMA's Hazard Mitigation Grant Program, Pre-Disaster Mitigation program, and Flood Mitigation Assistance program. Additionally, this regional Plan will serve as the basis for the State of Kansas to prioritize available grant funding.

This Plan has been prepared in coordination with the FEMA Region VII and the Kansas Division of Emergency Management (KDEM).

This Plan has been designed to be a living document, a document that will evolve to reflect regional changes, correct any omissions, and constantly strive to ensure the safety of south Kansas's citizens. In addition, this document allows each participating jurisdiction to integrate the data, information and hazard mitigation goals and actions from the plan into other planning mechanisms.

1.2 Background

South Kansas is vulnerable to a wide range of natural hazards, including flooding, tornadoes, drought, and winter storms. These hazards threaten the safety of citizens and have the potential to damage or destroy property and disrupt local and regional economies. Their occurrence is natural and there is little we can do to control their force and intensity. Each year some of these hazards cause disasters that cost hundreds of lives, cause countless injuries, and cost taxpayers billions of dollars to help communities recover. And while the intensity of these natural disasters cannot be controlled, there are many actions that can be taken to minimize their potential impacts to the region. Actions taken to reduce the potential impact of a hazard can greatly diminish the possibility that the hazard will result in a disaster. The practice of minimizing risks to people and property from identified hazards is referred to as hazard mitigation. FEMA describes hazard mitigation as "sustained action taken to reduce or eliminate long-term risk to people and their property from hazards and their effects."

1.3 DISASTER MITIGATION ACT OF 2000

In an effort to reduce natural disaster losses the United States Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) in order to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act). DMA 2000 amended the Stafford Act by repealing the previous Mitigation Planning section (409) and replacing it with a new Mitigation Planning section (322). Section 322 of the DMA makes the development of a hazard mitigation plan a specific eligibility requirement for any local government applying for Federal mitigation grant funds.

This Plan was prepared to meet the requirements of the DMA 2000, as defined in regulations set forth by the Interim Final Rule (44 CFR Part 201.6).

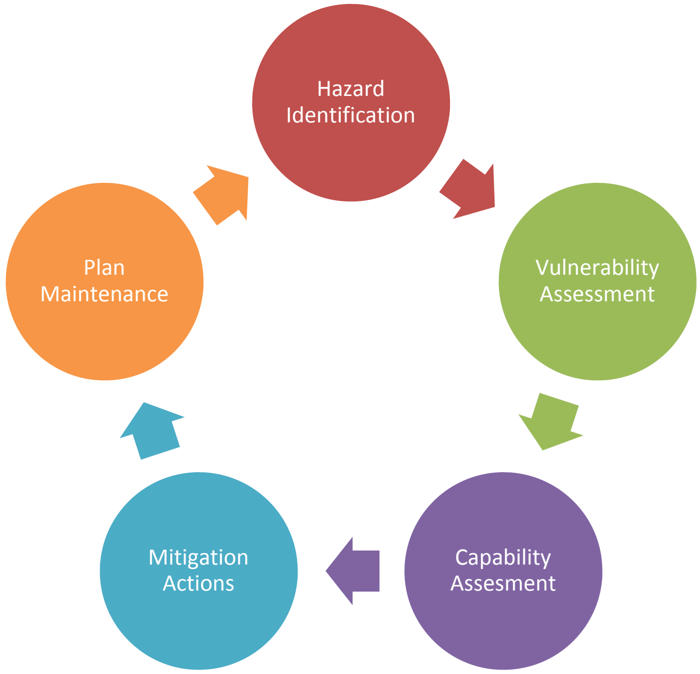
1.4 HAZARD MITIGATION PLANNING PROCESS

44 CFR 201.6(c)(1) Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

KDEM contracted with Blue Umbrella Solutions in November 2014 to assist south Kansas in developing a multi-jurisdictional, multi-hazard mitigation plan. Blue Umbrella Solutions and the south Kansas HMPC worked together in developing this Plan to meet the requirements of the DMA 2000, as defined in regulations set forth by the Interim Final Rule (44 CFR Part 201.6). As part of this process, the following tasks were conducted:

- Consultation with FEMA Region VII on Plan development
- Review of current mitigation plans for all participating jurisdictions
- Incorporation of review elements into new regional plan
- Delivery of organizational and planning meetings
- Solicitation of public input as to Plan development
- Assessment of potential regional risks
- Assessment of vulnerabilities and assets
- Development of the mitigation actions
- Development of a draft multi-jurisdictional, multi-hazard mitigation plan
- Implementation, adoption, and maintenance of the Plan

In general, the following diagram shows the planning cycle:



1.5 PLANNING PROCESS PARTICIPATION REQUIREMENTS

44 CFR 201.6(a)(4): Multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan.

All eligible jurisdictions within south Kansas were invited to participate in the organization, drafting, completion and adoption of this Plan. Invited jurisdictions included, but were not limited to, elected officials, relevant State of Kansas agencies, counties, cities, school districts, universities and community colleges, special districts, including rural fire and water districts, non-profit agencies, and businesses.

In order to have an approved hazard mitigation plan, DMA 2000 requires that each jurisdiction participate in the planning process. Each jurisdiction choosing to participate in the development of the Plan were required to meet detailed participation requirements, which included the following:

- When practical and affordable, participation in planning meetings
- Provision of information to support the Plan development
- Identification of relevant mitigation actions
- Review and comment on Plan drafts
- Formal adoption of the plan

County Emergency Managers were designated as HMPC representatives for each participating jurisdiction within their county. Jurisdiction provision of information, identification of mitigation actions and Plan review and comment are detailed throughout this Plan and were, in general coordinated by each relevant HMPC member.

Jurisdictions who were unable to attend meetings due to budgetary or time constraints were contacted by their HMPC member via email or phone to discuss hazard mitigation planning, including the process, goals, mitigation actions, local planning concerns and Plan review.

Multiple methods of communication with HMPC members, participating jurisdictions, and the public were used during the planning process. Communications used include:

- On-site meetings
- Telephone
- Email
- Internet resources
- Social media

1.6 Consultation With FEMA Region VII

Upon initiation of the planning process, a meeting was held with FEMA Region VII to review current and pending planning requirements and to discuss methods to provide for a smooth planning and review process. The meetings were held on January 3 and 4, 2013 at the FEMA Region VII offices, and the following participants were in attendance:

Participant	Organization
Joe Chandler	FEMA Region VII
Michelle Wolf	FEMA Region VII
Jeanne Bunting	State of Kansas
Matthew Eyer	Blue Umbrella Solutions

1.7 Review of Previous Mitigation Plans

44 CFR 201.6(b) :(3) Review and in corporation, if appropriate, of existing plans, studies, reports, and technical information.

Prior to the delivery of the south Kansas project kickoff meetings, all relevant south Kansas hazard mitigation plans and applicable planning documents were reviewed and mined for data to be used in the consolidation and creation of the new regional Plan, and for use to guide kickoff meeting discussions. In addition to the regional mitigation plans, the Kansas State Hazard Mitigation Plan and available relevant data from state and federal agencies was reviewed. These sources are noted throughout the Plan.

1.8 ORGANIZATIONAL AND PLANNING MEETINGS

44 CFR 201.6(b) : An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: ...... (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process.

Within south Kansas there are many jurisdictions and organizations who have a vested interest in participating in the creation and adoption of the hazard mitigation plan. An integral part of the planning process included the identification, development, and coordination of all of these entities. As such, a series of three organizational and planning meetings were scheduled and all past and potential future participants were notified by the State of Kansas as to the dates and locations of the meetings. In addition, communities neighboring the region were invited to participate in the planning process.

It is worth noting that all neighboring Kansas counties are undergoing a similar mitigation planning effort, and as part of this statewide process all county and state planners are working together toward common mitigation goals. During the creation and adoption of this plan communication channels were opened to facilitate the cross pollination of ideas, to incorporate neighboring regions concerns, and to ensure the overall preparedness of the State of Kansas.

The following table presents the date, location and purpose of each planning meeting.

Meeting Number	Date	Location City	Purpose
1	04/23/2014	Greensburg	Review of planning process, project coordination, scope, participation requirements, strategies for public involvement. Formation of HMPC. Discussion and review of potential hazards.
	04/24/2014	Pratt	
	04/25/2104	Saint John	
2	07/09/2104	Pratt	Results of the hazard identification, classification, and delineation discussed Sections of the plan were made available for review and comment. Development of mitigation goals and actions
3	08/18/2104	Greensburg	Review of completed draft Plan. Review of public comments. Incorporation of any changes. Discussion of approval and adoption timeframes.
	08/18/2014	Pratt	
	08/19/2014	Saint John	

A series of kick-off meetings were held with available representatives from jurisdictions within the planning region in attendance. At the kickoff meeting, the planning process, project coordination, scope, participation requirements, strategies for public involvement, and schedule were discussed in detail. Additionally, the HMPC was created to include the Emergency Manager from each participating county along with relevant State of Kansas partners. HMPC members were tasked with the following roles and responsibilities that continued for the duration of the planning process:

- Meeting attendance and facilitation assistance
- Data collection and submission
- Assistance in soliciting public involvement and input
- Draft and final Plan review
- Oversight of facilitation of final Plan adoption by respective jurisdictions

During the meeting, participants were led through a guided discussion concerning hazard data sourced from their previous hazard mitigation plans. Additionally, research was conducted prior to the meeting on recent regional hazard events to further inform the discussion. Participants were encouraged to discuss past hazard events, past impacts, and the future probability for all identified hazards. Based on this discussion, a comprehensive list of regional hazards was created.

At the conclusion of the meeting, all participants were provided with a data collection forms to solicit information needed to properly complete the Plan. The forms asked for information concerning data on historic hazard events, at risk populations and properties, and available capabilities. Additionally, participating jurisdictions were provided with their mitigation actions from the previous plans for review and comment, and asked to identify any additional mitigation actions.

Each participating jurisdiction was required to complete and return the forms and actions to be considered as participating. These forms were used in the development of this Plan.

A series of mid-term planning meetings were held with HMPC representatives in attendance. Based upon the initial research, discussions held during the kickoff meetings, information obtained from the data collection forms, additional research, and subsequent discussion with HMPC members, the results of the hazard identification, classification, and delineation were discussed in detail. In addition, sections of the Plan were made available for review and comment. Based on the supplied hazard information, participants were asked to assist in the development and review of mitigation goals and actions.

A final planning meeting was held with representatives from jurisdictions within the planning region in attendance. The completed draft Plan was made available for review and comment.

1.9 PUBLIC OUTREACH

44 CFR Requirement 201.6(b) : An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: (1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval (2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process

As part of the overall planning process, the general public were provided with numerous opportunities to contribute and comment on the creation and adoption of the Plan. These opportunities include:

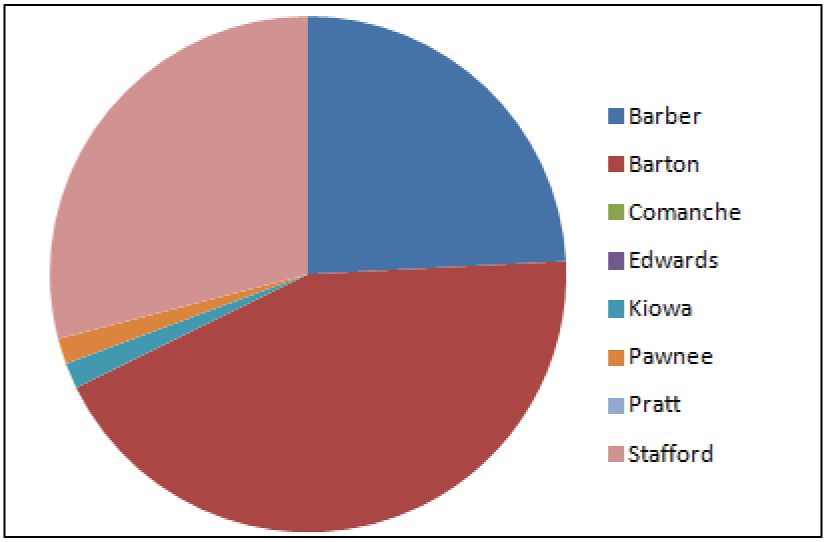
- SurveyMonkey (online survey)
- Facebook
- Meeting with local emergency managers
- Two week comment period upon completion of draft Plan

Input from the general public provided the HMPC with a clearer understanding of regional concerns, increased the likelihood of citizen buy-in concerning proposed mitigation actions, and provided elected officials with a guide and tool to set regional ordinances and regulations. This public outreach effort was also an opportunity for adjacent jurisdictions and entities to be involved in the planning process.

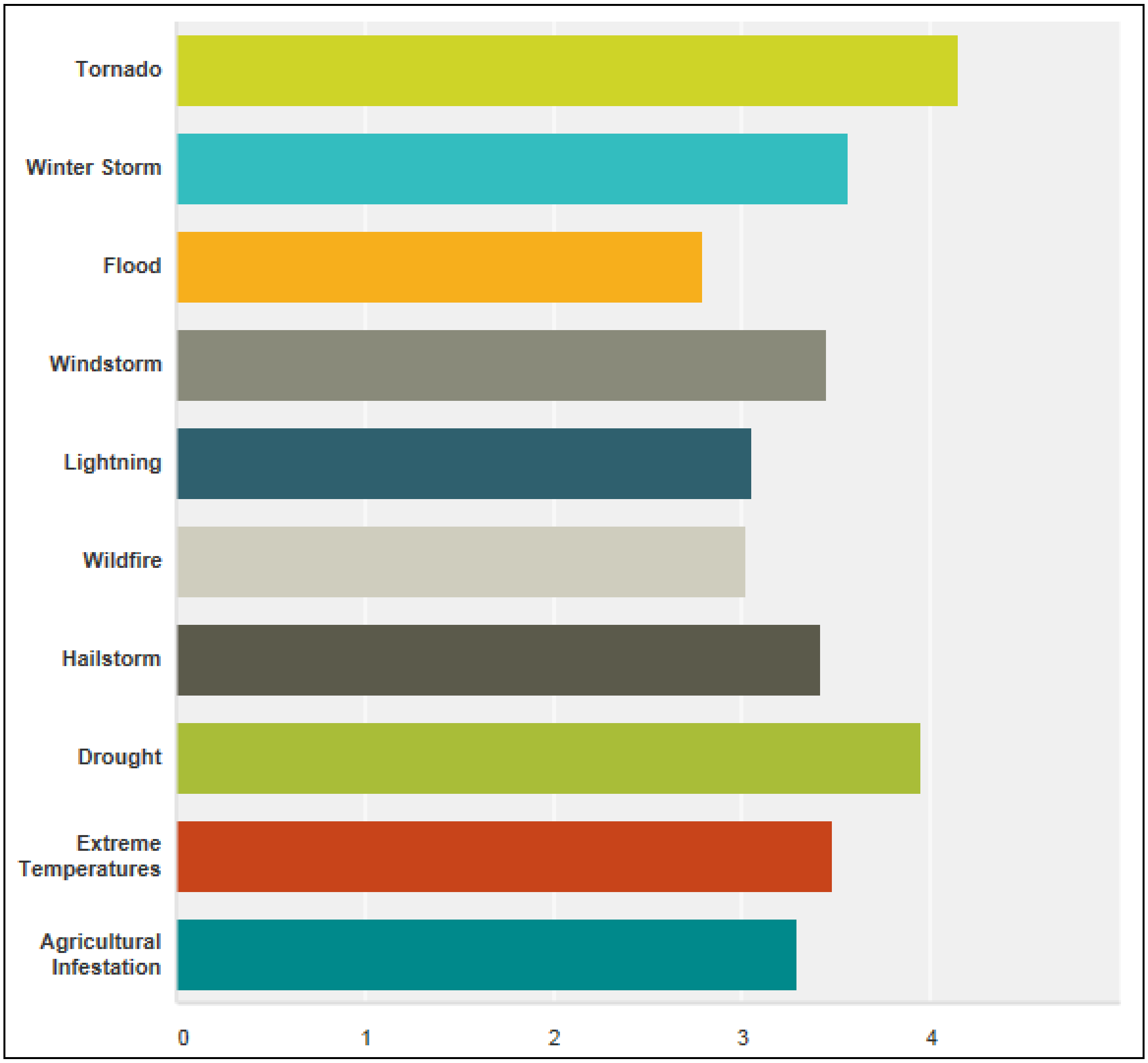
Additionally, as citizens were made more aware of potential hazards and the local and regional process to mitigation against their impacts, it was believed that they would take a stronger role in making their homes, neighborhoods, schools, and businesses safer from the potential effects of natural hazards.

The following graphics show the results of the public input, with 63 responses received, from the SurveyMonkey online survey for the region for each question asked.

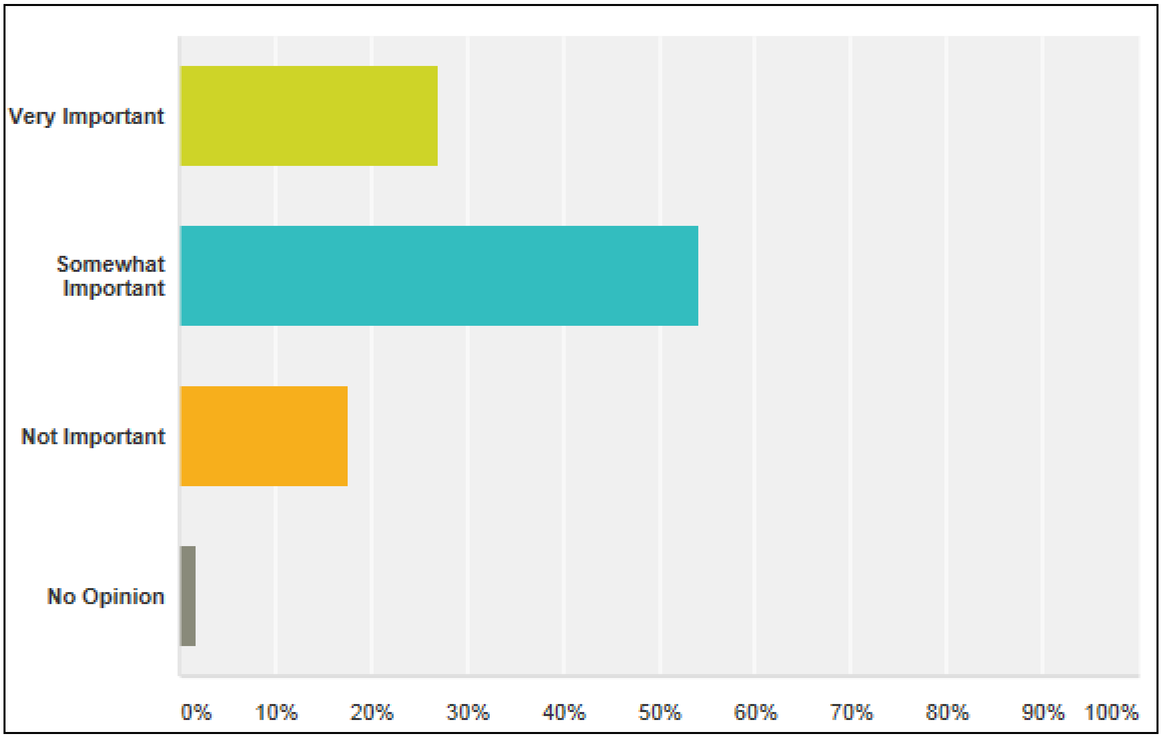
Question 1: What County and jurisdiction do you live in?



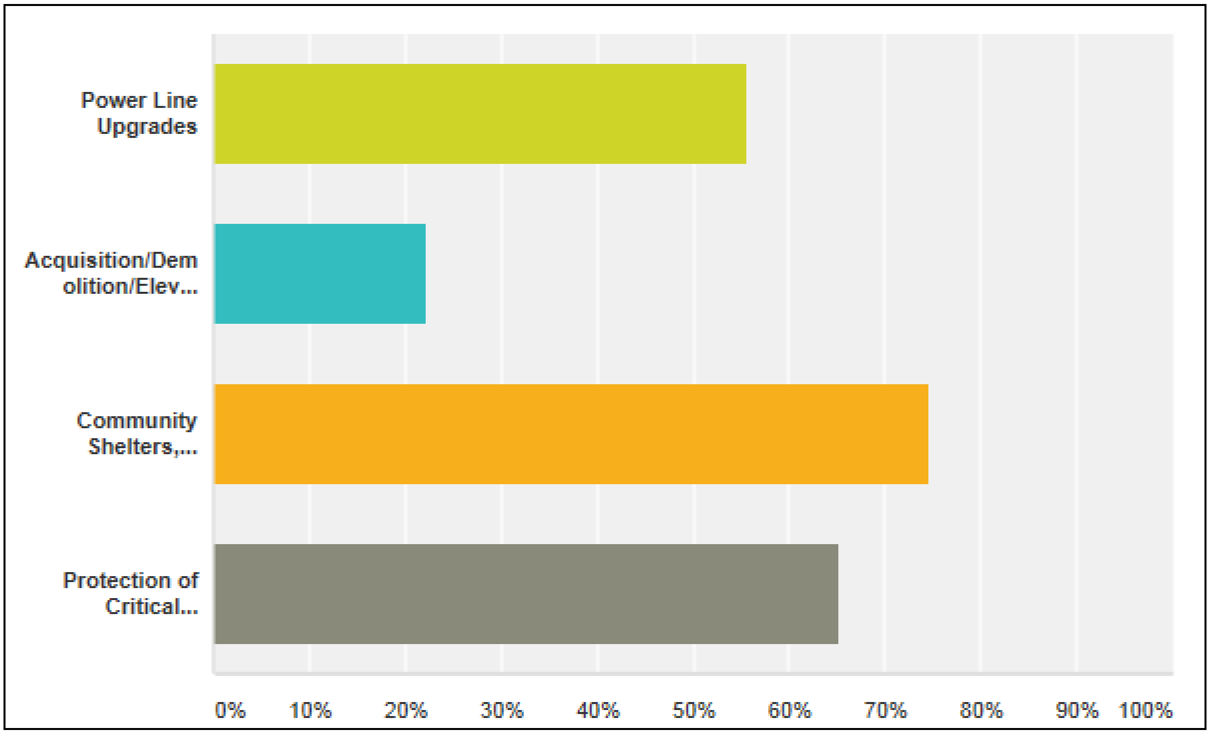
Question 2: In the Region consisting of Barber, Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford Counties, the planning committee has determined that the hazards listed below are of significance to the area. Please indicate the level of risk, or extent of potential impacts, in the Region, that you perceive for each hazard.



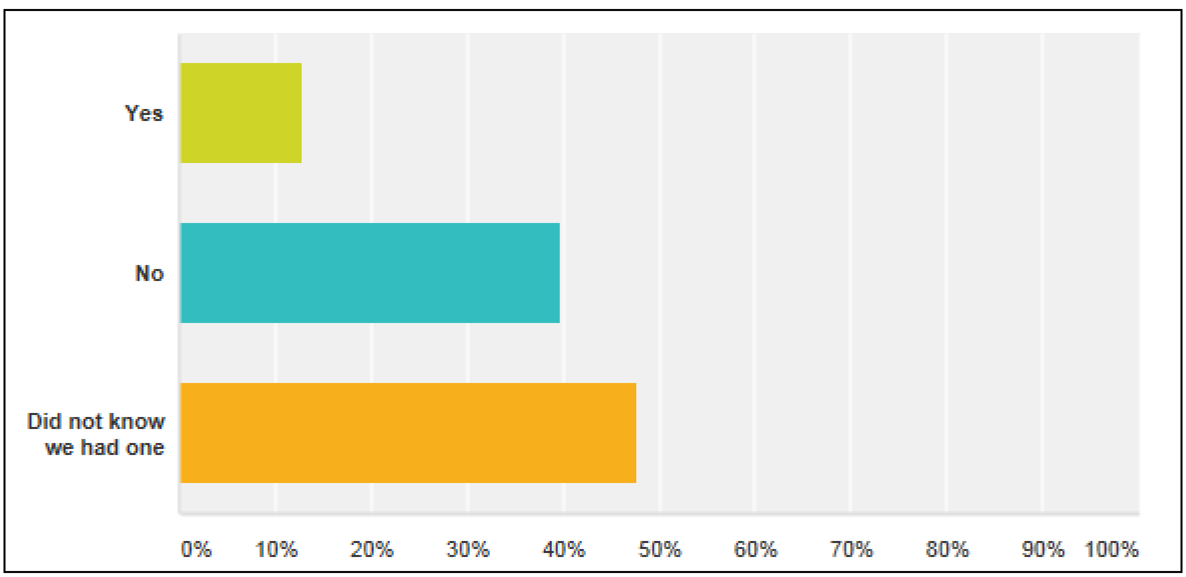
Question 3: In the region, the planning committee has determined that a flood event is a hazard for your region. How important to you is it that you participate or continue to participate in the National Flood Insurance Program?



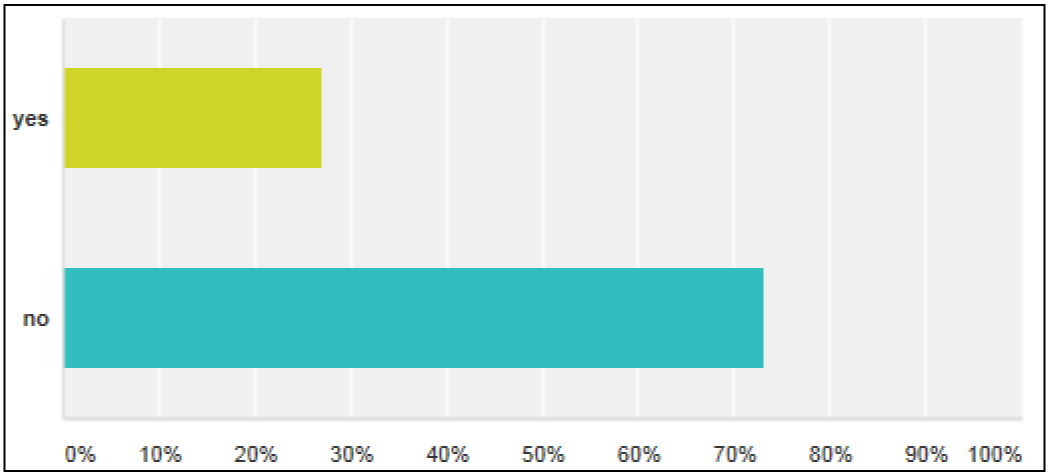
Question 4: Funding requests for FEMA Hazard Mitigation Grant Program funds are currently reviewed initially by the Kansas Division of Emergency Management. Listed below are their current funding priorities. Please check those that benefit your community.



Question 5: Have you had an opportunity to read your current Hazard Mitigation Plan?



Question 6: Do you know where the mitigation plan for your county can be found if you wanted to look at it?



In addition, the following comments relating to mitigation planning were from interested citizens of the region. Please note that questions answered with a "none," "non applicable," or similar response, or left blank are not reported.

Question 7: Your input is valuable to this planning process. Please comment on any other issues that the planning committee should consider in developing a strategy to reduce future losses caused by natural hazard events.

- I think snow is our biggest problem because there are so many people over the age of 70 that live here. The town never plows and makes it safe for them to get out and are stuck sometimes for days in their house. Also there is a lot of fames around that if a wild fire ever took off outside of town it could be real bad especially with the winds are blowing.
- Poles with lines are dangerous!
- Better communication between community leaders (ie: city, county, school, etc.) regarding collaboration in the situations leading up to and during an event listed above.
- Safety.
- Electro Magnetic Pulse, from Sun, Basic Protection
- The moderate to critical hazards indicated in my survey should be those the committee concentrate the focus for community welfare.
- Barton County needs to assist the residents of Hoisington to mitigate the designated flood areas in town. Property values and growth are stifled because of the flood designation. Most properties in the designated areas will NEVER flood, but they are forced to buy flood insurance and their values are diminished because of the designation. The county and city would make huge gains in valuation and housing units if there were a mitigation project. Increased valuation and population would benefit the entire county, city, and schools.
- Better training and Tools for Fire Dept and Law Enforcement.
- As a city, Great Bend needs more accessible tornado/storm safety locations. As a mobile home owner, we have storm plans and friends across town with basements. Availability

is totally dependent upon day & time. Great Bend does have good sirens and weather watchers. Great Bend also does a good job of spraying for mosquitoes.

- Proper drainage from the streets and gutters.
- Put a tornado siren in the town of Heizer. We don't. Know when one is coming by the time it's too late.
- Natural Hazards are unpreventable. I have watched the weather in Central Kansas change over the past 60 years. Central Kansas has not had a major flood since the 60s and a freak flood in north end of Great Bend since the 70s. Low lying areas are prone to Flooding and either people already know it, expect it, or a few signs could be put up warning people.
- I believe that after the tornado hit Hoisington in April of 2001 that we learned it very important to have competent Community Shelters. Also the need to protect our Critical Facilities like Clara Barton Hospital and the City Power Plant.
- Looking at emergency services beyond 911 and law enforcement is critical. Domestic and sexual violence emergency response, mental health emergency response should be an integral part of the plan.
- Better communication, more realistic/attainable action plans.
- Organize LEPC meetings in county so players are aware of what is going on.
- At a recent meeting I attended with other people from our hospital, EMS, Health Dept and Environmental I felt like we have good representation from all in the event of a hazard.
- Training for volunteers

Question 8: Do you have any mitigation projects you would like to see implemented and what are they?

- New poles and less lines on each one. Some of the poles have so many lines on it that it is dangerous!
- Increase in Neighborhood Awareness of Crime. Increase both City Police and County Sheriff's Budgets.
- Alleviate the designated flood zones / flood ways in Hoisington. The flood zone has significantly impacted the ability for the community to grow both in housing units and valuation. The designated areas in town could be mitigated and property values would significantly increase as would growth. There are numerous lots by the ball park that are now unusable since the tornado. Houses on north Center are paying for flood insurance and they will NEVER flood.
- A replacement for St. Rose basement: Are there businesses located around Court House Square that have basements that could be opened for tornado/storm shelters? The square would allow for adequate parking. Would not need to be unlocked all the time because then it could become a home-less shelter.
- A tornado siren be place in Heizer Kansas.
- I live in Pawnee Rock and we have homes that are dilapidated and have been empty for 20 years. One is on South Central St and the other on South Rock street. Both owned by (removed) of Great Bend. Both properties are about to fall in, are overgrown with trees and vegetation and shelter fox, skunks, raccoons, possums and snakes. Our Community

and City Council seem unable to have properties like this bulldozed down and burned which would be healthier for the citizens of Pawnee Rock.

- I will read the mitigation plan to better understand what implementation of the mitigation projects that would benefit our community and our county.
- New tornado sirens.
- Plan to mitigate the drought and how water conservation and alternative water sources might help.
- LEPC or ESF-8 meetings in county so all players are at the same table and know the plan for the county.
- County wide message system.
- Tornado Shelters.

A copy of the surveymonkey.com questionnaire may be found in Appendix C.

1.10 RISK ASSESSMENT

44 CFR 201.6(c) Plan Content. The plan shall incl ude the following: (2) A risk assessment tha t provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments mu st provide sufficient information to en able the jurisdiction to identify and prioritize appropria te mitigation actions to reduce losses from identified hazards. The risk assessment shall include: (i) A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

44 CFR 201.6(c)(2)(iii) For multi-ju risdictional plans, th e risk asse ssment section m ust assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

As part of the mitigation planning effort, the hazards that could potentially impact jurisdictions in south Kansas were identified based on historical data, past occurrences, and local and regional knowledge. Identified hazards were then provided with a risk ranking using a weighted formula whose parameters included probability of occurrence, potential magnitude/severity of the event, event duration, warning time of occurrence.

Initially, participants of the kickoff meetings discussed hazard data sourced from their previous hazard mitigation plans and any recent regional hazard events. In general, participants were asked to consider:

- Previously identified mitigation plan hazards
- State of Kansas mitigation plan identified hazards
- FEMA identified hazards
- Recent hazard events, including declared disasters

Participants were encouraged to discuss past hazard events, including magnitude and severity, past impacts, and the future probability for all identified hazards. Based on this discussion, a comprehensive list of regional hazards was created. It should be noted that all discussed hazards did not warrant inclusion in the south Kansas Plan.

Finally, a data collection form to solicit and further develop the discussed hazards was provided to participants. Based upon the initial research, discussion held during the kickoff meetings, information obtained from the data collection forms, additional research, and subsequent discussion with HMPC members, a complete profile was developed for each selected hazard, and each hazard was assigned a risk ranking. HMPC participants were asked to review the profiled and developed hazards at the second planning meeting to further refine the information.

Further discussion of hazards, and justification for hazard omission may be found in Section 3.

1.11 VULNERABILITY ASSESSMENT AND LOSS ESTIMATION

44 CFR 201.6(c)(2)(ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of: (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; (B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; (C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

As part of the information collection process, participating jurisdictions created an inventory of assets that could be potentially impacted by identified hazards, including a total number, identified values and potential losses, and development trends if available. Based on the gathered information an south Kansas assets at risk inventory was created.

Identified assets include:

- Critical facilities
- Critical infrastructure
- Historic structures and locations
- Economic assets
- Vulnerable populations
- Special needs populations

Further discussion of vulnerabilities and loss may be found throughout the Plan.

1.12 CAPABILITY ASSESSMENT

A capability assessment was conducted to determine the abilities, policies, and available resources of local and regional jurisdictions to implement mitigation actions. The following information was researched as part of the capability assessment:

- Existing and proposed local and regional ordinances, regulations, and policies
- Active and proposed plans related to mitigation planning, regional and local planning
- Current and proposed public outreach measures and programs
- Available personnel
- Available resources, including technological capabilities
- Available financial resources related to mitigation activities

Additionally, this assessment assisted in identifying any roadblocks, limitations or conflicts that could potentially obstruct mitigation actions and in identifying those activities that could be enhanced to further mitigation goals.

Further discussion of regional capabilities may be found in Section 4.

1.13 DEVELOPMENT OF MITIGATION GOALS

44 CFR 201.6(c)(3) A mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section shall include: (i) A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Based upon the developed regional hazards the HMPC and participating jurisdictions were asked during the second planning meeting to assist in developing a set of goals related to future hazard event outcomes. Research conducted prior to the meeting provided participants with a list of goals from previous planning efforts as a starting point for development. In general, the goals and objectives of this Plan are to:

- **Goal 1:** Reduce and/or eliminate the risk to the people and property of south Kansas from the identified hazards in this plan.
- **Goal 2:** Strive to protect all of the vulnerable populations, structures, and critical facilities in south Kansas from the impacts of the identified hazards.
- **Goal 3:** Improve public outreach initiatives to include education, awareness and partnerships with all willing entities in order to enhance understanding of the risks south Kansas faces due to the impacts of the identified hazards.
- **Goal 4:** Enhance communication and coordination among all agencies and between agencies and the public.

The above identified goals are discussed in detail in Section 5 of this Plan.

1.14 DEVELOPMENT OF MITIGATION ACTIONS

44 CFR 201.6(c)(3)(ii) A section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate. (iii) An action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs. (iv) For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

To accomplish the above identified goals, the HMPC has developed a list of robust and achievable mitigation actions for each participating jurisdiction that address hazard vulnerabilities that exist today and in the foreseeable future.

The mitigation actions noted in this Plan include both structural and non-structural measures. Examples include:

- Requiring resistant new construction
- Relocation of structures
- Structural modification
- Construction of shelters
- Construction of barrier, deflection, or retention systems
- Detection and warning systems
- Regulatory measures
- Community awareness and education programs
- Behavioral modification

Mitigation actions were prioritized by the responsible jurisdiction based on both historical and new information and jurisdictional capabilities.

A complete discussion of the development of mitigation actions can be found in Section 5.

1.15 DEVELOPMENT OF SOUTH KANSAS MULTI-HAZARD MITIGATION PLAN

44 CFR 201.6(d) Plan review.(1) Plans must be submitted to the State Hazard Mitigation Officer (SHMO) for initial review and coordination. The State will then send the plan to the appropriate FEMA Regional Office for formal review and approval. Where the State point of contact for the FMA program is different from the SHMO, the SHMO will be responsible for coordinating the local plan reviews between the FMA point of contact and FEMA.

Information obtained from previous mitigation plans, research, meetings, data collection forms, conversations, and public input was used to complete a draft of the Plan. The Plan was made available online for review for public comment. Valid comments and suggestions received from stakeholders were integrated into the final Plan. The Plan was then submitted to the Kansas Division of Emergency Management SHMO for initial review. The SHMO then submitted the Plan to FEMA Region VII for review and approval

1.16 PLAN ADOPTION, REVIEW AND MAINTENANCE

44 CFR 201.6(c)(4) A plan maintenance process t hat includes: (i) A se ction describing the method and schedule o f monitoring, evaluating, and updating the mitiga tion plan within a five-year cyc le. (ii) A process by which local gov ernments incorporate the requirements of the mitigation plan into other planni ng mechanisms such as comprehe nsive or capital improvement plans, when appropriate. (iii) Discussion on how the community will continue public participation in the plan maintenance process.

44 CFR 201.6(c)(5) Docume ntation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council) . For multi-jurisdi ctional plans, each ju risdiction requesting approval of the plan must document that it has been formally adopted.

In order to have an approved hazard mitigation plan, DMA 2000 requires that each jurisdiction officially adopt the Plan. After FEMA Region VII review and Approval Pending Adoption status participating jurisdictions were tasked with formally adopting the Plan. Information concerning adoption dates and, if applicable, resolution number were presented in the Resolutions of Adoption section and copies of the resolutions are presented in Appendix A.

Prior the Plan adoption process, the HMPC developed a long-term maintenance strategy. This strategy is discussed in detail in Section 6.

1.17 PLANNING PROCESS PARTICIPATION

44 CFR 201.6(a)(4): Multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan.

1.17.1 Barber County

	Meeting Attendance or Communication with HMPC Representative	Data Submission	Mitigation Action
Barber County	x	x	x
City of Hardtner	x	x	x
City of Hazelton	x	x	x
City of Isabel	x	x	x
City of Kiowa	x	x	x
City of Medicine Lodge	x	x	x
City of Sharon	x	x	x
City of Sun City	x	x	x
USD #254 - Barber County North	x	x	x
USD #255 - South Barber County	x	x	x
Barber County Water Districts (all)	x	x	x

1.17.2 Barton County

	Meeting Attendance or Communication with HMPC Representative	Data Submission	Mitigation Action
Barton County	x	x	x
City of Albert	x	x	x
City of Claflin	x	x	x
City of Ellinwood	x	x	x
City of Galatia	x	x	x
City of Great Bend	x	x	x
City of Hoisington	x	x	x
City of Olmitz	x	x	x
City of Pawnee Rock	x	x	x
City of Susank	x	x	x
City of Pawnee Rock	x	x	x
City of Susank	x	x	x
USD #112 - Claflin	x	x	x
USD #355 - Ellinwood	x	x	x
USD #428 - Great Bend	x	x	x
USD #431 - Hoisington	x	x	x
Barton County Community College	x	x	x
Post Rock Rural Water District #1	x	x	x

1.17.3 Comanche County

	Meeting Attendance or Communication with HMPC Representative	Data Submission	Mitigation Action
Comanche County	x	x	x
City of Coldwater	x	x	x
City of Protection	x	x	x
City of Wilmore	x	x	x
USD#300 - Comanche County	x	x	x

1.17.4 Edwards County

	Meeting Attendance or Communication with HMPC Representative	Data Submission	Mitigation Action
Edwards County	x	x	x
City of Belpre	x	x	x
City of Kinsley	x	x	x
City of Lewis	x	x	x
City of Offerle	x	x	x
USD #347 - Kinsley / Offerle	x	x	x
USD #502 - Lewis	x	x	x

1.17.5 Kiowa County

	Meeting Attendance or Communication with HMPC Representative	Data Submission	Mitigation Action
Kiowa County	x	x	x
City of Greensburg	x	x	x
City of Haviland	x	x	x
City of Mullinville	x	x	x
USD #422 - Kiowa County	x	x	x
USD #474 - Haviland	x	x	x

1.17.6 Pawnee County

	Meeting Attendance or Communication with HMPC Representative	Data Submission	Mitigation Action
Pawnee County	x	x	x
City of Burdett	x	x	x
City of Garfield	x	x	x
City of Larned	x	x	x
City of Rozel	x	x	x
USD #495 - Fort Larned	x	x	x
USD #496 - Pawnee Heights	x	x	x

1.17.7 Pratt County

	Meeting Attendance or Communication with HMPC Representative	Data Submission	Mitigation Action
Pratt County	x	x	x
City of Byers	x	x	x
City of Coats	x	x	x
City of Cullison	x	x	x
City of Iuka	x	x	x
City of Pratt	x	x	x
City of Preston	x	x	x
City of Sawyer	x	x	x
USD #382 - Pratt	x	x	x
USD #438 - Skyline Schools	x	x	x
Pratt Community College	x	x	x

1.17.8 Stafford County

	Meeting Attendance or Communication with HMPC Representative	Data Submission	Mitigation Action
Stafford County	x	x	x
City of Hudson	x	x	x
City of Macksville	x	x	x
City of Radium	x	x	x
City of Seward	x	x	x
City of St. John	x	x	x
City of Stafford	x	x	x
USD #349 - Stafford	x	x	x
USD #350 - St John/Hudson	x	x	x
USD #351 - Macksville	x	x	x

1.17.9 Stakeholders

The following list includes stakeholders involved in the planning process, including private, non-profit and charitable organizations.

Stakeholder	Meeting Attendance or Communication with HMPC Representative	Mitigation Action
Barber County		
Alfalfa REC	x	x
Ninnescah REC	x	x
South Pioneer REC	x	x
Barton County		
Arkansas Valley REC	x	x
Midwest Energy	x	x
Rolling Hills REC	x	x
Comanche County		
CMS Electrical Cooperative	x	x
Edwards County		
Midwest Energy	x	x
Pawnee County		
Midwest Energy	x	x
Pratt County		
Midwest Energy	x	x
Ninnescah REC	x	x
South Pioneer REC	x	x
American Red Cross	x	x
Stafford County		
Arkansas Valley REC	x	x
Midwest Energy	x	x

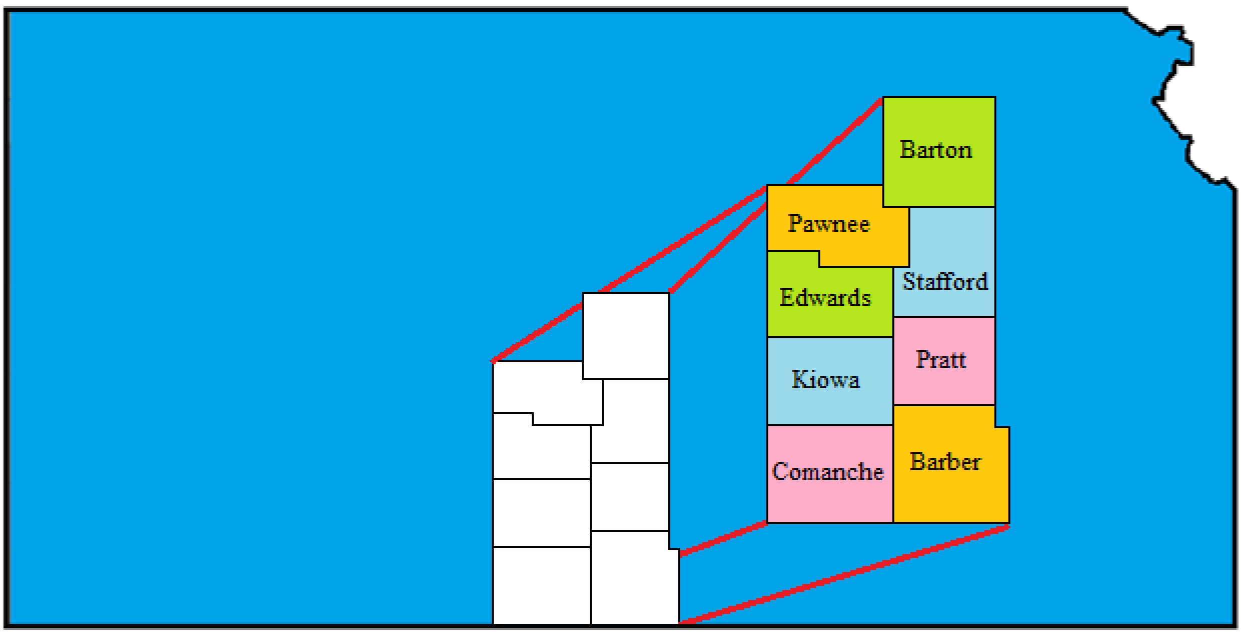
1.18 Non-Participating Jurisdictions

All previously participating jurisdictions participated in this planning effort.

2.0 REGIONAL PROFILE

2.1 PLANNING REGION

The south Kansas planning region includes Barber, Barton, Comanche, Edwards, Pawnee, Pratt and Stafford counties, as well as the cities and towns located within these counties. The counties and majority of the cities participating in the 2014 hazard mitigation plan update plan are briefly summarized in the following two sections.



2.2 COUNTY AND TRIBE PROFILES

The following includes a general discussion of participating counties.

Barber County

Barber County is located in south Kansas, along the state border with Oklahoma, and encompasses 1,134 square miles, with approximately 2.1 square miles being covered by water. It is bound to the north by Pratt and Kingman Counties, to the south by Alfalfa and Woods Counties, Oklahoma, to the east by Harper and Kingman Counties and to the west by Comanche and Kiowa Counties. The County seat is the City of Medicine Lodge.

Barber County was organized in 1873 with Medicine Lodge as the county seat. The county was named for Thomas Barber, an abolitionist who was killed in 1855 during the Wakarusa War.

Rivers and streams within Barber County include Cave Creek, Big Sandy Creek, Mule Creek, Spring Creek, East Branch Little Sandy Creek, Brush Creek, Wilson Slough, Antelope Creek, and Cedar Creek. Lakes in Barber County include Spicer Lake, Harqis Lake, Cook Lake, Lake Arrowshead, and Barber County State Lake.

Major roads include U.S. Highway 281, a north-south route that travels through the city of Medicine Lodge and U.S. Highway 160, an east-west route that passes south of Medicine Lodge.

According to the 2013 United States Census (Census), the population estimate for Barber County was 4,937 (a 7.0% decrease from a 2000 Census population of 5,307), with a population density of 4 people per square mile.

Barton County

Barton County is located in south Kansas and encompasses approximately 894 square miles, with approximately 6.5 square miles being covered by water. It is bound to the north by Russell County, to the south by Pawnee and Stafford Counties, to the east by Ellsworth and Rice Counties, and to the west by Pawnee and Rush Counties.

West Side 1400 Block, Main Street, Great Bend, Kansas

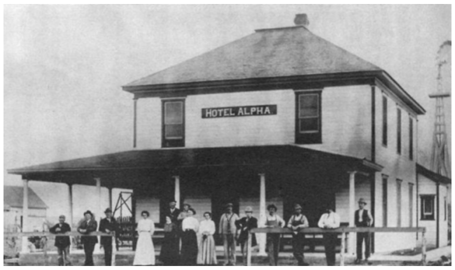
Barton County was organized in 1872 with Great Bend as the county seat. The county was named for Clara Barton, the founder of the American Red Cross, and is the only Kansas county named for a woman.

The main water course is the Arkansas River, which cuts across the southern third of the county. Walnut Creek and Dry Walnut Creek enter the western border of the county and form the Lower Walnut Creek drainage basin. The Cow River drainage basin includes Blood Creek, Deception Creek, Little Cheyenne Creek, and the Cow River. In northern Barton County streams include Landon Creek, Sellens Creek, Goose Creek, Beaver Creek, Coal Creek, and Blood Creek. Major bodies of water s include Lake Barton and Cheyenne Bottoms, a natural basin in which contributing creeks form a shallow lake and a large expanse of wetlands and marsh.

Major roads include U.S. Highway 281, a north-south route that travels through the cities of Great Bend and Hoisington and U.S. Highway 56, an east-west route that passes south of Great Bend and Ellinwood. State Highways include K-96, an east-west route passing through Albert, K-156, a northeast-southwest route passing through Great Bend, and K-4, an east-west route that passes through Hoisington.

According to 2013 Census data, the population estimate for Barton County was 27,509 (a 2.5% decrease from a 2000 Census population of 28,205), with a population density of 21 people per square mile.

Comanche County



Comanche County is located in south Kansas, along the state border with Oklahoma and encompasses 790 square miles, with approximately 1.4 square miles being covered by water. It is bound to the north by Kiowa County, to the south by Woods and Harper Counties, Oklahoma, to the east by Barber County, and to the west by Clark County.

Comanche County was organized in 1885, with the county seat as the City of Coldwater. The county was named in honor of the Comanche Indians.

Major rivers and streams include the Cimarron River, which flows southeast across the southwest corner of the county, the Salt Fork of the Arkansas River in the southwest corner of the county, Calvary Creek, which flows south through the western part of the county, Bluff Creek, Mustang Creek, Nescatonga, Creek, Indian Creek and Big Mule Creek. Lake Coldwater is the only major lake within the county.

Major roads include U.S. Highway 183, a north-south route that travels through the city of Coldwater and U.S. Highway 160, an east-west route that passes through the City of Coldwater.

According to 2013 Census data, the population estimate for Comanche County was 1,955 (a 0.6% decrease from a 2000 Census population of 1,967), with a population density of 2 people per square mile.

Edwards County

Edwards County is located in south Kansas. The county encompasses 622 square miles, with approximately 0.08 square mile being covered by water. It is bound to the north by Pawnee County, to the south by Kiowa County, to the east by Stafford and Pratt Counties, and to the west by Hodgeman and Ford Counties.

Edwards County was organized in 1874 with Kinsley as the county seat. The county was named for W.C. Edwards, an early settler. Edwards County was historically known as a stop along the Santa Fe Trail.

Major rivers include the Arkansas River, which runs in a northeasterly direction near the northwestern part of the county. The head waters of the Little Coon and the Big Coon creeks are in Trenton and Jackson townships. The Little Coon enters the Big Coon midway between Kinsley and Nettleton, and the Big Coon empties into the Arkansas at Garfield, Pawnee County. No major lakes were identified in Edwards County.

Major roads include Highway 50/56, an east-west route passing through the cities of Offerle and Kinsley, where the highways diverge, and Highway 183, a north-south route passing through the city of Kinsley.

According to 2013 Census data, the population estimate for Edwards County was 2,945 (a 15% decrease from a 2000 Census population of 3,449), with a population density of 5 people per square mile.

Kiowa County

Kiowa County is located in south Kansas. The county encompasses 723 square miles, with approximately 0.23 square miles being covered by water. It is bound to the north by Edwards County, to the south by Comanche County, to the east by Pratt and Barber Counties, and to the west by Ford and Clark Counties.

Kiowa County was established in 1874 with Greensburg as the county seat. The county was named in honor of the Kiowa Indians.

Major rivers and streams include the Medicine Lodge River in the southeastern part of the county, Rattlesnake Creek and its tributaries, Mule Creek, Wiggins Creek and East Kiowa Creek. The Kiowa State Fishing Lake is the only major lake within the county.

Major roads include Highway 400/54, an east-west route passing through the cities of Greensburg and Mullinville, where the Highways diverge, and Highway 183, a north-south route passing to the west of the city of Greensburg.

According to the 2013 United States Census, the population estimate for Kiowa County was 2,523 (a 23% decrease from a 2000 Census population of 3,278), with a population density of 3 people per square mile.

Pawnee County

Pawnee County is located in south Kansas. The county encompasses 755 square miles, with approximately 0.38 square miles being covered by water. It is bound to the north by Barton and Rush Counties, to the south by Edwards and Stafford Counties, to the east by Stafford and Barton Counties, and to the west by Hodgeman and Ness Counties.

Pawnee County was established in 1872 with Larned as the county seat. The county was named in honor of the Pawnee Indians who used the area as traditional hunting grounds.

The main water courses for Pawnee County include the Pawnee River, which enters the county from Hodgeman County to the west and flows in an easterly direction until connecting with the Arkansas River near Larned, and the Arkansas River, which enters Pawnee County from Edwards County to the southwest and flows in a general northeast direction. Named creeks include Sawmill Creek, Cocklebur Creek, Ash Creek, Dry Walnut Creek, Pickle Creek, Coon Creek, Hubbard Creek, and Wild Horse Creek. No major lakes were identified in Pawnee County.

Major roads include State Highway 156, an east-west route passing south of the cities of Burdett and Rozell and through the City of Larned where it merges with Highway 56, a northeast-southwest route that passes through Garfield, and Highway 183, a north-south route passing to the center of the county.

According to 2013 Census data, the population estimate for Pawnee County was 6,971 (a 3.6% decrease from a 2000 Census population of 7,233), with a population density of 9 people per square mile.

Pratt County

Pratt County is located in south Kansas. The county encompasses 736 square miles, with approximately 0.76 square miles being covered by water. It is bound to the north by Stafford County, to the south by Barber County, to the east by Kingman and Reno Counties, and to the west by Edwards and Kiowa Counties.

Pratt County was established in 1873, with Iuka as the county seat. The county seat was later changed to Pratt. The county was named in honor of Caleb Pratt, a Second Lieutenant of the First Kansas Infantry killed in action August 10, 1861 at Wilson's Creek, Missouri.

The main water courses are the South Fork of the Ninnescah River which flows generally eastward through the county, and the Chikaskia River which is located in the southeast corner of the county and flows eastward into Kingman County. Named creeks include Anderson Creek, Coon Creek, Hackberry Creek, Keno Creek, Little Driftwood Creek, and Yellowstone Creek. Major lakes include Pratt County Lake and Pratt Centennial Pond.

Major roads include Highway 281, a north-south route passing through the cities of Pratt and Sawyer, Highway 400/54, an east-west route passing through the city of Pratt, and State Highway 61, a northeast-southwest route originating in the city of Pratt.

According to 2013 Census data, the population estimate for Pratt County was 9,878 (a 2.4% increase from a 2000 Census population of 9,647), with a population density of 13 people per square mile.

Stafford County

Stafford County is located in south Kansas. The county encompasses 795 square miles, with approximately 2.7 square miles being covered by water. It is bound to the north by Barton County, to the south by Pratt County, to the east by Reno and Rice Counties, and to the west by Pawnee and Edwards Counties.

Stafford County was established in 1879 with the City of St. John as the county seat. The county was named in honor of the Lewis Stafford, a Captain in the First Kansas Infantry killed in at Young's Point Louisiana in 1863.

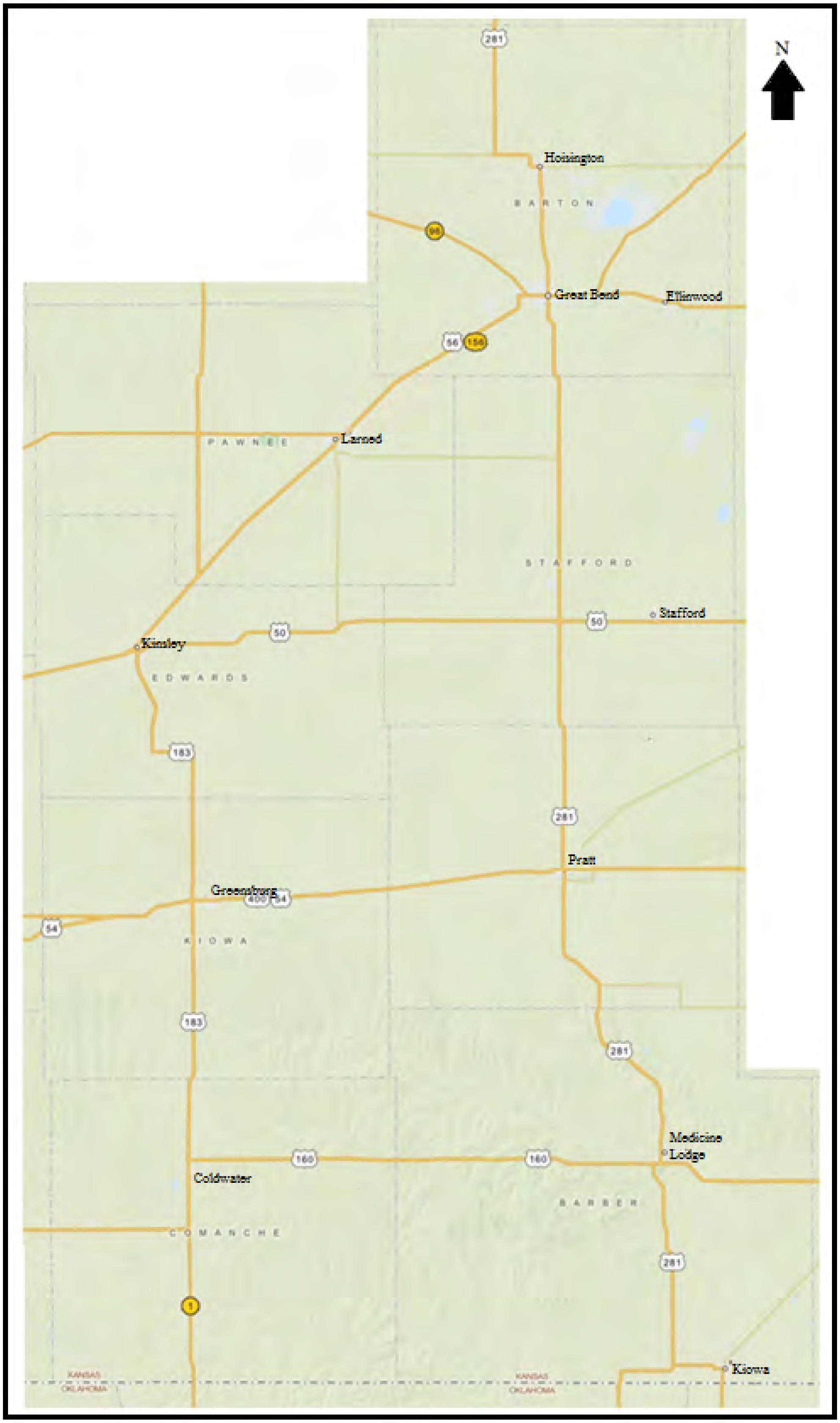
The main water course is the Ninnescah River, which flows in a generally northeast direction. Major lakes include Allens Lake, a reservoir around Stafford, Eppely Lake, a reservoir north of St. John, Gilmore, a reservoir north of Saint John, Lake Darrynane, a reservoir northwest of Alden, Park Smith Lake, a reservoir northwest of Alden, and Stafford Lake, a reservoir in Stafford. In addition, the Quivira National Wildlife Refuge was started in 1955 and for over 50 years has given migratory birds a stopover habitat along the Central Flyway of North America. There are approximately 7,000 acres of wetlands, large and small, scattered throughout the Refuge.

Major roads include Highway 281, a north-south route passing through the center of the county, Highway 50, an east-west route passing through the city of Macksville and south of the City of Stafford, and State Highway 19, an east-west route in the northwest of the county.

According to 2013 Census data, the population estimate for Stafford County was 4,359 (a 9.0% decrease from a 2000 Census population of 4,789), with a population density of 6 people per square mile.

2.3 CITY PROFILES

The following includes a brief discussion of participating cities, broken down by county.


N
Hoisington
BARTON
Great Bend
Ellinwood
Larned
PAWNEE
STAFFORD
Stafford
Kinsley
EDWARDS
Pratt
Greensburg
KIOWA
Medicine Lodge
Coldwater
BARBER
COMANCHE
Kiowa
KANSAS
OKLAHOMA

Barber County

Hardtner, founded in 1887 and named for Dr. John Hardtner, is located on the southern boundary of the county along Highway 169. The 2010 census indicates the city has a total area of 0.30 square miles a population of 281.

Hazelton, founded in 1883 and named for Reverend J.H. Hazelton, is located in the southeast corner of the county, along State Highway 14/2. The 2010 census indicates the city has a total area of 0.57 square miles and a population of 93.

Isabel is located northern boundary of the county. The 2010 census indicates the city has a total area of 0.20 square miles and a population of 90.

Kiowa, founded in 1872 and named for the Kiowa Indians, is located in the southeast corner of the county at the intersection of State Highways 14/2 and 8. The 2010 census indicates the city has a total area of 1.07 square miles and a population of 1,026.

Medicine Lodge, founded in 1873, is a located near the center of the county along Highway 281 and the Medicine Lodge River. The 2010 census indicates the city has a total area of 1.21 square miles and a population of 2,009. Medicine lodge is the county seat for Butler County.

Sharon, founded in 1883, is located near the eastern border of the county along Highway 160. The 2010 census indicates the city has a total area of 0.30 square miles and a population of 158.

Sun City is located in the northwest corner of the county. The 2010 census indicates the city has a total area of 0.14 square miles and a population of 53.

Barton County

Albert is located western boundary of the county along State Highway 96. The 2010 census indicates the city has a total area of 0.24 square miles and a population of 81.

Claflin, settled in 1887, is located near the western boundary of the county along State Highway 4. The 2010 census indicates the city has a total area of 0.30 square miles and a population of 645.

Ellinwood, settled in 1871, is located in the southeast corner of the county along State Highway 56. The 2010 census indicates the city has a total area of 1.14 square miles and a population of 2,131.

Galatia is located in the northwest corner of the county. The 2010 census indicates the city has a total area of 0.38 square miles and a population of 39.

Great Bend, founded in 1871 and named for its location along the Arkansas River, is located near the center of the county along Highways 56 and 281. The 2010 census indicates the city has a total area of 10.71 square miles, with 0.011 square miles of water, and a population of 15,995. Great Bend is the county seat of Barton County.

Hoisington, founded in 1886 and named after Andrew Hoisington, is located near the center of the county along Highway 281 and State Highway 4. The 2010 census indicates the city has a total area of 0.72 square miles, with 0.01 square miles of water, and a population of 2,706.

Olmitz is located near the western border of the county, just south of State Highway 4. The 2010 census indicates the city has a total area of 0.17 square miles and a population of 114.

Pawnee Rock, founded in 1874, is located in the southwest corner of the county along Highway 56. The 2010 census indicates the city has a total area of 0.28 square miles and a population of 252.

Susank is located near the northern border of the county. The 2010 census indicates the city has a total area of 0.10 square miles and a population of 34.

Comanche County

Coldwater, organized in 1885, is located near the center of the county, at the intersection of Highways 160 and 183. The 2010 census indicates the city has a total area of 2.98 square miles, with 0.34 square miles of water, and a population of 828. Coldwater is the county seat of Comanche County.

Protection, founded in 1884, is located near the western border of the county just north of Highway 160 . The 2010 census indicates the city has a total area of 0.95 square miles and a population of 514.

Wilmore, founded in 1883, is located near the northern border of the county along Highway 68/268. The 2010 census indicates the city has a total area of 0.20 square miles and a population of 53.

Edwards County

Belpre, founded in 1879, is located in the northeast corner of the county along Highway 50. The name Belpre comes from the French word for "beautiful meadow." The 2010 census indicates the city has a total area of 0.41 square miles and a population of 84.

Kinsley, laid out in 1873, is located near the center of the county, at the intersection of Highways 50, 56 and 183. The 2010 census indicates the city has a total area of 1.29 square miles and a population of 1,457. Kinsley is the county seat of Edwards County.

Lewis, founded in 1885, is located near the northern border of the county along Highway 50. The 2010 census indicates the city has a total area of 0.33 square miles and a population of 451.

Offerle, established in 1876, is located on the western border of the county along Highway 50/56. The 2010 census indicates the city has a total area of 0.26 square miles and a population of 199.

Kiowa County

Greensburg, settled in 1885, is located in the center of the county along Highway 400/54. The 2010 census indicates the city has a total area of 1.48 square miles and a population of 777. In the evening of May 4, 2007, Greensburg was devastated by an EF5 tornado that leveled at least 95 percent of the city and killed eleven people. Greensburg is the county seat of Kiowa County.

Haviland, settled in 1885, is located near the western border of the county along Highway 400/54. The 2010 census indicates the city has a total area of 0.45 square miles and a population of 701.

Mullinville, founded in 1886, is located near the western border of the county at the intersection of Highways 54 and 400. The 2010 census indicates the city has a total area of 0.60 square miles and a population of 255.

Pawnee County

Burdett is located on the western border of the county along State Highway 156. The 2010 census indicates the city has a total area of 0.27 square miles and a population of 247.

Garfield, named for President James Garfield, is located near the southern border the county along Highway 56. The 2010 census indicates the city has a total area of 0.54 square miles and a population of 190.

Larned, founded in 1873, is located near the center of the county along Highway 56/156. The 2010 census indicates the city has a total area of 2.39 square miles and a population of 4,054. Larned is the county seat of Pawnee County.

Rozel is located in the western half of the county along State Highway 156. The 2010 census indicates the city has a total area of 0.17 square miles and a population of 156.

Pratt County

Byers, founded in 1914, is located in the northwest corner of the county. The 2010 census indicates the city has a total area of 0.19 square miles and a population of 35.

Coats, founded in 1887, is located near the southwest corner of the county. The 2010 census indicates the city has a total area of 0.21 square miles and a population of 83.

Cullison is located near the western border of the county along Highway 400/54. The 2010 census indicates the city has a total area of 0.17 square miles and a population of 101.

Iuka, settled in 1877, is located near the northern border of the county along Highway 281. The 2010 census indicates the city has a total area of 0.60 square miles and a population of 163.

Pratt, founded in 1884, is located in the center of the county at the intersection of Highways 400/54 and 281. The 2010 census indicates the city has a total area of 7.49 square miles, with 0.12 square miles of water, and a population of 6,835. Pratt is the county seat of Pratt County

Preston, founded in 1887, is located near the northeast corner of the county along Highway 61. The 2010 census indicates the city has a total area of 0.47 square miles and a population of 158.

Sawyer, founded in 1886, is located on the southern border of the county along Highway 281. The 2010 census indicates the city has a total area of 0.14 square miles and a population of 124.

Stafford County

Hudson, incorporated in 1908, is located near the center of the county. The 2010 census indicates the city has a total area of 0.13 square miles and a population of 129.

Macksville, founded in 1885, is located near the western border of the county along Highway 50. The 2010 census indicates the city has a total area of 1.00 square miles and a population of 549.

Radium is located near the western border of the county just north of State Highway 19. The 2010 census indicates the city has a total area of 0.04 square miles and a population of 25.

Seward is located near in the northern part of the county just north of State Highway 19. The 2010 census indicates the city has a total area of 0.25 square miles and a population of 64.

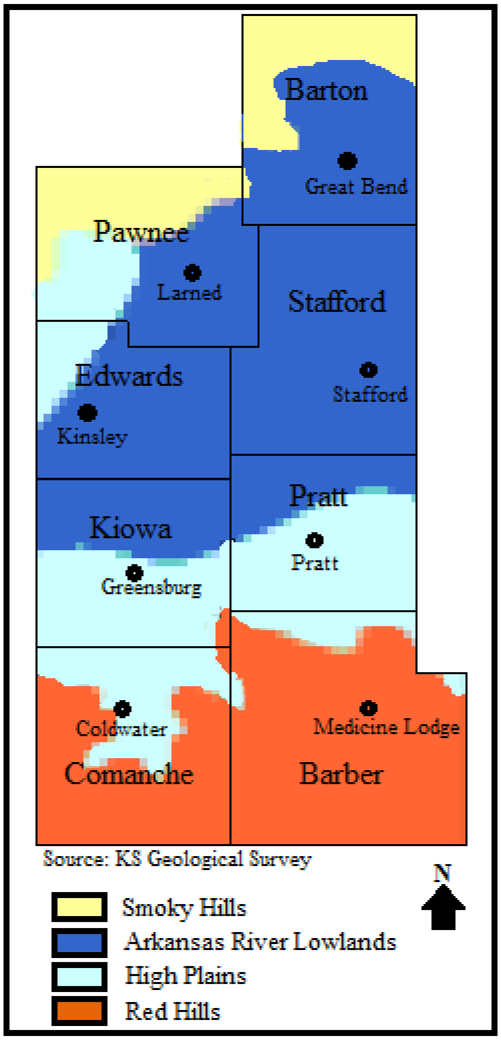
St. John, settled in 1875 and named after Governor John St. John, is located in the center of the county along Highway 281. The 2010 census indicates the city has a total area of 1.88 square miles and a population of 1,295. St. John is the county seat of Stafford County.

Stafford, founded in 1878, is located near the southeast corner of the county along State Highway 50. The 2010 census indicates the city has a total area of 0.92 square miles and a population of 1,042.

2.4 Regional Geology and Hydrology

The Kansas landscape was formed by alternating periods of deposition and erosion. The southern region of Kansas contains four distinct physiographic regions. Each region is differentiated by underlying rock formations, overlying soil types, and land use suitability. The following physiographic regions are found within southern Kansas.

Kansas Geological Survey
Generalized Physiographic Map of Kansas



The **Arkansas River Lowlands** follows the course of the Arkansas River through south-central Kansas. The broad floodplain contains large quantities of sand and silt carried from the Rocky Mountains by the river. A significant area of sand dunes occur on the south side of the plain formed by the prevailing winds from the glaciers to the north during the Pleistocene.

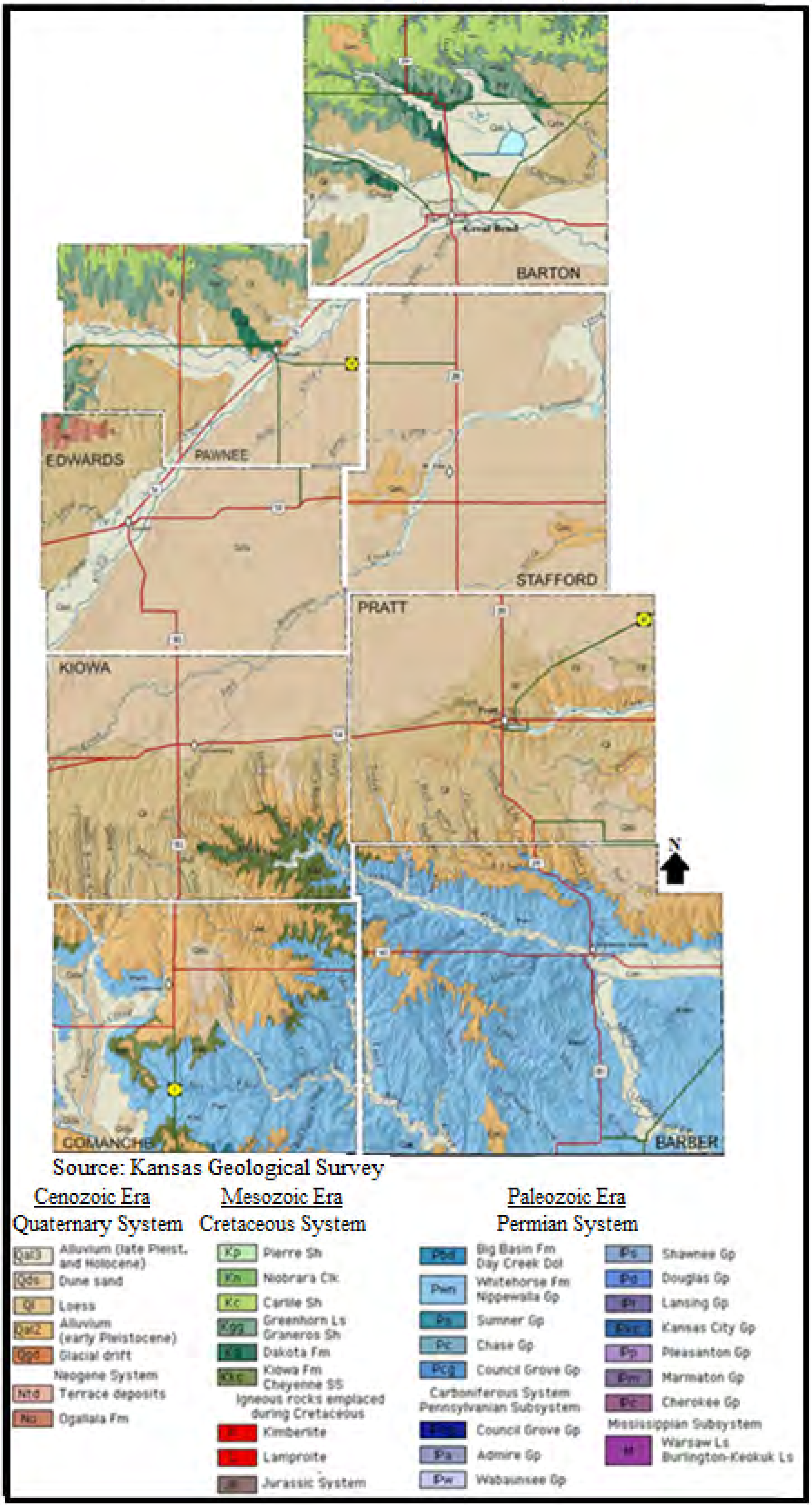
The **High Plains** area physiographic region is a result of the uplift of the Rocky Mountains during the Tertiary period. This event resulted in erosion and deposition of vast quantities of non-marine sediments eastward across the High Plains. The Ogallala Formation consists of a large wedge of unconsolidated sands and silts that is a significant aquifer under the plains. The Ogallala contains a sandstone layer cemented with opal.

The **Red Hills** cover the southwest corner of Harper County along the Oklahoma border. The Red Hills are named for their color derived from the Permian red beds which outcrop and underlie the region. The red color is produced by abundant iron oxides in the weathering sediments. The region is underlain by red shales, siltstones, and sandstones along with interbedded dolomites and gypsum evaporite layers. The soluble gypsum, anhydrite and dolomite have produce caves in the area.

The region known as the **Smoky Hills** occupies the northern part of the region. It is delineated by outcrops of Cretaceous-age rocks and takes its name from the early morning haze that often gathers in the valleys. The sandstones of the Dakota Formation crop out in a wide belt from Rice and McPherson counties. They are the remains of beach sands and sediments dumped by rivers draining into the early Cretaceous seas. The hills and buttes in this part of the Smoky Hills are capped by this sandstone and rise sharply above the surrounding plains.

The soils of Kansas are very diverse, with over 300 different soil types across 52 million-acres. In general, the soils of south-central Kansas are weathered, shallow clay-pan soils. The following map shows the predominant soils types identified in south Kansas.

South Kansas Geological Survey Map



Source: Kansas Geological Survey

Kansas soils are known around the world for their exceptional qualities. But even though Kansas has abundant and productive soils, erosion by wind and water continue to diminish this resource. According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service about 190 million tons of topsoil are degraded each year through human activities. Unfortunately, soils are not easily renewed and it takes about 500 years for an inch of topsoil to develop under prairie grasses.

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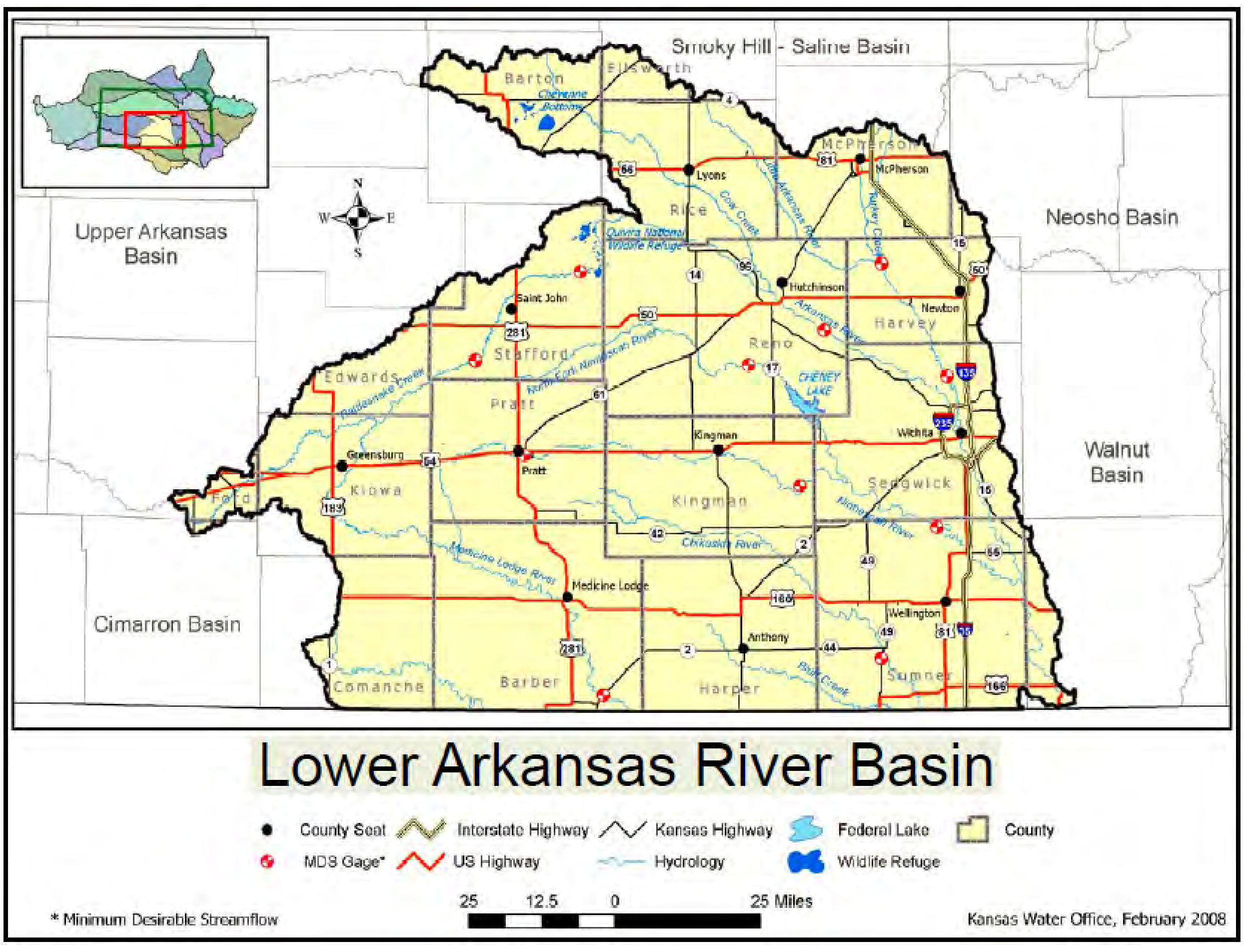
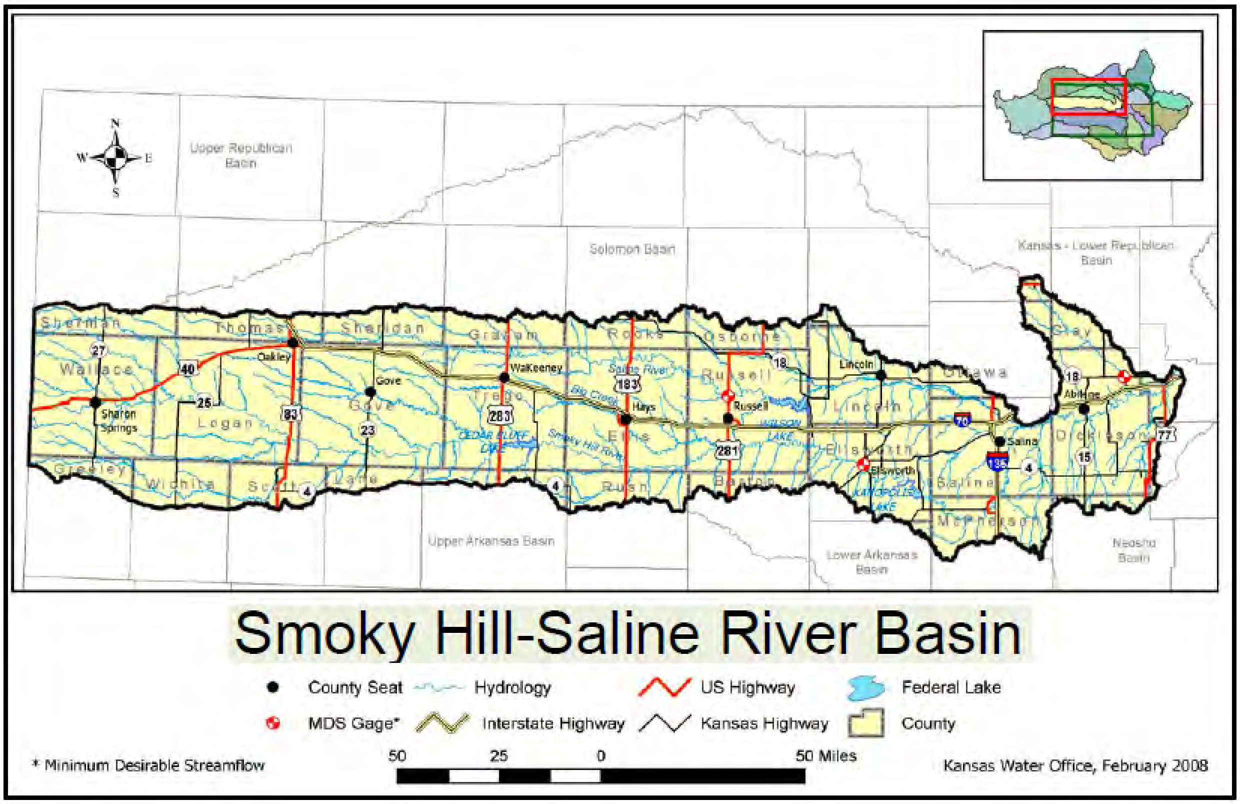
Four river basins cover south Kansas, the Cimarron, Lower Arkansas, Smoky Hills - Saline River, and Upper Arkansas Basins. Brief descriptions of each of these basins are presented below.

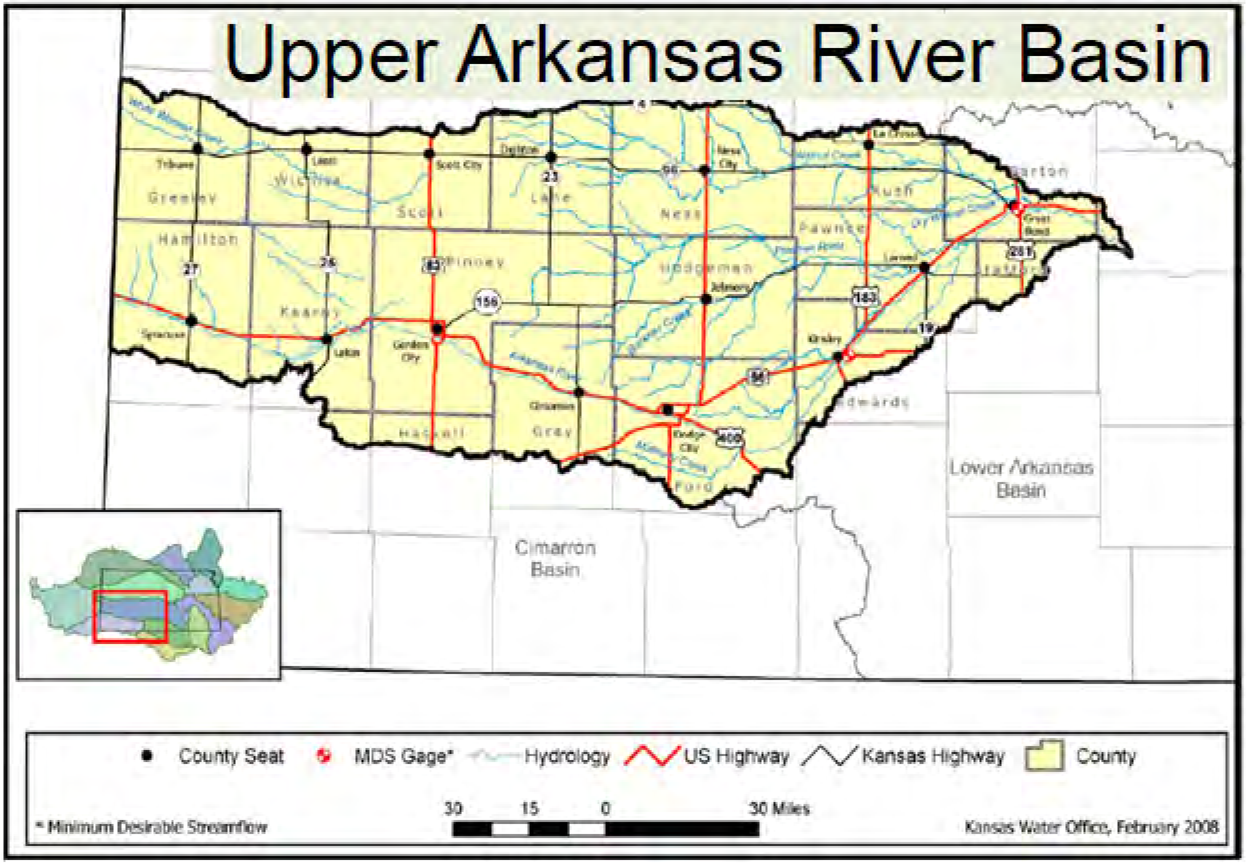


The **Lower Arkansas River Basin** is part of the Arkansas River basin. The Arkansas River originates in central Colorado, where it flows southeast into and across southern Kansas. The Arkansas River crosses the Kansas-Oklahoma border south of Arkansas City in Cowley County.

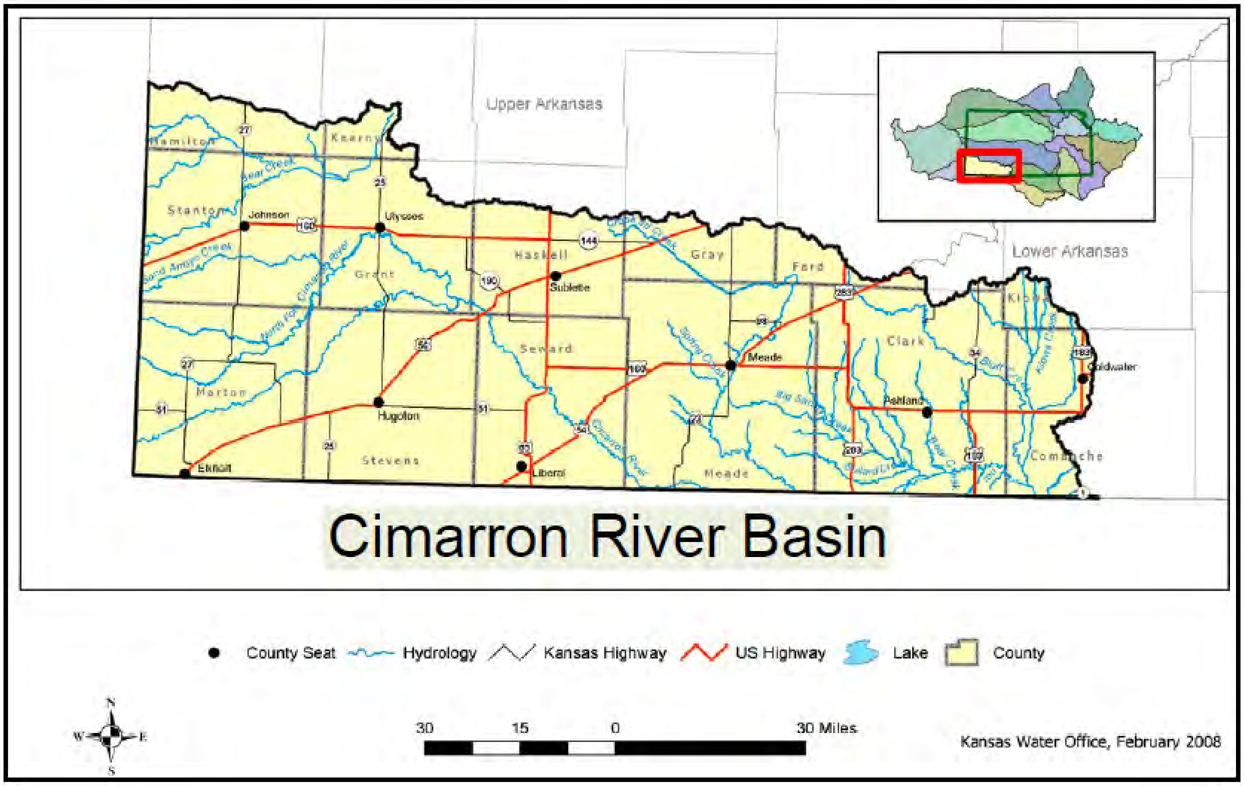
The Lower Arkansas basin begins where Rattlesnake Creek confluences with the Arkansas River in southwestern Rice County. Major tributaries entering the river along its course through the basin are Rattlesnake Creek, Cow Creek, Little Arkansas River, Ninnescah River and Slate Creek. Other major streams in the basin that join the Arkansas River in Oklahoma are the Chikaskia River, Medicine Lodge River and Salt Fork. The only major federal reservoir in the basin is Cheney Reservoir. The Lower Arkansas basin covers 11,500 square miles of south central Kansas and includes all or part of Barber, Barton, Comanche, Edwards, Kiowa, Pawnee, and Stafford counties. The basin has the second largest population of the twelve major river basins, with an estimated 641,000 residents in the year 2000.



The **Smoky Hill-Saline River Basin** is an elongated drainage area, which extends eastward from the Colorado border approximately 250 miles to the vicinity of Junction City, and covers the extreme northern border of Barton County. The entire Smoky Hill-Saline basin in Kansas has a drainage area of about 12,229 square miles. Topography within the basin is flat to gently rolling, with narrow, shallow valleys and low relief.



The **Upper Arkansas Basin** covers nearly 10,300 square miles of west central Kansas. The Upper Arkansas basin contains 13,165 miles of intermittent and 843 miles of perennial streams for a total of 14,008 stream miles. The Arkansas River is the dominant river. It receives water from snow and rain runoff resulting in periodic high flows with the Pawnee River, Walnut Creek and Coon Creek as major tributaries. There are no major federal reservoirs in the basin. The basin includes all or part of Barton, Edwards, Pawnee and Stafford counties. The basin had an estimated 128,500 residents in the year 2000.



The **Cimarron Basin** covers nearly 6,800 square miles of the southwest corner of Kansas. The Cimarron basin contains 6,421 miles of intermittent and 432 miles of perennial streams for a total of 6,853 stream miles. The major river in the basin is the Cimarron, with principal tributaries including the North Fork Cimarron, Crooked Creek, Bluff Creek and, on occasions of high runoff, Bear Creek. The Cimarron River has its source in Union County, New Mexico. It flows across the Oklahoma panhandle and the southeast corner of Colorado and enters Kansas nine miles northwest of Elkhart in Morton County. The Cimarron River leaves the state in the south-central portion of Meade County and reenters 30 miles east in Clark County. The river leaves the state for the last time in Comanche County and eventually joins the Arkansas River near Tulsa, Oklahoma. There are no major federal reservoirs in the basin. The basin includes all or part of Comanche and Kiowa counties. The basin had an estimated 54,300 residents in the year 2000.

2.5 Regional Climate

The Midwest climate region is known for extremes in both temperature and precipitation. In particular, Kansas lacks any mountain ranges that could act as a barrier to cold air masses from the north or hot, humid air masses from the south or any oceans or large bodies of water that could provide a moderating effect on the climate. The polar jet stream is often located over the region during the winter, bringing frequent storms and precipitation. In the summer the jet stream migrates north, resulting in the collision of air masses with differing temperatures and moisture levels. The result if this is often severe thunderstorms, high winds and tornados, with peak severe weather season from May to June.

Kansas summers are generally warm and humid due to the clockwise air rotation caused by Atlantic high pressure systems bringing warm humid air up from the Gulf of Mexico. In general, summer also tends to have the most rain. Historically, precipitation has been reasonably predicable and adequate, however the region is noted for severe droughts such as is occurring now. Winter months can bring severe weather in the form of snow and ice storms. All seasons are noted for damaging high winds.

Data from the following High Plains Regional Climate Center weather stations from the first available date (in parenthesis) to 2013 was obtained to create a regional average:

- Medicine Lodge, Barber County (1893)
- Great Bend, Barton County (1909)
- Coldwater, Comanche County (1893)
- Kinsley, Edwards County (1935)
- Greensburg, Kiowa County (1893)
- Larned, Pawnee County (1903)
- Pratt, Pratt County (1895)
- Hudson, Stafford County (1922)

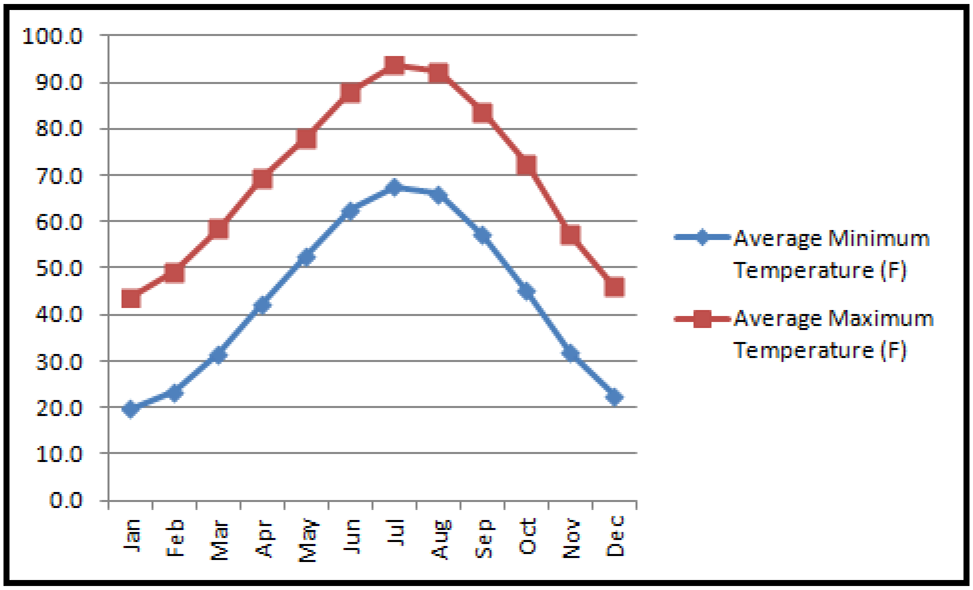
The following tables and charts present average climate data for South Kansas.

Regional Average Temperatures

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Minimum Temperature (F)	19.8	23.6	31.7	42.4	52.8	62.6	67.5	66.1	57.2	45.1	31.8	22.6	43.6
Average Maximum Temperature (F)	43.8	49.2	58.5	69.5	78.1	88.2	93.8	92.5	83.9	72.4	57.3	46.1	69.4

Source: High Plains Regional Climate Center

Regional Average Temperature Graph



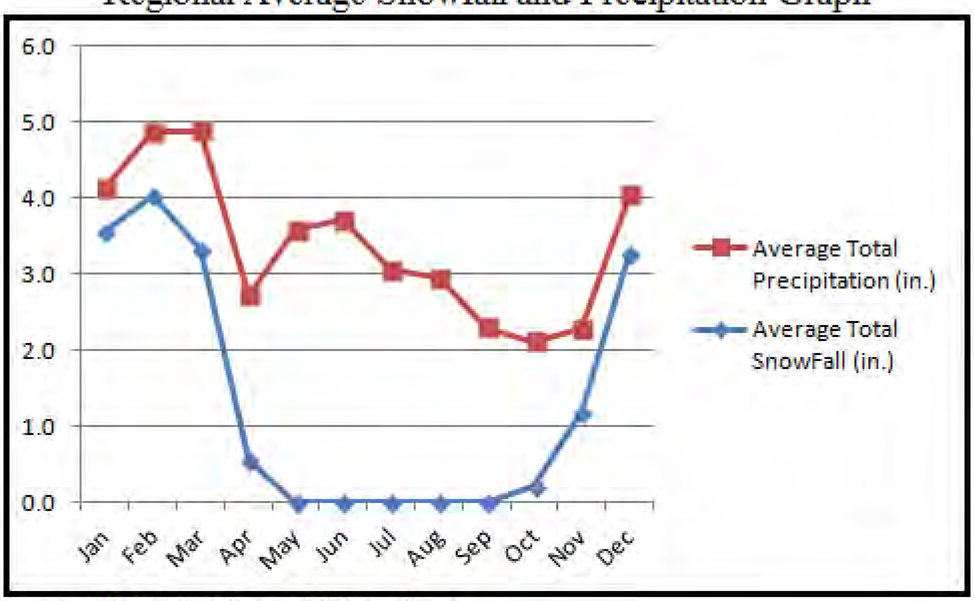
Source: High Plains Regional Climate Center

Regional Average Snowfall and Precipitation

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Total Snowfall (in.)	3.6	4.0	3.3	0.6	0.0	0.0	0.0	0.0	0.0	0.2	1.2	3.3	16.1
Average Total Precipitation (in.)	0.6	0.8	1.6	2.2	3.6	3.7	3.0	3.0	2.3	1.9	1.1	0.8	24.5

Source: High Plains Regional Climate Center

Regional Average Snowfall and Precipitation Graph



Source: High Plains Regional Climate Center

When discussing weather patterns climate change should be taken into account as it may markedly change future weather related events. There is a scientific consensus that climate change is occurring, and recent climate modeling results indicate that extreme weather events may become more common. Rising average temperatures produce a more variable climate system which may result in an increase in the frequency and severity of some extreme weather events including longer and hotter heat waves (and by correlation, an increased risk of wildfires), higher wind speeds, greater rainfall intensity, and increased tornado activity. As climate modeling improves, future plan updates should include climate change as a factor in the ranking of natural hazards as these are expected to have a significant impact on southern Kansas communities.

2.6 Regional Population and Demographics

In general, south Kansas is a rural area with no larger metropolitan areas. According to the United States Census Bureau, the estimated regional population for 2013 is 61,087 persons. This represents a 4.37% regional decrease from the 2000 census of 63,875.

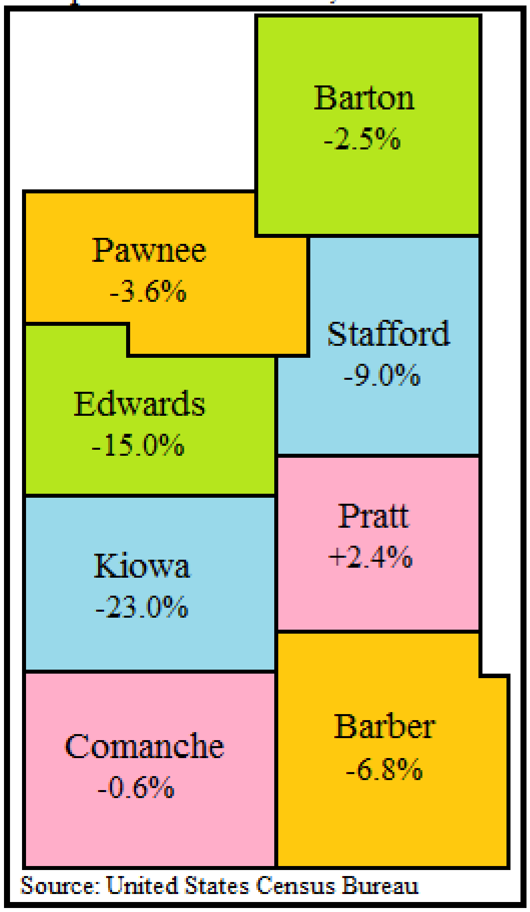
The region accounts for approximately 2.11% of the State of Kansas' 2013 estimated population of 2,893,957. Additionally, the region occupies approximately 6,499 square miles (representing 7.9% of the total land area of the state, at 81,759 square miles). The 2013 regional population density is calculated at 9 people per square mile.

Regional Population Data

County	Population (2000)	Population (2013 Estimate)	Percentage Change (2000-2013)	Population (2040 Projection)
Barber	5,307	4,947	-6.8%	3,201
Barton	28,205	27,509	-2.5%	21,685
Comanche	1,967	1,955	-0.6%	1,774
Edwards	3,449	2,945	-15.0%	1,894
Kiowa	3,278	2,523	-23.0%	613
Pawnee	7,233	6,971	-3.6%	4,063
Pratt	9,647	9,878	+2.4%	8,775
Stafford	4,789	4,359	-9.0%	3,245
Kansas	2,688,418	2,893,957	+7.65%	3,238,356

Source: United States Census Bureau and Wichita State University

Population Variance, 2000 - 2013



The following table indicates the levels of education for citizens of the region.

Regional Educational Data

County	High school graduate or higher, age 25+ (2008-2012)	Bachelor's degree or higher, age 25+ (2008-2012)
Barber	92.80%	19.90%
Barton	85.40%	18.40%
Comanche	90.00%	24.10%
Edwards	83.80%	22.70%
Kiowa	90.80%	21.40%
Pawnee	90.10%	23.30%
Pratt	89.50%	23.90%
Stafford	87.90%	20.80%
Kansas	89.70%	30.00%

Source: United States Census Bureau

The following information provides a snapshot of regional housing trends. In general, the region enjoys a high percentage of home ownership. Additionally, available data indicates a small proportion of available housing units are in the form of multi-unit spaces.

Regional Housing Data

County	Housing Units (2000)	Housing Units (2012)	Multi Unit Percentage (2008-2012)	Homeownership Rate (2008-2012)	Households (2008-2012)	Persons per Household (2008-2012)	Issued Building Permits, All Categories (2012)
Barber	2,740	2,754	7.90%	75.10%	2,251	2.15	1
Barton	12,888	12,636	9.30%	72.40%	11,310	2.39	33
Comanche	1,088	1,039	7.60%	74.60%	811	2.26	0
Edwards	1,754	1,627	4.10%	77.80%	1,312	2.25	1
Kiowa	1,643	1,230	11.40%	67.70%	1,064	2.20	0
Pawnee	3,114	3,151	10.30%	73.70%	2,512	2.40	21
Pratt	4,633	4,499	10.80%	67.50%	4,026	2.30	0
Stafford	2,458	2,310	5.00%	79.90%	1,893	2.28	7
Kansas	1,131,200	1,238,719	17.60%	68.20%	1,109,391	2.50	6,252

Source: United States Census Bureau

2.7 REGIONAL ECONOMY

Data from the University of Kansas Institute for Policy and Social Research Kansas County Profile reports indicate that in general, the number of business establishments in south region are decreasing on a yearly basis. From 2000 to 2010 the average rate of decrease for the region was -4.9%. Major sources of employment include construction, manufacturing, retail, transportation, and utilities. The average regional unemployment rate of 4.45% in 2011 was lower than the average State of Kansas unemployment rate of 6.5%.

Regional Business and Unemployment Data

County	Total Number of Business (2000)	Total Number of Business (2010)	01 - 19 Staff (2010)	20 - 99 Staff (2010)	100+ Staff (2010)	Average Wage (2010)	Unemployment Rate (2011)
Barber	213	220	205	13	2	$27,176	4.00%
Barton	1029	962	861	89	12	$33,639	5.00%
Comanche	70	85	80	5	0	$22,440	4.20%
Edwards	107	99	92	7	0	$32,649	4.20%
Kiowa	114	89	77	12	0	$26,764	3.70%
Pawnee	184	177	162	13	2	$39,937	4.60%
Pratt	383	375	340	32	3	$31,733	4.60%
Stafford	153	135	130	5	0	$26,684	5.30%
Regional Total	2,253	2,142	1,947	176	19	$30,128	4.45%

Source: University of Kansas Institute for Policy and Social Research Kansas County Profile

2.8 REGIONAL AGRICULTURE AND LIVESTOCK

Agriculture is a major component of the economy of south Kansas. According to the Kansas Department of Agriculture:

- Kansas farmers typically produce more wheat than any other state in the nation
- In 2009, Kansas wheat accounted for more than 16 percent of all wheat produced
- Kansas ranks first in grain sorghum produced
- Kansas ranks second in cropland
- Kansas ranks sixth in hay produced
- One in five Kansans work in jobs related to agriculture and food production

The following tables present information from the USDA National Agricultural Statistics Service relating to farm totals, agricultural acreage and farm size for south Kansas.

Regional Farm Data, 2002 to 2012

County	Number of Farms, 2002	Number of Farms, 2007	Number of Farms, 2012	Percent Change	Farm Acreage, 2002	Farm Acreage, 2007	Farm Acreage, 2012	Percentage Change
Barber	471	427	378	-19.7%	696,850	611,493	590,678	-15.2%
Barton	772	678	694	-10.1%	650,065	558,977	566,088	-12.9%
Comanche	274	253	234	-14.6%	447,029	432,378	485,080	8.5%
Edwards	353	371	292	-17.3%	420,001	439,243	394,445	-6.1%
Kiowa	379	399	403	6.3%	434,783	440,473	455,235	4.7%
Pawnee	430	438	401	-6.7%	520,360	487,373	480,739	-7.6%
Pratt	591	538	543	-8.1%	501,168	480,162	464,527	-7.3%
Stafford	534	558	536	0.4%	472,714	502,229	498,769	5.5%
Regional	3,804	3,662	3,481	-8.5%	4,142,970	3,952,328	3,935,561	-5.0%

Source: United States Department of Agriculture National Agricultural Statistics Service

Regional Farm Size, 2012

County	1 to 9 acres	10 to 49 acres	50 to 179 acres	180 to 499 acres	500 to 999 acres	1,000 or more acres
Barber	12	26	65	85	58	132
Barton	28	72	168	154	103	169
Comanche	8	8	40	35	38	105
Edwards	7	16	66	71	33	99
Kiowa	10	16	109	92	68	108
Pawnee	13	42	77	87	52	130
Pratt	3	38	175	121	63	143
Stafford	6	42	144	103	80	161
Regional	87	260	844	748	495	1,047

Source: United States Department of Agriculture National Agricultural Statistics Service

Regional Cropland and Pastureland Information

County	Percentage Cropland	Cropland Acreage	Percentage Pastureland	Pasture Acres
Barber	32.0%	189,017	65.0%	383,941
Barton	73.0%	413,244	24.0%	135,861
Comanche	30.0%	145,524	68.0%	329,854
Edwards	75.0%	295,834	23.0%	90,722
Kiowa	52.0%	236,722	46.0%	209,408
Pawnee	78.0%	374,976	20.0%	96,148
Pratt	67.0%	311,233	31.0%	144,003
Stafford	77.0%	384,052	17.0%	84,791
Regional Average	60.5%	2,350,603	36.8%	1,474,729

Source: United States Department of Agriculture National Agricultural Statistics Service

The rearing of livestock play a major role in the regional economy. According to the Kansas Department of Agriculture (KDA):

- Kansas produces more than 19 percent of all U.S. beef
- Kansas ranks third in cattle and calves on farms and third in cattle and calves on grain feed
- Kansas ranks 16th in milk produced

Additionally, major production crops include corn, forage, soybeans, wheat, and sorghum.

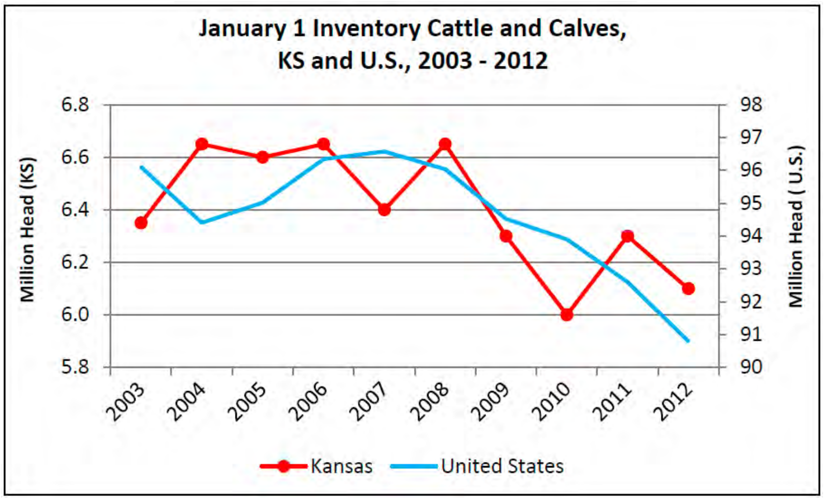
The following table presents information relating to livestock and crop production in south Kansas. Information was obtained from the USDA National Agricultural Statistics Service for 2012, the latest year for which this data was available on a county basis.

Top Livestock and Crop Items , 2012

County	Cattle and Calves (number of head)	Hogs and Pigs (number of head)	Sheep and Lambs (number of head)	Corn for Grain (acres)	Corn for Silage (acres)	Wheat (acres)
Barber	46,214	-	-	6,736	5,720	110,917
Barton	114,771	-	-	23286	3557	163,706
Comanche	35,030	-	-	1,921	8,945	66,671
Edwards	35,936	-	-	74,394	45,261	95,391
Kiowa	25,305	-	-	23,458	1,982	84,741
Pawnee	87,335	9	-	-	61,980	134,343
Pratt	58,323	-	-	56,145	799	163,371
Stafford	48,978	8,897	934	56,586	2,827	184,229
Regional	451,892	8,906	934	242,526	131,071	1,003,369

Source: United States Department of Agriculture National Agricultural Statistics Service
-: Data not reported

Regional data indicate that the number of cattle has been falling over the past five years, from 599,466 in 2007 to 451,892 in 2102, -24.6% decrease. In general, this follows a trend in the State of Kansas and the United States as a whole. The following chart from the USDA National Agricultural Statistics Service Kansas Field Office produced in 2012 indicates this trend.



Source: US Department of Agriculture National Agricultural Statistics Service, Kansas Field Office, 2012

Regional data indicate that the number market value of agricultural products sold has increased dramatically over the past five years, following a trend in the State of Kansas. The following data from the USDA National Agricultural Statistics Service Kansas Field Office produced in 2012 indicates this trend.

Market Value of Agricultural Products Sold

County	Market Value of Products Sold (2002)	Market Value of Products Sold (2007)	Market Value of Products Sold (2012)	Percentage Change
Barber	$49,839,000	$64,475,000	$88,472,000	77.5%
Barton	$171,158,000	$282,786,000	$278,963,000	63.0%
Comanche	$25,755,000	$53,837,000	$48,680,000	89.0%
Edwards	$131,404,000	$172,990,000	$151,705,000	15.4%
Kiowa	$36,491,000	$50,462,000	$80,577,000	120.8%
Pawnee	$139,484,000	$320,071,000	$362,349,000	159.8%
Pratt	$130,667,000	$173,605,000	$273,462,000	109.3%
Stafford	$110,752,000	$167,828,000	$197,621,000	78.4%
Regional	$795,550,000	$1,286,054,000	$1,481,829,000	86.3%

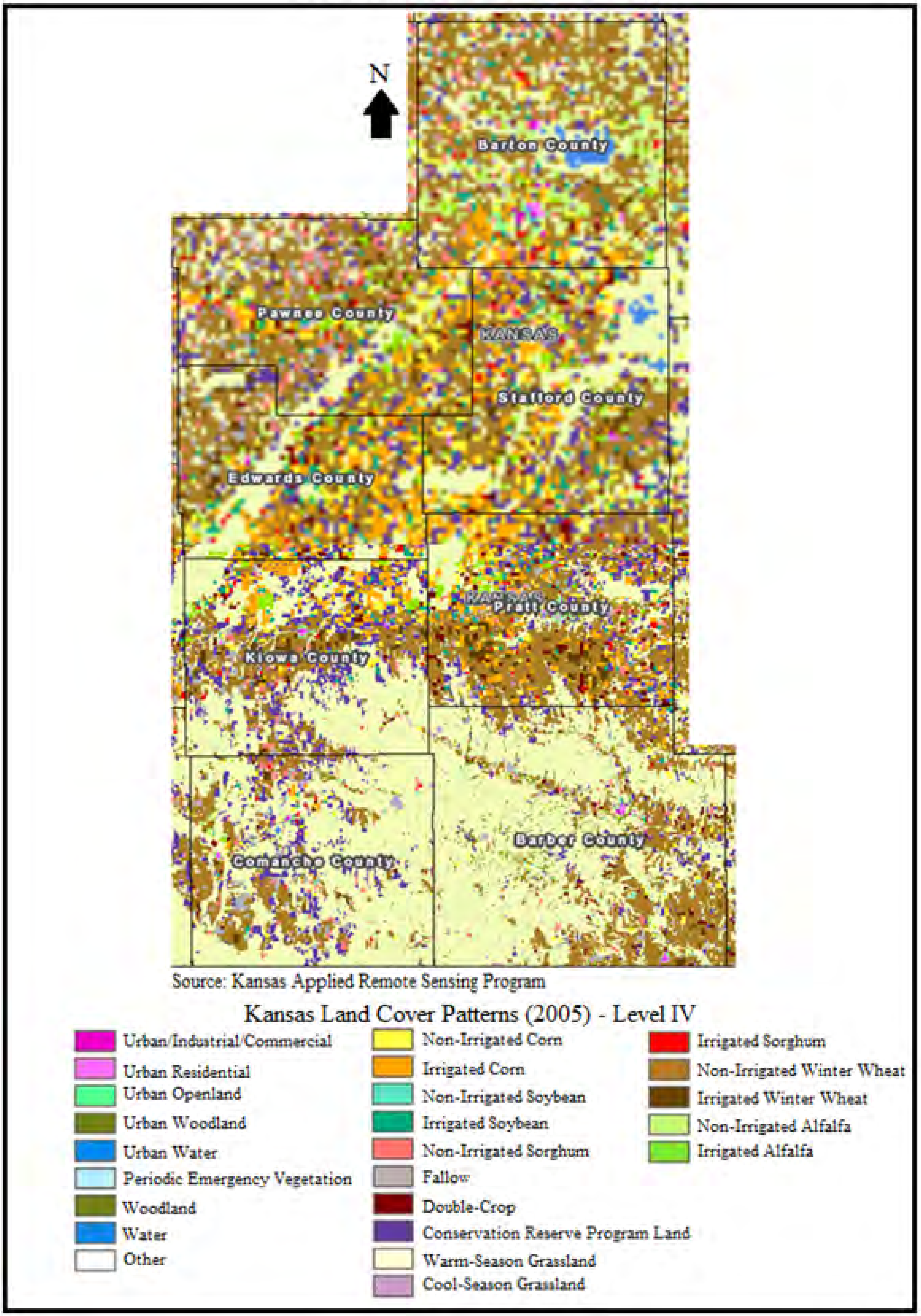
Source: USDA National Agricultural Statistics Service

2.9 REGIONAL LAND USE AND DEVELOPMENT TRENDS

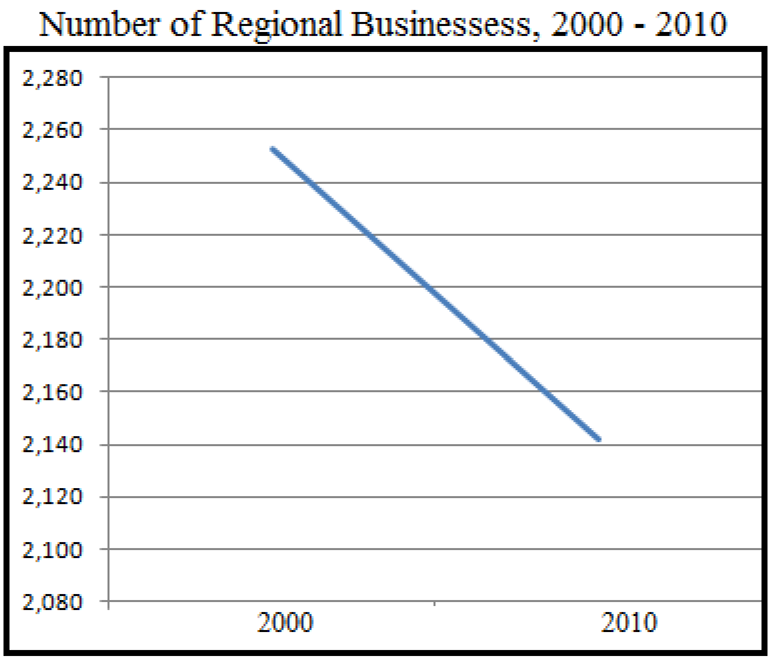
44 CFR 201.6 (C) Plan Content. The plan shall in clude the following: (2)(ii)(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Land use patterns in South Kansas have remained relatively stable over many years. The 2005 Kansas Applied Remote Sensing Kansas Land Cover Patterns map shows the majority of the region is covered by cropland and grassland. Urban, residential, commercial and industrial uses comprise a small percentage of the land cover and are primarily found around the major towns and cities. In general, most development is regulated by local entities. However, it should be noted that large sections of the region are unregulated as to building and development.

South Kansas Land Cover Map

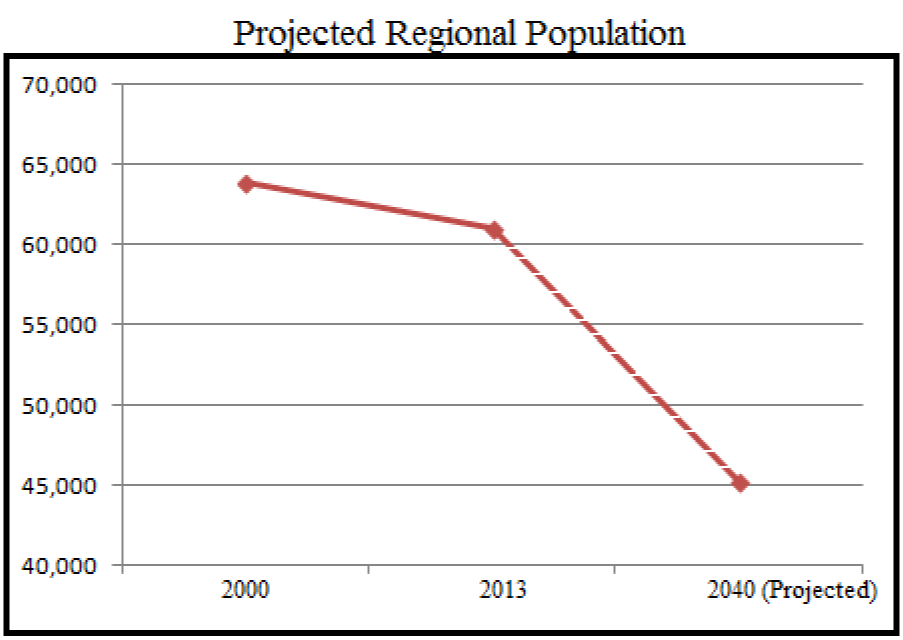


South Kansas has experienced an overall decrease in population, with a 4.37% regional decrease from the 2000 to estimated 2013 census. In addition, the region has seen the number of businesses decline from 2000 to 2010, as indicated by the following graph.



Source: University of Kansas Institute for Policy and Social Research
Kansas County Profile

While forecasting future population movement and growth is challenging, past trends can be used to assist in predicting future development. The following graph indicates trends regional population using data from the above referenced tables.



Source: United States Census and Wichita State University

Based on these historical rates, it is possible that that minor land use changes and minor land development initiatives will be completed.

Data was obtained from the Office of Local Government, Kansas State Research and Extension office concerning capital expenditures on infrastructure. The data indicates that there is a general regional increasing trend in infrastructure spending. However, where the capital expenditures have increased the data and general observations indicate that the increase is being spent on maintenance of aging infrastructure rather than new construction.

Regional Capital Infrastructure Expenditures, 2001 to 2011

County	Road & Bridge Expenditure (2001)	Road & Bridge Expenditure (2011)	Percent Change
Barber	$1,569,458	$2,028,930	29%
Barton	$3,215,564	$4,369,024	36%
Comanche	$907,101	$1,005,986	11%
Edwards	$891,857	$1,255,907	41%
Kiowa	$1,308,156	$1,594,761	22%
Pawnee	$1,654,888	$1,995,202	21%
Pratt	$2,787,578	$3,303,415	19%
Stafford	$1,780,585	$2,222,539	25%

Source: Office of Local Government, Kansas State Research and Extension

2.10 STRUCTURES EXPOSED TO POTENTIAL HAZARDS

This section quantifies the buildings exposed to potential hazards in south Kansas. The following tables provide the value of the region's built environment and contents, which in addition to the population information presented above, forms the basis of the vulnerability and risk assessment presented in this plan. This information was derived from inventory data associated with FEMA's loss estimation software HAZUS-MH 2.1 (February 2012). HAZUS-MH 2.1 classifies building stock types into seven categories: residential, commercial, industrial, agriculture, religion, government, and education. Values associated with each of these categories reflect 2006 valuations, published by R.S. Means Company (Means Square foot Costs", 2006) with replacement costs. According to the HAZUS-MH 2.1 inventory, the total estimated replacement value of buildings within the south Kansas region is $4,199,591 and the total buildings content's estimated value within the south Kansas region is $2,928,961. The exposure value of buildings is incorporated as a factor in vulnerability assessments for hailstorm, tornado, windstorm, and winter storm hazards that are profiled later in this plan.

Estimated Replacement Value of Buildings by Category (2006 Valuations)

County	Residential ($1,000s)	Commercial ($1,000s)	Industrial ($1,000s)	Agriculture ($1,000s)	Religion ($1,000s)	Government ($1,000s)	Education ($1,000s)
Barber	$266,528	$72,098	$13,008	$13,267	$11,273	$5,034	$6,928
Barton	$1,151,374	$331,999	$172,749	$29,202	$47,319	$13,122	$26,353
Comanche	$92,396	$18,993	$3,414	$6,385	$4,222	$1,175	$8,553
Edwards	$160,455	$37,428	$10,718	$7,531	$4,962	$5,398	$5,890
Kiowa	$170,579	$35,317	$4,938	$9,171	$9,614	$2,307	$5,729
Pawnee	$360,996	$52,604	$4,303	$8,340	$13,861	$3,513	$5,975
Pratt	$477,623	$119,524	$18,891	$14,891	$14,291	$7,428	$36,591
Stafford	$206,392	$47,655	$5,707	$14,240	$10,567	$1,933	$8,837
Regional Total	$2,886,343	$715,618	$233,728	$103,027	$116,109	$39,910	$104,856

Estimated Replacement Value of Building's Contents by Category (2006 Valuations)

County	Residential ($1,000s)	Commercial ($1,000s)	Industrial ($1,000s)	Agriculture ($1,000s)	Religion ($1,000s)	Government ($1,000s)	Education ($1,000s)
Barber	$133,698	$79,348	$17,854	$13,267	$11,273	$5,216	$7,074
Barton	$576,757	$358,032	$248,874	$29,202	$47,319	$14,623	$27,504
Comanche	$46,361	$20,796	$4,876	$6,385	$4,222	$1,213	$8,553
Edwards	$80,505	$40,323	$15,381	$7,531	$4,962	$6,335	$6,014
Kiowa	$85,629	$37,648	$6,639	$9,171	$9,614	$2,640	$5,743
Pawnee	$180,910	$55,825	$5,145	$8,340	$13,861	$3,869	$5,975
Pratt	$239,416	$123,775	$25,218	$14,891	$14,291	$8,413	$50,692
Stafford	$103,523	$50,964	$7,694	$14,240	$10,567	$1,933	$8,837
Regional Total	$1,446,799	$766,711	$331,681	$103,027	$116,109	$44,242	$120,392

2.11 REGIONAL CRITICAL FACILITIES

This section details the critical facilities and assets that may be at risk by county and available jurisdiction for the region. A critical facility is essential in providing utility or direction either during the response to an emergency or during the recovery operation. Facilities were determined from jurisdictional feedback, historic research, available data from the State of Kansas and HAZUS-MH 2.1. Critical assets are equipment or systems that may be needed during a response or recovery effort and may be at risk of damage or destruction from a hazard. In addition, jurisdictions considered facilities that, if damaged or destroyed, would result in a high economic, human, or societal losses. Finally, jurisdictions also considered transportation facilities and corridors that would provide critical lifelines in the event of a hazard event. The following are examples of critical facilities and assets:

- Hospitals and other medical facilities
- Police stations
- Fire stations
- Emergency operations centers

- Power plants
- Dams and levees
- Military installations
- Hazardous material sites
- Schools
- Shelters
- Day care centers
- Nursing homes
- Highways, bridges, and tunnels
- Railroads and facilities
- Airports
- Water treatment facilities
- Natural gas and oil facilities and pipelines
- Communications facilities
- Community facilities

Participating jurisdictions were given the option to supply as much information as possible relating to critical facilities, however they were not compelled to provide any information, up to and including name, address, replacement value and occupancy. A detailed list of critical facilities may be found in Appendix D. Appendix D has been deemed sensitive information, and as such is restricted and unavailable to the public.

2.12 HISTORICALLY SIGNIFICANT STRUCTURES AND LOCATIONS

The following sections detail structures that have local historical significance. Historic structure means any structure that is:

- Listed in the National Register of Historic Places or preliminarily determined as meeting the requirements for listing
- Certified as contributing to the historical significance of a registered historic district
- Listed on a state inventory of historic places
- Listed on a local inventory of historic places
- Deemed by the community as a locally historic structure

These structures may warrant a greater degree of protection due to their unique and irreplaceable nature. Additionally, the rules for reconstruction, restoration, rehabilitation, and/or replacement are often different for these types of designated resources.

2.12.1 BARBER COUNTY

Name of Historic Property	Address or Location	City
Medicine Lodge Peace Treaty Site	SE of Medicine Lodge	Medicine Lodge
Nation, Carry A., House	211 W. Fowler Ave.	Medicine Lodge

2.12.2 BARTON COUNTY

Name of Historic Property	Address or Location	City
Beaver Creek Native Stone Bridge	NE. 50 Ave. S. & NE 230 Rd	Beaver
Bridge #218--Off System Bridge	NE. 60 Ave. S. & NE. 220 Rd.	Beaver
Bridge No. 222--Off System Bridge	NE 60 Ave S and NE 210 Rd, 1/8 mile East on 210 Rd	Beaver
Bridge No. 640 Federal Aid Highway System Bridge	NE 60 Ave, 1/8 mile north of NE 210 Rd	Beaver
Bridge No. 650--Federal Aid Highway System Bridge	NE 60 Ave, 1/12 mile south of NE 220 Rd	Beaver
Wolf Hotel	104 E. Santa Fe	Ellinwood
Wolf Park Band Shell	Lots 12 and 13, Block 2, 200 Blk of N. Main	Ellinwood
Abel House	2601 Passeo	Great Bend
Crest Theater	1905 Lakin Ave.	Great Bend
Nagel House	1411 Wilson St.	Great Bend
Walnut Creek Crossing	Address Restricted	Great Bend
Walnut Creek Bridge	Over Walnut Creek, NW of Heizer	Heizer
Hitschmann Cattle Underpass Bridge	NE. 110 Ave. S. & NE. 190 Rd.	Hitschmann
Hitschmann Double Arch Bridge	NE. 110 Ave. S. & NE 190 Rd.	Hitschmann
Hoisington High School	218 E 7th St.	Hoisington
Manweiler--Maupin Chevrolet	271 S. Main St.	Hoisington
US Post Office--Hoisington	121 E. 2nd St.	Hoisington
Pawnee Rock	0.2 mi. N of Pawnee Rock off U.S. 56	Pawnee Rock

2.12.3 COMANCHE COUNTY

Name of Historic Property	Address or Location	City
Chief Theater	122 E. Main St.	Coldwater
Comanche County Courthouse	201 S. New York Ave.	Coldwater
Protection High School	210 S. Jefferson	Protection
Archeological Site Number 14CM305	Address Restricted	Unknown

2.12.4 EDWARDS COUNTY

Name of Historic Property	Address or Location	City
Gano Grain Elevator and Scale House	Jct. of US 50 and Co. Rd 9	Kinsley
Kinsley Civil War Monument	L Rd., Hillside Cemetery	Kinsley
Palace Theater	222 E. 6th St.	Kinsley

2.12.5 KIOWA COUNTY

Name of Historic Property	Address or Location	City
Belvidere Medicine River Bridge	0.25 miles N of Belvidere	Belvidere
Archeological Site Number 14KW301	Address Restricted	Coldwater
Greensburg Well	Sycamore St.	Greensburg
Robinett, S.D., Building	148 S. Main	Greensburg
Archeological Site Number 14KW302	Address Restricted	Greensburg vicinity
Fromme-Birney Round Barn	SW of Mullinville	Mullinville

2.12.6 PAWNEE COUNTY

Name of Historic Property	Address or Location	City
Babbitt--Doerr House	423 W. 5th St.	Larned
Fort Larned National Historic Site	6 mi. W of Larned on U.S. 156	Larned
Lewis Site	Address Restricted	Larned
Ooten House	507 W 15th St.	Larned
Patterson House	841 W 8th St.	Larned
Township Line Bridge	Off US 156 3 mi. W of Rozel	Rozel

2.12.7 PRATT COUNTY

Name of Historic Property	Address or Location	City
Rice, J. R., Barn and Granary	N of US 54, NW of Cullison	Cullison
Rice, J.R., Farmstead	NE4, SE4, SE4, NE4, 3-28-15	Cullison
Thornton Adobe Barn	1 mi. E and 1.25 mi N of Isabel	Isabel
Ellis, Earl H., VFW Post #1362	701 E. 1st St.	Pratt
Gebhart, S. P., House	105 N. Iuka St.	Pratt
Norden Bombsight Storage Vaults	305 Flint Rd.	Pratt
Parachute Building	40131 Barker Ave.	Pratt
Pratt Archeological Site	Address Restricted	Pratt

2.12.8 STAFFORD COUNTY

Name of Historic Property	Address or Location	City
Gray, William R., Photography Studio and Residence	116 N. Main	St. John
Comanche Archeological Site	Address Restricted	Stafford
Convenanter Church	113 N. Green St.	Stafford
Farmers National Bank	100 N. Main	Stafford
First Methodist Episcopal Church	219 W. Stafford	Stafford
Henderson, Sarah L., House	518 W. Stafford St.	Stafford
Larabee, Nora E., Memorial Library	108 N. Union St.	Stafford
Spickard, Joseph L., House	201 N. Green St.	Stafford

2.13 REGIONAL AT RISK POPULATIONS

In general, at risk populations may have difficulty with medical issues, poverty, extremes in age, and communications due to language barriers. Several principles may be considered when discussing potentially at risk populations, including:

- Not all people who are considered at risk are at risk
- Outward appearance does not necessarily mark a person as at risk
- The hazard event will, in many cases, affect at risk population in differing ways

The National Response Framework defines at risk populations as "populations whose members may have additional needs before, during, and after an incident in functional areas, including but not limited to: maintaining independence, communication, transportation, supervision, and medical care."

The following tables present information on potential at risk populations within south Kansas.

Potential At Risk Population Data

County	2013 Population	Population 5 and Under (2013)	Population 18 and Under (2013)	Population 65+ (2013)	Population 85+ (2010)	Food Stamp Beneficiaries (2011)	Estimated People in Poverty (2013)	Person Speaking Language Other Than English At Home (2013)
Barber	4,937	311	1,081	1,027	152	301	459	99
Barton	28,205	1,918	6,910	4,710	768	3,334	4,203	3,582
Comanche	1,955	133	475	463	61	94	121	80
Edwards	2,945	171	677	571	94	248	474	492
Kiowa	2,523	141	515	495	88	180	338	116
Pawnee	6,971	397	1,485	1,290	197	487	620	328
Pratt	9,878	622	2,242	1,837	363	781	1,017	464
Stafford	4,359	253	1,020	902	164	336	532	471

Source: University of Kansas Institute for Policy and Social Research Kansas County Profile and the United States Census Bureau

Potential At Risk Population Data, Care Facilities

County	Number of Hospitals (2011)	Number of Hospital Beds (2011)	Adult Care Homes (2011)	Adult Care Beds (2011)	Assisted Living Homes (2011)	Assisted Living Beds (2011)	Child Care Facilities (2011)
Barber	2	86	1	36	0	0	9
Barton	3	81	3	236	4	131	87
Comanche	1	12	2	70	1	9	5
Edwards	1	22	1	42	1	6	8
Kiowa	1	15	1	50	1	32	6
Pawnee	2	493	1	80	2	41	20
Pratt	1	85	1	59	1	68	22
Stafford	1	25	2	65	2	39	13

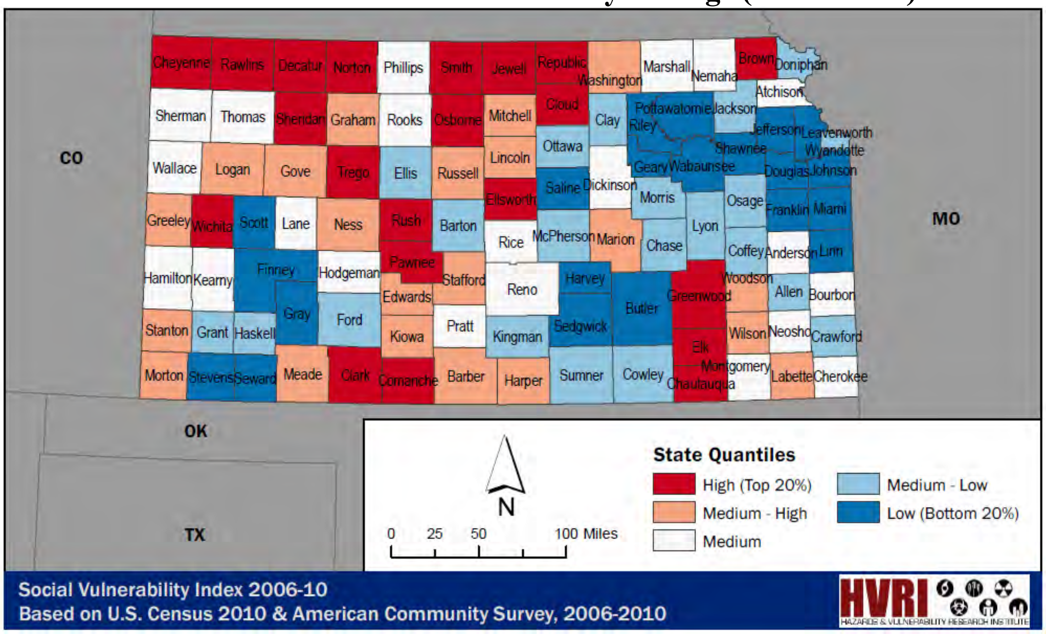
Source: University of Kansas Institute for Policy and Social Research Kansas County Profile and the United States Census Bureau

The Social Vulnerability Index (SoVI) 2006 - 2010 compiled by the Hazards and Vulnerability Research Institute in the Department of Geography at the University of South Carolina measures the social vulnerability of counties to environmental hazards. The index synthesizes 30 socioeconomic variables, including social, economic, demographic, and housing characteristics, which may contribute to reduction in a community's ability to prepare, respond and recover from a hazard. The major data source for this index is primarily the United States Census Bureau.

After obtaining the relevant data, a principle components analysis is used to reduce the data into set of components. All components are added together to determine a numerical value that represents the social vulnerability for each county. Scores in the top 20% of the United States are more vulnerable counties (red) and scores in the bottom 20% of the United States indicate the least vulnerable counties (blue).

The following map illustrates social vulnerability ratings for Kansas counties.

State of Kansas Social Vulnerability Ratings (2006 - 2010)



The following table presents the SoVi rating and national percentile for each county. In general, the higher the national percentile the higher the vulnerability.

County Social Vulnerability Ratings

County	SoVI Score (2006 - 2010)	National Percentile (2006 - 2010)
Barber	1.806982	78.97%
Barton	-0.43506	42.14%
Comanche	2.67207	86.26%
Edwards	1.339632	73.69%
Kiowa	1.379736	74.29%
Pawnee	2.249619	82.82%
Pratt	-0.03142	51.61%
Stafford	1.840015	79.45%

Source: Hazards and Vulnerability Research Institute, University of South Carolina

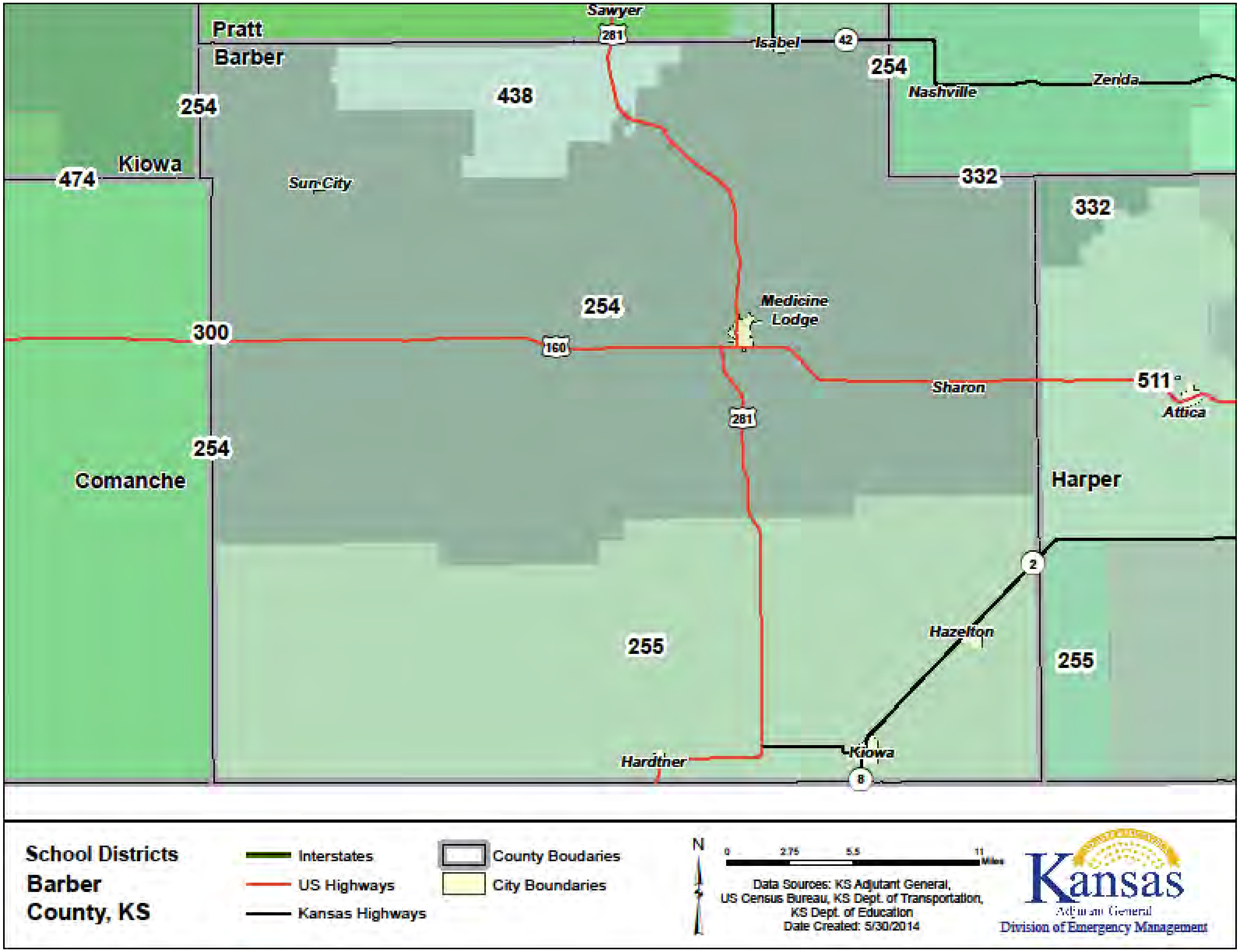
2.14 School District Information and Boundaries

The following tables present participating USD enrollment information, the number of staff and faculty, and the number of offices and schools.

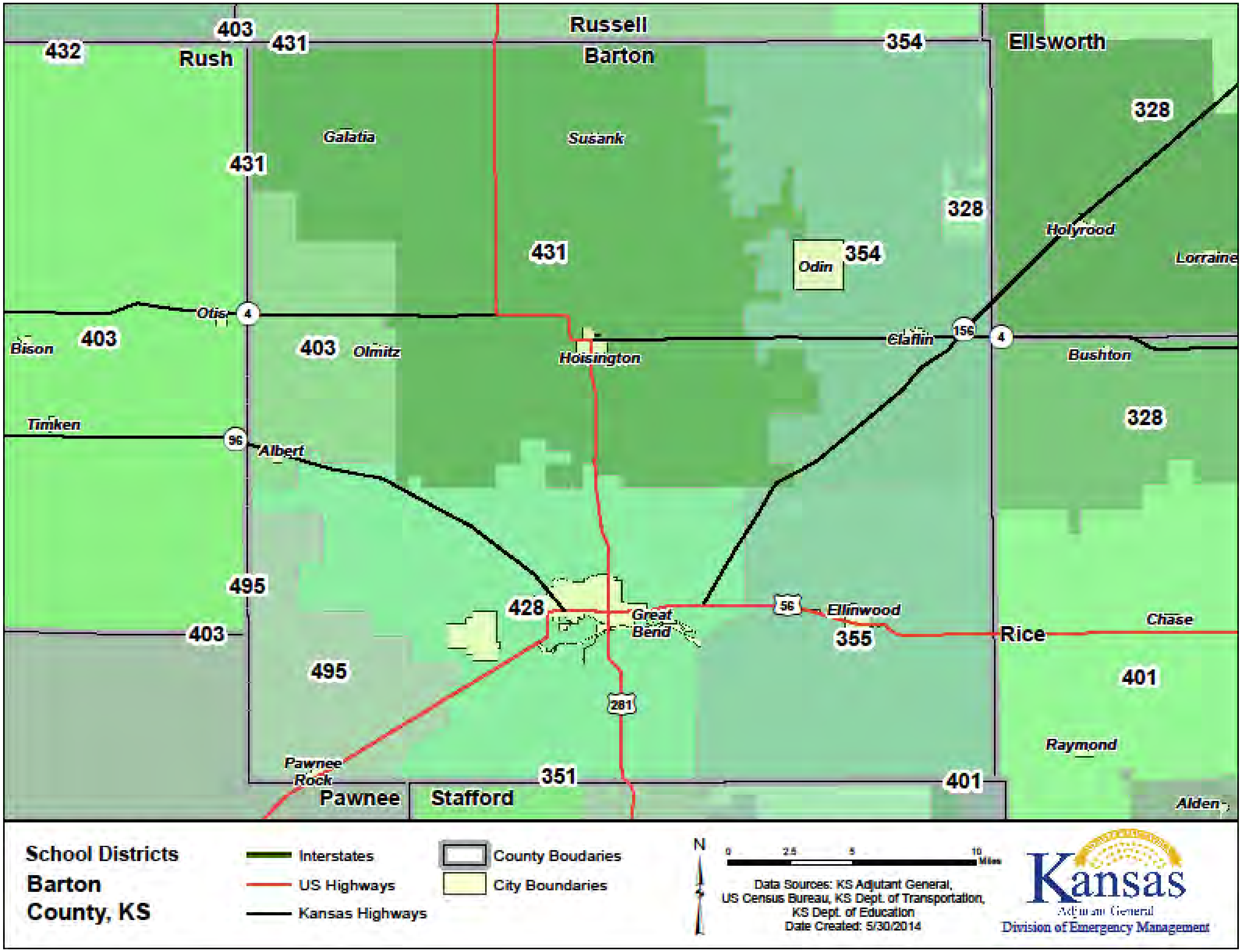
Participating USD Information

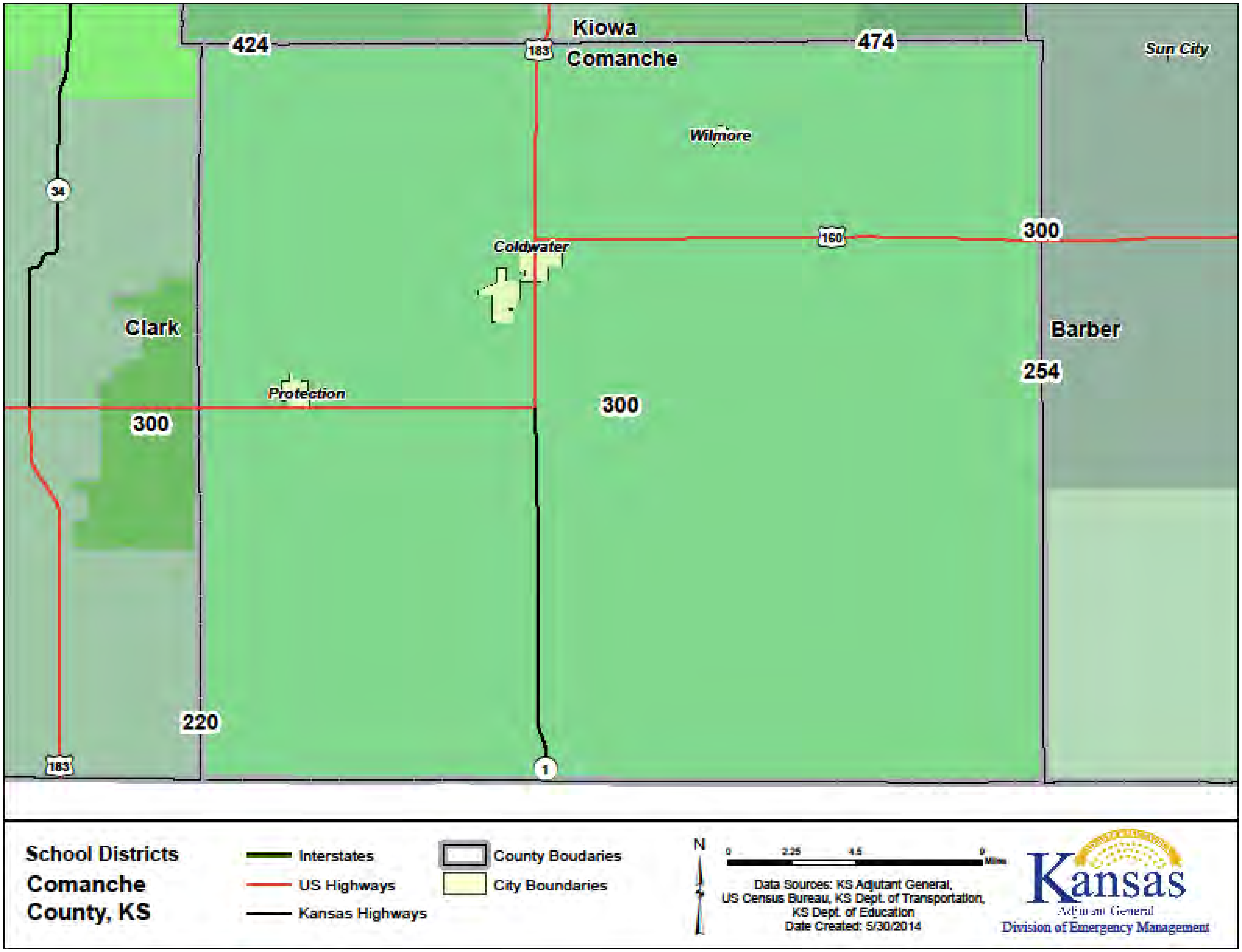
School , College or University	Total Enrollment (2013-2014)	Staff and Faculty (2013-2012)	Number of Offices and Schools (2013)
Barber County			
USD #254 - Barber County North	489	47	6
USD #255 - South Barber County	269	32	6
Barton County			
USD #112 - Claflin	592	71	9
USD #355 - Ellinwood	485	41	8
USD #428 - Great Bend	3,209	301	16
USD #431 - Hosington	789	59	9
Comanche County			
USD #300 - Comanche County	364	29	7
Edwards County			
USD #347 - Kinsley / Offerle	384	33	7
USD #502 - Lewis	105	12	5
Kiowa County			
USD #422 - Kiowa County	480	41	7
USD #474 - Haviland	115	11	5
Pawnee County			
USD #495 - Fort Larned	990	105	13
USD #496 - Pawnee Heights	185	19	5
Pratt County			
USD #382 - Pratt	1,301	81	10
USD #438 - Skyline	432	38	7
Stafford County			
USD #349 - Stafford	306	27	8
USD #350 - St. John / Hudson	382	32	7
USD #351 - Macksville	282	31	6

The following maps present regional school district boundaries by county. Capability information for each participating district is presented Section 4.



Pratt
Barber
Sawyer
281
Isabel
42
254
Nashville
Zenda
438
254
Kiowa
474
Sun City
332
332
254
Medicine Lodge
300
160
Sharon
511
Attica
281
254
Comanche
Harper
2
Hazelton
255
255
Hardtner
Kiowa
8
School Districts
Barber County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
City Boundaries
N
0
2.75
5.5
11
Miles
Data Sources: KS Adjutant General, US Census Bureau, KS Dept. of Transportation, KS Dept. of Education
Date Created: 5/30/2014
Kansas
Adjutant General
Division of Emergency Management


Russell
Barton
Ellsworth
Rush
Rice
Pawnee
Stafford
432
403
431
354
328
495
428
355
351
401
Galatia
Susank
Odin
Holyrood
Lorraine
Otis
Bison
Olmitz
Hoisington
Claflin
Bushton
Timken
Albert
Great Bend
Ellinwood
Chase
Raymond
Pawnee Rock
Alden
School Districts
Barton County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
City Boundaries
Data Sources: KS Adjutant General, US Census Bureau, KS Dept. of Transportation, KS Dept. of Education
Date Created: 5/30/2014
Kansas
Division of Emergency Management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Interstates
US Highways
Kansas Highways
County Boudaries
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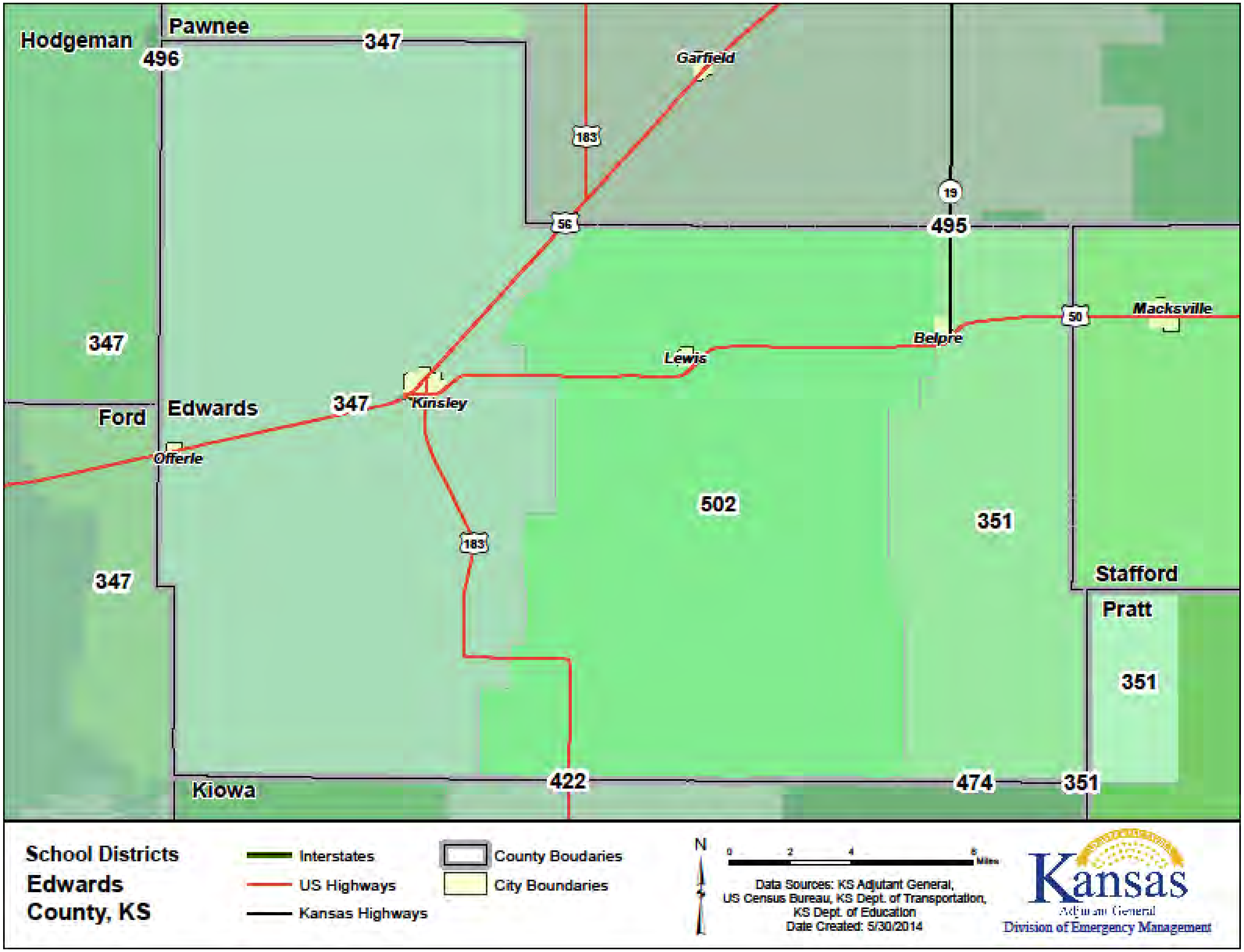
Date Created: 5/30/2014
Kansas
Adjutant General
Division of Emergency Management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Offerle
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Stafford
Pratt
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Kiowa
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Interstates
US Highways
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City Boundaries
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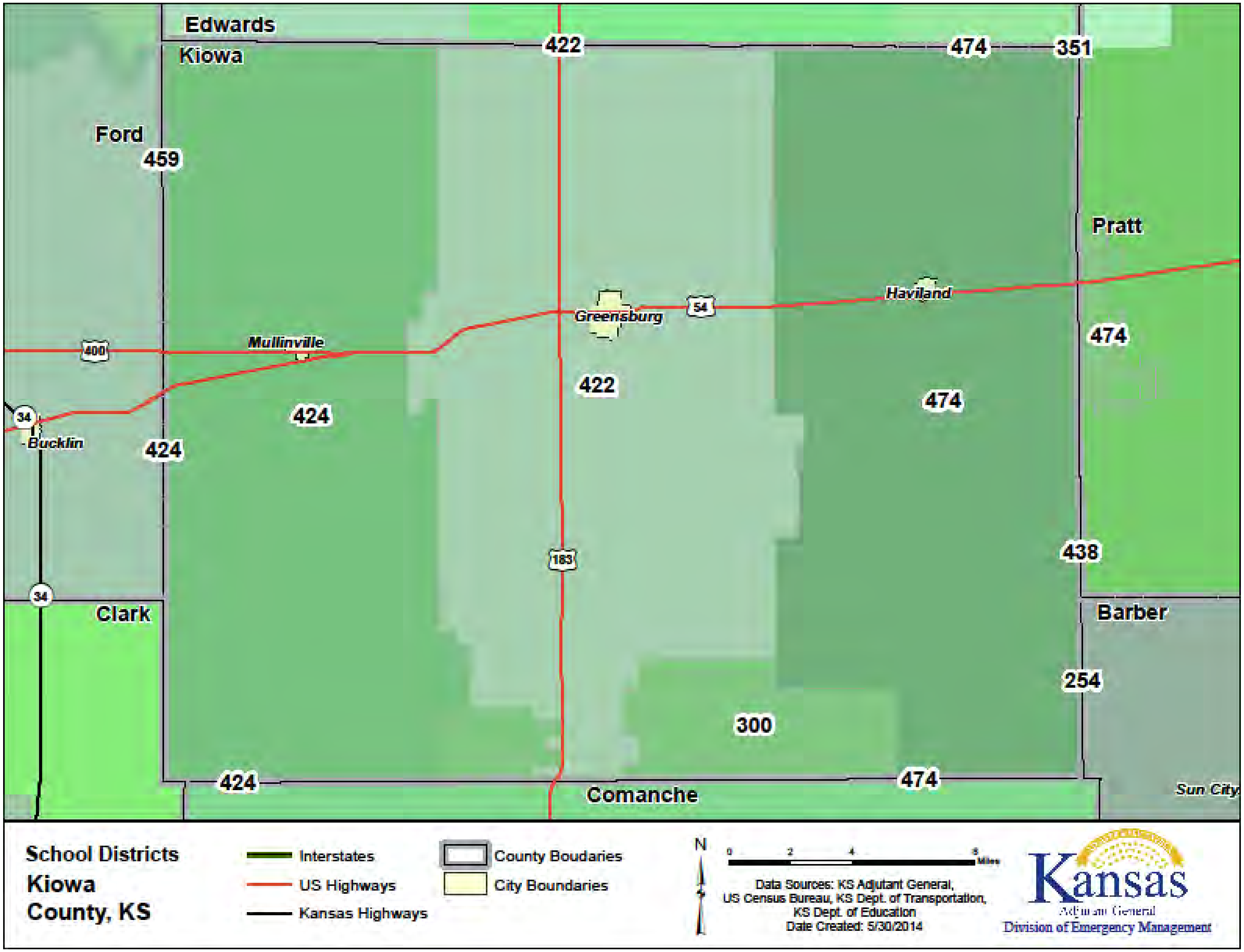
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Haviland
Bucklin
Sun City
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School Districts
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County, KS
Interstates
US Highways
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County Boudaries
City Boundaries
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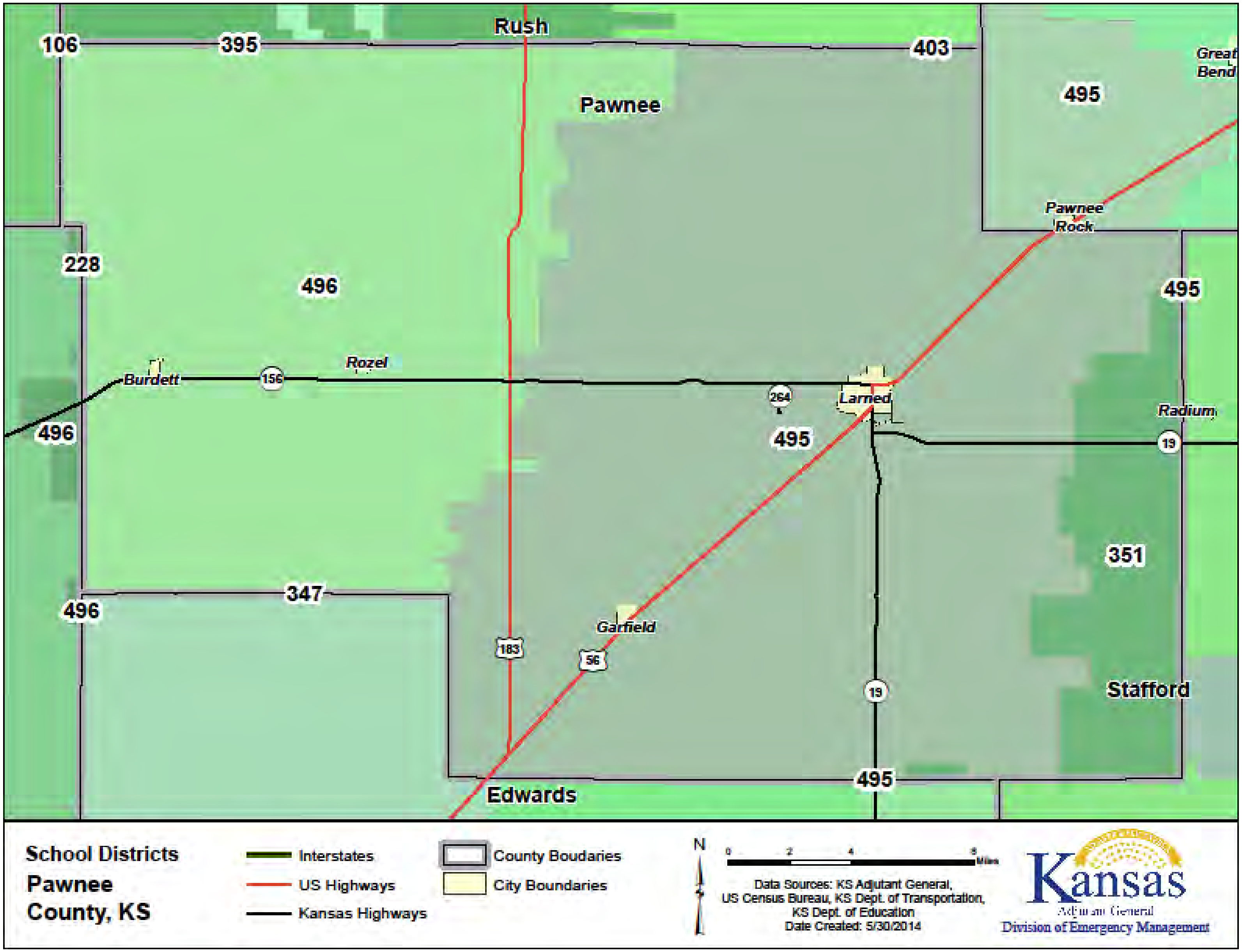
Date Created: 5/30/2014
Kansas
Adjutant General
Division of Emergency Management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Burdett
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Rozel
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Larned
Radium
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495
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Garfield
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Stafford
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Edwards
School Districts
Pawnee County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
City Boundaries
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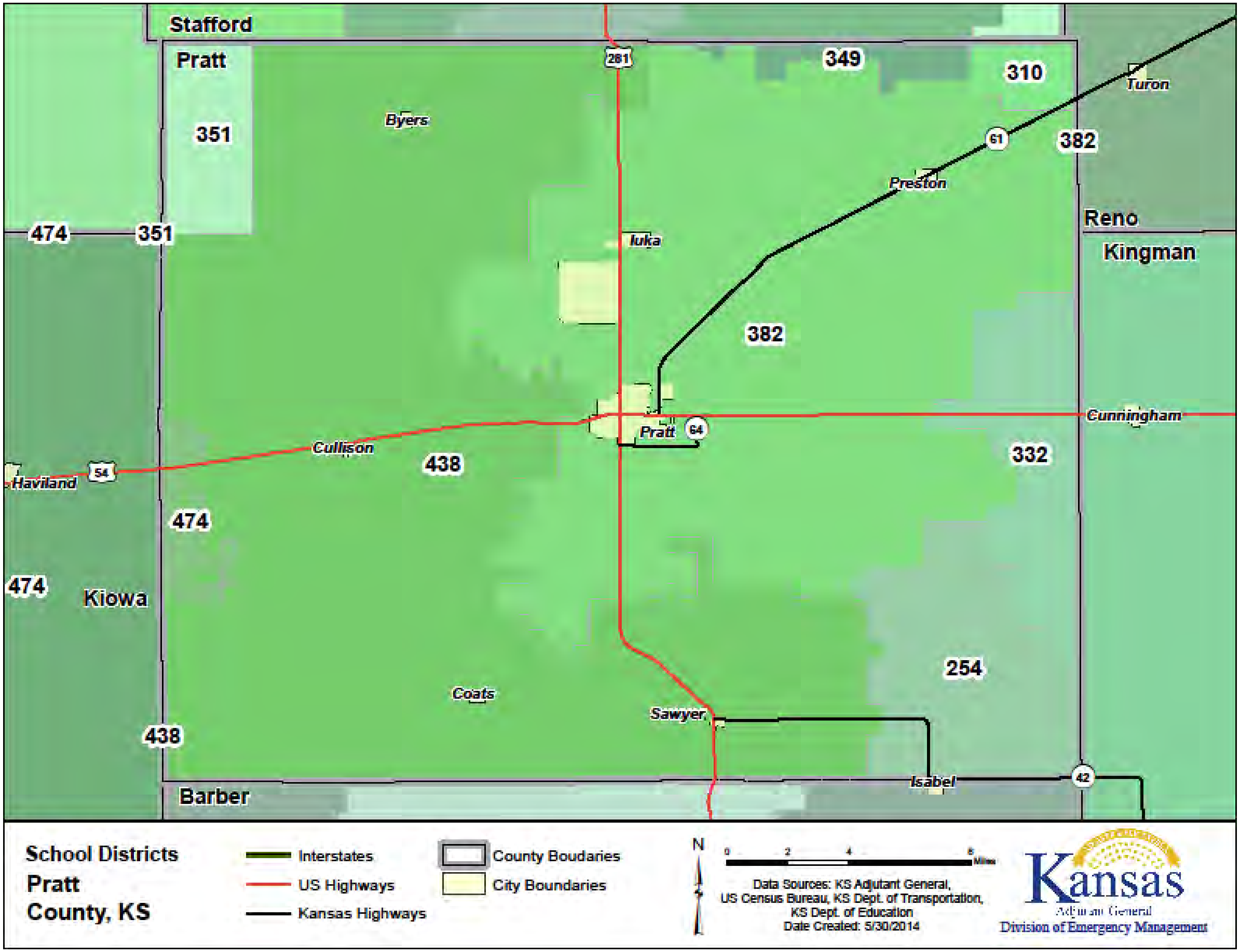
Division of Emergency Management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Turon
Pratt
Cullison
Haviland
Cunningham
Coats
Sawyer
Isabel
281
61
64
54
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School Districts
Pratt
County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
City Boundaries
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Date Created: 5/30/2014
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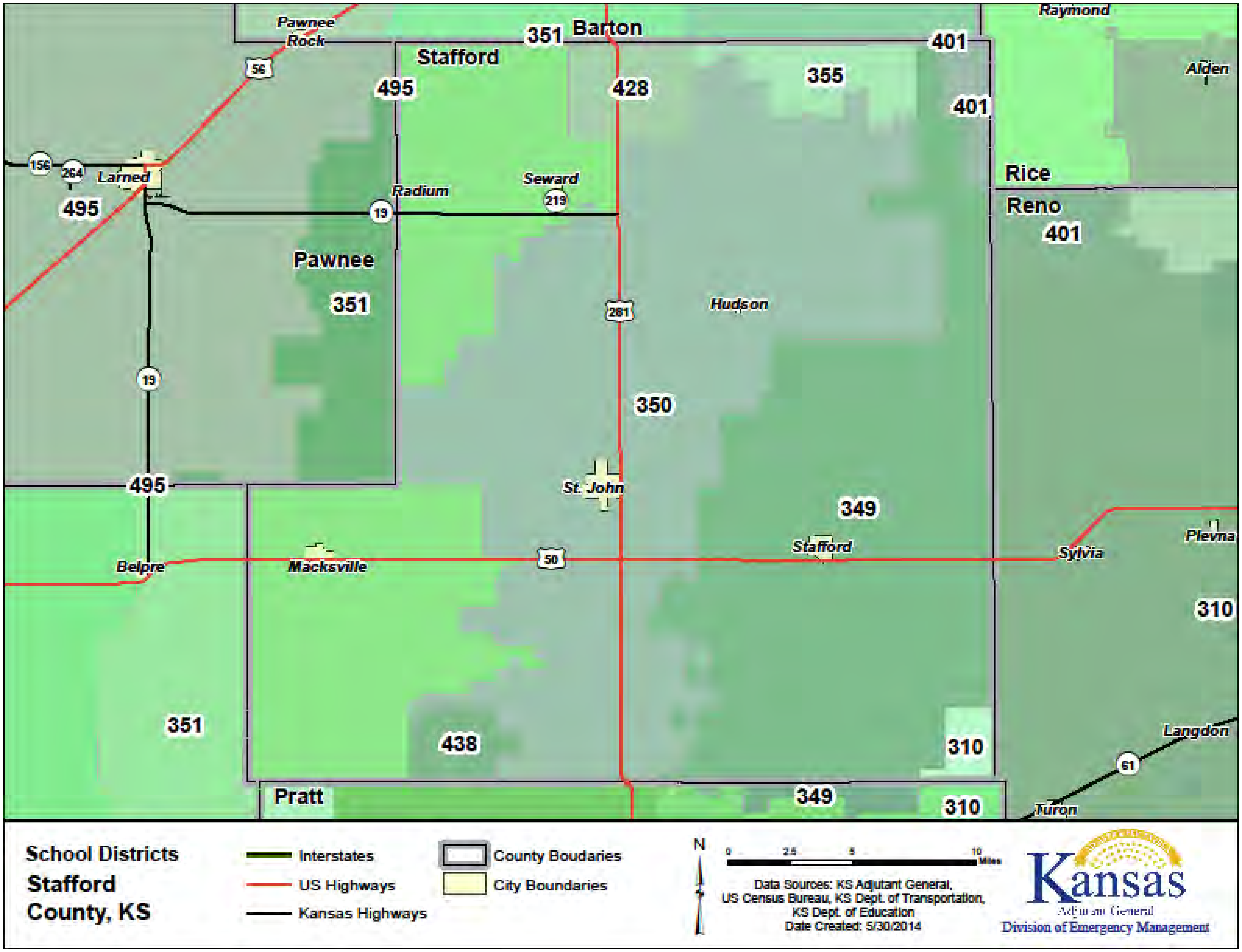
Adjutant General
Division of Emergency Management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Pawnee
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Hudson
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St. John
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Stafford
Plevna
Belpre
Macksville
Sylvia
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Langdon
Pratt
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Turon
School Districts
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County, KS
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County Boudaries
City Boundaries
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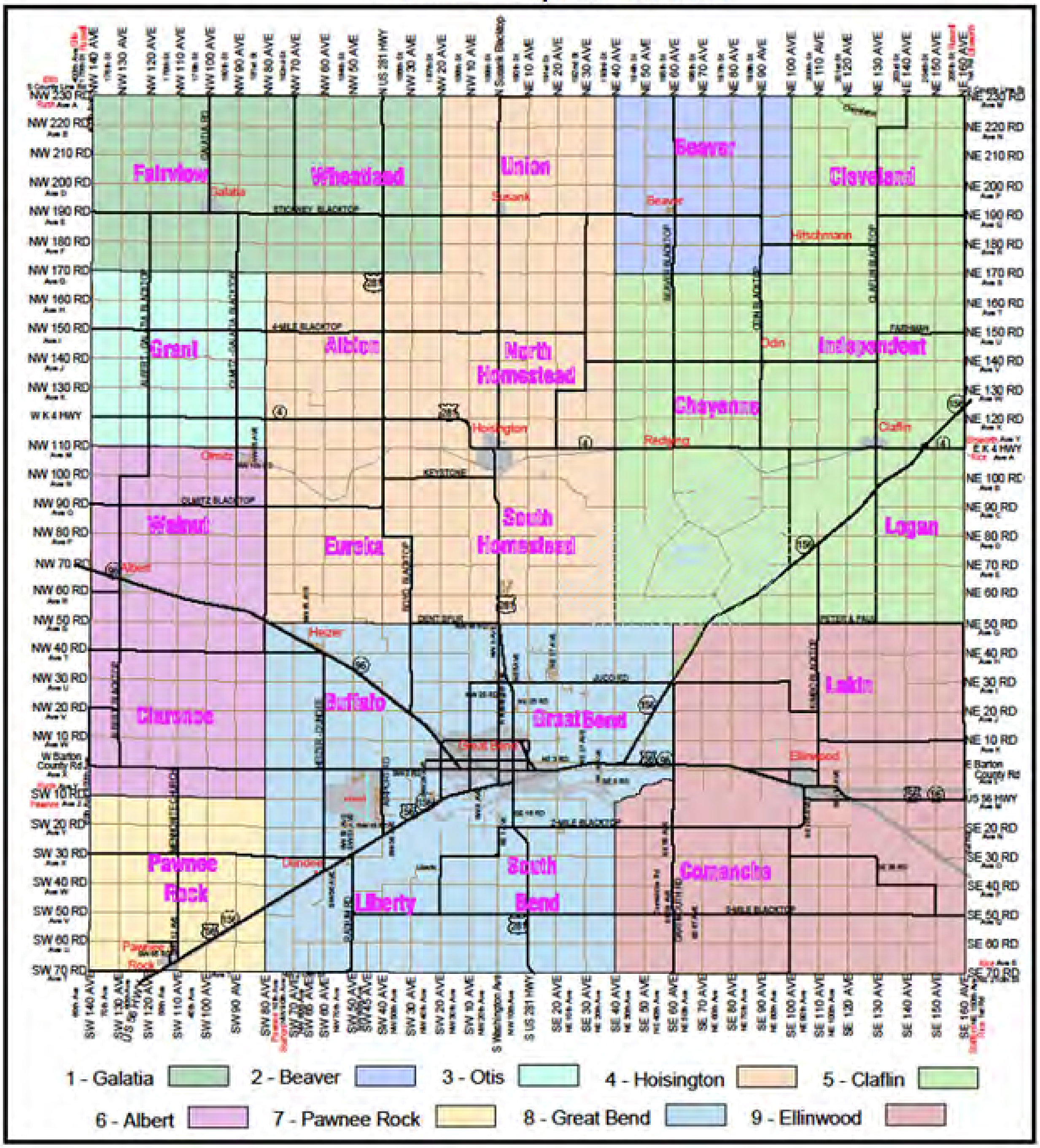
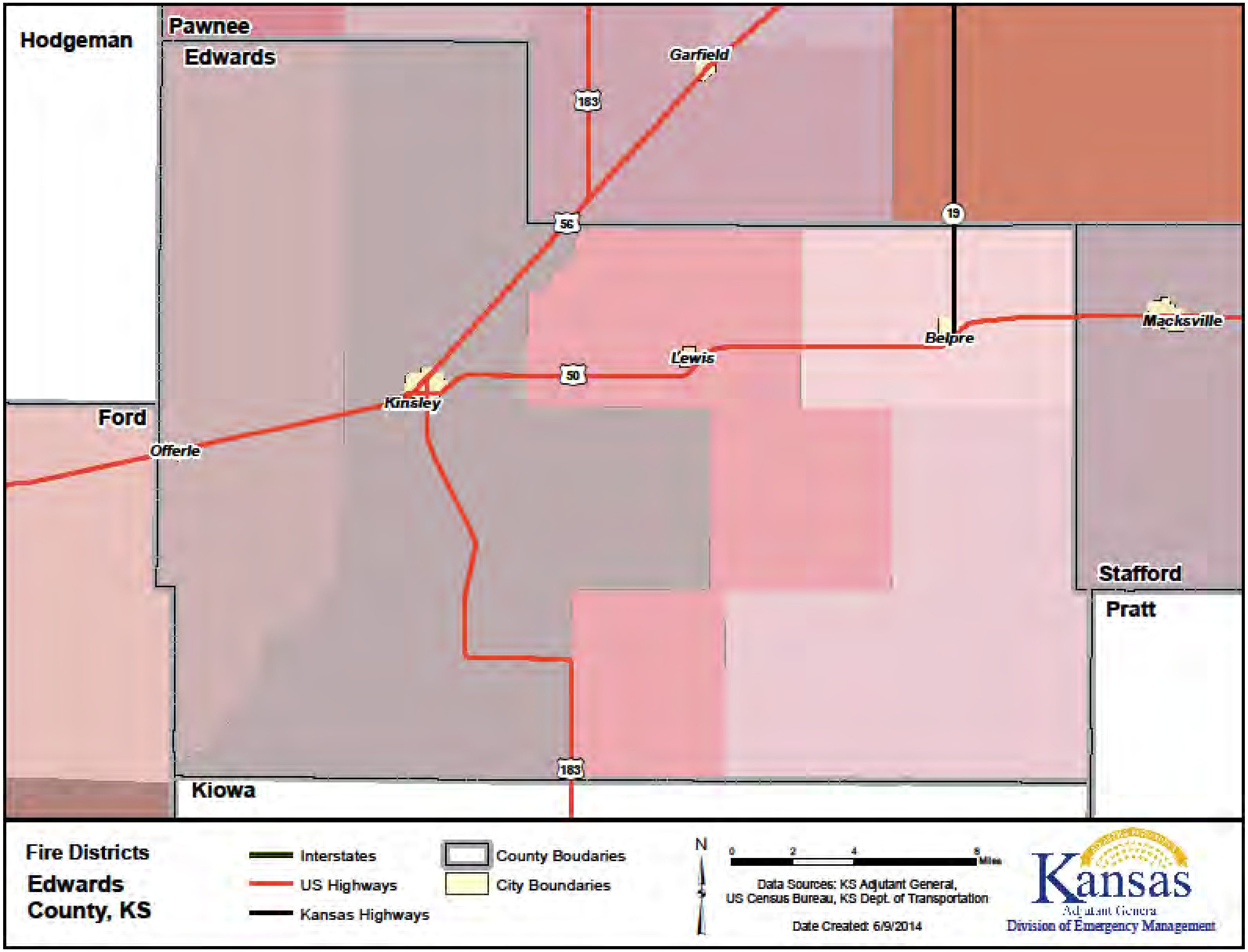
Data Sources: KS Adjutant General,
US Census Bureau, KS Dept. of Transportation,
KS Dept. of Education
Date Created: 5/30/2014
Kansas
Adjutant General
Division of Emergency Management

2.15 FIRE DISTRICT BOUNDARIES

The following maps present regional fire district boundaries by county. Note that not all participating counties and jurisdictions had this information available for use

Barton County Fire Districts

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Macksville
Belpre
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Kinsley
Ford
Offerle
Stafford
Pratt
183
Kiowa
Fire Districts
Edwards County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
City Boundaries
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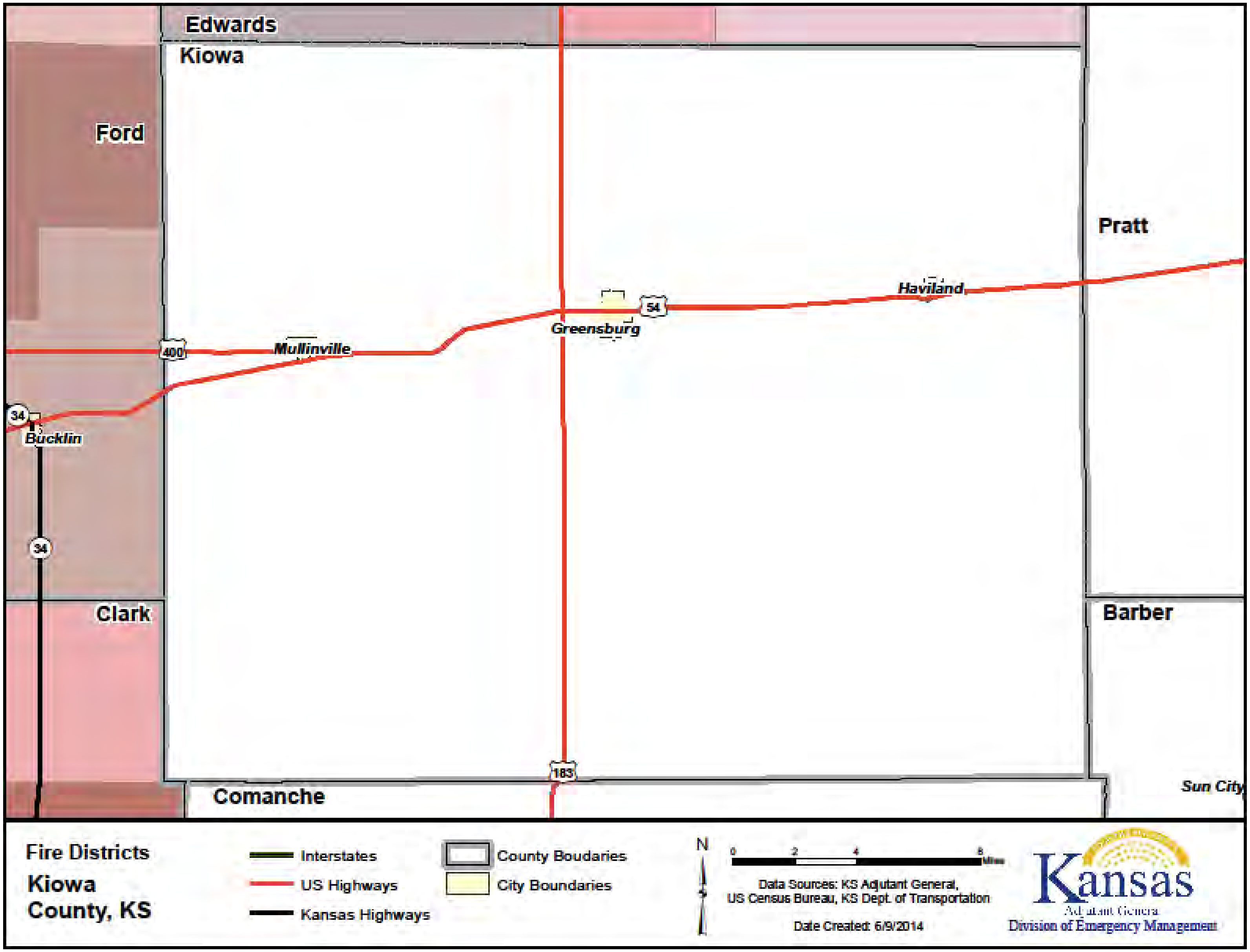
Data Sources: KS Adjutant General, US Census Bureau, KS Dept. of Transportation
Date Created: 6/9/2014
Kansas
Adjutant General
Division of Emergency Management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Haviland
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Bucklin
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Clark
Barber
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Comanche
Sun City
Fire Districts
Kiowa County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
City Boundaries
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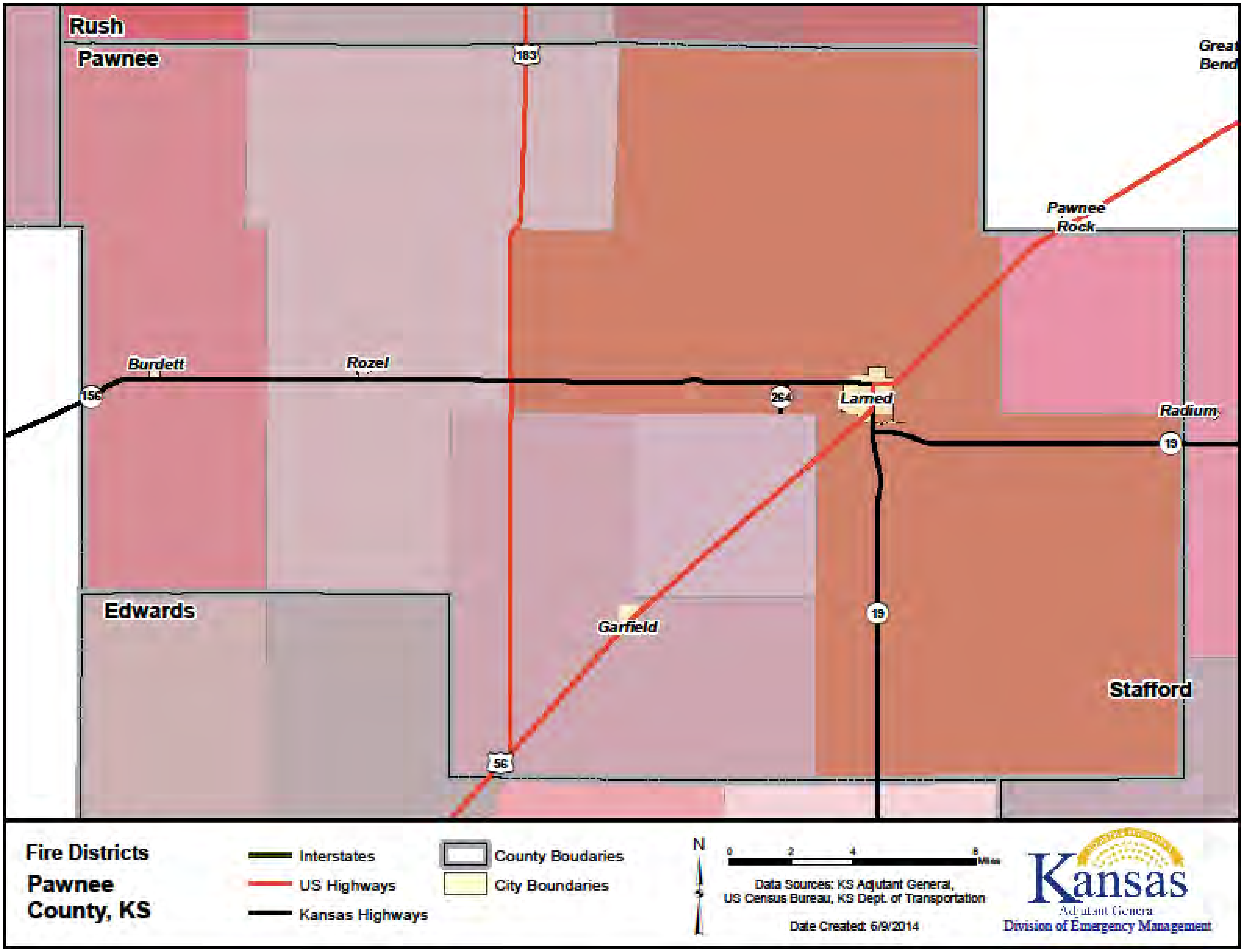
0 2 4 8 Miles
Data Sources: KS Adjutant General, US Census Bureau, KS Dept. of Transportation
Date Created: 6/9/2014
Kansas
Division of Emergency Management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Great Bend
Pawnee Rock
Burdett
Rozel
Larned
Radium
Edwards
Garfield
Stafford
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Fire Districts
Pawnee County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
City Boundaries
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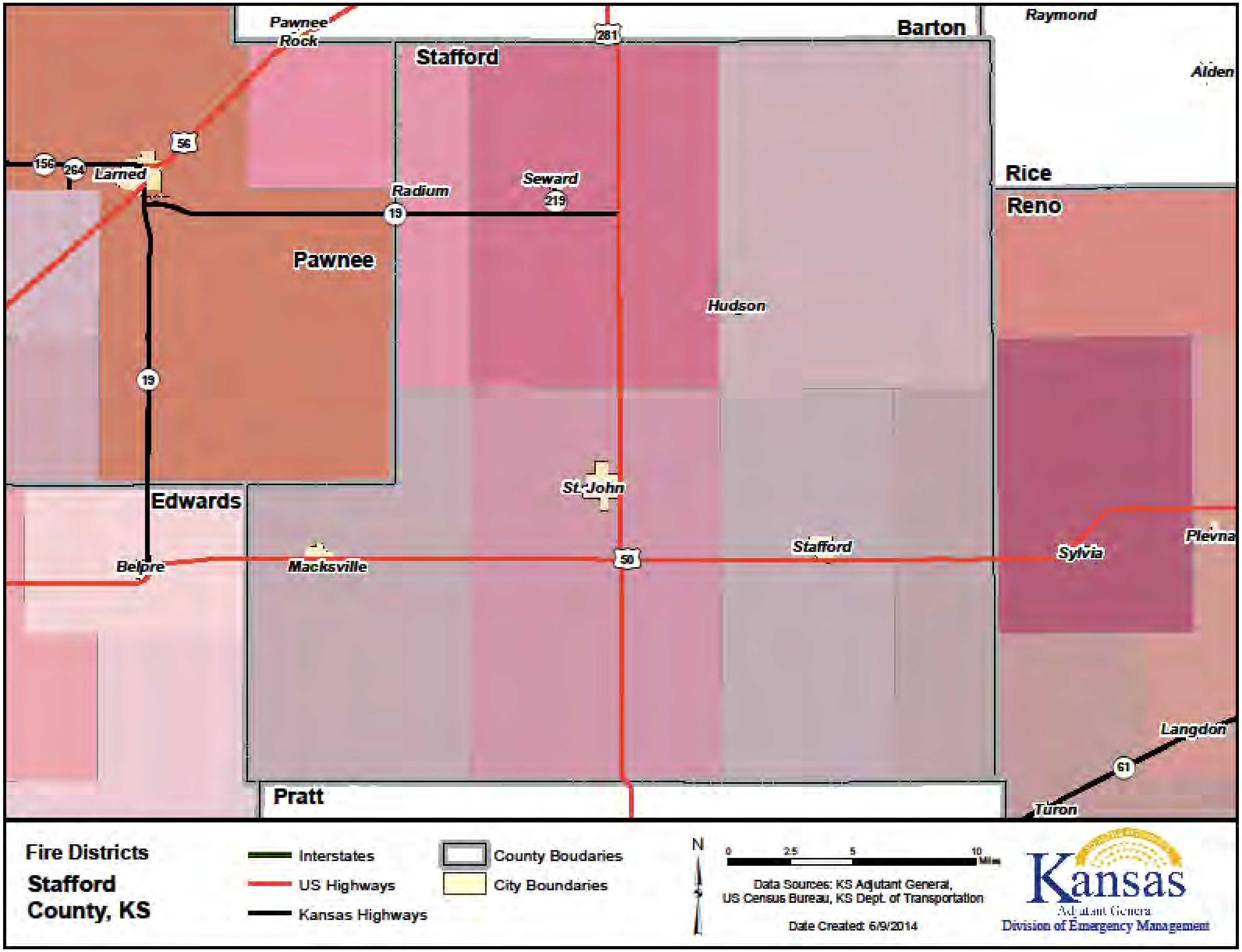
0 2 4 8 Miles
Data Sources: KS Adjutant General, US Census Bureau, KS Dept. of Transportation
Date Created: 6/9/2014
Kansas
Adjutant General
Division of Emergency Management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Stafford
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Seward
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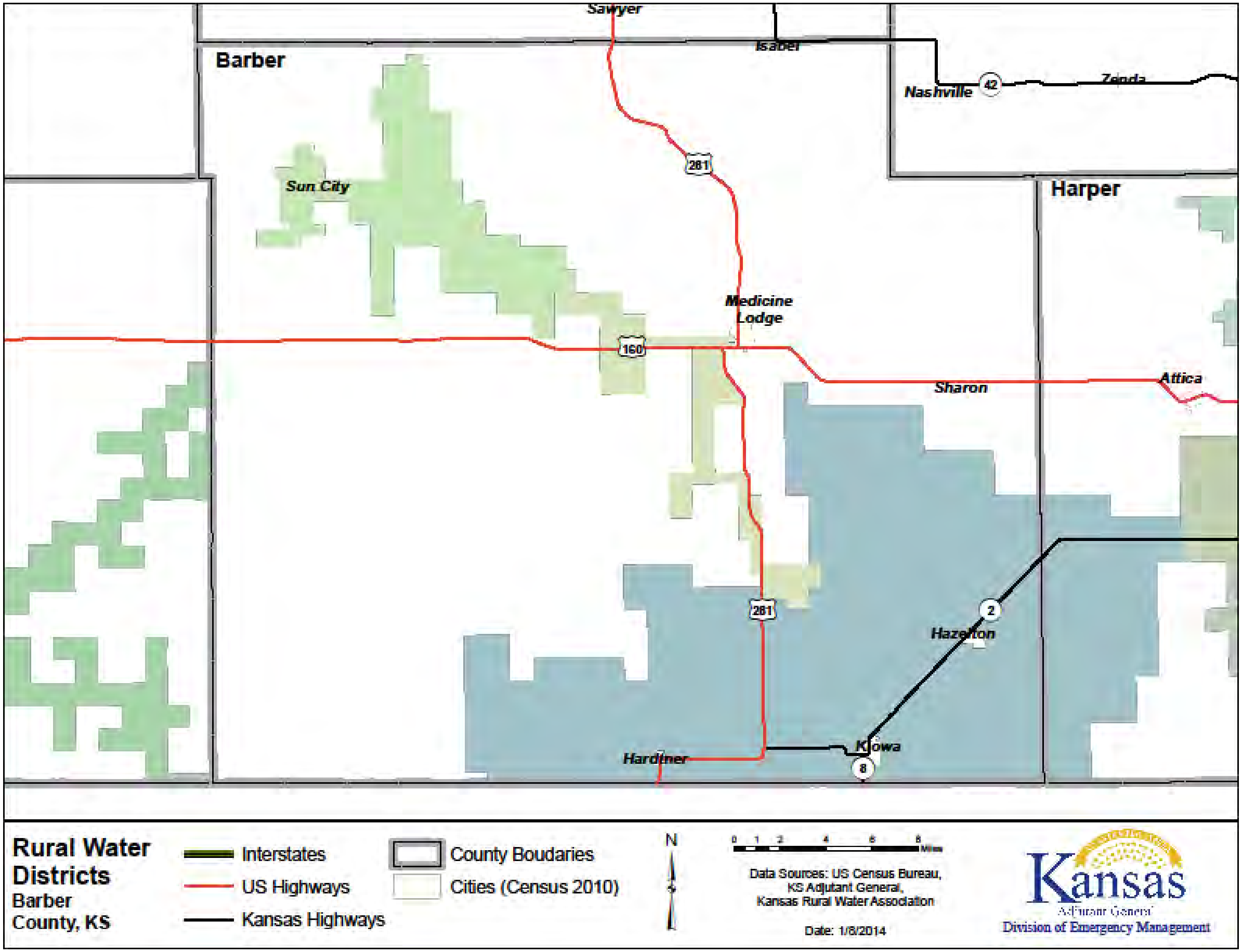
Hudson
19
St. John
Edwards
Stafford
Plevna
Belpre
Macksville
50
Sylvia
Langdon
61
Pratt
Turon
Fire Districts
Stafford County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
City Boundaries
N
0 2.5 5 10 Miles
Data Sources: KS Adjutant General, US Census Bureau, KS Dept. of Transportation
Date Created: 6/9/2014
Kansas
Division of Emergency Management

2.16 WATER DISTRICT BOUNDARIES

The following maps present regional water district boundaries by county.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Sharon
Attica
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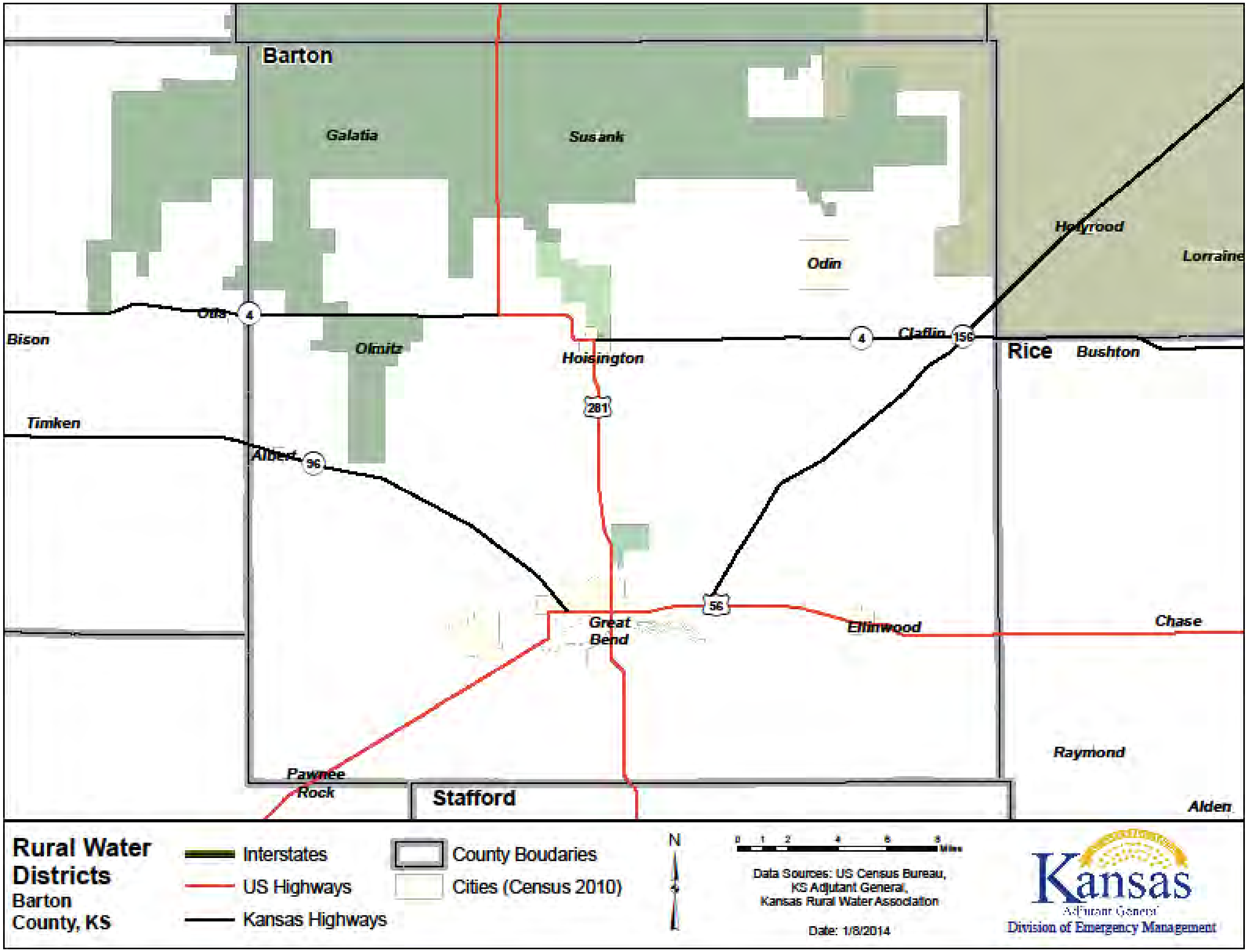
Hazelton
Kiowa
Hardtner
8
Rural Water Districts
Barber County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
Cities (Census 2010)
N
Data Sources: US Census Bureau, KS Adjutant General, Kansas Rural Water Association
Date: 1/6/2014
Kansas
Division of Emergency Management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Bison
Claflin
Rice
Bushton
Olmitz
Hoisington
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Timken
Albert
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Great Bend
Ellinwood
Chase
Raymond
Pawnee Rock
Stafford
Alden
Rural Water Districts
Barton County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
Cities (Census 2010)
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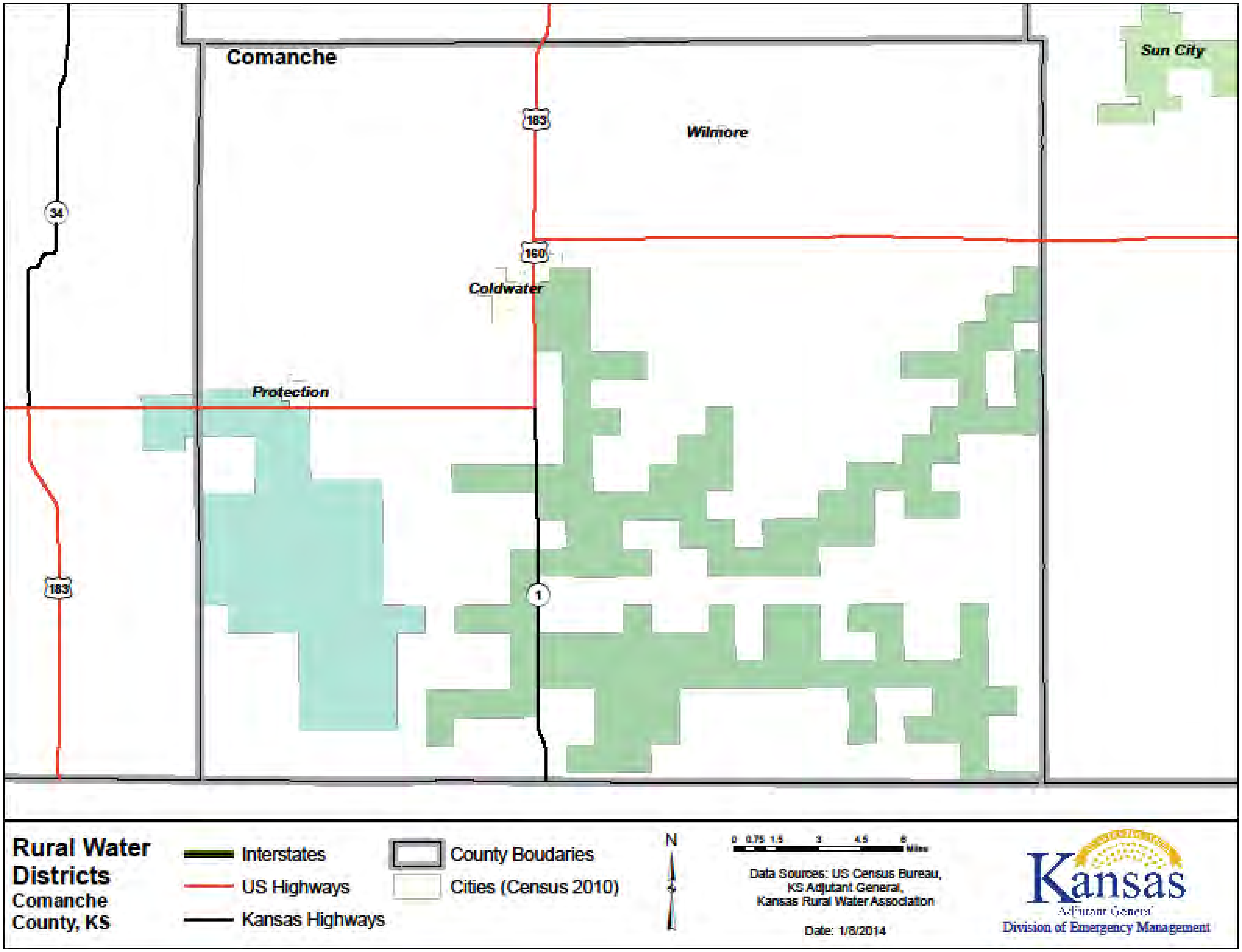
Data Sources: US Census Bureau, KS Adjutant General, Kansas Rural Water Association
Date: 1/8/2014
Kansas
Adjutant General
Division of Emergency Management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Wilmore
Sun City
Coldwater
Protection
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Rural Water Districts
Comanche County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
Cities (Census 2010)
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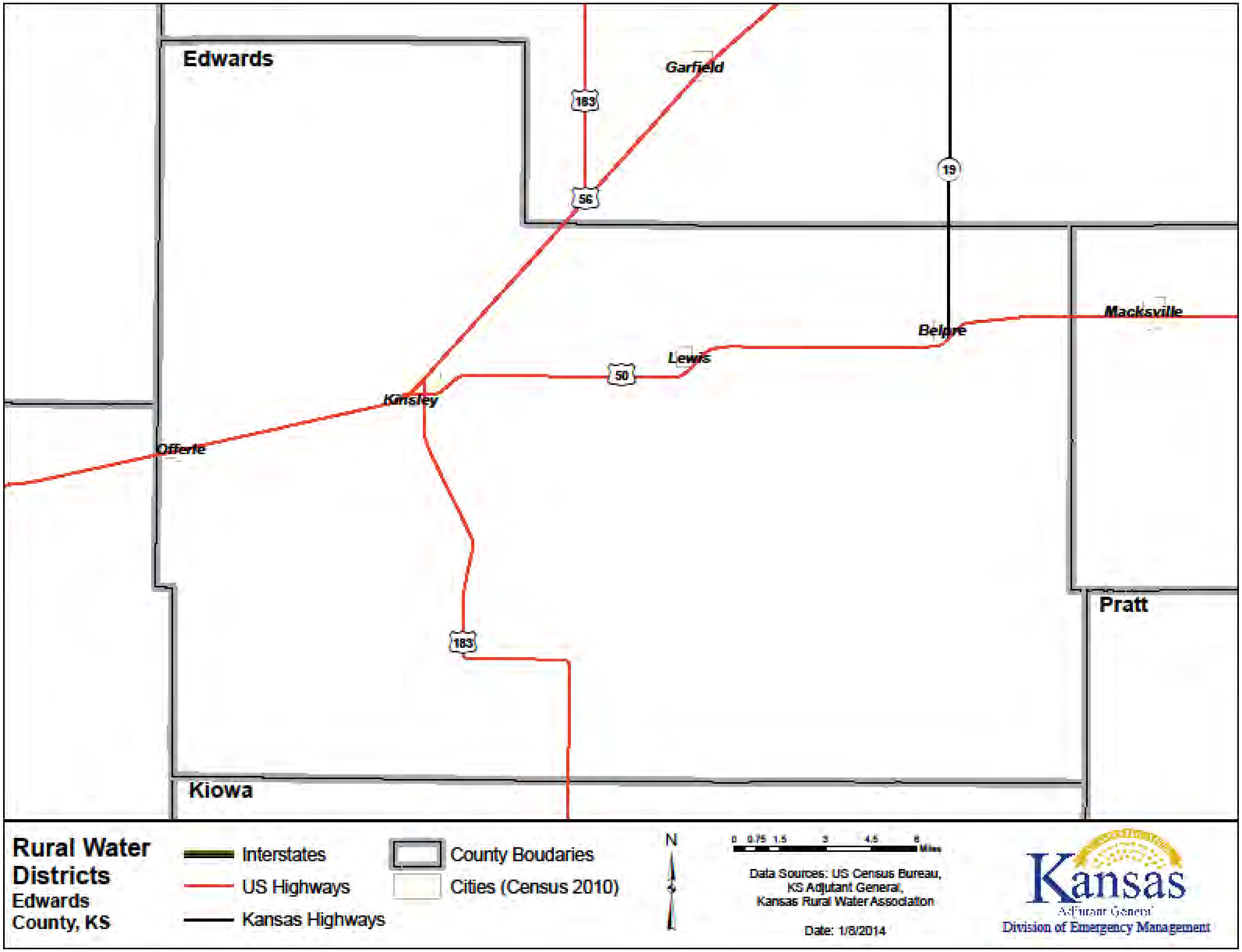
Data Sources: US Census Bureau, KS Adjutant General, Kansas Rural Water Association
Date: 1/8/2014
Kansas
Adjutant General
Division of Emergency Management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Macksville
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Kinsley
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Kiowa
Rural Water Districts
Edwards County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
Cities (Census 2010)
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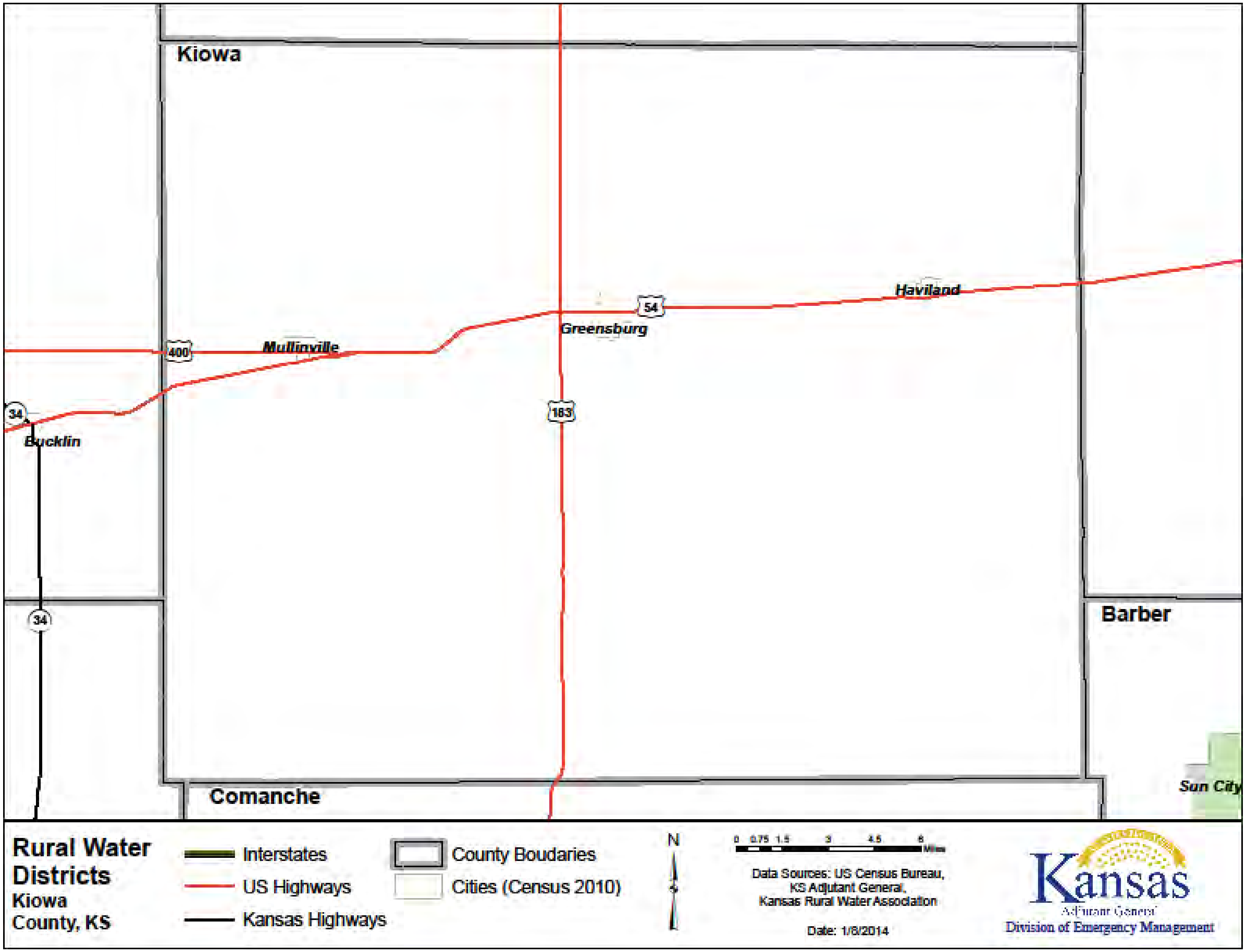
Data Sources: US Census Bureau, KS Adjutant General, Kansas Rural Water Association
Date: 1/6/2014
Kansas
Adjutant General
Division of Emergency Management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Greensburg
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Bucklin
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Barber
Comanche
Sun City
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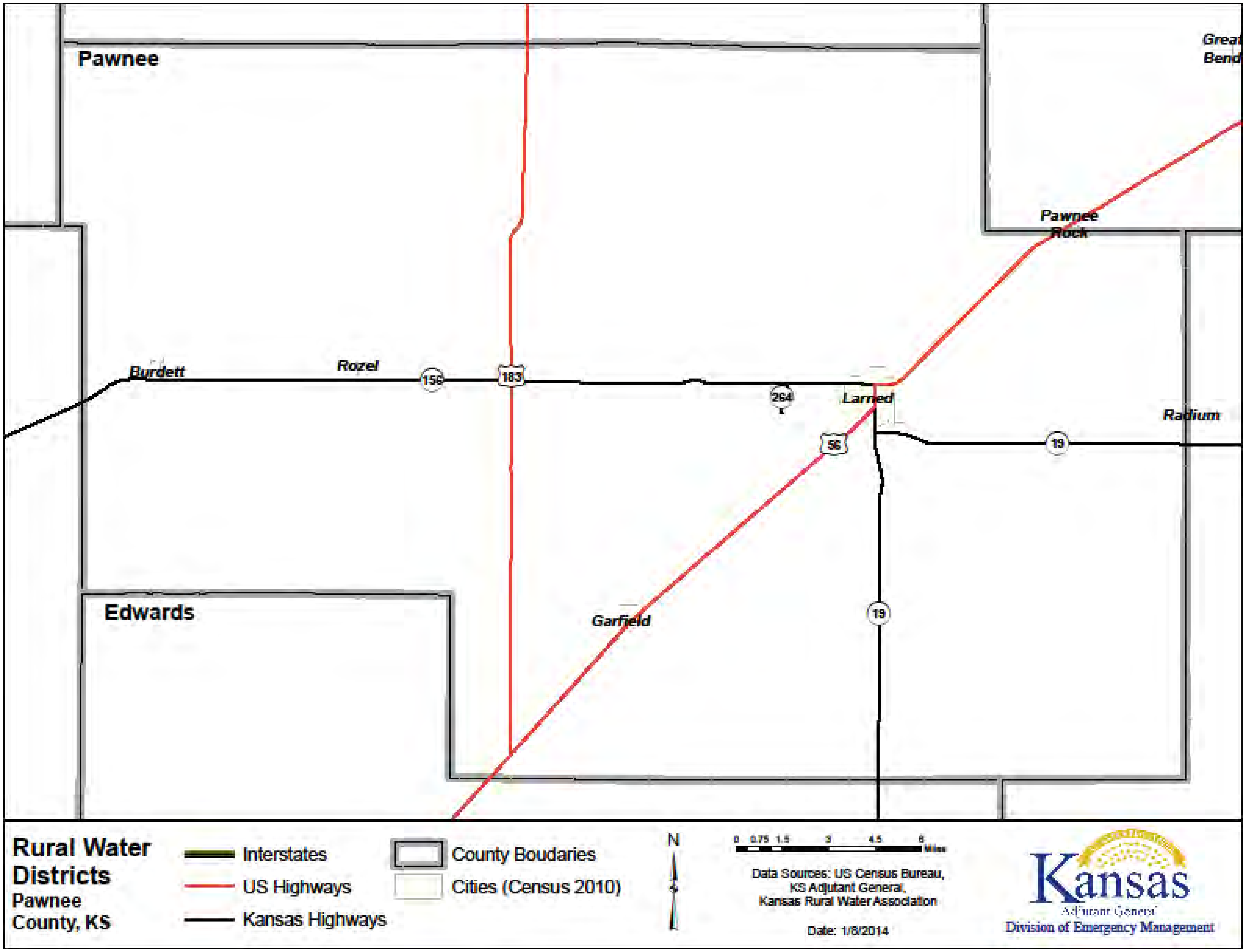
Kiowa County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
Cities (Census 2010)
N
0 0.75 1.5 3 4.5 6 Miles
Data Sources: US Census Bureau, KS Adjutant General, Kansas Rural Water Association
Date: 1/6/2014
Kansas
Adjutant General
Division of Emergency Management



Pawnee
Great Bend
Pawnee Rock
Burdett
Rozel
156
183
264
Larned
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Radium
Edwards
Garfield
Rural Water Districts
Pawnee County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
Cities (Census 2010)
N
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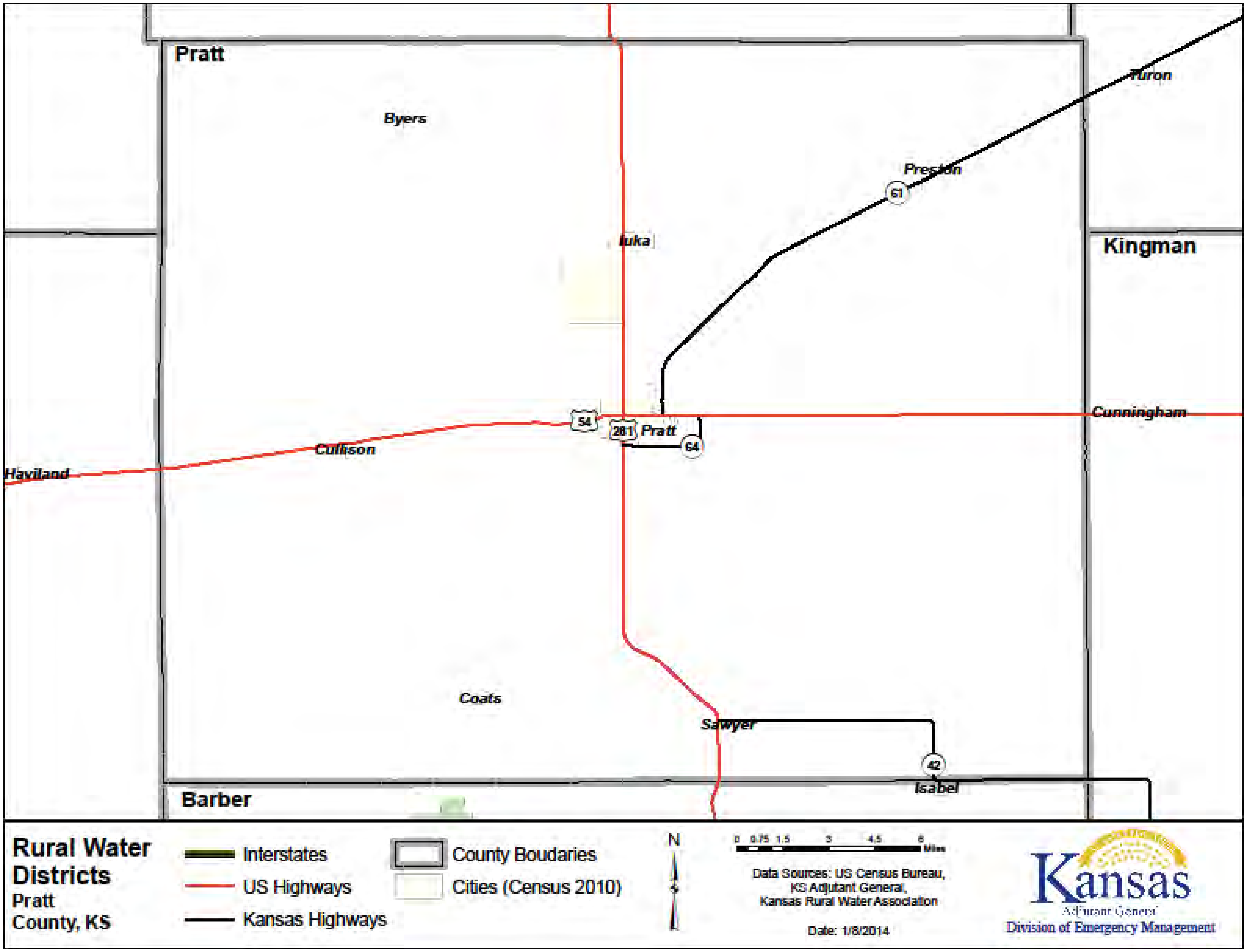
Data Sources: US Census Bureau, KS Adjutant General, Kansas Rural Water Association
Date: 1/6/2014
Kansas
Adjutant General
Division of Emergency Management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Cullison
Haviland
Coats
Sawyer
42
Isabel
Barber
Rural Water Districts
Pratt County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
Cities (Census 2010)
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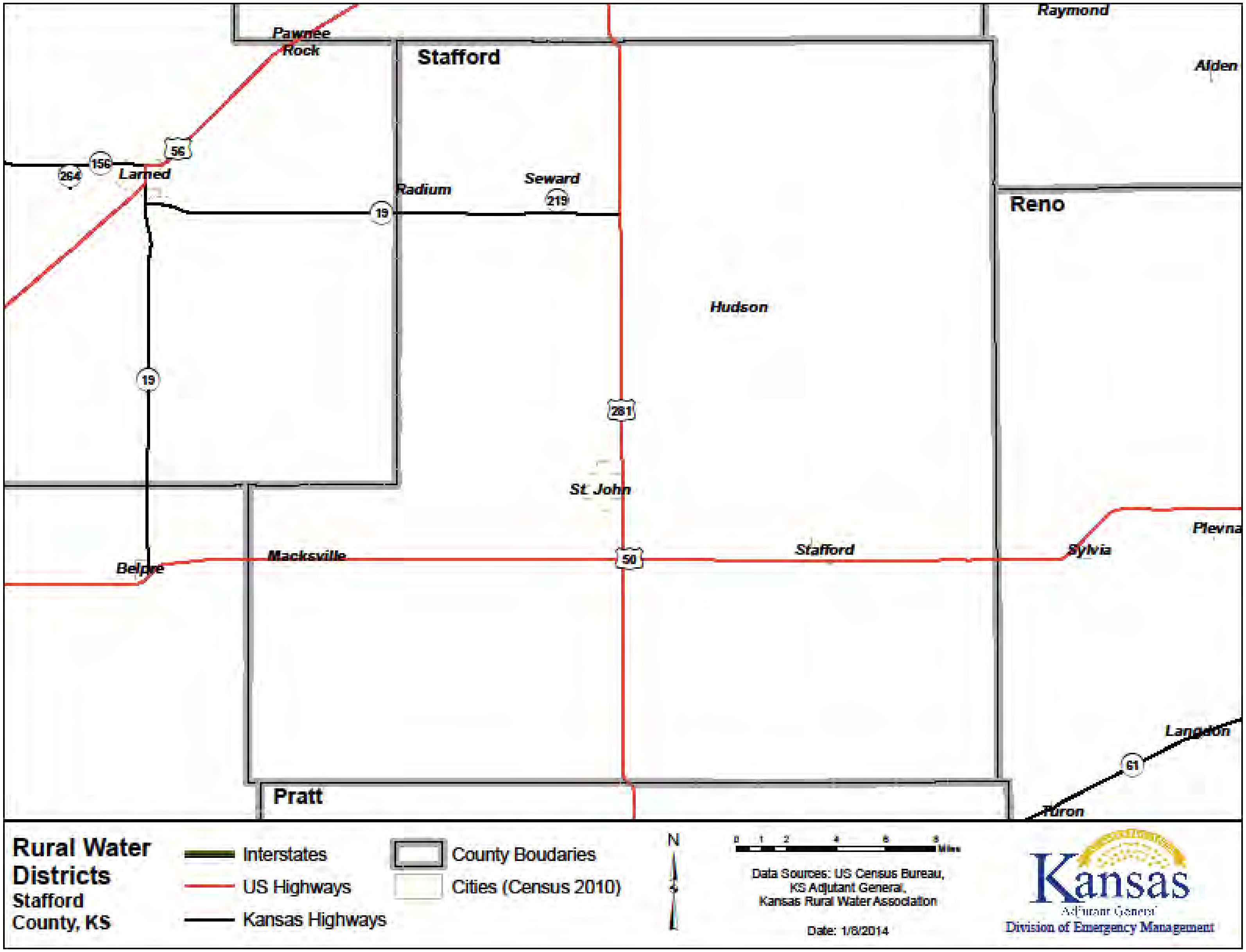
Data Sources: US Census Bureau, KS Adjutant General, Kansas Rural Water Association
Date: 1/8/2014
Kansas
Adjutant General
Division of Emergency Management



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Rural Water Districts
Stafford County, KS
Interstates
US Highways
Kansas Highways
County Boudaries
Cities (Census 2010)
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0 1 2 4 6 8 Miles
Data Sources: US Census Bureau, KS Adjutant General, Kansas Rural Water Association
Date: 1/6/2014
Kansas
Adjutant General
Division of Emergency Management

2.17 REGIONAL THREATENED AND ENDANGERED SPECIES

The Endangered Species Act (ESA) established a Federal program to conserve, protect, and restore threatened or endangered plants and animals, as well as their habitats. ESA specifically charges Federal agencies with the responsibility of using their authority to conserve threatened or endangered species. Jurisdictions using funding from the Federal government cannot authorize any actions that jeopardize the existence of an endangered or threatened species, or result in the destruction of habitats for these species. The following provide definitions for endangered and threatened species:

- **Endangered species:** any species of wildlife whose continued existence as a viable component of the state's wild fauna is determined to be in jeopardy. That term shall also include any species of wildlife determined to be an endangered species pursuant to Pub. L. No. 93-205 (December 28, 1973), the Endangered Species Act of 1973, and amendments thereto

- **Threatened species:** any species of wildlife which appears likely, within the foreseeable future, to become an endangered species. That term shall also include any species of wildlife determined to be a threatened species pursuant to Pub. L. No. 93-205 (December 28, 1973), the Endangered Species Act of 1973, and amendments thereto.

The following table is a list of the endangered or threatened species for the region.

- Whooping Crane (Grus Americana
- Lesser Prarie Chicken (Tympanuchus pallidicinctus)
- Arkansas Darter (Eteostama cragini)
- Least Tern (Sterna antillarum)
- Piping Plover (Charadrius melodus)
- Arkansas River Shiner (Notropis girardi)

3.0 RISK ASSESSMENT

3.1 INTRODUCTION

44 CFR 201.6(C) Plan content. The plan shall include the following: (2) risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

The ultimate purpose of this Hazard Mitigation Plan is to minimize the loss of life and property in the planning region. In order to accomplish this all relevant hazards, potential vulnerabilities and exposures for the region have been identified. Once potential hazards, vulnerabilities and exposure have been identified communities within the region are able to conceptualize their potential risks as part of a risk assessment process. Based on this understanding of risk, communities can then develop a strategy to identify and prioritize mitigation action to defend against these potential risks. The following table presents a definition of terms used within this section.

Definition of Terms

Term	Definition
Hazard	A potential source of injury, death or damage
Vulnerability	Susceptibility to injury, death or damage
Exposure	People and property within the area the potential hazard could affect
Risk	Function of potential hazard, vulnerability and exposure, it is the likelihood of a hazard event resulting in injury, death or damage
Risk Mitigation	A systematic reduction in the exposure and vulnerability to a potential hazard

3.2 METHODOLOGY

The risk assessment for south Kansas followed the methodology described in the FEMA "Local Mitigation Planning Handbook" (March 2013). FEMA recommends the following steps be taken, with each step described in further detail in the following sections:

Each step is described in detail in the following sections, with Inventory Assets and Estimate Losses being combined into Hazard Vulnerability and Impact.

3.3 IDENTIFY POTENTIAL HAZARDS

44 CFR 201.6(C)(2)(i) A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

The hazard identification was compiled by investigating the various hazard occurrences within the south Kansas region. The HMPC identified 21 natural hazards that may affect the planning area and organized these hazards to be consistent with the Kansas Hazard Mitigation Plan (2013). These hazards are listed below and profiled in further detail in the next sections.

- Agricultural Infestation
- Civil Disorder
- Dam/Levee Failure
- Drought
- Earthquake
- Expansive Soils
- Extreme Temperatures
- Flood
- Hailstorm
- Hazardous Materials
- Land Subsidence
- Landslide
- Lightning
- Major Disease Outbreak
- Radiological
- Soil Erosion and Dust
- Terrorism/Agri-terrorism
- Tornado
- Utility/Infrastructure Failure
- Wildfire
- Wind Storm
- Winter Storm

For purposes of this multi-jurisdictional plan, hazards were identified initially by county to include all participating jurisdictions within that county, and then expanded to a regional basis.

Based on discussion with the HMPC and a lack of identified risk or history, numerous FEMA identified hazards, such as avalanche, coastal erosion, hurricane, tsunami and volcano, were not included in the scope of this plan.

3.4 PROFILE HAZARD EVENTS

Based on the identification of potential hazards, each hazard is profiled to provide data concerning previous occurrences, the probability of future occurrence and the threat to the planning area. As south Kansas is generally uniform in terms of climate, topography, building characteristics and development trends, overall hazards and vulnerability do not vary greatly across the planning area. Weather-related hazards such as drought, extreme temperatures, hail, tornados, windstorms and winter storms affect the entire planning area. As such, one general profile will be created for these hazards. However, some hazards such as dam and levee failure, flood and landslide may have local variances and multiple profiles may be developed if the risk does not match with the entire planning area .

For each identified hazard the following information is provided:

- Hazard Description: a general discussion of the hazard and includes information on potential warning time, the potential duration of the event, and potential impacts
- Hazard Location: the geographic extent or location of the hazard in the planning area
- Previous Occurrences and Extent: information on historic incidents and their impacts
- Hazard Vulnerability and Impact: discussion of the vulnerability of the region, or specific jurisdiction as appropriate, and potential impacts of identified hazards
- Future Development: potential results of future development related to hazards
- Probability of Future Occurrence: frequency of past events used to gauge the likelihood of future occurrences
- Consequence Analysis: analysis the potential impacts using set criteria

Calculated Priority Risk Index

The south Kansas HMPC used the calculated priority risk index (CPRI) methodology to prioritize each of the identified hazards. CPRI prioritization considers the following four elements of risk:

- Probability
- Magnitude/Severity
- Warning Time
- Duration

The following tables provide a summary for each of the risk elements, including a rationale behind each numerical rating.

Probability	Rating	Rating Parameters
	4 Highly Likely	Event is probable within the calendar year
		Event has up to 1 in 1 year chance of occurring (1/1=100%)
		History of events is greater than 33% likely per year
		Event is "Highly Likely" to occur
	3 Likely	Event is probable within the next three years
		Event has up to 1 in 3 years chance of occurring (1/3=33%)
		History of events is greater than 20% but less than or equal to 33% likely per year
		Event is "Likely" to occur
	2 Occasional	Event is probable within the next five years
		Event has up to 1 in 5 years chance of occurring (1/5=20%)
		History of events is greater than 10% but less than or equal to 20% likely per year
		Event could "Possibly" occur
	1 Unlikely	Event is possible within the next 10 years
		Event has up to 1 in 10 years chance of occurring (1/10=10%)
		History of events is less than or equal to 10% likely per year
		Event is "Unlikely" but is possible of occurring

Magnitude /Severity	Rating	Rating Parameters
	4 Catastrophic	Multiple deaths
		Complete shutdown of facilities for 30 or more days
		More than 50 percent of property is severely damaged
	3 Critical	Injuries and/or illnesses result in permanent disability
		Complete shutdown of critical facilities for at least two weeks
		25–50 percent of property is severely damaged
	2 Limited	Injuries and/or illnesses do not result in permanent disability
		Complete shutdown of critical facilities for more than one week
		10–25 percent of property is severely damaged
	1 Negligible	Injuries and/or illnesses are treatable with first aid
		Minor quality of life lost
		Shutdown of critical facilities and services for 24 hours or less
		Less than 10 percent of property is severely damaged

Warning Time	Rating	Rating Parameters
	4	Less than 6 hours
	3	6-12 hours
	2	12-24 hours
	1	24+ hours

Duration	Rating	Rating Parameters
	4	More than 1 week
	3	Less than 1 week
	2	Less than 1 day
	1	Less than 6 hours

Using the rankings described in the tables above, the following weighted formula was used to determine each hazard's CPRI:

(Probability x 0.45) + **(Magnitude/Severity x 0.30)** + **(Warning Time x 0.15)** + **(Duration x 0.10)**

Based on their CPRI, each hazard was assigned a planning significance category. Each planning significance category was assigned a CPRI range, with a higher score indicating greater planning criticality. The following table details planning significance CPRI ranges.

CPRI Range Planning Significance

	CPRI Range	
Planning Significance	**Low CPRI**	**High CPRI**
High	3.0	4.0
Moderate	2.0	2.9
Low	1.0	1.9

The terms high, moderate and low indicate the level of prioritization of planning effort for each hazard, and do not indicate the potential impact of a hazard occurring. Hazards rated with moderate or high planning significance were more thoroughly investigated and discussed due to the availability of data and historic occurrences, while those with a low planning significance were generally addressed due to lack of available data and historical occurrences. The following table shows previous CPRI ratings for each county. Based on discussions with the HMPC, the CPRIs were reviewed and approved or modified as required

County Specific Hazard CPRI Planning Significance

	Barber	Barton	Comanche	Edwards	Kiowa	Pawnee	Pratt	Stafford
Agricultural Infestation	1.60	1.60	2.50	1.60	2.50	1.60	1.60	1.60
Civil Disorder	1.75	1.75	1.75	1.75	1.75	1.75	1.75	2.20
Dam and Levee Failure	1.45	2.05	1.30	2.35	2.20	2.25	2.25	2.50
Drought	2.05	1.90	3.25	2.50	2.80	2.80	1.75	1.75
Earthquake	1.45	1.45	1.45	1.75	1.75	1.75	1.75	1.45
Expansive Soils	1.30	1.30	2.65	1.30	1.75	1.75	1.75	1.30
Extreme Temperature	1.65	2.25	2.40	1.75	2.70	2.95	1.75	2.40
Flood	3.60	3.00	2.70	3.33	2.85	2.70	2.70	3.23
Hailstorm	3.25	3.40	3.10	3.40	2.80	3.40	3.40	3.18
Hazardous Materials	2.70	1.85	2.30	1.85	1.85	1.85	1.85	1.85
Land Subsidence	1.45	1.45	2.20	1.45	1.75	1.30	1.30	1.45
Landslide	1.45	1.45	1.45	1.45	1.75	1.45	1.45	1.45
Lightning	1.45	1.75	2.80	1.75	2.35	3.40	1.75	1.75
Major Disease Outbreak	1.90	1.90	2.95	1.90	1.90	1.90	1.90	1.90
Radiological	1.75	1.75	1.30	1.75	1.75	1.75	1.75	1.75
Soil Erosion & Dust	1.75	1.75	2.95	1.75	2.80	1.75	1.75	1.75
Terrorism, Agri-Terrorism	1.75	1.75	1.60	1.75	1.75	1.75	1.75	1.75
Tornado	3.70	3.40	3.50	2.95	3.70	2.95	2.95	2.95
Utility / Infrastructure Failure	2.00	2.80	3.20	2.84	2.63	2.85	2.85	2.85
Wildfire	2.45	3.06	3.20	3.45	3.20	3.05	3.05	3.46
Windstorm	3.35	3.13	3.30	3.50	2.90	3.35	3.35	3.20
Winter Storm	3.30	3.40	3.45	3.25	3.30	3.30	3.30	2.85

Based on the above noted county specific CPRIs, a regional CPRI was calculated for the region. The following table summarizes CPRI rating for each identified hazard.

Hazard CPRI Planning Significance

Hazard	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Agricultural Infestation	1.50	2.00	1.00	4.00	1.83
Civil Disorder	1.13	2.00	4.00	1.00	1.81
Dam and Levee Failure	1.25	2.63	2.38	3.38	2.04
Drought	2.63	2.06	1.00	4.00	2.35
Earthquake	1.00	1.50	4.00	1.00	1.60
Expansive Soils	1.63	1.00	1.63	3.63	1.64
Extreme Temperature	2.63	1.75	1.25	3.38	2.23
Flood	3.25	2.88	2.50	3.13	3.01
Hailstorm	4.00	2.78	3.38	1.00	3.24
Hazardous Materials Event	1.25	2.13	4.00	2.13	2.01
Land Subsidence	1.38	1.00	1.75	3.63	1.54
Landslide	1.13	1.00	3.63	1.38	1.49
Lightning	2.50	1.38	3.25	1.00	2.13
Major Disease Outbreak	1.38	2.88	1.00	4.00	2.03
Radiological Event	1.00	1.00	3.63	4.00	1.69
Soil Erosion & Dust	2.38	1.38	1.00	4.00	2.03
Terrorism, Agri-Terrorism	1.00	2.00	3.63	1.38	1.73
Tornado	3.50	3.25	4.00	1.13	3.26
Utility / Infrastructure Failure	2.78	2.00	4.00	3.00	2.75
Wildfire	3.44	2.56	4.00	2.00	3.12
Windstorm	3.94	2.75	3.00	2.13	3.26
Winter Storm	3.88	3.06	1.88	3.25	3.27

In general, the average CPRI for each identified hazard remained similar to the calculated CPRI for each participating county, both for their previous planning effort and this plan update. Notable changes for calculated CPRIs include the Terrorism/Agri-Terrorism CPRI being lowered for each county due to a lack of historical events.

Emergency Management Accreditation Program Consequence Analysis

The Emergency Management Accreditation Program (EMAP) is a voluntary review process for local emergency management program. EMAP accreditation is a means of demonstrating that a program meets national standards for emergency management programs. In an effort to foster EMAP accreditation, a consequence analysis of the potential for detrimental impacts of hazard was conducted. In this analysis the potential impacts of all 21 of the above referenced hazards have been addressed in regards to:

- Health and safety of persons in the area of the incident
- Responders

- Continuity of Operations
- Property, Facilities, and Infrastructure
- Delivery of Services
- Environment
- Economic Conditions
- Public Confidence in Governance

Available data and estimations of potential future events for each of the identified hazards was used to provide guidance for a consequence analysis. The ranking elements are categorized as Minimal, Moderate, or Severe, with a methodology for the rankings provided in the following table.

EMAP Ranking Methodology

Impact On	Minimal	Moderate	Severe
Public	Less than 5 people	Between 5 to 14 people	15 people or greater
Responders	Less than 5 people	Between 5 to 14 people	15 people or greater
Continuity of Operations	0 days	1 to 7 days	8 or greater days
Delivery of Services	Less than 1 day	1 to 7 days	8 or greater days
Property, Facilities, & Infrastructure	Less than $1.37 per capita	$1.37 to $10.00 per capita	Greater than $10.01 per capita
Environment	Less than 10%	10% to 20%	Greater than 20.01%
Economy	Less than 8% unemployment	8% to 15% unemployment	Greater than 15% unemployment
Public Confidence	Less than 1%	1.0% to 10%	Greater than 10.01%

The ratings are meant to be only a guide due to the variances that could apply such as population, location, time, hazard type, and the amount of jurisdictions within the hazard area. The results of the EMAP consequence analysis are presented in each hazard profile's Consequence Analysis Section.

3.5 REGIONAL VULNERABILITY ASSESSMENT

(ii) A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:
(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;
(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate;
(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.
(iii) For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

Each identified hazard is detailed to meet the above stated criteria, including potential regional variances. For these variances, where the risk may vary on a local basis, a discussion is included identifying the unique risk or concern under the relevant hazard. In addition, a complete discussion of regional population, business, land use, special needs and development trends as part of the regional vulnerability assessment is presented in Section 2.

3.6 HISTORICAL DISASTER DECLARATIONS

The HMPC reviewed federal and state disaster declarations to assist in hazard identification. Federal and state declarations may be enacted when local governments are unable to cope with the magnitude of an event. In those cases a state disaster declaration may be issued, allowing for state assistance. In more extreme cases, when both the local and state governments' abilities are inadequate; a federal disaster declaration may be issued allowing federal assistance. These federal disaster declarations may be issued through a variety of agencies based on the scale and sectors affected.

The following information on past declared disasters is presented to provide a historical perspective on potential hazards that could impact south Kansas. The information was obtained from the FEMA and KDEM. Many of the disaster events reported in the following tables were multi-regional or statewide. As a result, the reported costs do not solely reflect losses to south Kansas. Further discussion of disasters and events may be found under the relevant hazard in the following sections.

Major Disaster Declarations

Declaration Number	Declaration Date*	Disaster Description	Regional Counties Involved	Disaster Cost**
4150	10/22/2013 (7/22/2013 - 08/16/2013)	Severe Storms, Winds, Tornados and Flooding	Barber, Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford	$11,412,827
4112	04/26/13 (02/20-23/2013)	Snowstorm	Barber, Barton, Pawnee, Pratt , Stafford	$1,269,251
4063	05/24/2012 (4/14-4/15/2012)	Severe Storms, Tornados, Straight-line Winds and Flooding	Edwards, Kiowa and Stafford	$6,923,919
4010	07/29/2011 (5/19-6/4/2011)	Severe Storms, Straight-line Winds, Tornados and Flooding	Barton and Stafford	$8,259,620
1932	08/10/2010 (6/7-7/21/2010)	Severe Storms, Flooding and Tornados	Comanche, Kiowa and Pawnee	$9,279,257

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Major Disaster Declarations, Continued

Declaration Number	Declaration Date*	Disaster Description	Regional Counties Involved	Disaster Cost**
4112	04/25/2013 (02/20-23/2013)	Severe Winter Storm	Barton, Barber, Pawnee, Pratt, Stafford	$1,286,885
1849	06/25/2009 (4/25-5/16/2009)	Severe Storms, Flooding, Straight-line Winds, and Tornados	Barber and Butler	$15,013,488
1848	06/24/2009 (3/26-29/2009)	Severe Winter Storm and Record and Near Record Snow	Butler	$20,174,657
1808	10/31/2008	Severe Storms, Flooding, and Tornados	Butler	$4,167,044
1776	07/09/2008	Severe Storms, Flooding, and Tornados	Barber, Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford	$70,629,544
1741	02/01/2008 (12/06-19/2007)	Severe Winter Storms	Barber, Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford	$359,557,345
1711	7/2/2007 (6/26-30/2007)	Severe Storms and Flooding	Edwards and Pawnee	$40,238,600
1699	5/6/2007 (5/4/2007)	Severe Storms, Tornados, and Flooding	Barton, Comanche, Edwards, Kiowa, Pawnee, Prattand Stafford	$117,565,269
1675	1/7/2007 (12/28-30/2006)	Severe Winter Storm	Comanche, Edwards, Kiowa, Pawnee and Stafford	$315,201,639
1626	1/26/2006 (11/27-28/2005)	Severe Winter Storm	Edwards and Pawnee	$50,281,517
1579	2/8/2005 (1/4-6/2005)	Severe Winter Storm, Heavy Rains, and Flooding	Barber, Comanche, Kiowa and Pratt	$106,873,672
1535	8/3/2004 (6/12-7/25/2004)	Severe Storms, Flooding, and Tornados	Barton and Pawnee	$12,845,892
1402	2/6/2002 (1/29-2/15/2002)	Ice Storm	Barber, Comanche, Kiowa and Pratt	$60,185,754
1366	4/27/2001 (4/21/2001)	Severe Storms and Tornado	Barton	$4,730,957
1000	7/22/1993 (6/28-10/5/1993)	Flooding, Severe Storms	Barton, Edwards, Pawnee and Stafford	$99,790,368

Major Disaster Declarations, Continued

Declaration Number	Declaration Date*	Disaster Description	Regional Counties Involved	Disaster Cost**
644	7/18/1981	Severe Storms, Flooding, Tornados	Barton	$670,436
403	9/28/1973	Severe Storms, Tornados, Flooding	Barber, Barton,Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford	$4,296,913
378	5/2/1973	Severe Storms, Flooding	Barber, Barton, Edwards, Kiowa, Pawnee, Pratt and Stafford	$1,954,624
201	6/23/1965	Flooding	Barton, Edwards, Pawnee and Stafford	$1,046,450

Sources: FEMA and Kansas Division of Emergency Management

* Incident dates are in parentheses.

** Disaster costs include Public Assistance and Individual Assistance for all affected counties, including those not listed

In addition, the following table presents Emergency Declarations for regional counties.

Emergency Declarations

Declaration Number	Declaration Date	Disaster Description	Regional Counties Involved	Disaster Cost
3282	12/12/2007	Severe Winter Storms	All	N/A
3236	9/1/0/2005	Hurricane Katrina Evacuation	All	N/A

Sources: FEMA and Kansas Division of Emergency Management

3.7 HAZARD PROFILES

Each identified hazard is profiled in this section, with the level of detail varying based on available information. Sources of information have been generally cited in the above sections and are specifically cited in the detailed hazard profiles below.

Each profile describes the hazard and its location, previous occurrences, potential impact, and its probability of future hazard events. Additionally, the profiles explore regional vulnerability analysis, estimates of potential losses, development in hazard prone areas and the hazard impact overview. The magnitude of the impact caused by a hazard event (actual and perceived) is related directly to the vulnerability of the people, property, and the environment. This is a function of when the event occurs, the jurisdictions and community sectors affected, the resilience of the community, and the effectiveness of the emergency response and disaster recovery efforts.

As this is an update and consolidation of previous planning efforts, for this 2014 Hazard Mitigation update each hazard from each participating jurisdiction was reviewed and updated as indicated and required. For the update, each profile was updated with additional historical impact information, where available. The vulnerability assessment and estimates of potential losses have been expanded for all hazards addressed in the plan where sufficient data is available. In addition, statewide flood and earthquake losses have been quantified using HAZUS-MH 2.1.

With each update of this plan, new information will be incorporated to provide for better evaluation and prioritization of the hazards that affect south Kansas.

The following hazards are presented in alphabetical order, and not by CPRI planning significance rating, for ease of reference.

3.7.1 AGRICULTURAL INFESTATION

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Agricultural Infestation	1.50	2.00	1.00	4.00	1.83

Description

Agricultural infestation is a naturally occurring infection of crops or livestock that may cause them to be unusable. Numerous factors influence the severity and longevity of agricultural infestations, including rainfall amount, drought conditions, seasonal patterns, and movement of materials. Typical causes can include:

- Fungus
- Insects
- Rodents and vermin
- Transmissible animal diseases

A reasonable level of agricultural infestation is expected by regional farmers and ranchers who have readily available methods to mitigate against the impact. However, if levels of routine infestation rapidly increase, or a novel form of infestation were to appear, normal methods of mitigation may fail to control the outbreak.

The onset of agricultural infestation can be rapid and controlling the rate of spread is important to limiting impacts. Methods to limit the rate of spread include:

- Early harvest
- Crop destruction
- Culling of a herd
- Quarantine

The duration of an infestation depends on the degree to which the infestation is controlled from the onset, but is generally over a period of weeks and months. The warning time of an infestation is affected by the timely monitoring and reporting of potential outbreaks by both the community, industry groups and governmental agencies.

Animal Disease

The south region has a high number of cattle, 451,892 as of 2012 according to the USDA National Agricultural Statistics Service. Because cattle are both raised locally and imported into the region from other localities within Kansas and other states the potential for highly contagious diseases poses a threat to the regional economy. Currently the south region, and the state of Kansas, is Brucellosis, Tuberculosis and Pseudorabies free. However, of concern are two economically devastating animal diseases, foot and mouth disease and bovine spongiform encephalopathy (BSE). Infection with these, and other animal diseases, could result in a decline in milk production, spontaneous abortion, and animal death. It would not only affect farmer and ranchers, but support and related industries as well. With a medium sized agricultural industry throughout the region, the potential for infestation of livestock poses a moderate risk to the regional economy.

According to the Kansas Department of Health & Environment, Bureau of Water, Livestock Waste Management the south region has 72 confined animal feeding operation (CAFOs) facilities with 300 or more animal units. There have been substantial changes in the animal production industry over the past several decades, with the total number of CAFOs decreasing through consolidation resulting in operations of increasing size. This is a potential concern as high concentration of animals in proximity enhances potential transmission of disease among members of the group. Many experts fear that intentional, criminal introduction of a disease such as foot and mouth would result in very rapid spread of the disease throughout the nation and could have very severe economic consequences to the industry. The following is a list of the number of CAFOs per county in the region:

- Barber: 3
- Barton: 16
- Comanche: 1
- Edwards: 12
- Kiowa: 1
- Pawnee: 14
- Pratt: 12
- Stafford: 13

Knowing where diseased and at-risk animals are, where they've been and when, is important to ensuring a rapid response when animal disease events take place. The Kansas Department of Agriculture (KDA), Division of Animal Health monitors and reports on animal reportable diseases. Producers are required by state law to report any of the reportable animal diseases. Additionally, the USDA and the KDA, Division of Animal Health have implemented the Animal Disease Traceability system. In order to aid in rapid reporting and identification of animal borne disease, this system establishes minimum national official identification and documentation requirements for the traceability of livestock. Animals moved interstate, unless otherwise exempt, must be officially identified and accompanied by an interstate certificate of veterinary inspection.

There are also several fatal diseases that can affect the deer or captive elk population in Kansas. These disease include Chronic Wasting Disease and Hemorrhagic Disease. There have been 48 positive cases of Chronic Wasting Disease found in Kansas since surveillance started in 1996. The exact number of deaths caused by Hemorrhagic Disease is not known, but generally 25 percent of the deer population affected with this disease die. There are no wildlife management tools or strategies available to prevent or control of these diseases other than the prevention of transport of infected deer.

Other diseases such as bovine tuberculosis and a host of detrimental parasites such as exotic lice, meningeal worms, flukes, and stomach worms are fatal to deer and are transmitted more efficiently when deer are concentrated in a small area. These diseases can seriously damage the populations of the captive deer and elk farms and the wild deer populations but also affect the annual $350 million dollar hunting economy in Kansas.

Crop Disease and Insect Infestation

The USDA 2012 Agricultural Census reports that the value of field crops in the region averaged approximately $1,481,829,000 for the year 2012. This accounts for approximately 8.0% of the state of Kansas average of $18,460,564,000 for the same year.

Field crops can be subject to infestation, including leaf rust, wheat streak mosaic, barley yellow dwarf virus, strawbreaker, and tan spot. According to the KDA, Plant Protection and Weed Control Division, the following are the highest risk crop pests to Kansas:

- Corn – Aspergillus Ear Rot (Alfatoxin)
- Soybean – Austro-Asian Rust
- Wheat – Black Stem Rust, Blast – South American strains, Stripe Rust, Leaf Rust, Karnal Bunt

Additionally, both crops in the field and harvested crops may be subject to insect infestation. The estimated damage to stored grain from the lesser grain borer, rice weevil, red flour beetle, and rusty grain beetle in the United States is approximately $500 million annually.

Tree Pests

According to the KDA, Plant Protection and Weed Control Division, the following are the highest risk plant pests by host to Kansas:

- Ash Trees – Emerald Ash Borer
- Maple, Birch, Willow, Mimosa, Ash, Sycamore & Poplar Trees – Asian Longhorned Beetle
- Walnut Trees – Thousand Cankers

The Emerald Ash Borer, a emerald green beetle that is ½ inch long, is a pest of ash trees. This pest is responsible for the destruction of approximately 20 million ash trees in the United States and Canada. In 2012 the pest was confirmed at the Wyandotte County Lake in Wyandotte County, Kansas. Immediately after confirmation by USDA, the Kansas Secretary of Agriculture implemented an emergency intrastate quarantine for Wyandotte County. Financially, the United States risks an economic loss of $20 billion to $60 billion because of this pest. According to the 2011 Kansas Forest Action Plan ash trees are the third most common species of trees, with 56.1 million (60.8 million cubic feet) green and white ash found in Kansas.

The Asian Longhorned Beetle is an exotic insect that threatens a wide variety of hardwood trees. It has not been detected in Kansas yet.

The Thousand Cankers is newly recognized disease in 2008 and first noticed in the western U.S. Currently it is located in both the east and western parts of the United States. It has not been detected in Kansas. This disease is caused by a combination of a fungus and the walnut twig beetle. There are an estimated 26.2 million (35.3 million cubic feet) black walnut trees in Kansas.

Wildlife Pests

Kansas farmers also lose a significant amount of crops each year as a result of wildlife foraging. This can be particularly problematic in areas where natural habitat has been diminished or in years where weather patterns such as early/late frost deep snow, or drought has caused the wild food sources to be limited. Wildlife pests can include:

- Birds
- Deer
- Hogs
- Rodents

Many of these wildlife pests can be controlled through simple measures including fencing, netting, baiting, and herd management through culling. According to the USDA, a particular success story has been the control of feral hogs. Feral hogs caused an estimated $1.6 billion in damage to crops, lawns, wildlife habitat and by introducing diseases to domestic animals in 2011. It is estimated that in 2006, there were 2,500 feral hogs in Kansas. As of 2012 that figure has dropped to 1,000.

	Warning Time
Agricultural Infestation	1.00

	Duration
Agricultural Infestation	4.00

Hazard Location

The entire planning area may be affected by agricultural infestation. The following table presents regional information on farms, agricultural acreage and cattle.

Regional Farm Data, 2012

County	Number of Farms	Farm Acreage	Cropland Acreage	Pasture Acres
Barber	378	590,678	189,017	383,941
Barton	694	566,088	413,244	135,861
Comanche	234	485,080	145,524	329,854
Edwards	292	394,445	295,834	90,722
Kiowa	403	455,235	236,722	209,408
Pawnee	401	480,739	374,976	96,148
Pratt	543	464,527	311,233	144,003
Stafford	536	498,769	384,052	84,791
Regional	3,481	3,935,561	2,350,603	1,474,729

Source: United States Department of Agriculture National Agricultural Statistics Service

Cattle and Crop Information, 2012

County	Cattle (number of head)	Corn for Grain (acres)	Corn for Silage (acres)	Wheat (acres)
Barber	46,214	6,736	5,720	110,917
Barton	114,771	23286	3557	163,706
Comanche	35,030	1,921	8,945	66,671
Edwards	35,936	74,394	45,261	95,391
Kiowa	25,305	23,458	1,982	84,741
Pawnee	87,335	-	61,980	134,343
Pratt	58,323	56,145	799	163,371
Stafford	48,978	56,586	2,827	184,229
Regional	451,892	242,526	131,071	1,003,369

Source: United States Department of Agriculture National Agricultural Statistics Service
-: Data not reported

While rural areas within the region are more susceptible to crop and livestock infestation, urban and suburban areas are also at risk. Agricultural infestation does not cause damage to buildings or critical facilities.

Previous Occurrences and Extent

The following is a list of notable agricultural infestation events in south Kansas.

Summer 2012: Scrapie was found in two sheep at a regulatory slaughter test in Kansas. The sheep were from two unrelated flocks. There had not been any cases in Kansas for more than two years.

August 29, 2012: The emerald ash borer pest was confirmed at the Wyandotte County Lake in Wyandotte County, Kansas. Immediately after confirmation by USDA, the Kansas Secretary of Agriculture implemented an emergency intrastate quarantine.

2001: A major infestation of webworms attacked the State's alfalfa crop, particularly in eastern Kansas.

1989: Gray leaf spot of corn was first identified in the State in the Republican River Valley. The disease reached economic threshold levels by 1992 and has caused economic damages somewhere in the State every year from 1992 to 1998. In 1998, it was the most severe in northeast Kansas and in the irrigated areas of south central and southwest Kansas.

Hazard Vulnerability and Impact

The following table provides an indication of the potential magnitude of agricultural infestation, to include disease and wildlife damage, to south Kansas.

Annualized Crop Insurance Paid per County, 2010-2013

County	Annualized Crop Insurance Paid for Infestation Damages
Barber	$11,249
Barton	$3,677
Comanche	$0
Edwards	$8,834
Kiowa	$15,957
Pawnee	$27,927
Pratt	$42,101
Stafford	$37,517
Regional	$147,262

Source: USDA Risk Management Agency and USDA National Agricultural Statistics Service, 2012

This table only reflects insured losses that were claimed. According to the 2011 Kansas Crop Insurance profile Report issued by the USDA Risk Management Agency, 82 percent of Kansas row crops were insured in 2011 (there is no information available for the 18 percent of uninsured crop losses). Data regarding the number or value of livestock and wildlife lost to disease or infestation was not available for this planning effort.

In addition, threats have been identified which while currently not impacting Kansas may present a future risk. According to the KDA, Plant Protection and Weed Control Division the following table lists the highest risk plant pests to Kansas.

High Risk Plant Pests

Pest (Disease Insect, or weed)	Crop or Host Plant	Current Distribution	Type of Loss
Rust, Austro-Asian	Soybean	Australia, Japan, Pacific, Gulf of Mexico	Direct Loss to production
Aspergillus ear rot (Alfatoxin)	Corn	Worldwide, endemic to Kansas	Toxin renders the grain unusable
Black Stem Rust UG99 strain	Wheat	Africa, Asia	Direct Loss to production
Blast – South American strains	Wheat	South America	Direct Loss to production
Stripe Rust (new races)	Wheat	North America	Direct Loss to production
Leaf Rust (new races)	Wheat	North America	Direct Loss to production
Karnal Bunt	Wheat	Asia, Mexico, Arizona	International export quarantines, degradation of flour quality
Thousand Cankers	Walnut	Western US states and PA, VA, Tenn	Death of municipal trees, loss of nut crop, loss of timber
Emerald Ash Borer	Ash	North Central and North Eastern U.S., including Kansas (Wyandotte County)	Death of trees. Cost of removal and re-vegetation.
Asian Longhorned Beetle	Maples, Birches, Willows, Mimosa, Ash, Sycamore, Poplar trees	Small parts of Ohio, New York, and Massachusetts	Death of trees. Cost of removal and re-vegetation.
Hydrilla	Water Bodies	Southern U.S. and one park pond in Olathe	Economic and environmental.

	Magnitude/Severity
Agricultural Infestation	2.00

Future Development

Data suggests that the acres of land in farms is slightly decreasing in south Kansas. The average regional farm acreage from 2002 to 2012 saw a -4.0% decrease. However, the amount of land in the region is a fixed amount, and already a large percentage is used for agricultural purposes. As such, it is believed that the decrease in farm acreage will slow over the coming years and the potential for this hazard to impact the region will be static.

Probability of Future Occurrences

The region experiences agricultural losses every year as a result of naturally-occurring diseases that impact animals/livestock and crops. However, the occurrence of large scale, economically impactful infestations have not been recently documented in the region. Therefore, while it is very likely that small scale infestations will occur, the probability of a large scale infestation is considered unlikely.

	Probability
Agricultural Infestation	1.50

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Agricultural Infestation Consequence Analysis

Subject	Ranking	Impacts of Agricultural Infestation
Health and Safety of Persons in the Area of the Incident	Minimal	Impact for this incidence on the Health and Safety of Persons in the area would be minimal. If the infestation is unrecognized, then there is the potential for the food supply to be contaminated.
Responders	Minimal	Impact to responders would be minimal with protective clothing, gloves, etc as these diseases cause no risk to humans.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal	Localized impact to facilities and infrastructure in the incident area is minimal to non-existent.
Delivery of Services	Minimal	Impacts to the delivery of services would be non-existent to minimal. Impact could be larger depending on the extent of the contaminated crop/crop loss.
Environment	Minimal to Severe	Impact could be severe to the incident area, specifically, plants, trees, bushes, and crops.
Economic Conditions	Minimal to Severe	Impacts to the economy will depend on the severity of the infestation. The potential for economic loss to the community and state could be severe if the infestation is hard to contain, eliminate, or reduce. Impact could be minimized due to crop insurance.
Public Confidence in Governance	Minimal to Severe	Confidence could be in question depending on timeliness and steps taken to warn the producers and public, and treat/eradicate the infestation.

3.7.2 CIVIL DISORDER

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Civil Disorder	1.13	2.00	4.00	1.00	1.81

Description

Civil disorder is a term that generally refers to a public disturbance by three or more people involving acts of violence that cause immediate danger, damage, or injury to others or their property. However, it is important to remember that gatherings in protest are recognized rights of any person or group, and this right is protected under the United States Constitution.

Civil disorder can take many shapes, including demonstrations, civil unrest, public disorder, and riots. These events may happen for a number of reasons, including:

- Economic hardships
- Social injustices
- Objections to organizations or governments
- Political grievances
- Ideological grievances

An event can be triggered by a single or combination of causes, with demonstrations ranging from simple, nonviolent protests to events that turn into full-scale riots. Most protesters are law-abiding citizens who intend that their protests be nonviolent, but some individuals or groups within an organized demonstration may have the intent to cause disruption, incite violence, destroy property, and/or provoke the authorities. Violence is often the result of demonstrators beginning to conduct unlawful or criminal acts and authorities enforcing the laws of the municipality, state, or nation.

A crowd is defined as a large number of persons gathered temporarily together. There are many types of crowds which are based on their reasons for getting together

- **Causal crowds**: This type has no common bond other than the immediate reason for being present. An example would be a football game or a symphony orchestra performance where the only bond is enjoyment.
- **Planned crowds**: Planned crowds are likely to be more organized. A leader will call a meeting to establish a goal in which members have a common interest.
- **Mob**: The extreme crowd behavior is a mob. A mob is a crowd whose members have lost their concern for law and authority and follow their leaders into unlawful and disruptive acts.

Normally, when a crowd is orderly, not violating any laws and not causing a threat to life or property it does not represent a problem. Crowds, however, are subject to control by skillful troublemakers and therefore capable of violence and disregard for law and order. If problems exist, they usually fall into the following three categories:

- Public disorder: Public disorder is a basic breach of civic order. Individuals or small groups assembling have a tendency to disrupt the normal flow of things around them.
- Public disturbance: Public disturbance is designed to cause turmoil on top of the disruption. Individuals and groups assembling into a crowd begin chanting, yelling, singing, and voicing individual or collective opinions.
- Riot: A riot is a disturbance that turns violent. Assembled crowds become a mob that violently expresses itself by destroying property, assaulting others, and creating an extremely volatile environment.

In general, civil disorder has some important similarities. Most disturbances start from minor incidents and can spread quickly and gain in strength and force. Any crowd, regardless of its purpose, is a potentially violent group. As such, there is very little warning time for a crowd to turn violent. However, with effective law enforcement the duration of a civil unrest event would likely be very short.

	Warning Time
Civil Disorder	4.00

	Duration
Civil Disorder	1.00

Hazard Location

In the United States, civil disorder has been most commonly associated with urban areas and college campuses. And while the entire planning area may be affected by civil disorder, with its generally small population and low population density, the magnitude of such an event would likely be limited.

With human-caused hazards such as this that can have multiple variables involved, increases in development and increases in the replacement cost of the built environment can be factors that increase the cost of the event. The cost for such an event is largely related to the location and the level of violence the crowd chooses.

Previous Occurrences and Extent

There have been no notable previous occurrences in south Kansas which could be described as Civil Disorder.

Hazard Vulnerability and Impact

Economic impacts and human injury or death are the primary concern with civil disorder. Increases in population or the hosting of major political, economic or social events could increase the likelihood and severity of a civil disturbance.

In general, it is difficult to quantify potential losses of Civil Disorder due to the many variables and human elements and lack of historical precedence. Therefore, for the purposes of this plan, the loss estimates will take into account a hypothetical scenario. **Please note that the hypothetical scenario is included for illustrative purposes only.**

Event: City organizers set up a two-block long fan zone near the local community college sports field. Two big screen TVs were set up for fans to watch the game. Temporary fences and gates were set up to provide checkpoints where police could control access to the area and check for alcohol. Crowds, estimated to be at 5,000 people, had been generally well-behaved in the fan zone, however people found ways to enter the zone without being checked for alcohol. Planned corridors to allow movement of emergency vehicles became impassable.

Riot: The riot began to take shape as the game came to a close, with some spectators throwing bottles and other objects at the large screens in the viewing area. Flags and jerseys were set alight, and soon some rioters overturned a vehicle A group was heard chanting "let's go riot" as early as the first period of the game were among those responsible for flipping the first car. People began jumping on the car that had been first overturned, and then it was set afire. Fist fights broke out when people standing on porta-potties fell when others tipped them over. With a crowd of onlookers chanting "burn the truck", a second vehicle in the same area was set on fire. Firemen were able to put it out, but the truck was again set alight after it was overturned. In a nearby parking lot, two police cars were later also set on fire. Riot police eventually managed to disperse the rioters.

Results: Ten people required hospitalization for non-life threatening injuries. Numerous rioters had injuries that did not require hospitalization. The Police Department made 30 arrests during the riot. The majority were arrested for disturbing the peace, with additional arrests for public intoxication, breaking and entering, assault and theft. In total, six cars were burned, including police cars. Windows were smashed in local businesses along the fan zone corridor, some of which were also looted. After event estimates suggested the losses due to vandalism, theft, and damage to property to be nearly $1 million.

	Magnitude/Severity
Civil Disorder	2.00

Future Development

Future development and population increases would tend to increase the likelihood of a civil disorder event. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

While civil disorder is a fairly rare event, when they do occur they are extremely disruptive and difficult to control. It is possible that south Kansas will experience marches, protests, demonstrations, and gatherings in various cities and communities that could lead to some type of civil disorder. However, based on the region's general lack of history of civil disturbance and the various human factors noted above, the probability that such incidents will develop into full-scale events is considered unlikely.

	Probability
Civil Disorder	1.13

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Consequence Analysis of Civil Disorder

Subject	Ranking	Impacts of Civil Disorder
Health and Safety of Persons in the Area of the Incident	Severe	Impact could be severe for persons in the incident area.
Responders	Minimal to Severe	Impact to responders could be severe if not trained and properly equipped. Responders that are properly trained and equipped will have a low to moderate impact.
Continuity of Operations	Minimal to Severe	Depending on damage to facilities/personnel in the incident area, re-location may be necessary and lines of succession execution.
Property, Facilities, and Infrastructure	Severe	Impact within the incident area could be severe for explosion, moderate for Hazmat.
Delivery of Services	Minimal to Severe	Delivery of services could be affected within and around the affected area especially if communications, road and railways, and facilities incur damage.
Environment	Minimal to Severe	Localized impact within the incident area could be severe depending on the type of human caused incident.
Economic Conditions	Minimal to Severe	Economic conditions could be adversely affected and dependent upon time and length of clean up and investigation.
Public Confidence in Governance	Minimal to Severe	Impact will be dependent on whether or not the incident could have been avoided by government or non-government entities, clean-up and investigation times, and outcomes.

3.7.3 DAM AND LEVEE FAILURE

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Dam and Levee Failure	1.25	2.63	2.38	3.38	2.04

Description

A dam is defined by the National Dam Safety Act as an artificial barrier that impounds or diverts water and is more than 6 feet high and stores 50 acre feet or more or is 25 feet or more high and stores more than 15 acre feet. Dams are usually engineered to withstand a flood with a computed risk of occurrence. If a larger flood occurs, then that structure will likely be overtopped. If during the overtopping the dam fails or is washed out, the water behind it is released as a flash flood. Failed dams can create floods that are catastrophic to life and property because of the tremendous energy of the released water. However, dams are complicated structures, and it can be difficult to predict how a structure will respond to distress. Dams can fail for one or a combination of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam.
- Deliberate acts of sabotage.
- Structural failure of materials used in dam construction.
- Movement and/or failure of the foundation supporting the dam.
- Settlement and cracking of concrete or embankment dams.
- Piping and internal erosion of soil in embankment dams.
- Inadequate maintenance and upkeep.

There are two categories to describe dam failure.

- **Rainy day failure** involves periods of excessive precipitation leading to an unusually high runoff. This high runoff increases the reservoir of the dam and if not controlled, the overtopping of the dam or excessive water pressure can lead to dam failure. Normal storm events can also lead to rainy day failures if water outlets are plugged with debris or otherwise made inoperable.

- **Sunny day failures** occur due to poor dam maintenance, damage/obstruction of outlet systems, or vandalism. This is the worst type of failure and can be catastrophic because the breach is unexpected and there may be insufficient time to properly warn downstream residents.

Even though both types of failures can be disastrous, it can be assumed that a sunny day failure would be more catastrophic due to its unanticipated occurrence and the lack of time to warn residents downstream.

Over 95 percent of dams are non federal, with most being owned by state governments, municipalities, watershed districts, industries, lake associations, land developers, and private citizens. Dam owners have primary responsibility for the safe design, operation, and maintenance of their dams. They also have responsibility for providing early warning of problems at the dam, for developing an effective emergency action plan, and for coordinating that plan with local officials.

State-Regulated Dams

In Kansas, the State has regulatory jurisdiction over non-federal dams that meet the following definition of a "jurisdictional" dam as defined by K.S.A. 82a-301 et seq, and amendments thereto:

- *any artificial barrier including appurtenant works with the ability to impound water, waste water or other liquids that has a height of 25 feet or more; or has a height of six feet or greater and also has the capacity to impound 50 or more acre feet. The height of a dam or barrier shall be determined as follows: (1) A barrier or dam that extends across the natural bed of a stream or watercourse shall be measured from the downstream toe of the barrier or dam to the top of the barrier or dam; or (2) a barrier or dam that does not extend across a stream or watercourse shall be measured from the lowest elevation of the outside limit of the barrier or dam to the top of the barrier or dam.*

The KDA Division of Water Resources (KDA-DWR) is the State agency responsible for regulation of jurisdictional dams. Within the Division of Water Resources, the Water Structures Program has the following Responsibilities: reviewing and approving of plans for constructing new dams and for modifying existing dams, ensuring quality control during construction, and monitoring dams that, if they failed, could cause loss of life, or interrupt public utilities or services

Dam classifications have been developed to describe the level of risk associated with dam failure. These classifications do not reflect the physical condition of the dams, but rather describe areas downstream of the dams that could be impacted in the event of failure, which is generally unlikely. The KDA-DWR classifies jurisdictional dams as follows:

- **Class A (low hazard**): A dam located in an area where failure could damage only farm or other uninhabited buildings, agricultural or undeveloped land including hiking trails, or traffic on low-volume roads that meet the requirements for hazard class A dams.

- **Class B (significant hazard)**: A "hazard class B dam" means a dam located in an area where failure could endanger a few lives, damage an isolated home, damage traffic on moderate volume roads that meet the requirements for hazard class B dams, damage low-volume railroad tracks, interrupt the use or service of a utility serving a small number of customers, or inundate recreation facilities, including campground areas intermittently used for sleeping and serving a relatively small number of persons.

- **Class C (high hazard)**: A "hazard class C dam" shall mean a dam located in an area where failure could result in any of the following: extensive loss of life, damage to more than one home, damage to industrial or commercial facilities, interruption of a public utility serving a large number of customers, damage to traffic on high-volume roads that meet the requirements for hazard class C dams or a high-volume railroad line, inundation of a frequently used recreation facility serving a relatively large number of persons, or two or more individual hazards described in hazard class B. Emergency Action Plans (EAPs) are required for all High Hazard Dams.

Levees

A levee is an artificial barrier, usually an earthen embankment, constructed along rivers to protect adjacent lands from flooding. Generally, a levee is subjected to water loading (a high water event) only a few days or weeks each year, unlike a dam that is retaining water most of the year. Floodwalls are concrete structures, often components of levee systems, designed for urban areas where there is insufficient room for earthen levees.

Levees are usually engineered to withstand a flood with a computed risk of occurrence. When a larger flood occurs and/or levees and floodwalls and their structures are stressed beyond their capabilities to withstand floods, levee failure can result in loss of life and injuries as well as damages to property, the environment, and the economy.

A levee breach results when a portion of the levee breaks away, providing an opening for water to flood the landward side of the structure. Such breaches can be caused by surface erosion due to water velocities, or they can be the result of subsurface actions. Levee overtopping is similar to dam overtopping in that the flood waters simply exceed the design capacity of the structure. Such overtopping can lead to erosion on the land side which can lead to breaching. In order to prevent this type land side erosion, many levees are reinforced with rocks or concrete.

For purposes of the levee failure hazard profile and risk assessment in this hazard mitigation plan, levees in Kansas will be discussed in four categories:

1. Levees in the United States Army Corps of Engineers (USACE) Levee Safety Program
2. FEMA Accredited Levees
3. Levees that are both in the USACE Levee Safety Program and Accredited by FEMA
4. All other levees

In terms of assessing risk, levees in categories 1, 2, and 3 all undergo or have undergone some sort of inspection, certification, or accreditation that indicates the level of protection and/or structural integrity of the levee system. However, the levees in the category 4 may not be regularly monitored or inspected.

Levees in the USACE Levee Safety Program

The USACE created the Levee Safety Program (LSP) in 2006 to assess the integrity and viability of levees and to make sure that levee systems do not present unacceptable risks to the public, property, and environment. Under the Levee Safety Program, USACE conducts levee inspections (routine, periodic and special event). During these inspections, deficiencies may be identified such as unsatisfactory culverts, non-compliant vegetation, encroachments, and animal burrows. USACE uses inspection findings to "rate" levee systems to determine compliance with operation and maintenance requirements, understand the overall levee condition, and determine eligibility for federal rehabilitation assistance under P.L. 84-99.

According to the National Levee Database (NLD) managed by USACE, there are currently seven identified levees in south Kansas. Three of the identified levees are not rated, and four are rated Minimally Acceptable.

FEMA Accredited Levees

Many levees shown on effective Flood Insurance Rate Maps (FIRM) were mapped in the 1970s and 1980s and have never been remapped by FEMA. Prior to 1986, levees were shown on FIRMs as providing protection from the base flood when they were designed and constructed in accordance with sound engineering practices. Since 1986, levees have been shown as accredited on FIRMs only when they meet the requirements of 44 CFR 65.10 "Mapping Areas Protected by Levee Systems", including certification by a registered professional engineer or a Federal agency with responsibility for levee design.

Levees that do not meet the requirements of 44 CFR 65.10 cannot be shown as accredited on a FIRM. Furthermore, floodplain areas behind the levee are at risk to base flood inundation and are mapped as high risk areas subject to FEMA's minimum floodplain management regulations and mandatory flood insurance purchase requirement.

In 2004, as it initiated work under the Flood Map Modernization Initiative (Map Mod), FEMA determined that analysis of the role of levees in flood risk reduction would be an important part of the mapping efforts. A report issued in 2005 noted that the status of the nation's levees was not well understood and the condition of many levees and floodwalls had not been assessed since their original inclusion in the NFIP. As a result, FEMA established policies to address existing levees.

FEMA Accredited levees generally fall into two types:

- Levees mapped on Digital Flood Insurance Rate Maps (DFIRM) since the Flood Map Modernization Initiative
- Levees, mapped prior to the Flood Map Modernization Initiative and are not mapped on DFIRMs.

As DFIRMs are developed, levees fall under one of the three following categories:

- **Accredited Levee** : With the exception of areas of residual flooding (interior drainage), if the data and documentation specified in 44 CFR 65.10 is readily available and provided to FEMA, the area behind the levee will be mapped as a moderate-risk area. There is no mandatory flood insurance purchase requirement in a moderate-risk area, but flood insurance is strongly recommended.

- **Provisionally Accredited Levee (PAL)**: If data and documentation is not readily available, and no known deficiency precludes meeting requirements of 44 CFR 65.10, FEMA can allow the party seeking recognition up to two years to compile and submit full documentation to show compliance with 44 CFR 65.10. During this two-year period of provisional accreditation, the area behind the levee will be mapped as moderate-risk with no mandatory flood insurance purchase requirement.

- **De-Accredited Levees**: If the information established under 44 CFR 65.10 is not readily available and provided to FEMA, and the levee is not eligible for the PAL designation, the levee will be de-accredited by FEMA. If a levee is de-accredited, FEMA will evaluate the level of risk associated with each non-accredited levee through their Levee Analysis Mapping Procedures (LAMP) criteria to consider how to map the floodplain and which areas on the dry side of the levee will be shown as high risk. The mapping will then be updated to reflect this risk..

According to the Mid-Term Levee Inventory, regionally only Barton County has accredited levees in DFIRM:

FEMA Accredited Levees not Mapped on DFIRMs

Throughout the early days of the National Flood Insurance Program (NFIP), little guidance was available associated with the inclusion of existing levees. Decisions were made on whether to accredit hundreds of levees across Kansas. Because there were no levee standards and accreditation of a levee was left largely to the judgments of the study contractors, many levees were accredited as providing flood protection even though they would not meet the current NFIP levee standards as stated in 44 CFR 65.10.

During subsequent re-mapping, many of these levees were re-evaluated and accredited as providing flood protection, but do not meet the standards of 44 CFR 65.10. Additionally, some levees, originally indicated as accredited have never been re-evaluated. If levees are depicted on the paper FIRMS in counties that have not been re-mapped on DFIRMs, their protection level has not been re-evaluated. Until re-evaluation occurs, these levees are considered accredited. According to the MLI, Pawnee County has areas protected by FEMA-accredited levees that have not yet been re-evaluated through the re-mapping process.

This information was obtained by comparing the levees in the Mid-term Levee Inventory indicated as showing protection on the FIRM against the list of counties that have effective DFIRMs.

All Other Levees

There are also levees throughout the State that are intended to mitigate low-level flooding and/or protect agricultural land that are not in the USACE Levee Safety program. Additionally, since these levees are not intended to protect populations or development from flooding from the 1% annual chance flood, they are not, nor seek to be accredited by FEMA for flood insurance purposes. These levees may provide a false sense of security to residents behind these levees.

Additionally, these levees may not be routinely inspected by levee owners. There is no agency with regulatory authority over these levees.

According to comparative analysis of the MLI and NLD, there are currently 39 levees that are not accredited by FEMA or in the USACE Levee Safety Program. Shawnee county is identified as having some of these unaccredited levees. There are also likely many more levees, such as agricultural levees that have not been inventoried. Populations and development behind these levees could be considered to be at a higher risk since there are no requirements for these levees to be routinely inspected and/or certified.

The inventory of levees has been compiled from the USACE NLD as well as the FEMA MLI. Please note that there may be some duplication as the names of the levees as well as the segmentation of the levees is not consistent in both inventories.

In general, dam and levee failures occur with some warming, with the exception of sunny day failures. Additionally, while the effects can be catastrophic, the duration is generally short.

	Warning Time
Dam and Levee Failure	2.28

	Duration
Dam and Levee Failure	3.38

Hazard Location

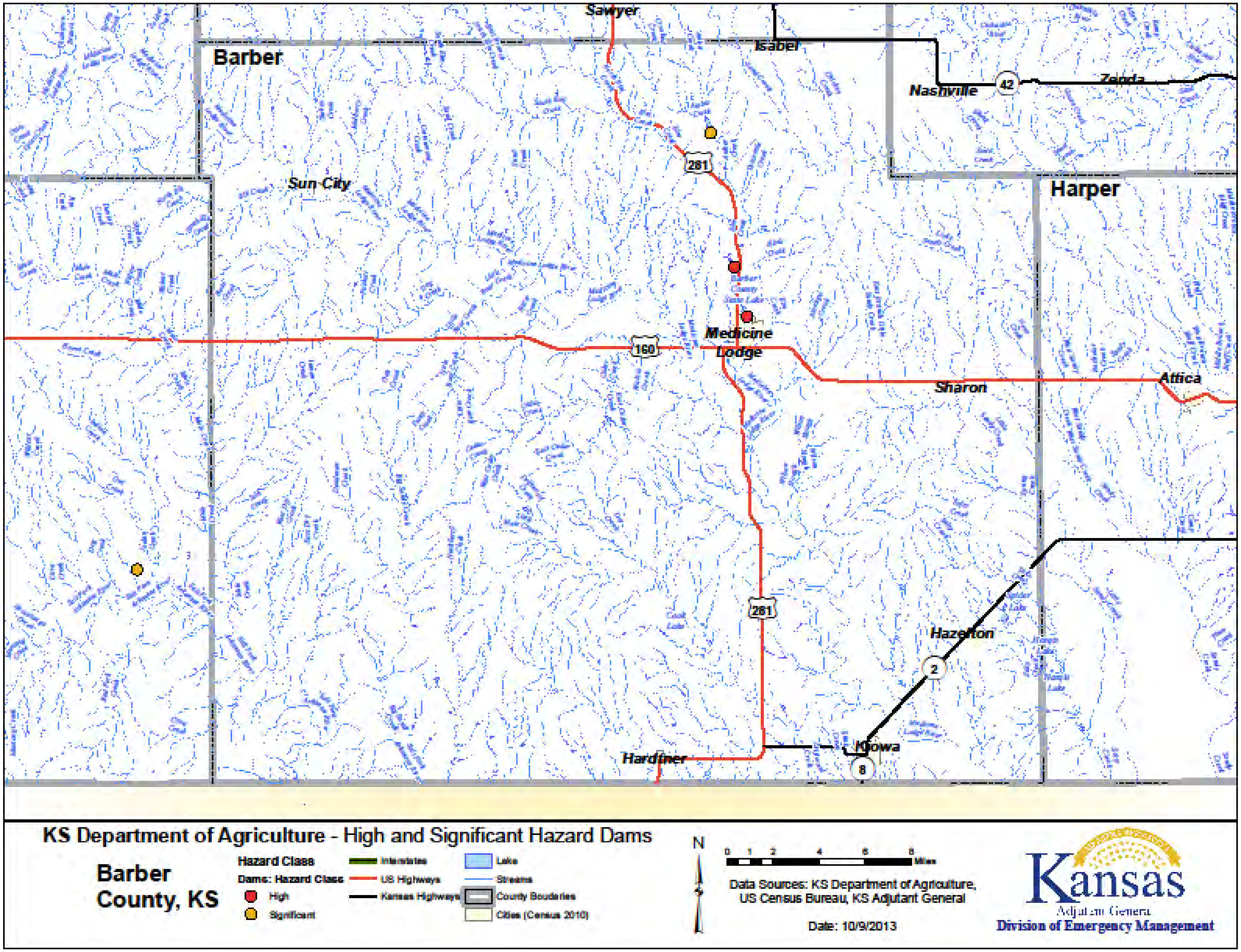
At the time this plan was developed there were 185 state-regulated jurisdictional dams in south Kansas. Of those, 5 were Class C (High Hazard Dams), 4 were Class B (Significant Hazard Dams), and 176 were Class A (Low Hazard Dams).

Number of State Regulated Dams by Hazard Class in Region

County	Low Hazard Dams	Significant Hazard Dams	High Hazard Dams	High Hazard Dams Without Emergency Action Plan	Total Dams
Barber	91	1	2	0	94
Barton	16	0	1	1	17
Comanche	26	1	1	0	28
Edwards	3	0	0	0	3
Kiowa	8	0	0	0	8
Pawnee	21	2	0	0	23
Pratt	9	0	0	0	9
Stafford	2	0	1	0	3
Regional Total	176	4	5	1	185

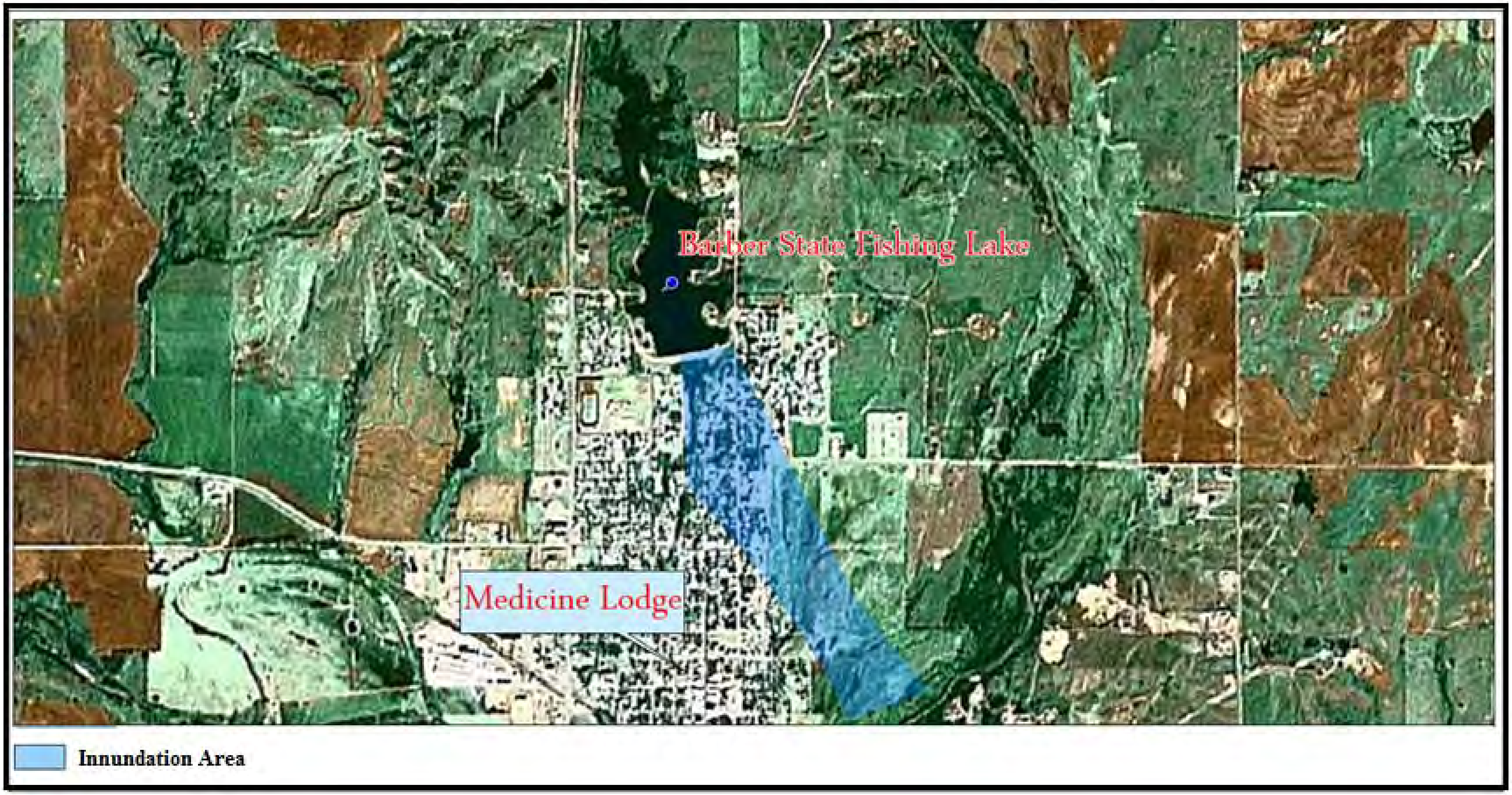
Source: Kansas Department of Agriculture, Division of Water Resources, Water Structures Program, 2012

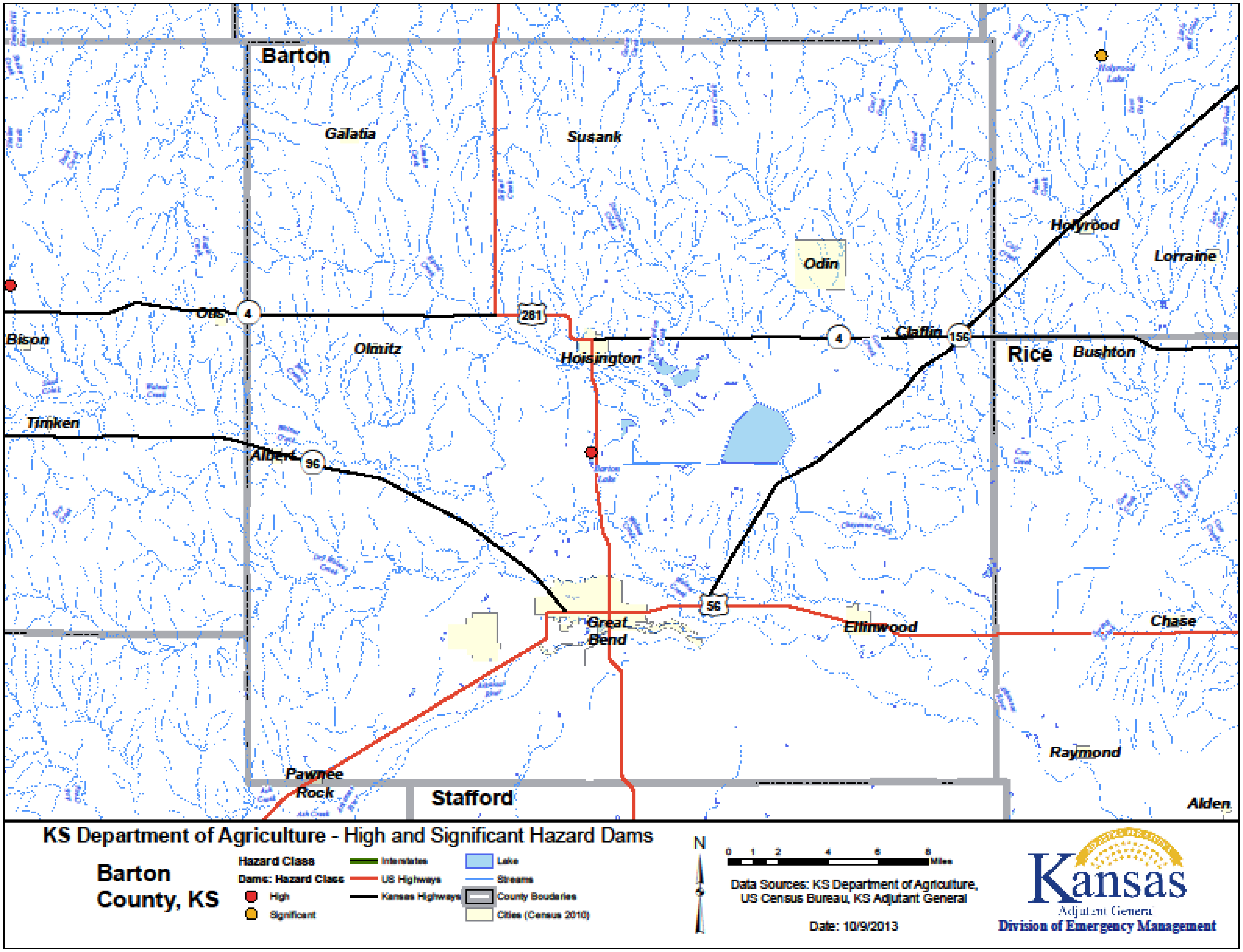
The following maps shows dam locations in participating counties and, if available, potentially impacted cities within south Kansas. In addition, available inundation maps for high hazard dams within the region have been included.



Sawyer
Isabel
Barber
Nashville
42
Zenda
281
Sun City
Harper
Medicine
Lodge
160
Sharon
Attica
281
Hazelton
2
Kiowa
8
Hardtner
KS Department of Agriculture - High and Significant Hazard Dams
Barber
County, KS
Hazard Class
Dams: Hazard Class
High
Significant
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
Cities (Census 2010)
N
0 1 2 4 6 8
Miles
Data Sources: KS Department of Agriculture,
US Census Bureau, KS Adjutant General
Date: 10/9/2013
Kansas
Adjutant General
Division of Emergency Management

Barber County State Fishing Lake Dam Failure Map




Barton
Galatia
Susank
Odin
Holyrood
Lorraine
Otis
Bison
Olmitz
Hoisington
Claflin
Rice
Bushton
Timken
Albert
Great Bend
Ellinwood
Chase
Raymond
Pawnee Rock
Stafford
Alden
4
281
156
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56
KS Department of Agriculture - High and Significant Hazard Dams
Barton County, KS
Hazard Class
Dams: Hazard Class
High
Significant
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
Cities (Census 2010)
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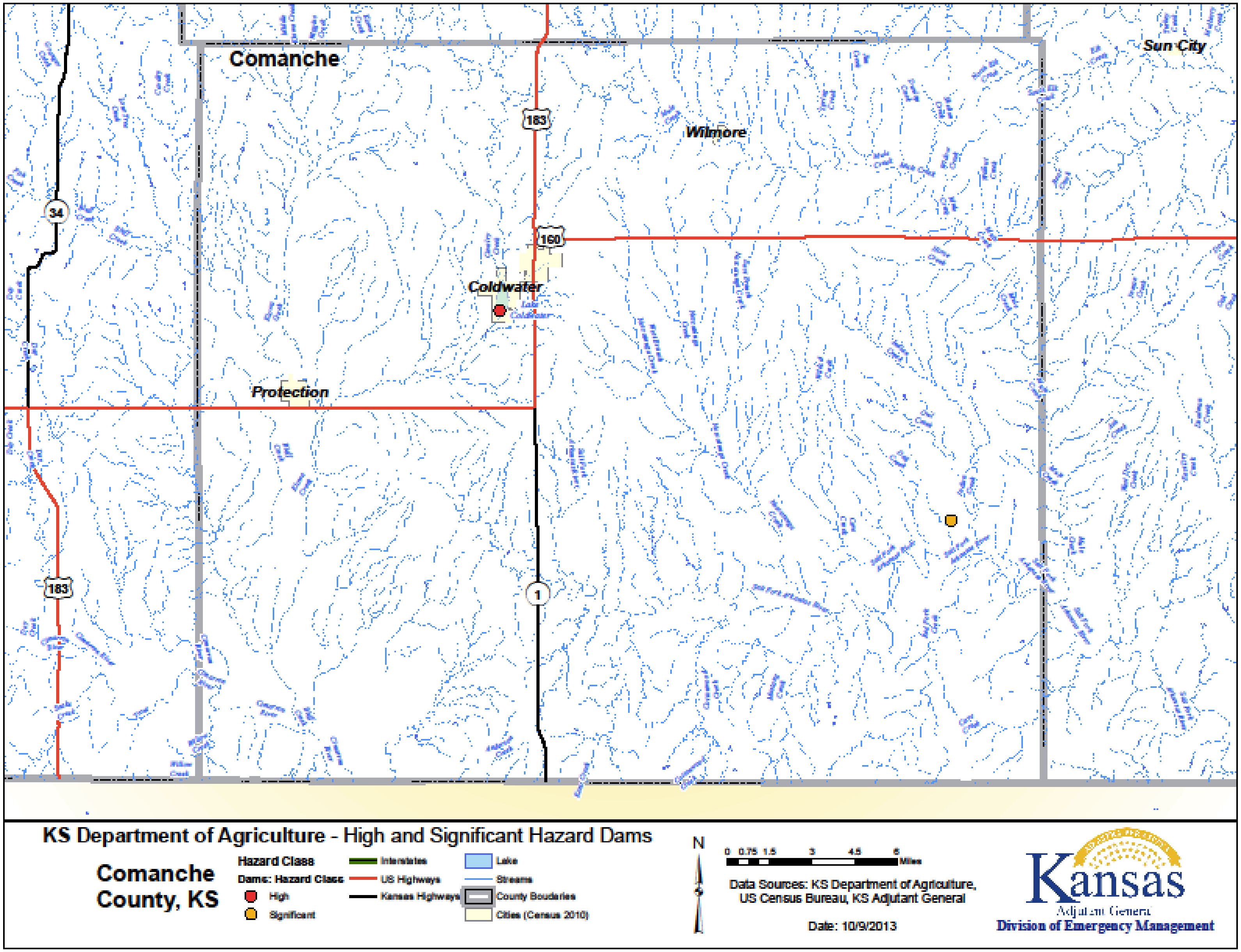
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General
Date: 10/9/2013
Kansas
Adjutant General
Division of Emergency Management



Comanche
Coldwater
Wilmore
Protection
Sun City
183
160
34
1
KS Department of Agriculture - High and Significant Hazard Dams
Comanche County, KS
Hazard Class
Dams: Hazard Class
High
Significant
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
Cities (Census 2010)
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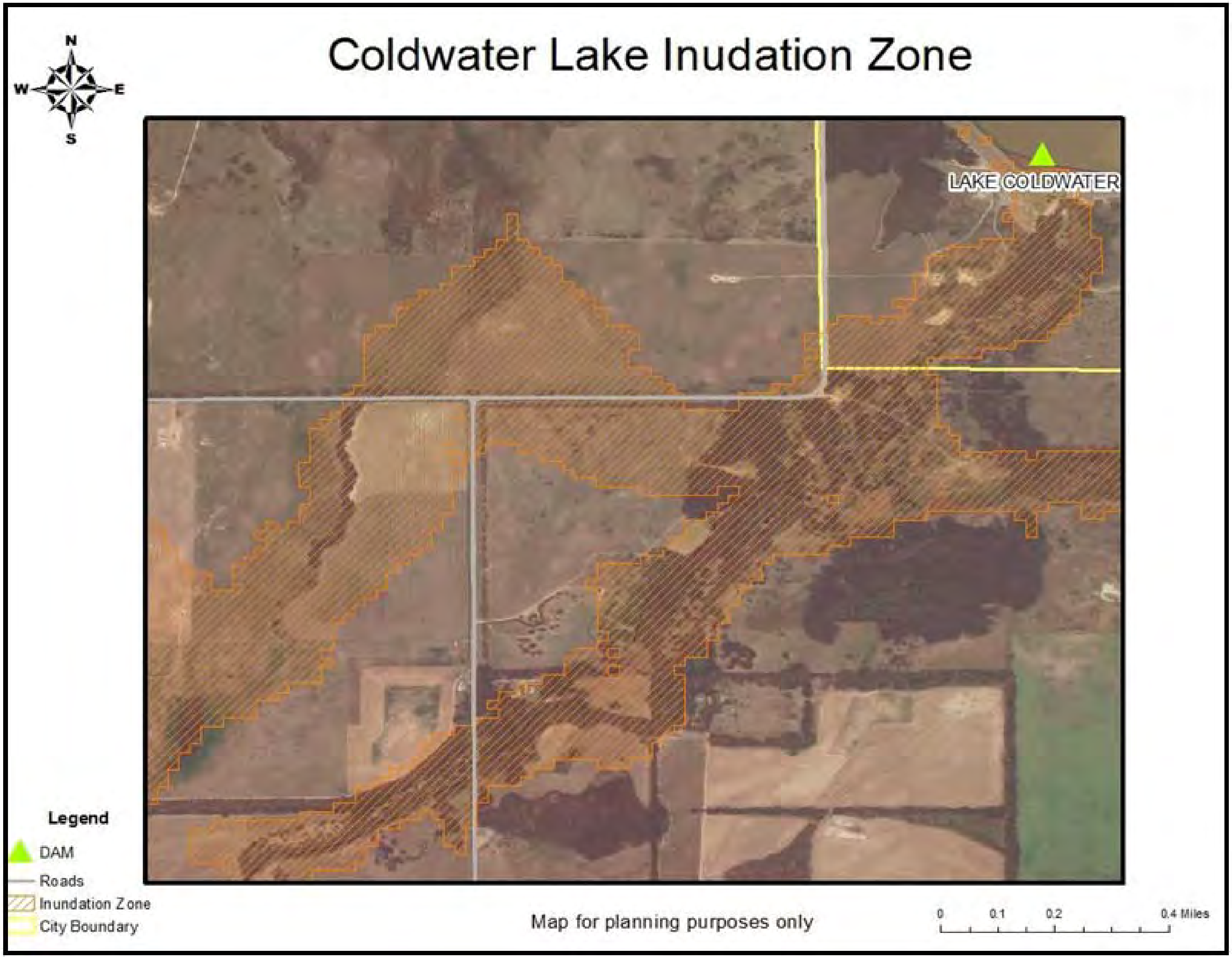
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General
Date: 10/9/2013
Kansas
Adjutant General
Division of Emergency Management


Coldwater Lake Inudation Zone
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LAKE COLDWATER
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DAM
Roads
Inundation Zone
City Boundary
Map for planning purposes only
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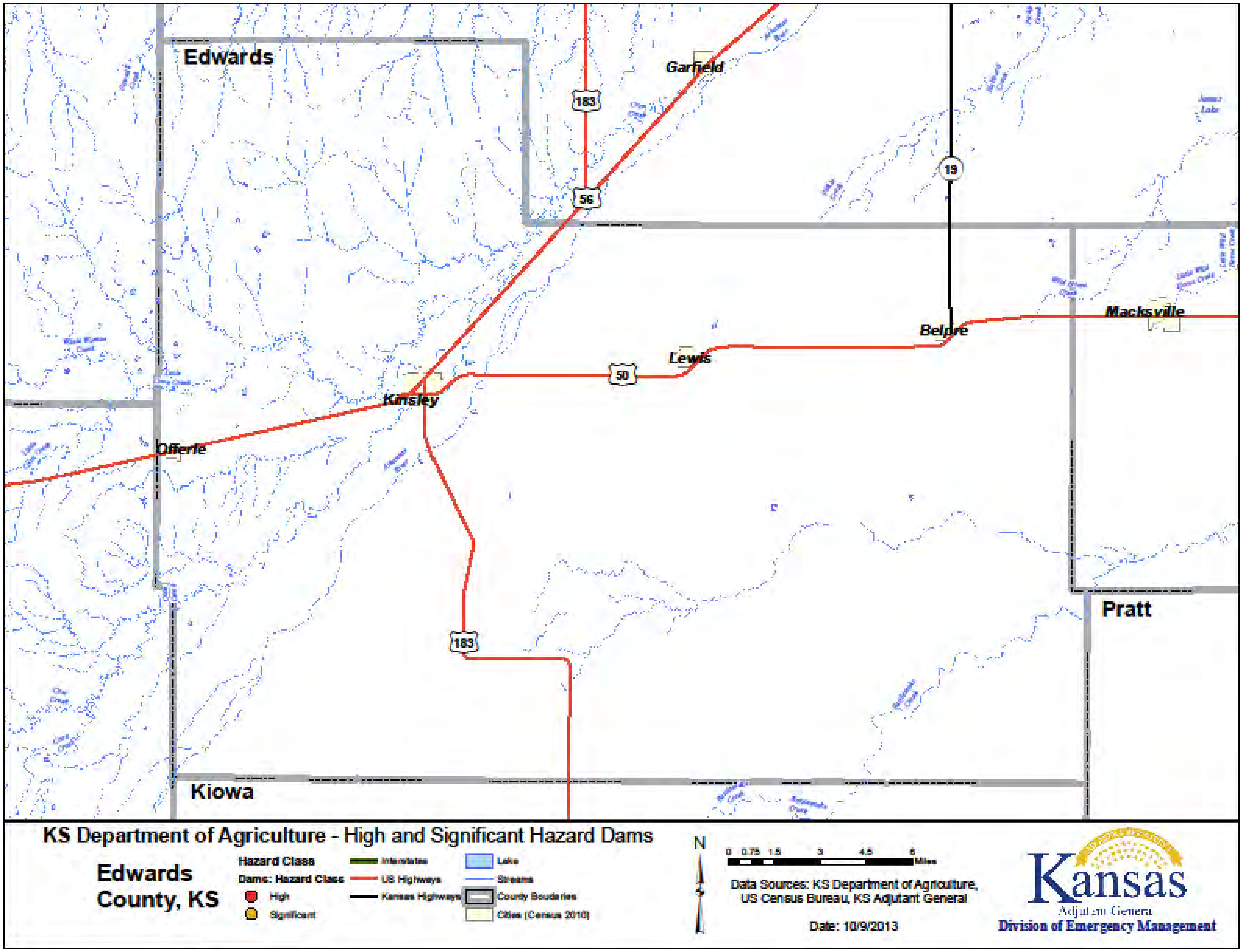

Edwards
Garfield
Kinsley
Offerle
Lewis
Belpre
Macksville
Pratt
Kiowa
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50
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KS Department of Agriculture - High and Significant Hazard Dams
Edwards County, KS
Hazard Class
Dams: Hazard Class
High
Significant
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
Cities (Census 2010)
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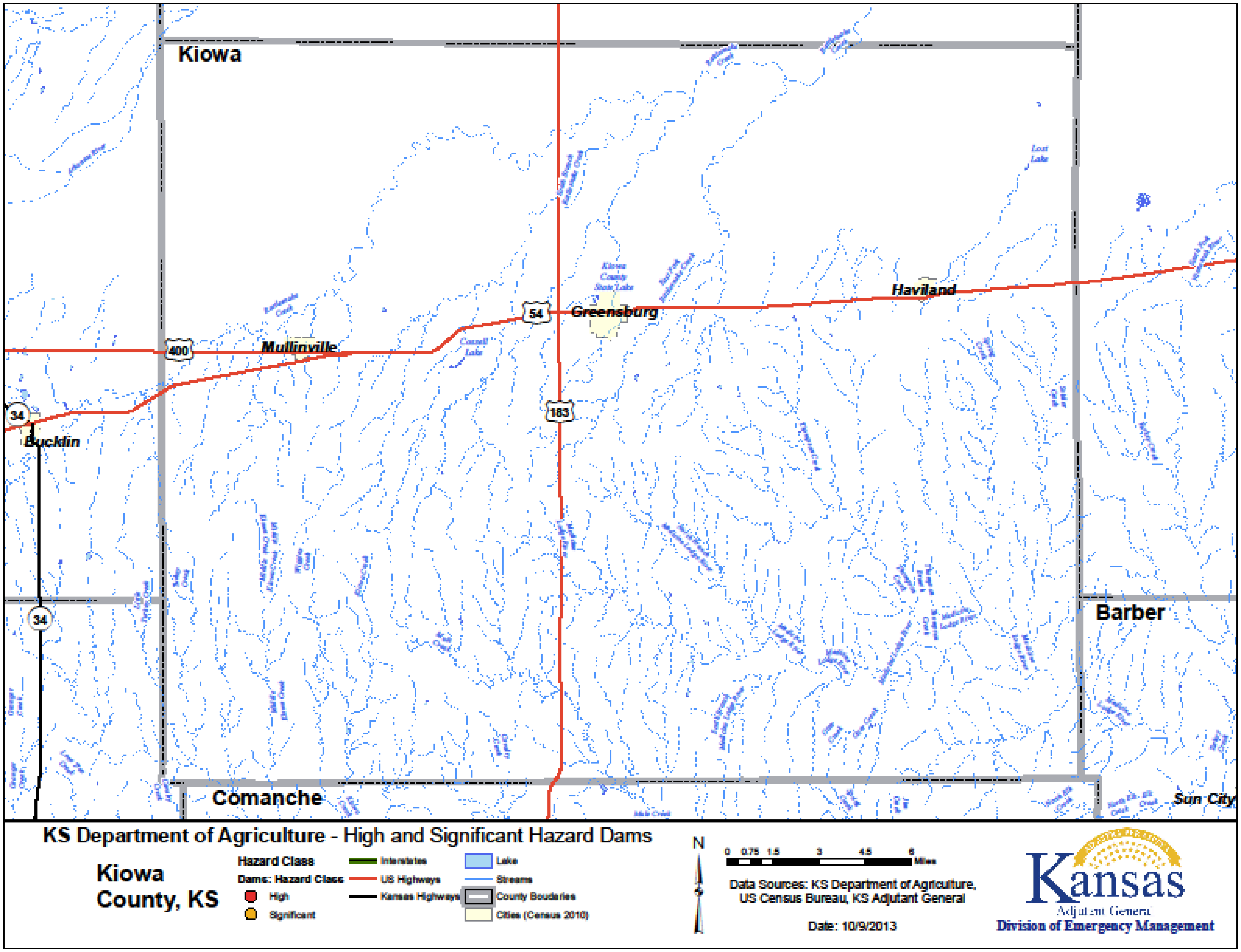
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General
Date: 10/9/2013
Kansas
Adjutant General
Division of Emergency Management


Kiowa
Haviland
Greensburg
Mullinville
Bucklin
Barber
Comanche
Sun City
54
400
183
34
KS Department of Agriculture - High and Significant Hazard Dams
Kiowa
County, KS
Hazard Class
Dams: Hazard Class
High
Significant
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US Highways
Kansas Highways
Lake
Streams
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Cities (Census 2010)
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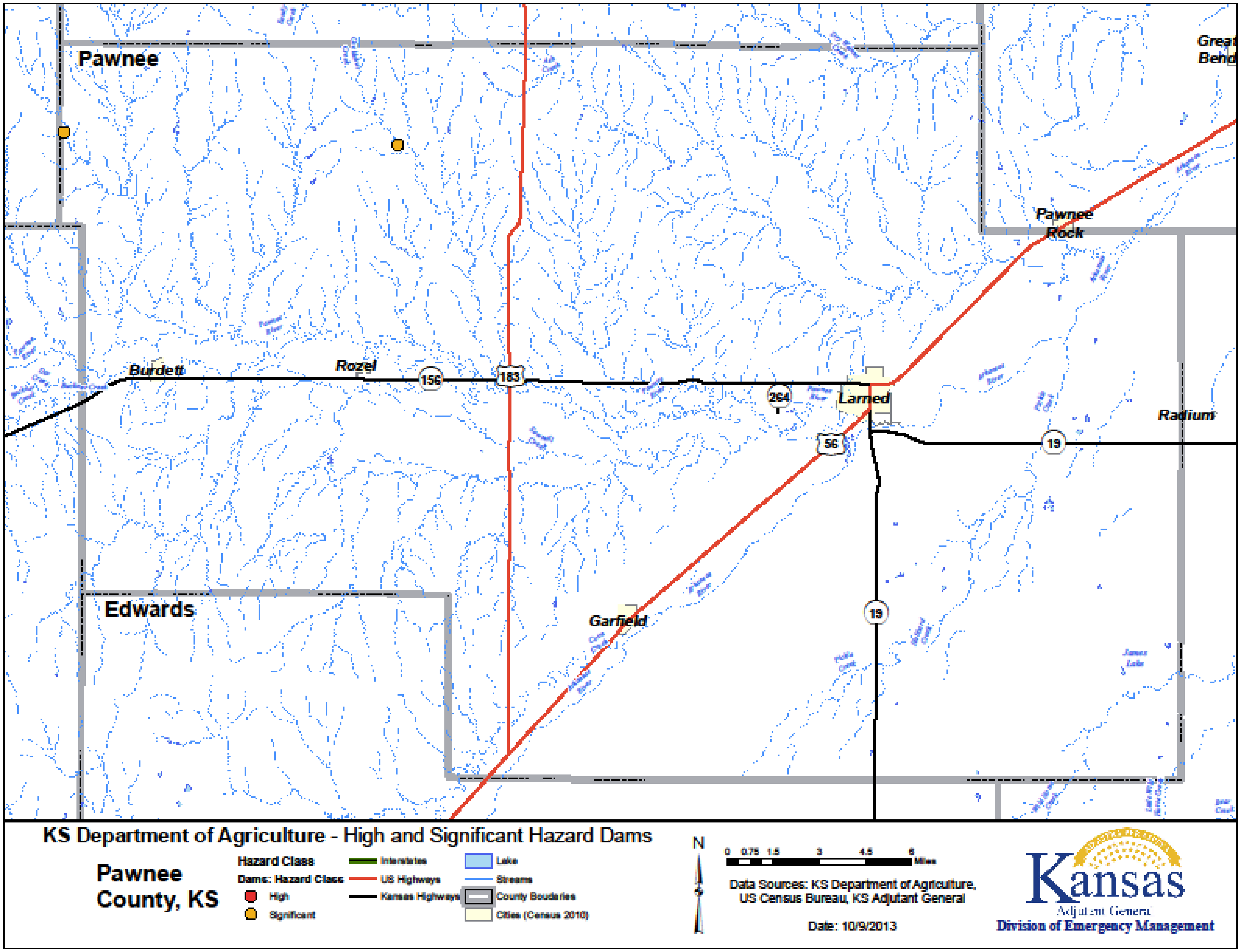
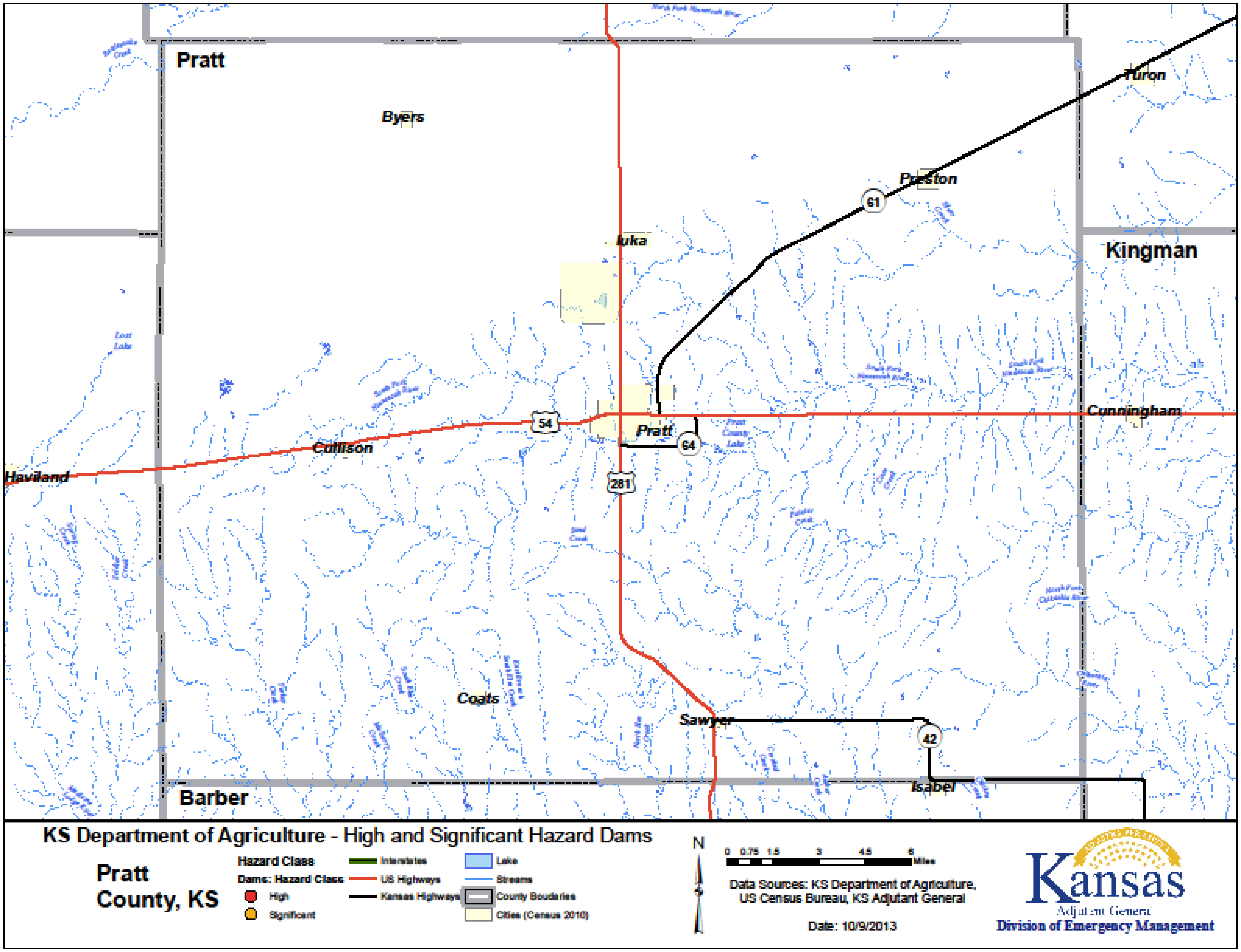
Data Sources: KS Department of Agriculture,
US Census Bureau, KS Adjutant General
Date: 10/9/2013
Kansas
Adjutant General
Division of Emergency Management



Pawnee
Great Bend
Pawnee Rock
Burdett
Rozel
156
183
264
Larned
56
19
Radium
Edwards
Garfield
KS Department of Agriculture - High and Significant Hazard Dams
Pawnee County, KS
Hazard Class
Dams: Hazard Class
High
Significant
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
Cities (Census 2010)
N
0 0.75 1.5 3 4.5 6 Miles
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General
Date: 10/9/2013
Kansas
Division of Emergency Management


Pratt
Byers
Iuka
Preston
Turon
Kingman
Cunningham
Pratt
Cullison
Haviland
Coats
Sawyer
Isabel
Barber
61
54
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281
42
KS Department of Agriculture - High and Significant Hazard Dams
Pratt
County, KS
Hazard Class
Dams: Hazard Class
High
Significant
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
Cities (Census 2010)
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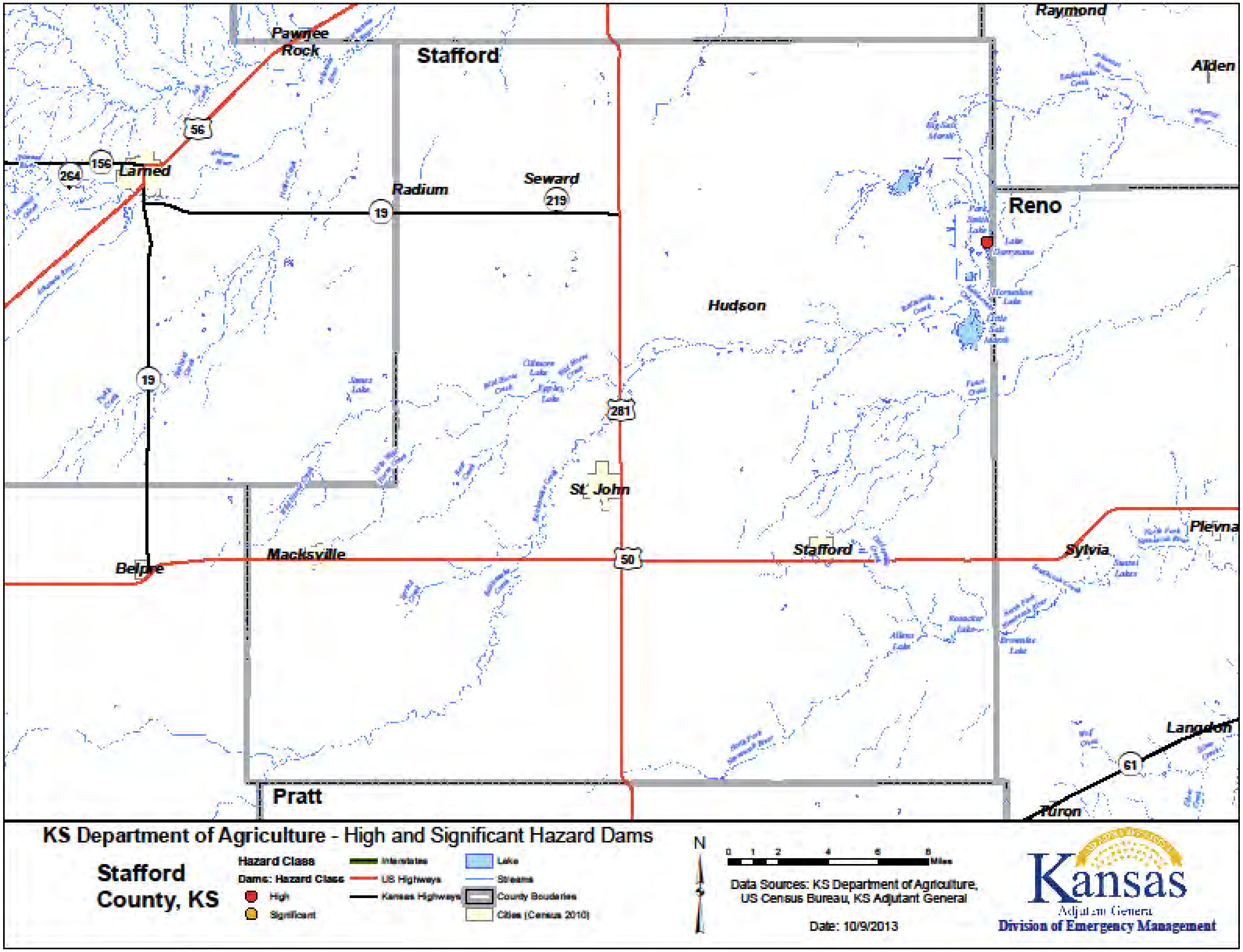
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General
Date: 10/9/2013
Kansas
Adjutant General
Division of Emergency Management


KS Department of Agriculture - High and Significant Hazard Dams
Stafford County, KS
Hazard Class
Dams: Hazard Class
High
Significant
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
Cities (Census 2010)
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General
Date: 10/9/2013
Kansas
Adjutant General
Division of Emergency Management
Stafford
Reno
Pratt
Pawnee Rock
Larned
Radium
Seward
Hudson
St. John
Macksville
Belpre
Stafford
Sylvia
Plevna
Raymond
Alden
Langdon
Turon

Federal Dams and Reservoirs

There is also one dam in south Kansas that is maintained and operated by the federal government in the form of the United States Fish and Wildlife Service. While not technically classified as a reservoir, the following table shows information on this dam and lake.

Federally Operated Dams/Reservoirs in Region

Reservoir	County	Year Storage Began	Operating Agency	River Basin	Contributing Drainage Area (Square Miles)	Surface Area (Acres)	Estimated Storage Capacity (Acre Feet)
Lake Darrynane	Stafford	1955	US Fish & Wildlife Service	-	NR	NR	50

Source: Kansas Water Office and Kansas Department of Agriculture, Division of Water Resources

There are no classified federal reservoirs within south Kansas.

Dams in Adjacent States and Regions

There are no identified dams located in bordering Oklahoma counties that could impact the region in the event of a failure.

There are no dams identified in any adjacent regions that could impact the region in the event of a failure.

Levees

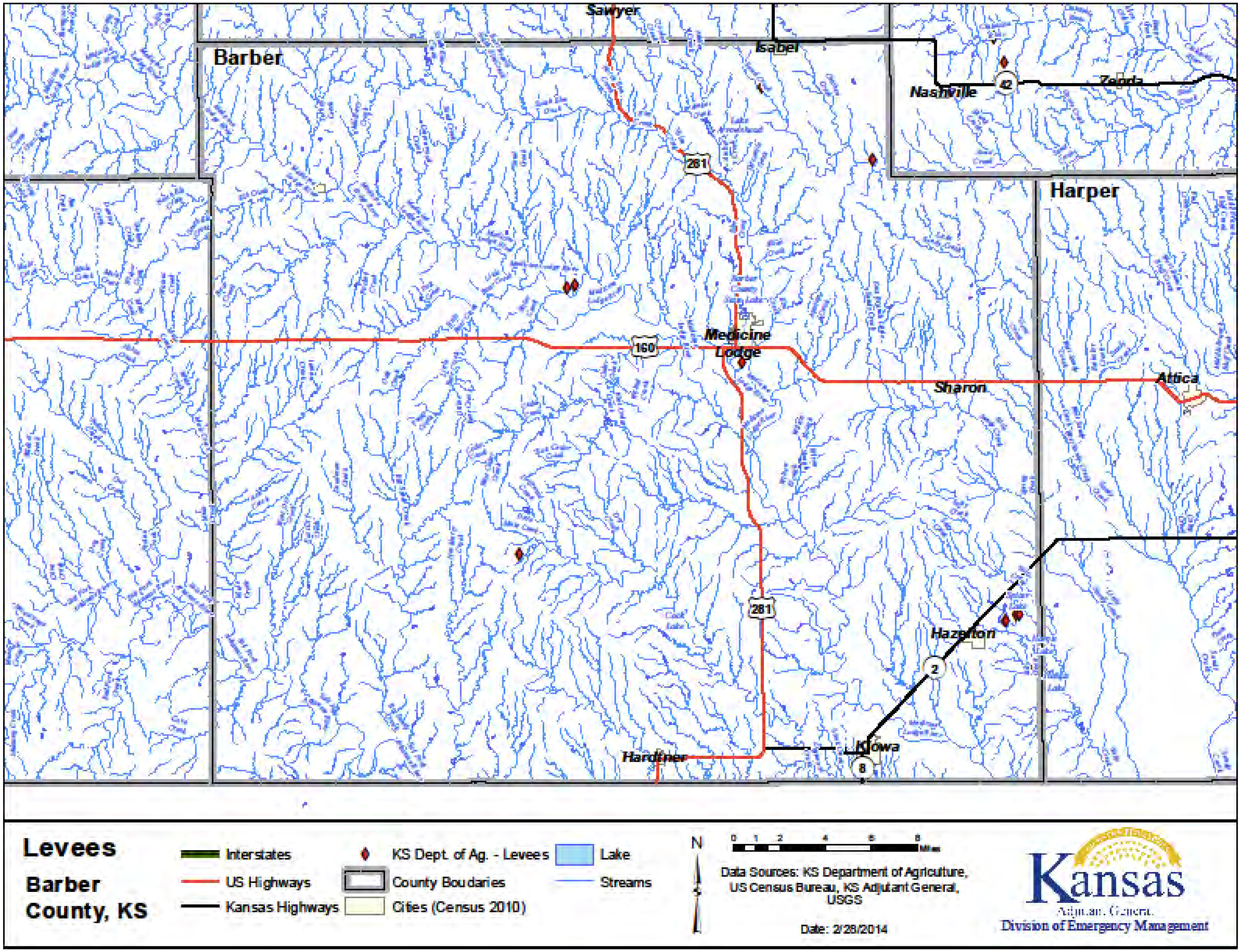
In Kansas, there are hundreds of levees ranging in size from small agricultural levees that were constructed primarily to protect farmland from high frequency flooding to large urban levees that were constructed to protect people and property from larger, less frequent flooding events, such as the 100-year and 500-year flood events. Levees have been constructed across the State by public and private entities with varying levels of protection, inspection oversight, and maintenance. Currently there is no one comprehensive database of all levees in the State. However, significant strides have been made toward compiling such an inventory. In 2010, FEMA published the MLI database of levees. The MLI contains levee data gathered primarily for structures that were designed to provide protection from at least the base (1-percent-annual-chance) flood. Levees that provide protection for less than the base flood event are included, but only where data was readily available. The MLI was developed to complement the USACE NLD. During development of this plan update, USACE was in the process of integrating the MLI with the NLD to provide a more comprehensive database of levees. Every effort was made during development of this plan to consider all known levees from both databases.

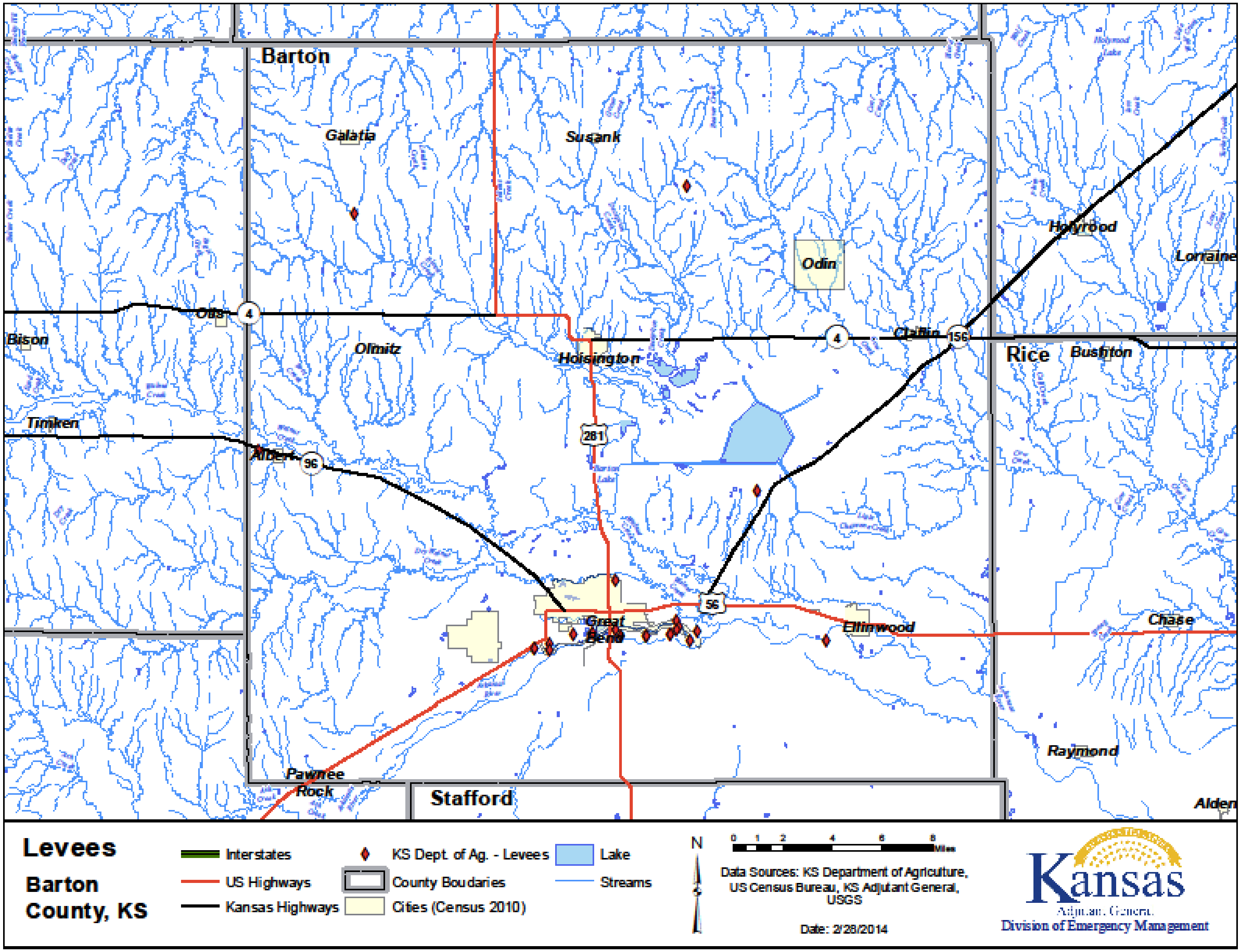
Regional Levees

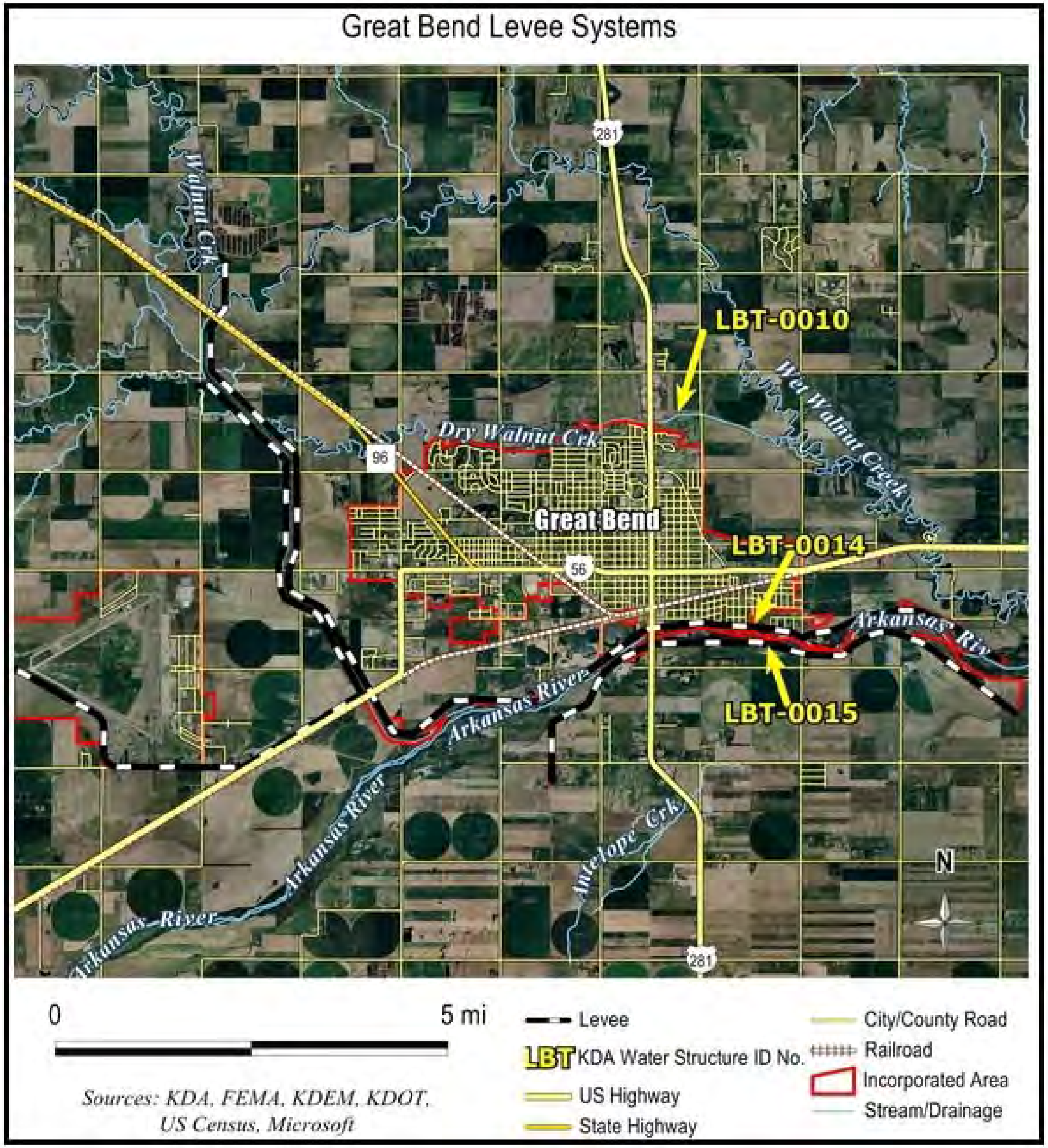
County	Levee Name	USACE LSP	USACE District	USACE Inspection Rating	MLI	Flooding Source	Accredited	DFIRM	Design Frequency
Barton	Barton Co, Ks Agricultural Levees	No	N/A	N/A	Yes	ARKANSAS RIVER	No	Yes	Unknown
Barton	Great Bend Levee North Side & Walnut Creek	Yes	TULSA	Minimally Acceptable	No	Not Reported	No	-	Unknown
Barton	Great Bend Levee South Side	Yes	TULSA	Minimally Acceptable	No	Not Reported	No	-	Unknown
Barton	Phase Arkansas River Levee	No	N/A	N/A	Yes	ARKANSAS RIVER	Yes	Yes	1% Annual Chance
Barton	Phase Iii Airport Levee	Yes	Tulsa	Minimally Acceptable	Yes	WALNUT CREEK	Yes	Yes	1% Annual Chance
Barton	Phase Iii Walnut Creek	No	N/A	N/A	Yes	WALNUT CREEK	Yes	Yes	1% Annual Chance
Pawnee	Larned Levee	Yes	Tulsa	Minimally Acceptable	Yes	ARKANSAS RIVER	Yes	No	1% Annual Chance

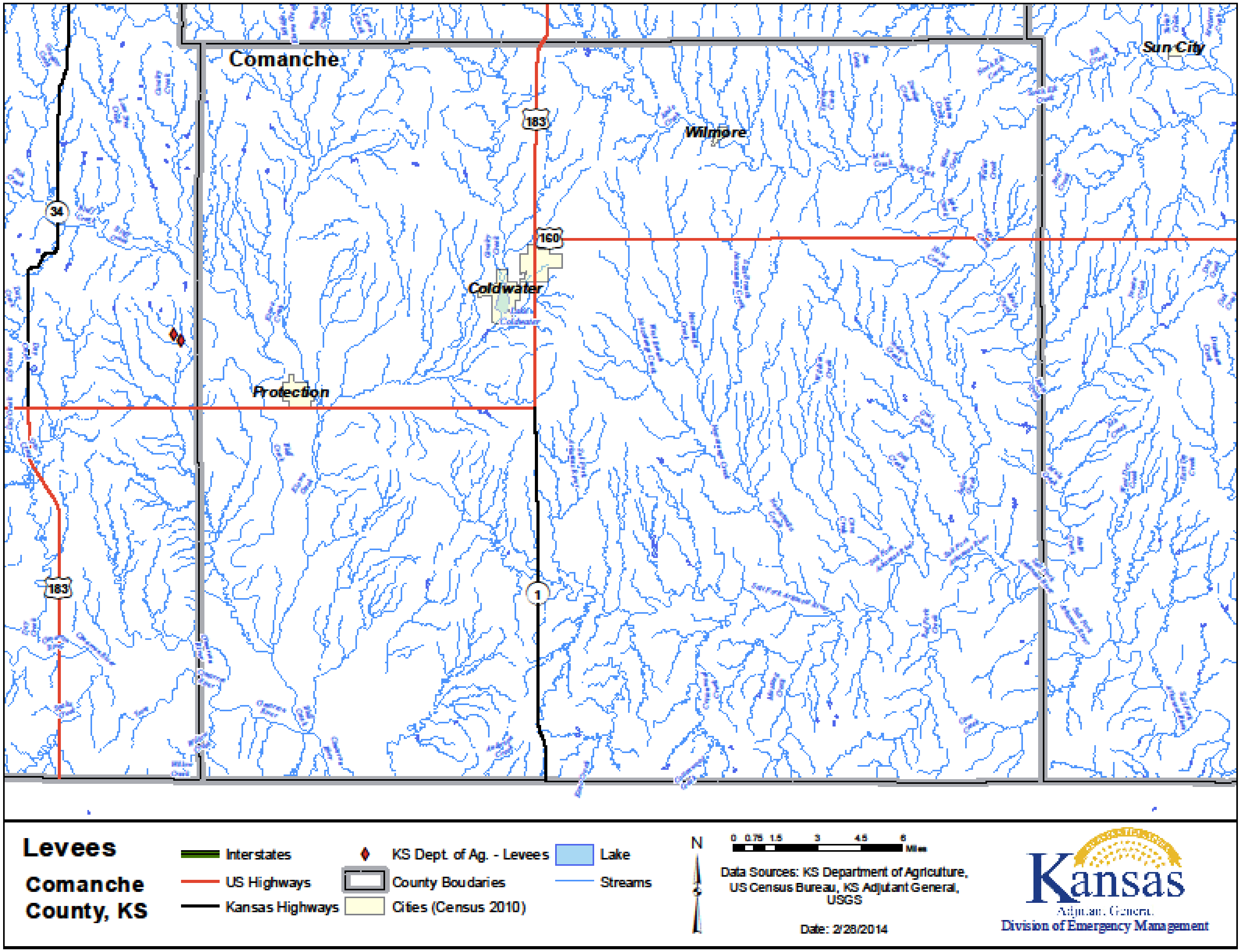
Compiled from the USACE NLD as well as the FEMA MLI

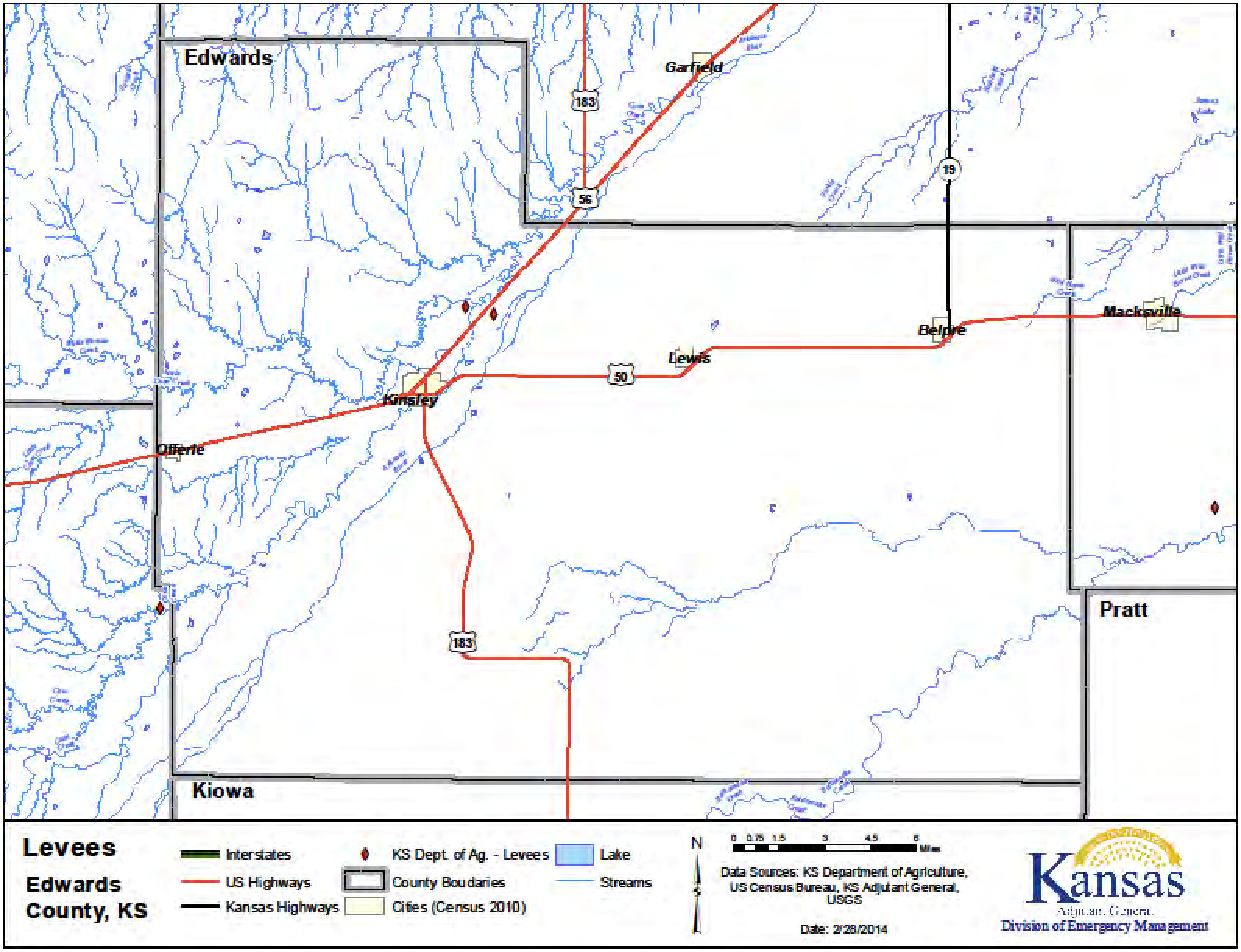
The following maps show identified levees within the south Kansas region.

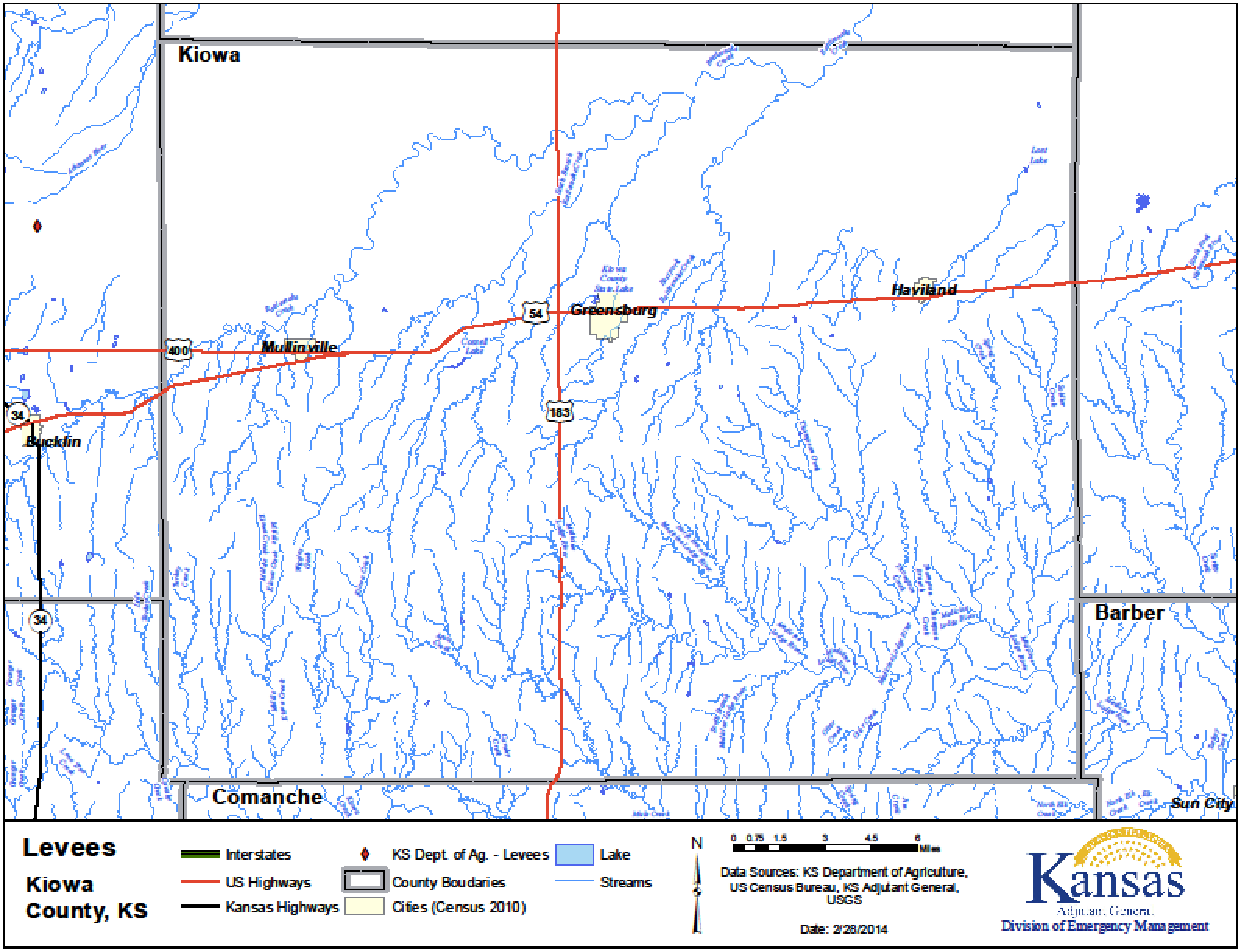

Sawyer
Isabel
Barber
Nashville
Zenda
Harper
Medicine Lodge
Sharon
Attica
Hazelton
Kiowa
Hardtner
Levees
Barber County, KS
Interstates
US Highways
Kansas Highways
KS Dept. of Ag. - Levees
County Boudaries
Cities (Census 2010)
Lake
Streams
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General, USGS
Date: 2/28/2014
Kansas
Division of Emergency Management

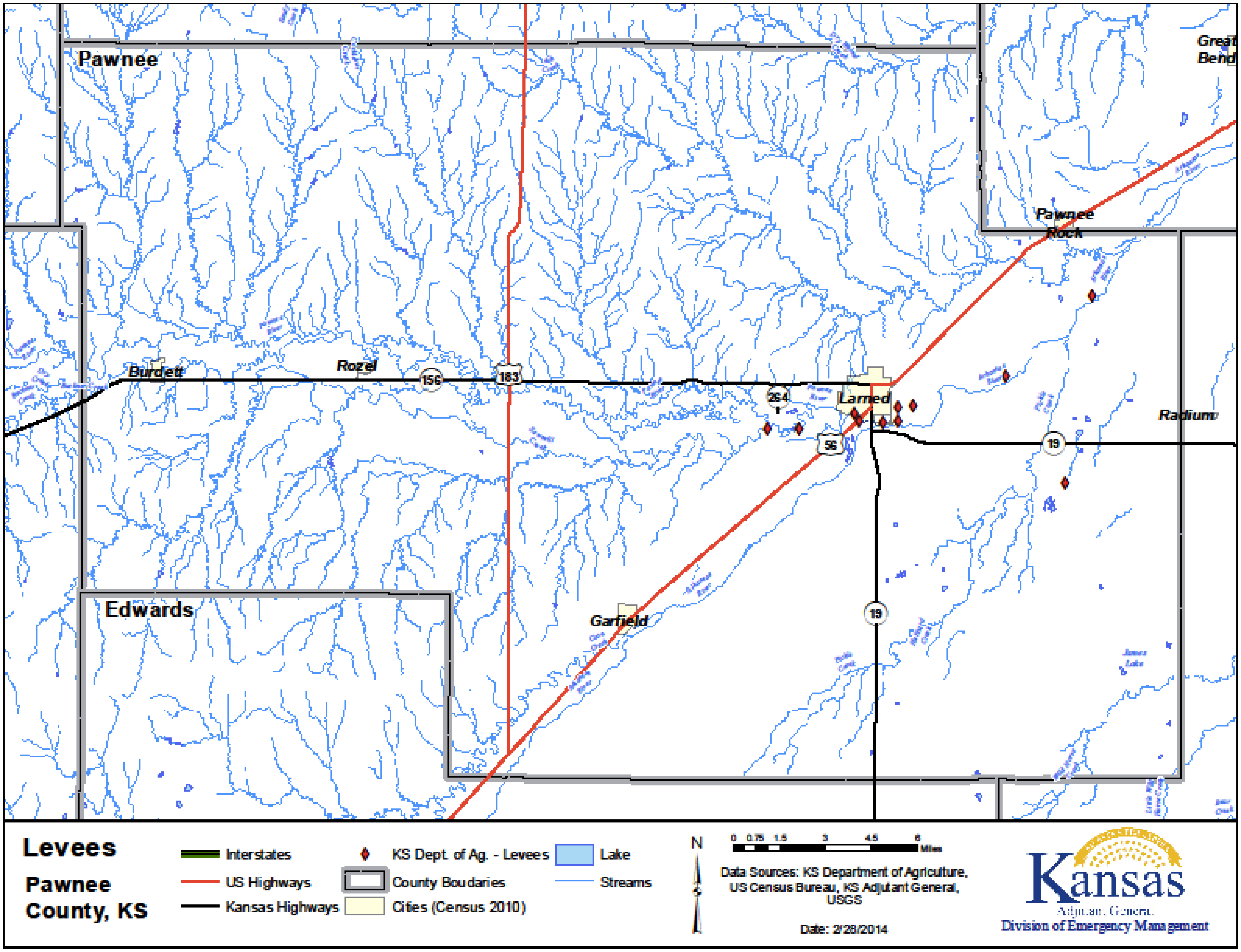

Barton
Galatia
Susank
Odin
Holyrood
Lorraine
Otis
4
Bison
Olmitz
Hoisington
Claflin
156
Rice
Bushton
Timken
Albert
96
281
Great Bend
56
Ellinwood
Chase
Raymond
Pawnee Rock
Stafford
Alden
Levees
Barton County, KS
Interstates
US Highways
Kansas Highways
KS Dept. of Ag. - Levees
County Boudaries
Cities (Census 2010)
Lake
Streams
N
0 1 2 4 6 8 Miles
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General, USGS
Date: 2/28/2014
Kansas
Adjutant General
Division of Emergency Management

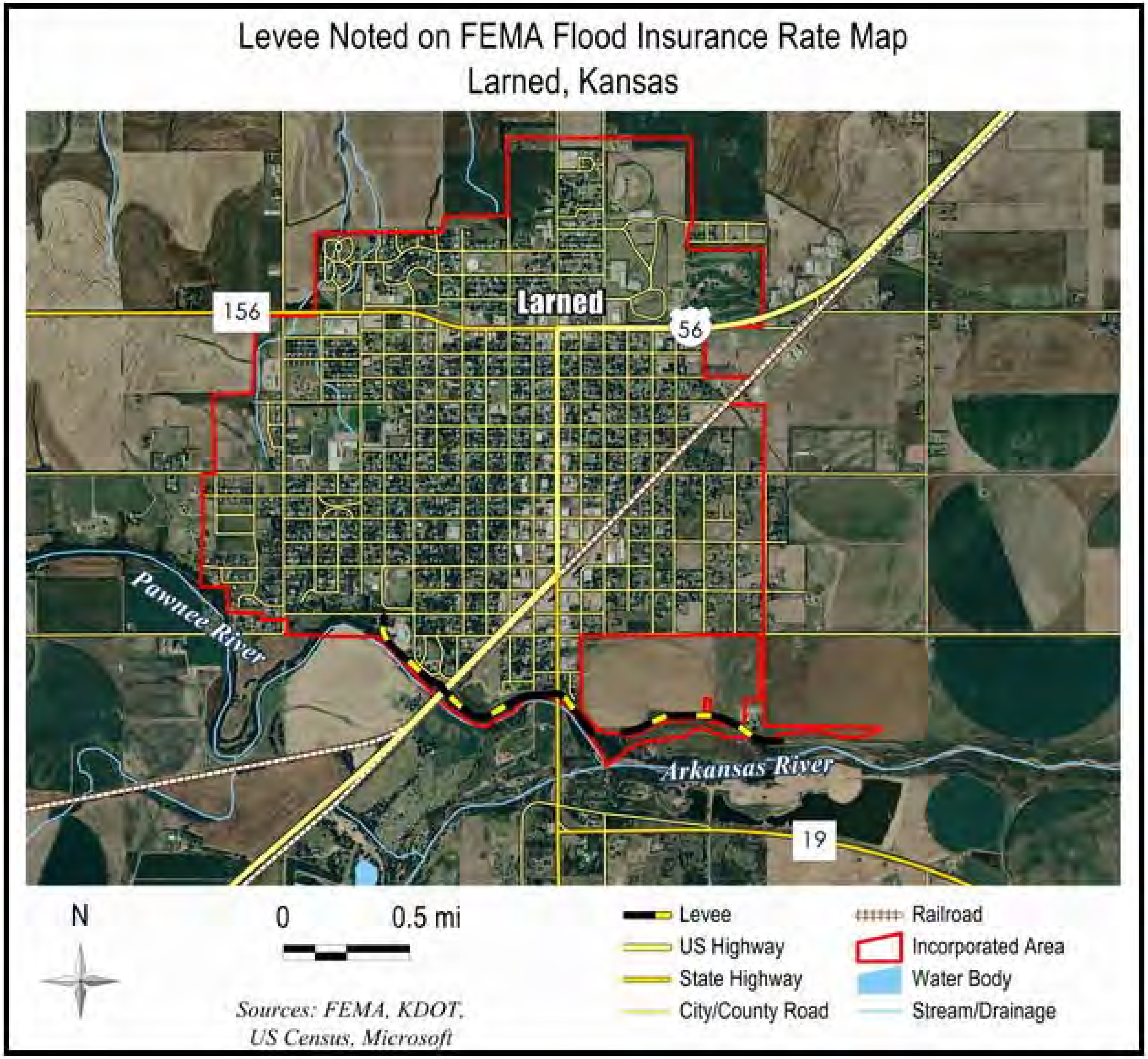

Great Bend Levee Systems
281
Walnut Crk
LBT-0010
Wet Walnut Creek
Dry Walnut Crk
96
Great Bend
LBT-0014
56
Arkansas Riv
Arkansas River
LBT-0015
Arkansas River
Antelope Crk
Arkansas River
N
281
0
5 mi
Levee
LBT KDA Water Structure ID No.
US Highway
State Highway
City/County Road
Railroad
Incorporated Area
Stream/Drainage
Sources: KDA, FEMA, KDEM, KDOT, US Census, Microsoft


Comanche
Sun City
Wilmore
Coldwater
Protection
183
160
34
1
Levees
Comanche County, KS
Interstates
US Highways
Kansas Highways
KS Dept. of Ag. - Levees
County Boudaries
Cities (Census 2010)
Lake
Streams
N
0 0.75 1.5 3 4.5 6 Miles
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General, USGS
Date: 2/28/2014
Kansas
Adjutant General
Division of Emergency Management

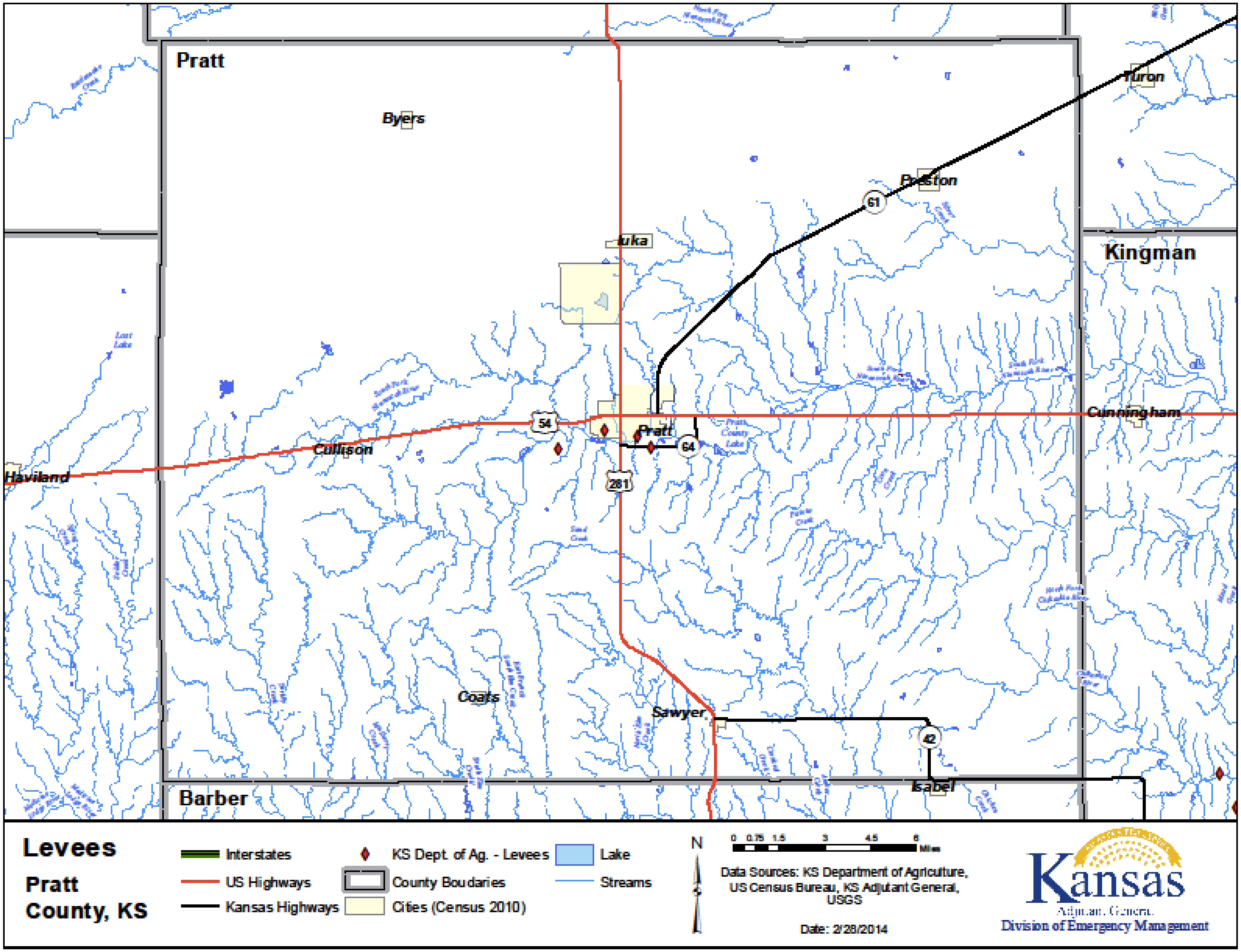

Edwards
Garfield
183
56
19
Macksville
Belpre
Lewis
50
Kinsley
Offerle
183
Pratt
Kiowa
Levees
Edwards County, KS
Interstates
US Highways
Kansas Highways
KS Dept. of Ag. - Levees
County Boudaries
Cities (Census 2010)
Lake
Streams
N
0 0.75 1.5 3 4.5 6 Miles
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General, USGS
Date: 2/28/2014
Kansas
Division of Emergency Management

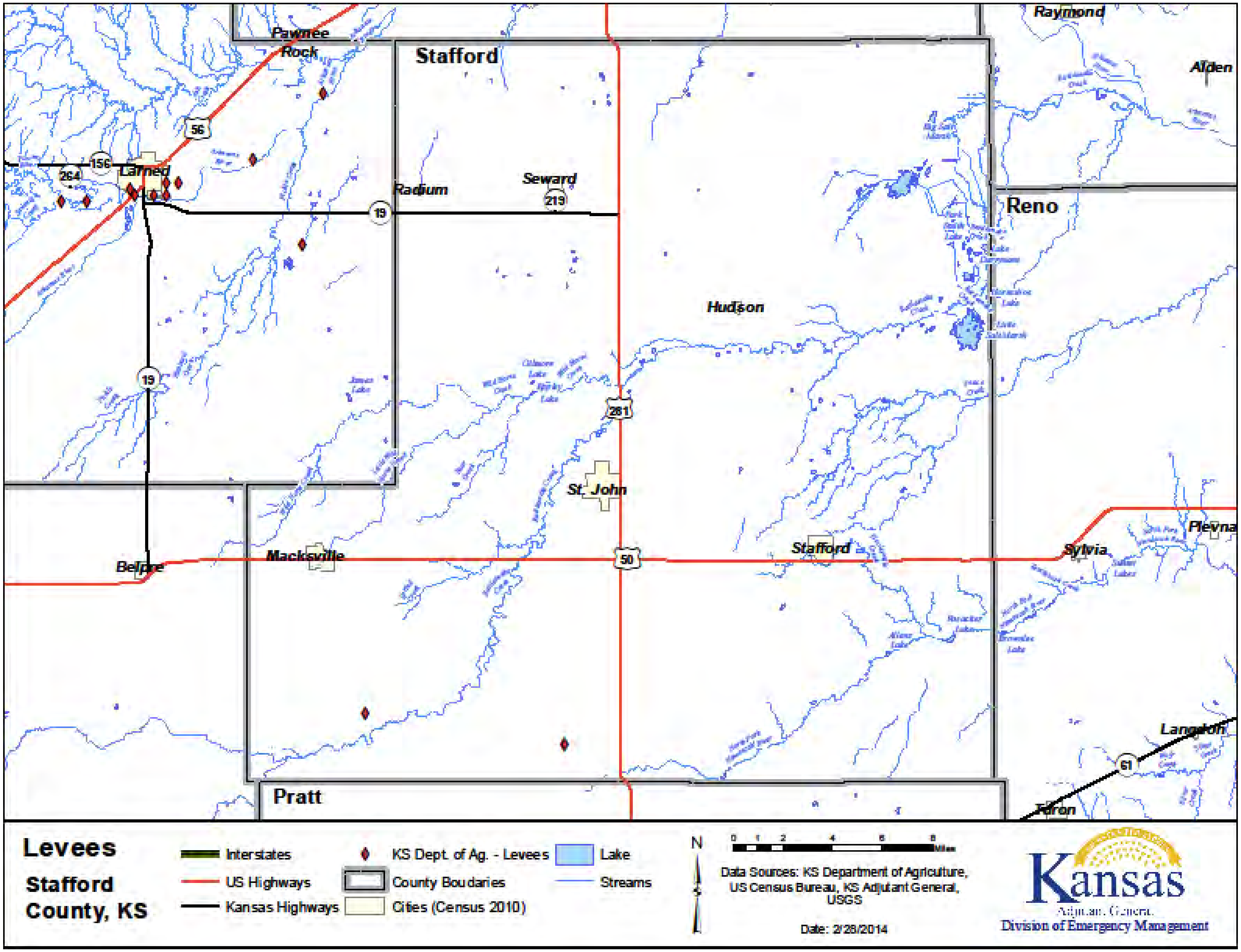

Kiowa
Barber
Comanche
Greensburg
Haviland
Mullinville
Bucklin
Sun City
54
400
183
34
Levees
Kiowa County, KS
Interstates
US Highways
Kansas Highways
KS Dept. of Ag. - Levees
County Boudaries
Cities (Census 2010)
Lake
Streams
N
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General, USGS
Date: 2/28/2014
Kansas
Adjutant General
Division of Emergency Management


Pawnee
Edwards
Great Bend
Pawnee Rock
Burdett
Rozel
Larned
Radium
Garfield
156
183
264
56
19
Levees
Pawnee County, KS
Interstates
US Highways
Kansas Highways
KS Dept. of Ag. - Levees
County Boudaries
Cities (Census 2010)
Lake
Streams
N
0 0.75 1.5 3 4.5 6 Miles
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General, USGS
Date: 2/28/2014
Kansas
Adjutant General
Division of Emergency Management



Levee Noted on FEMA Flood Insurance Rate Map
Larned, Kansas
Larned
156
56
19
Pawnee River
Arkansas River
N
0
0.5 mi
Levee
US Highway
State Highway
City/County Road
Railroad
Incorporated Area
Water Body
Stream/Drainage
Sources: FEMA, KDOT, US Census, Microsoft


Pratt
Byers
Iuka
Preston
Turon
Kingman
Haviland
Cullison
Pratt
Cunningham
Coats
Sawyer
Isabel
Barber
54
61
64
281
42
Levees
Pratt
County, KS
Interstates
US Highways
Kansas Highways
KS Dept. of Ag. - Levees
County Boudaries
Cities (Census 2010)
Lake
Streams
N
0 0.75 1.5 3 4.5 6 Miles
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General, USGS
Date: 2/28/2014
Kansas
Adjutant General
Division of Emergency Management


Stafford
Pratt
Reno
Raymond
Alden
Pawnee Rock
Larned
Radium
Seward
Hudson
St. John
Macksville
Belpre
Stafford
Sylvia
Plevna
Langdon
Turon
56
156
264
19
219
281
50
61
Levees
Stafford County, KS
Interstates
US Highways
Kansas Highways
KS Dept. of Ag. - Levees
County Boudaries
Cities (Census 2010)
Lake
Streams
N
Data Sources: KS Department of Agriculture, US Census Bureau, KS Adjutant General, USGS
Date: 2/28/2014
Kansas
Division of Emergency Management

Previous Occurrences and Extent

There have been no notable previous dam and levee failures in south Kansas. The following table presents regionally known minor events.

Regional Dam Incidents, 1925-2013

County	NID #	Dam Name	Incident Date	Incident Type	Dam Failure
Pratt	KS07714	Pratt County Lake Dam	6/2/1995	Piping	No

Source: Stanford University's National Performance of Dams Program

Hazard Vulnerability and Impact

Dam Failure

The 2009 Kansas Water Plan states that some dams are exhibiting structural deficiencies because of age, while post-construction development downstream of others has raised their hazard class. Common problems with older dams include:

- Deteriorating metal pipes and structural components,
- Inadequate hydrologic capacity,
- Increased runoff because of upstream development, and
- Increased failure hazard because of downstream development.

To complete an analysis of vulnerability to dam failure as well as attempt to describe vulnerability in terms of the jurisdictions most threatened by dam failure, points were assigned to each type of dam and then aggregated for a total point score for each county. Points were assigned as follows for each dam: Low Hazard Dams, 1 point, Significant Hazard Dams, 2 points, High Hazard Dams, 3 points, High Hazard Dams without an Emergency Action Plan (EAP), an additional 2 points, Federal Reservoir Dams, 3 points. This analysis does not intend to demonstrate vulnerability in terms of dam structures that are likely to fail, but rather provides a general overview of the counties that have a high number of dams, with weighted consideration given to dams whose failure would result in greater damages. The following table shows the results of this analysis.

Dam Failure Vulnerability Analysis

County	Low Hazard Dams	Significant Hazard Dams	High Hazard Dams	High Hazard Dams Without EAP	Federal Reservoirs	Vulnerability Rating	Vulnerability Level
Barber	91	1	2	0	0	99	Medium-High
Barton	16	0	1	1	0	21	Medium-Low
Comanche	26	1	1	0	0	31	Medium-Low
Edwards	3	0	0	0	0	3	Low
Kiowa	8	0	0	0	0	8	Low
Pawnee	21	2	0	0	0	25	Low
Pratt	9	0	0	0	0	9	Low
Stafford	2	0	1	0	0	5	Low
Regional Total	176	4	5	2	0	201	-

Source: Analysis utilizing data from: Kansas Department of Agriculture, Division of Water Resources, Water Structures program; U.S. Army Corps of Engineers; Bureau of Reclamation; U.S. Army, U.S. Fish and Wildlife

None of the regional counties are on the top 10 list for the State of Kansas for vulnerability to dam failure.

During the development of this plan, the Kansas Department of Agriculture, Division of Water Resources was working on a project to complete dam inundation mapping for High and Significant hazard dams. This project will is ongoing due to funding issues. A statewide dam inundation map does not exist at this time.

Levee Failure

To complete an analysis of vulnerability to levee failure as well as attempt to describe vulnerability in terms of the jurisdictions most threatened by levee failure, the MLI geodatabase along with census block data available in HAZUS MH 2.1 is used to determine the number of people and the value of development in these identified levee protected areas. This analysis does not attempt to evaluate which levees are more prone to overtopping or failure, but rather provide a general picture of those counties that have more people and property protected by levees and therefore the potential for more damage if failure or overtopping were to occur.

The following table presents the calculated value of structures and the contents of the structures protected by levees within the region, by applicable county. This data is to be used only for general determination of those areas of the state that could suffer the greatest losses in the event of levee failure events. Data limitations prevent a more accurate analysis including: lack of delineation of protected areas for all levees and, lack of statewide parcel-type data which would provide more accurate results in determining structures and values within levee protected areas.

Regional Populations and Values Protected by Levees

County	Structures Exposure	Contents Exposure	Total Exposure	Population Exposed
Barton	$1,073,579	$774,543	$1,848,122	16,751
Pawnee	$21,651	$13,712	$35,363	317
Regional Total	$1,095,230	$788,255	$1,883,485	17,068

Source: FEMA MLI, 2010

Barton County is in the state top 10 for both development and population protected by levees.

To estimate potential losses associated with levee failure, 20 percent loss was considered for all development (structure and contents) in levee protected areas as defined on the MLI. The 20 percent damage estimation is based on FEMA Flood Insurance Administration (FIA) depth-damage curves for a one-story structure with no basement flooded to two feet. Again, this analysis does not intend to make a determination as to specific levees that are prone to failure, but rather demonstrate an overall worst case scenario for those counties if they were all to fail in an event causing an average 20 percent in damages to the development protected by those levees.

Estimate of Potential Loss Due to Levee Failure

County	Value of Development in Levee Protected Areas	Loss Estimates at 20% Damage
Barton	$1,848,122	$369,624
Pawnee	$35,363	$7,073
Regional Total	$1,883,485	$376,697

Economic impacts and human injury or death are the primary concern with dam and levee failure. The future construction of dams and levees within the region and/or the development of additional structures or infrastructure within areas with dams or protected by levees would likely increase the impact of an event. The following items are of additional concern:

- Private levees and dams are a consideration when the risk of failure is analyzed. These levees and dams are normally maintained by their owners, which can often cost a great deal of money.
- The USACE maintains many levees in and around the planning area, however, there are also levees that are not federally maintained, so local jurisdictions or private property owners are responsible for maintaining the structures. As the levees age, the costs to repair and rebuild them will increase.

	Magnitude/Severity
Dam and Levee Failure	2.63

Local Concerns

The following detail specific local concerns as related to dam and levee failure:

- In Barber County, there are numerous downstream properties in and around the City of Medicine Lodge at risk in if the Barber State Fishing Lake Dam were to fail.
- In Barton County, the flood control levee for the City of Great Bend is located along the south and west boundaries of the city limits along the Arkansas River and Walnut Creek diversion channel. The majority of Great Bend (81.44%) is reported to be Zone X - protected by levee, as determined by FEMA DFIRMS GIS overlay of the city.
- In Comanche County, a dam breach of the Coldwater Lake Dam could potentially result in significant damage to approximately three residential structures, a golf course, a ball field complex, and surrounding agricultural land.
- In Pawnee County, the City of Larned is protected by a levee located on the southern boundary of the city on the Pawnee and Arkansas rivers. Areas north of the levee are identified as Zone C - area of minimal flood hazard.
- In Stafford County, the Lake Darrynane Dam is owned and operated by the US Fish and Wildlife Service and is located within the Quivira National Wildlife Refuge boundaries. This High Hazard dam does not have an owner provided EAP or inundation maps available for review and evaluation.

Future Development

Future development and population increase would tend to increase the likelihood of the population being impacted by a dam or levee failure event. Barton County is in the top 10 statewide for population and development protected by levees, however the county is reporting yearly declines in population. Regionally, $1,883,485 is currently protected by levees along with 17,086 persons. However, regional population totals are estimated to decrease from 61,087 persons in 2013 to 45,250 by 2040. These decreases may be further offset as many of the flood prone cities have enacted floodplain ordinances limiting development in hazardous areas and/or are members of the NFIP.

Probability of Future Occurrences

The variability of the size and construction of the dams in south Kansas makes estimating the probability of dam failure difficult on any scale less than a case-by-case basis. The limited data on previous occurrences indicates that in the last 87 years, there has been seven recorded dam failure events in all of Kansas, which is less than 1 event in 10 years.

Although both federal and nonfederal levees in the State of Kansas have been damaged in flood events, the damage has not resulted in catastrophic failure and/or damages. Levees in Kansas that have been constructed to protect development and populations from the 1-percent annual chance flood are routinely inspected and maintained. Based on current historical data pertaining to damaging/significant levee failure incidents, the probability of occurrence of this hazard is considered unlikely.

	Probability
Dam and Levee Failure	1.25

Consequence Analysis

When a dam fails, the stored water can be suddenly released and have catastrophic effects on life and property downstream. Homes, bridges, and roads can be demolished in minutes. Emergency plans written for dams include procedures for notification and coordination with law enforcement and other governmental agencies, information on the potential inundation area, plans for warning and evacuation, and procedures for making emergency repairs.

The impact of levee failure during a flooding event can be very similar to a dam failure in that the velocity of the water caused by sudden release as a result of levee breach can result in a flood surge or flood wave that can cause catastrophic damages. If the levee is overtopped as a result of flood waters in excess of the levee design, impacts are similar to flood impacts. The information in the following table provides the Consequence Analysis.

Dam Failure Consequence Analysis

Subject	Ranking	Impacts of Dam and Levee Failure
Health and Safety of Persons in the Area of the Incident	Severe	Localized impact expected to be severe for the inundation area and moderate to minimal for other affected areas.
Responders	Minimal	Impact to responders is expected to be minimal with proper training. Impact could be severe if there is lack of training.
Continuity of Operations	Minimal	Temporary relocation may be necessary.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact could be severe in the inundation area of the incident to facilities and infrastructure. The further away from the incident area the damage lessens.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities. Minimal to severe depending on area size and location affected.
Environment	Severe	Impact will be severe for the immediate impacted area. Impact will lessen as distance increases.
Economic Conditions	Minimal to Severe	Impacts to the economy will depend on the scope of the inundation and the time it takes for the water to recede.
Public Confidence Governance	Minimal to Severe	Perception of whether the failure could have been prevented, warning time, and response and recovery time will greatly impact the public’s confidence.

3.7.4 DROUGHT

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Drought	2.63	2.06	1.00	4.00	2.35

Description

In general, drought can be defined as a condition of moisture levels significantly below normal for an extended period of time over a large area that adversely affects plants, animal life, and humans. Because these dry conditions develop gradually, and impact regions differently, there is no standard way to determine when a drought begins or ends, or to objectively determine its severity.

Drought can also be defined in terms of meteorology, agricultural, hydrological and socio-economic. The first three definitions apply to ways to measure drought as a physical phenomenon. The last deals with drought in terms of supply and demand, tracking the effects on socioeconomic systems

- **Meteorological Drought:** The degree of dryness as related to an average amount of moisture, and the duration of the dry period. Definitions of meteorological drought must be considered as region specific since the atmospheric conditions that result in deficiencies of precipitation are highly variable.
- **Hydrological Drought:** The effects of periods of precipitation shortfalls on surface or subsurface water supply. The frequency and severity of hydrological drought is often defined on a watershed or river basin scale. 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 groundwater and reservoir levels.
- **Agricultural Drought:** Links the characteristics of meteorological and/or hydrological drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, and so forth.
- **Socioeconomic Drought:** The lack of available water has a direct effect on the population. In general, this results in the demand for an economic good exceeding the supply as a result of a weather-related shortfall in water supply.

The impacts of drought can be categorized as economic, environmental, or social. Many economic impacts occur in agriculture and related sectors, including increasing food prices globally. 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 disease to forests and reduce growth. The incidence of wildfires 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, increasing 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, wildfires, 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, with increased soil erosion, may lead to a more permanent loss of biological productivity of the landscape.

Periods of drought are normal occurrences in south Kansas. Drought in south Kansas is caused by severely inadequate amounts of precipitation that adversely affect farming and ranching, surface and ground water supplies, and uses of surface waters for navigation and recreation.

The most widely used tool to measure and report drought conditions is the Palmer Drought Severity Index (PDSI). The PDSI combines temperature, precipitation, evaporation, transpiration, soil runoff and soil recharge data for a given region to produce a single negative number representing conditions there. This index serves as an estimate of soil moisture deficiency, which roughly correlates with a drought's severity, and thus, its impacts.

The U.S. Drought Monitor, an organization run by government and academic partners that maintains a nationwide drought map, uses the PDSI to categorize dry weather into five levels of severity:

U.S. Drought Monitor Severity Rating

Designation	Category	PDSI Rating
Abnormally Dry	D0	-1.0 to -1.9
Moderate Drought	D1	-2.0 to -2.9
Severe Drought	D2	-3.0 to -3.9
Extreme Drought	D3	-4.0 to -4.9
Exceptional Drought	D4	-5.0 to -5.9

The effects range from slow crop and pasture growth to widespread crop failure and water emergencies. Additionally, the Drought Monitor defines droughts as either short-term, if they have lasted less than six months, and long-term for prolonged events.

The State of Kansas Operations Plan (June 30, 2012) utilizes a phased response to drought and identifies specific program actions related to each drought stage. The following provides a brief summary of this phased response approach.

- **Drought Watch** – Impacts include some damage to crops and pastures, high rangeland fire danger and a growing threat of public water supply shortages. The Governor is notified and the Governor's Drought Response Team assembled. Open outdoor burning bans may be imposed. Public water systems may ask for voluntary water use restrictions.

- **Drought Warning** – Crop and pasture losses are likely with some stock water shortages and very high rangeland fire danger. Public water supply shortages are present and some stream flow targets are not being met. Public water systems may impose mandatory water use restrictions. Urgent Kansas Water Marketing Program surplus water supply contracts can be authorized for municipal and industrial users. The Governor may request emergency haying and grazing authorization for Conservation Reserve Program acres.

- **Drought Emergency** – Widespread major crop and pasture losses are accompanied by stock water shortages and extreme rangeland fire danger. Severe public water supply shortages are widespread with many stream flow targets not met. The Governor may declare an outdoor burning ban. Public water systems may impose additional mandatory water use restrictions. Emergency Kansas Water Marketing Program surplus water supply contracts can be authorized for municipal and industrial users. Emergency water withdrawals from Corps of Engineers reservoirs and state fishing lakes can be authorized. Corps of Engineers emergency water assistance to municipalities is available if needed. The Governor may request a USDA Secretarial disaster designation for drought.

	Warning Time
Drought	1.00

	Duration
Drought	4.00

Hazard Location

Drought tends to affect broad regions and the entire planning area is subject to drought occurrence at roughly equal probability. The impacts of prolonged drought are most significant in agricultural areas of the region. In addition to impacts on the region's agricultural areas, drought can affect cities by severely limiting public water supplies due to depletion of natural water sources and greatly increased demand.

The passage by Congress of the farm bill in 2014 allows drought affected producers in affected counties, if qualified, eligible for low interest emergency loans from USDA's Farm Service Agency. Farmers in eligible counties have eight months from the date of the declaration to apply for loans to help cover part of their actual losses.

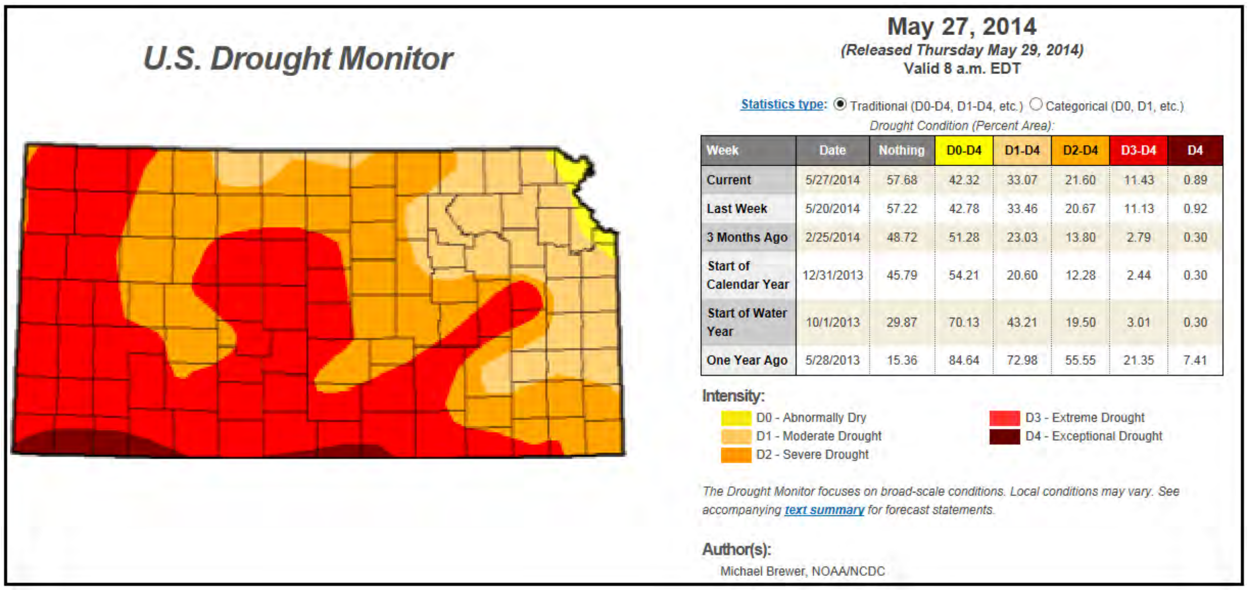
As of May 21, 2014, the Kansas Water Office (KWO) has indicated the following drought conditions and advisories for the entire planning region.

- Executive Order 14-04 (replacing Executive Order 13-02) is in effect with all regional counties remaining under a Drought Emergency.
- The US Drought Monitor indicates drought conditions persist across the state. No portion of the state is in normal conditions. Nearly 81 percent of the state is now in extreme

drought conditions, 48 percent in severe drought and three percent in exceptional drought.

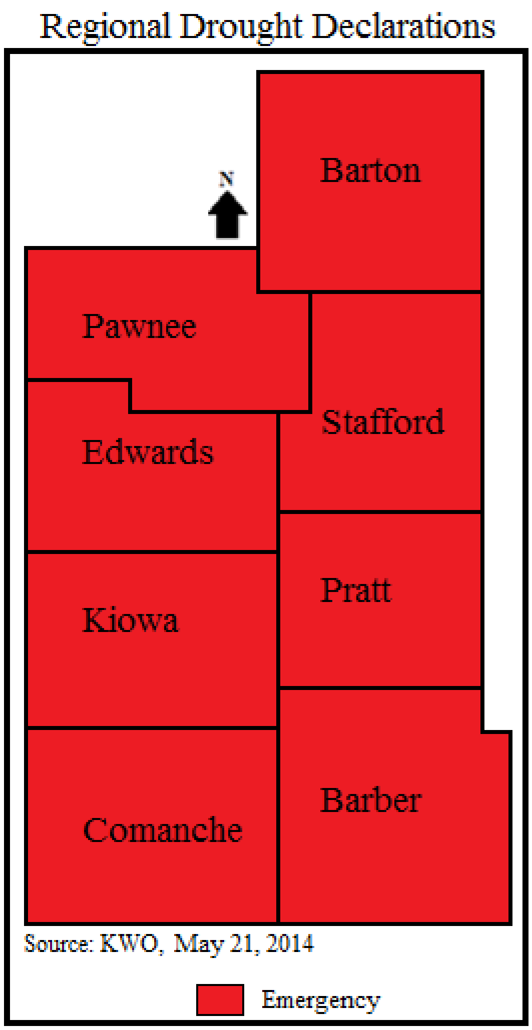
- The Monthly Drought Outlook for May indicates drought conditions to persist or intensify for western and portions of central Kansas. Removal of drought is likely for eastern Kansas.
- The Seasonal Drought Outlook through August 2014 indicates drought conditions to remain in the south with possible improvement or removal in the remainder of the state.

The following U.S. Drought Monitor map from May 13, 2014 shows that all of south Kansas is currently in drought conditions, classified as severe to extreme.



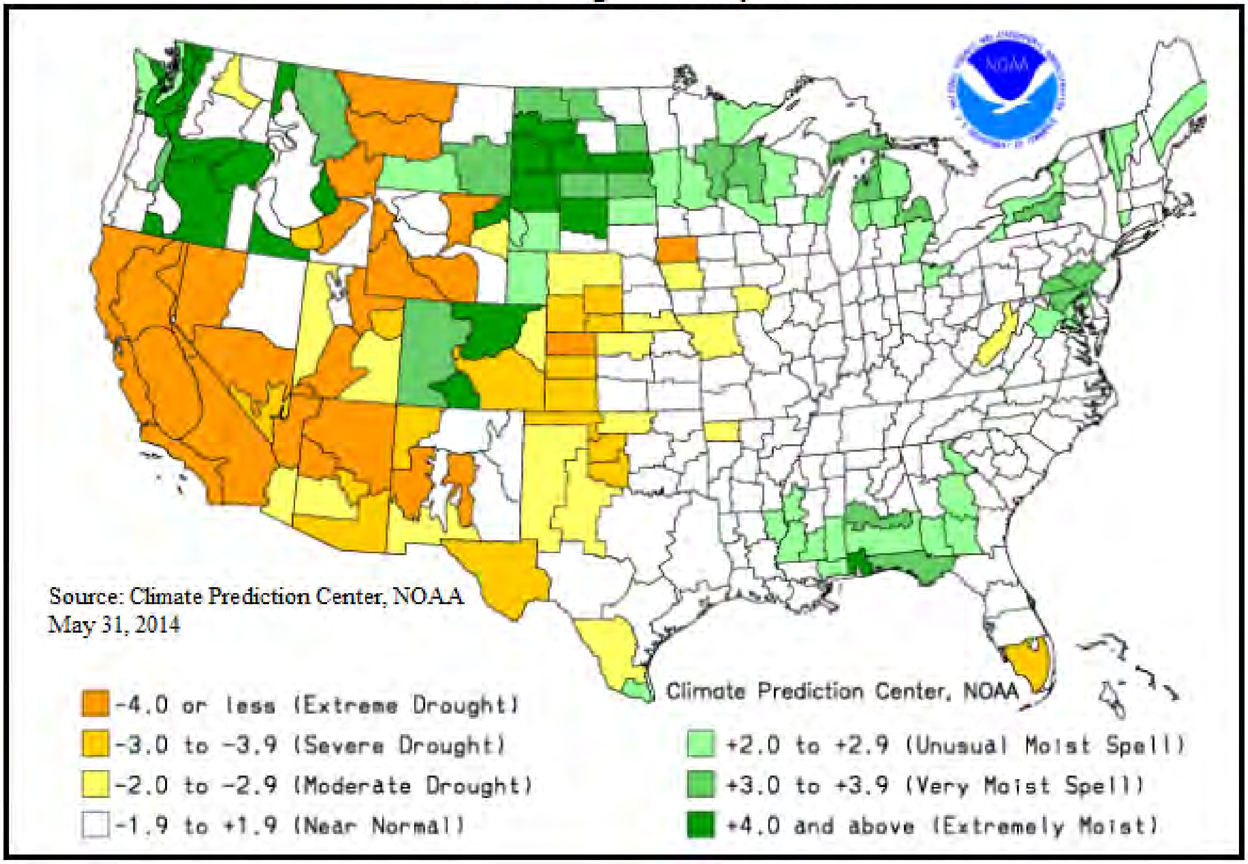
Week	Date	Nothing	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	5/27/2014	57.68	42.32	33.07	21.60	11.43	0.89
Last Week	5/20/2014	57.22	42.78	33.46	20.67	11.13	0.92
3 Months Ago	2/25/2014	48.72	51.28	23.03	13.80	2.79	0.30
Start of Calendar Year	12/31/2013	45.79	54.21	20.60	12.28	2.44	0.30
Start of Water Year	10/1/2013	29.87	70.13	43.21	19.50	3.01	0.30
One Year Ago	5/28/2013	15.36	84.64	72.98	55.55	21.35	7.41

The following map from May 21, 2014 from the KWO shows that all of south Kansas is under a Drought Emergency.



The following map from May 21, 2014 shows PSDI information and designations for the region.

Palmer Drought Severity Index



The following table provides the latest drought designations and seasonal outlooks for the region.

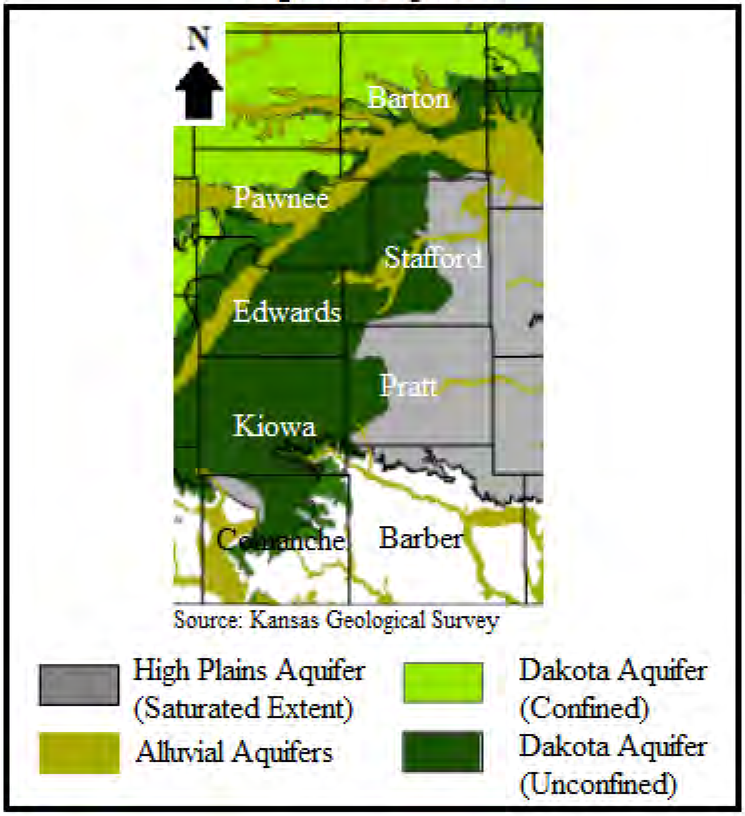
Regional Drought Designations and Outlooks

County	KWO Drought Designation	Kansas 2014 Secretarial Designations for Drought	U.S. Drought Monitor	NWS Climate Prediction Center Seasonal Outlook through February 28, 2014
Barber	Emergency	Primary	D3 (Severe)	Drought Persists or Intensifies
Barton	Emergency	Primary	D3 (Severe)	Drought Persists or Intensifies
Comanche	Emergency	Primary	D3 (Severe)	Drought Persists or Intensifies
Edwards	Emergency	Primary	D2-3 (Extreme/Severe)	Drought Persists or Intensifies
Kiowa	Emergency	Primary	D3 (Severe)	Drought Persists or Intensifies
Pawnee	Emergency	Primary	D2-3 (Extreme/Severe)	Drought Persists or Intensifies
Pratt	Emergency	Primary	D3 (Severe)	Drought Persists or Intensifies
Stafford	Emergency	Primary	D3 (Severe)	Drought Persists or Intensifies

Source: KWO

In south Kansas, the primary source of water is surface water, including rivers, federal reservoirs, multipurpose small lakes, and municipal lakes. The following map shows the aquifers in south Kansas and adjacent counties.

Regional Aquifers



Drought can severely challenge a public water supplier through depletion of the raw water supply and greatly increased customer water demand. Even if the raw water supply remains adequate, problems due to limited treatment capacity or limited distribution system capacity may be encountered. A 2007 assessment of 800 city or rural water district drinking water systems by the KWO found 132 to be drought vulnerable. The following are potential limiting factors:

- **Basic Source Limitation** - The supplier's primary raw water source is particularly sensitive to drought as evidenced by depleted streamflow, depleted reservoir inflow and storage, or by declining water levels in wells. Restrictions imposed due to inability to use a well(s) because water quality problems were considered indicative of a basic source limitation.
- **Contractual Limitation** - The supplier's sole water source is purchased from another system that is drought vulnerable and there is a drought-cut-off clause in their water purchase contract. In such situations where there is not a drought cut-off clause, the purchaser is considered drought vulnerable under the same limitation category as the seller.
- **Distribution System Limitation** - The supplier has difficulty or is unable to meet drought-induced customer demand for water due to inadequate finished water storage capacity, inadequate pumping capacity, or inadequate transmission line sizes.

- **Minimum Desirable Streamflow** - The supplier reported imposing restrictions because of minimum desirable streamflow administration. Water rights junior to those granted for maintenance of established minimum desirable flows are subject to such administration.
- **Single Well Source** - The supplier relies upon a single well as its sole source for raw water. Suppliers with one active well and one emergency well were considered drought vulnerable because emergency wells are not a dependable long-term water source. Excessive hours of operation to meet drought-induced customer demand for water will result in the increased likelihood of mechanical breakdown with no alternative water supply source available.
- **Treatment Capacity Limitation** - The supplier has difficulty or is unable to meet drought-induced customer demand for water due to inadequate raw water treatment capacity.
- **Water Right Limitation** - The supplier reported imposing restrictions because the quantity of water they are authorized to divert under their water right(s) was insufficient to meet customer demands.

The following tables provide information from the KWO May 2014 Drought Update on Known Conservation Stages.

KWO, Kansas 2014 Drought Update, Known Conservation Stages

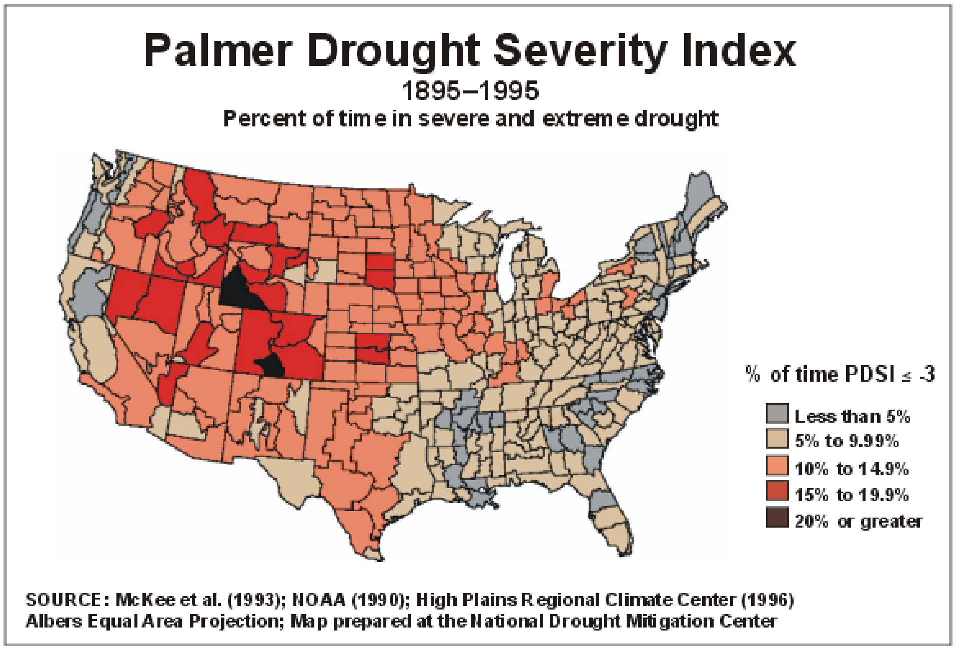
County	Public Water Supply	2014 Stage	Conservation Stage Designation
Barber	Medicine Lodge	3	Water Emergency
Barber	Barber RWD 02	1	Water Watch
Barton	Barton RWD 02	1	Water Watch
Barton	Susank	2	Water Warning

Source: KWO Kansas 2014 Drought Update (Mid May, 2014)

Areas that appear to be the most vulnerable to drought are the focus of the Governor's Drought Response Team for planning, management and mitigation activities. While drought does not usually cause damage to buildings and critical facilities, work and living locations do affect people. However, as regional counties experience decreases and agricultural activities it could potentially create lower demands on public water suppliers.

Previous Occurrences and Extent

As is indicated in the following PDSI map, droughts are common throughout the south Kansas planning region. For the period of 1895 to 1995, south Kansas has had a PDSI rating of less than -3 (Severe Drought) 10% to 14.95% of the time.



The following are notable instances of drought in the planning region:

2014: Executive Order 14-04 supersedes Executive Order 13-02, with all regional counties remaining under a Drought Emergency.

2014: The 2014 Farm Bill makes the Livestock Forage Disaster Program a permanent program. The program provides compensation to eligible livestock producers who have suffered grazing losses due to drought, equal to 60 percent of the monthly feed cost for up to five months. An eligible livestock producer that owns or leases grazing land or pastureland physically located in a county rated by the U.S. Drought Monitor as D2 (severe drought) for eight consecutive weeks or more during the normal grazing period: assistance equals one monthly payment; D3 (extreme drought) anytime during the normal grazing period: assistance equals three monthly payments; D3 (extreme drought) for four weeks or more during the normal grazing period or D4 (exceptional drought) anytime during the normal grazing period: assistance equals four monthly payments; D4 (exceptional drought for four weeks (consecutive weeks unnecessary) during the normal grazing period: assistance equals five monthly payments.

2013: Executive Order 13-02 indicates Barber, Comanche, Edwards, Kiowa, Pawnee and Pratt Counties are under a Drought Warning.

2012: The Governor signed three executive orders this year for drought with all south Kansas counties being declared in emergency drought status with the last order. The Governor approved the June 2012 Operations Plan for the Governor's Drought Response Team which updated activities and responses. The Kansas Water Office increased the frequency of the Drought/Climate report to weekly for much of the year due to intensity of conditions.

2012: USDA agricultural disaster due to drought was declared for all 105 counties in Kansas based on crop losses through a series of six designations in July and August 2012. This makes producers eligible for certain emergency funding. The crop losses were estimated at $1.5 billion for the State. At least 197 communities and rural water districts in Kansas had voluntary or mandatory restrictions on water use as drought and high demand depleted public water supplies and challenged treatment and distribution. Mandatory restrictions were placed on water right holders junior to minimum desirable streamflow in as many as 17 locations affecting 540 water appropriations. Livestock ponds, feed and pasture were insufficient to meet needs. Contingencies for feed and water were made available to producers through hay networks, motor carrier authorities and emergency water from state fishing lakes and federal reservoirs. Despite these efforts, livestock numbers in June marked the lowest cattle inventory since 1973. The risk of wildfires was high throughout the State with as many as 78 counties issuing burn bans over some period of 2012. At least 41,000 acres burned. Dry conditions in the fall of 2012 resulted in dust storms visible by satellite.

2011: Precipitation for 2011 was -8.92 inches below normal for the year statewide, with climatic divisions varying from -3.51 to -14.36 inches below normal. The Governor signed six executive orders between April and November for various drought stages over the year, increasing the number of counties to 100 in the November order including 40 counties in emergency stage. The year began with extraordinarily low winter moisture and the very little precipitation continued throughout the year. Throughout the year the severity and area affected varied. Conditions improved slightly through the end of the year. USDA agricultural disaster due to drought was declared for 70 counties in Kansas based on crop losses. Kansas agricultural losses were estimated by the Kansas Department of Agriculture at over $1.77 billion due to drought. Statewide, soil moisture was around 50 percent adequate as 2011 began but never exceeded 55 percent for topsoil moisture until November. Significant portions of southern Kansas had below normal monthly-average stream flows begin to occur in April, increasing in area and or severity each month until peaking in July.

October 2006: Kansas also experienced drought conditions in 2006. In October 2006, the U.S. Department of Agriculture designated 57 Kansas counties primary natural disaster areas because of losses caused by the combined effects of various disasters that occurred during the past year, including a late spring freeze, drought, high winds, and extreme temperatures. Provisional stream flow data from the U.S. Geological Survey indicated that several long-term low stream flow records were broken in July.

May 4, 2002–October 1, 2003: Low water in the Missouri River interfered with river barge traffic and necessitated the release of water from Milford, Tuttle Creek, and Perry Lakes. This drought caused many counties to impose water use restrictions and burn bans. Grazing was prohibited on government lands to protect the drought-stressed grass, affecting thousands of cattle. Emergency haying and grazing was allowed by the USDA on Conservation Reserve Program lands. All 105 counties were eligible for federal assistance through the USDA. The drought had a $1.1 billion impact on crop production.

1988–1992: The severity of this drought varied across the state. It was most severe in the southwestern, central, and northeastern parts of the state but minimal in the northwestern and southeastern parts. Surface-water supplies were sufficient to meet demands through the end of water year 1988, but rainfall during this period was less than 50% of the long-term average, so quantities were insufficient to maintain soil moisture or contribute to ground-water supplies. Estimated drought-related losses to 1988 crops were $1 billion. Water levels in shallow aquifers declined rapidly and led to the abandonment of many domestic water wells. The drought of 1988 continued into the 1990s, but at a reduced level.

1974–1982: This appeared to be a series of relatively short droughts at some stream gauging stations, but longer droughts at others (similar to the 1962–1972 droughts). The recurrence interval of this drought was greater than 25 years in the north-central and southeastern parts but was between 10 and 25 years across the remaining eastern two-thirds of the state. The severity of this drought could not be determined for the western third of the state.

1962–1972: The duration of this regional drought varied considerably across Kansas. Many of the streamflow records indicated alternating less than average and greater-than-average flows, while others indicated less than average flows for the entire period. The recurrence interval was generally greater than 25 years but was between 10 and 25 years in parts of the northwestern, northeastern, southern, and southeastern areas of the state.

1952–1957: This regional drought had a recurrence interval greater than 25 years statewide. One exception was in the Big Blue River Basin, where the recurrence interval was 10-25 years. Because of its severity and areal extent, this drought is used as the base period for studies of reservoir yields in Kansas. In 1954, 41 counties were declared eligible for aid under the Emergency Feed program. During this period, 175 cities reported water shortages, most of which restricted water use.

1929–1942: This drought, which includes the Dust Bowl of the 1930s, was regional in scale and affected many of the Midwestern and western states. Nevertheless, it ranks among the most significant national events of the twentieth century. The recurrence interval was greater than 25 years throughout Kansas. Drought, wind, and poor agricultural practices combined to result in enormous soil erosion. Agricultural losses were extreme, and many farms were abandoned. Effects of the drought sent economic and social ripples throughout the country, contributing to the economic, physical, and emotional hardships of the Great Depression.

In addition, the following are USDA disaster declarations related to drought.

USDA Drought Related Disaster Declarations, 2010 - 2014

Declaration Number	Declaration Date	Disaster Description	Regional Counties Involved
S3690	05/14/2014	Drought-Fast Track	Primary: Pratt and Stafford Contiguous: Barber, Barton, Edwards, Kiowa and Pawnee
S3686	05/07/2014	Drought-Fast Track	Contiguous: Barber, Pratt and Stafford
S3682	04/30/2014	Drought-Fast Track	Primary: Barber Contiguous: Comanche, Kiowa and Pratt
S3664	03/26/2014	Drought-Fast Track	Contiguous: Barber
S3663	03/26/2014	Drought-Fast Track	Primary: Barton, Edwards and Kiowa Contiguous: Barber, Comanche, Pawnee, Pratt and Stafford
S3632	05/07/2104	Drought-Fast Track	Contiguous: Comanche
S3629	01/15/2014	Drought-Fast Track	Primary: Comanche and Pawnee Contiguous: Barber, Barton, Edwards, Kiowa and Stafford
S3463	01/09/2103	Drought-Fast Track	Contiguous: Barber and Comanche
S3459	01/09/2013	Drought-Fast Track	Primary: Barber, Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford
S3302	07/17/2012	Drought-Fast Track	Contiguous: Barton and Pawnee
S3284	01/1/2012	Drought-Fast Track	Contiguous: Barber and Comanche
S3276	01/1/2012	Drought-Fast Track	Primary: Barber, Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford
S3167	09/20/2011	Drought, High Winds & Excessive Heat	Primary: Barton and Pawnee Contiguous: Barton, Edwards and Stafford
S3080	12/27/2010	Drought, High Winds, Excessive Heat	Contiguous: Barber

Source: USDA

Hazard Vulnerability and Impact

Droughts have historically had the greatest impact on the largest number of people of all weather phenomenon, according to the National Climatic Data Center (NCDC). Recent droughts, have had serious economic impacts. Between 1980 and today, 16 identified drought events within the United States have cost a combined $210 billion. As of May, 2014 647 United States counties, including all counties within the south region of Kansas, were in a drought. In addition, as of May 2014 drought conditions persist across the state. No portion of the state was in near normal conditions, and the portion of the state in abnormally dry conditions continues to shrink. Nearly 25 percent of the state is now in extreme drought conditions and 47 percent of the state is in severe drought. Warm, dry conditions will likely intensify conditions and data indicates a one and two degree severity increase has occurred in Kansas over the past month.

The following statistical analysis uses two significant factors in determining the drought vulnerability for south Kansas. One is the USDA Risk Management Agency's annualized insured crop losses as a result of drought conditions during the ten-year period of 2002 -2011, with the ratio being all sums paid as indemnities under any eligible crop insurance policy to that portion of the premium designated for anticipated losses and a reasonable reserve, other than that portion of the premium designated for operating and administrative expenses, and the number of drought vulnerable public water suppliers in Kansas from the information provided above. It was determined that all counties in south Kansas have either insured crop loss and/or drought vulnerable public water suppliers thus all counties are rated at least at a medium vulnerability rating since agriculture is a major economic factor in most south Kansas counties and public water supply is an essential service to all south Kansans.

The rating values of the two factors were divided by 50 percent to determine the total drought vulnerability rating. The total drought vulnerability rating put all counties in either the medium, medium-high or high category. The following table provides the factors considered and the rating values assigned.

Ranges for Drought Vulnerability Factor Ratings

Factors Considered	Low (1)	Low-Medium (2)	Medium (3)	Medium-High (4)	High (5)
Crop Loss Ratio Rating	.599 to 2.817	2.818 to 4.595	4.596 to 6.373	6.374 to 8.151	8.152 to 14
Drought Vulnerable Public Water Supplies Ratio Rating	1	2	3-6	7-9	10-14
Total Drought Vulnerability Rating	n/a	n/a	1	2 to 3	4+

The following table shows the variance of drought conditions by county in south Kansas using the latest available data that allows for correlation.

Regional Drought Vulnerability Rating

County	Crop Exposure (2012 Census of Agriculture)	Annualized Crop Insurance Paid/Drought Damage (2010 - 2013)	Annual Crop Claims Ratio	Crop Loss Ratio Rating	Number of Drought Vulnerable Public Water Suppliers	Drought Vulnerable Public Water Suppliers Rating	Total Rating (Crops & Water Suppliers)	Vulnerability Rating
Barber	$45,420,000	$3,224,552	7.10%	4	2	2	6	High
Barton	$96,206,000	$8,755,242	9.10%	5	2	2	7	High
Comanche	$21,783,000	$1,677,519	7.70%	4	0	0	4	High
Edwards	$126,933,000	$3,383,311	2.67%	2	0	0	2	Low-Medium
Kiowa	$63,956,000	$2,412,273	3.77%	2	0	0	2	Low-Medium
Pawnee	$92,111,000	$6,170,349	6.70%	4	0	0	4	High
Pratt	$52,353,000	$3,159,873	6.04%	3	0	0	3	Medium-High
Stafford	$74,549,000	$4,990,510	6.69%	4	0	0	4	High

Source: USDA Risk Management Agency

A drought period can last for months, years, or even decades. It is rarely a direct cause of death, though the associated heat, dust, and stress can all contribute to increased mortality. Also, as counties experience decreases in population it will create lower demands on public water suppliers.

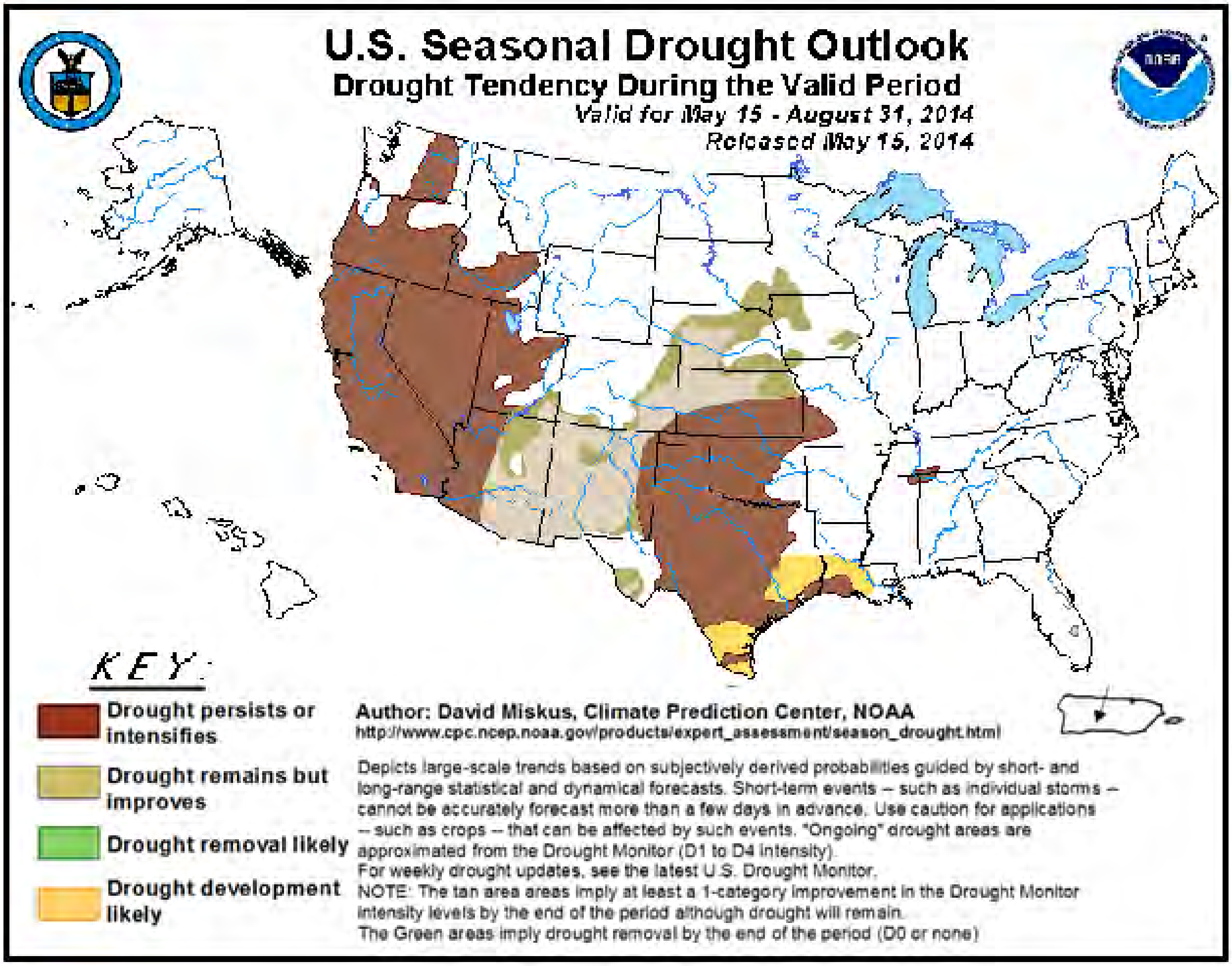
	Magnitude/Severity
Drought	2.06

Future Development

Future development of infrastructure and agricultural resources and/or increases in population would tend to increase the risk of this hazard. Increases in this type of development could potentially result in impacts on the growth and development of crops and livestock, on utility delivery due to either damage or increased demand, and on an individual basis due to foundation damages to homes. However, data indicate that farmable acres have slightly decreased and are projected to remain relatively static, and that the population is generally decreasing, which would tend to lessen the future impact of this hazard.

Probability of Future Occurrences

Although drought is not predictable, the National Oceanic and Atmospheric Administration (NOAA) long-range outlooks indicate no drought posted or predicted.



In recent years, drought has affected regional counties on a reoccurring basis. With the possibility of climate change, this hazard may affect more areas of the region more often. Based on historical Drought Impact Reporter reporting, there were 575 drought impacts in Kansas between May 2004 and May 2014, south Kansas can expect a drought occurrence at a minimum of every 3 years.

	Probability
Drought	2.63

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Drought Consequence Analysis

Subject	Ranking	Impacts of Drought
Health and Safety of Persons in the Area of the Incident	Minimal - Moderate	Drought impact tends to be agricultural however, because of the lack of precipitation water supply disruptions can occur which can affect people. Impact is expected to be minimal.
Responders	Minimal	Impact to responders is expected to be minimal.
Continuity of Operations	Minimal	Minimal expectation for utilization of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Impact to property, facilities, and infrastructure could be minimal to severe, depending on the length and intensity of the drought. Structural integrity of buildings, and buckling of roads could occur.
Delivery of Services	Minimal	Impact on the delivery of services should be non-existent to minimal, unless transportation nodes are affected.
Environment	Minimal to Severe	The impact to the environment could be severe. Drought can severely affect farming, ranching, wildlife and plants due to the lack of precipitation.
Economic Conditions	Minimal to Moderate	Impacts to the economy will be dependent on how extreme the drought is and how long it lasts. Communities that depend on water recreation could be tested, as well as agricultural. Minimal to Moderate.
Public Confidence in Jurisdiction's Governance	Minimal	Confidence could be at issue during periods of extreme drought if planning is not in place to address intake needs and loss of crops.

3.7.5 EARTHQUAKE

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Earthquake	1.00	1.50	4.00	1.00	1.60

Description

An earthquake is the movement, shaking or trembling of the ground produced by sudden displacement of rock in the Earth's crust. Earthquakes may result from the sudden collapse of a void within the earth, landslides, or volcanic activity. However, most earthquakes are caused by the release of stresses accumulated as a result of the rupture of rocks along opposing fault planes in the Earth's outer crust. These fault planes are typically found along borders of the Earth's tectonic plates, which generally follow the outlines of the continents.

The areas of greatest tectonic instability occur at the perimeters of the slowly moving plates, as these locations are subjected to the greatest strains from plates traveling in opposite directions and at different speeds. Deformation along plate boundaries causes strain in the rock and the consequent buildup of stored energy. When the built-up stress exceeds the rocks' strength, a rupture occurs. The rock on both sides of the fracture is snapped, releasing the stored energy and producing seismic waves, generating an earthquake.

Concerns about induced seismicity, or earthquake activity related to hydraulic fracturing or fracking, have been raised in some areas. Fracking is a method of enhancing oil and gas recovery from wells by injecting water, sand, and chemicals into rock formations under very high pressure to fracture the rock and release trapped hydrocarbons. According to the Kansas Geological Survey, there is no evidence that hydraulic fracturing itself triggers earthquakes (Kansas Geological Survey, Public Information Circular 32).

Earthquakes can affect large areas, cause extensive damage to property, result in loss of life and injury to people within the area of the quake, and disrupt or destroy the areas infrastructure.

	Warning Time
Earthquake	4.00

	Duration
Earthquake	1.00

Hazard Location

Overall, south Kansas is in an area of relatively low seismic activity. Based on available data, the earthquake hazard is considered roughly the same across the south Kansas planning area.

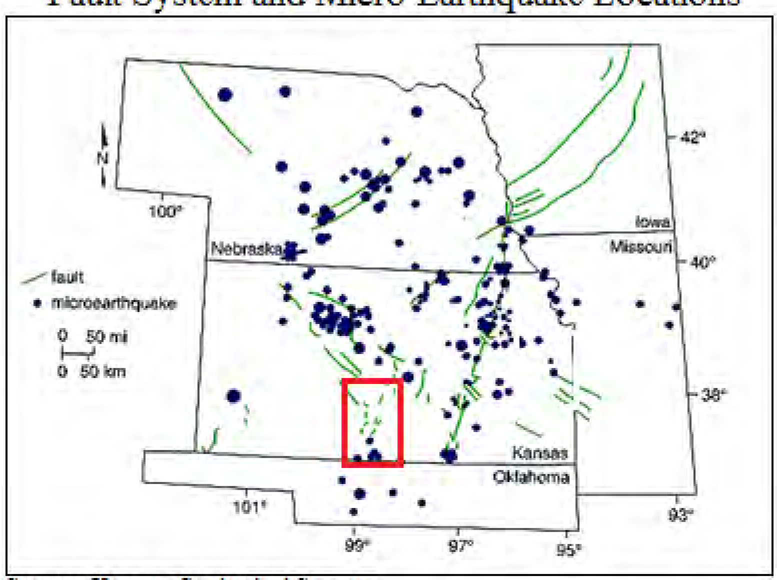
The closest series of major faults is called the Humboldt Fault Zone. Also known as the Nemaha Uplift, the Humboldt Fault Zone runs to the east of the region.

Humboldt Fault Zone

Source: Kansas Geological Survey, Earthquakes in Kansas

The following figure from the Kansas Geological Survey shows the locations of fault systems and micro earthquakes across the Midwest.

Fault System and Micro-Earthquake Locations



Source: Kansas Geological Survey

Previous Occurrences and Extent

South Kansas is in an area of relatively low seismic activity. According to a 2006 FEMA report, Kansas ranks 44th among the states in the amount of damage caused by earthquakes in an average year and 43rd in annualized earthquake loss per year. There have been no regionally centered earthquake occurrences recorded.

According to the United States Geological Survey (USGS) Earthquake Hazards Program, from 1974 to 2003 Kansas has had four earthquakes of a 3.5 or greater magnitude. This represents approximately 0.02% out of 21.080 earthquakes recorded throughout the United States during the same period.

Hazard Vulnerability and Impact

The effect of an earthquake on the Earth's surface is called the intensity. The intensity scale consists of a series of certain key responses such as people awakening, movement of furniture, damage to chimneys, and finally total destruction. The Modified Mercalli Intensity Scale is currently used in the United States. It was developed in 1931 by the American seismologists Harry Wood and Frank Neumann. This scale, composed of 12 increasing levels of intensity that range from imperceptible shaking to catastrophic destruction, is designated by Roman numerals. It does not have a mathematical basis; instead it is an arbitrary ranking based on observed effects.

Modified Mercalli Intensity Scale

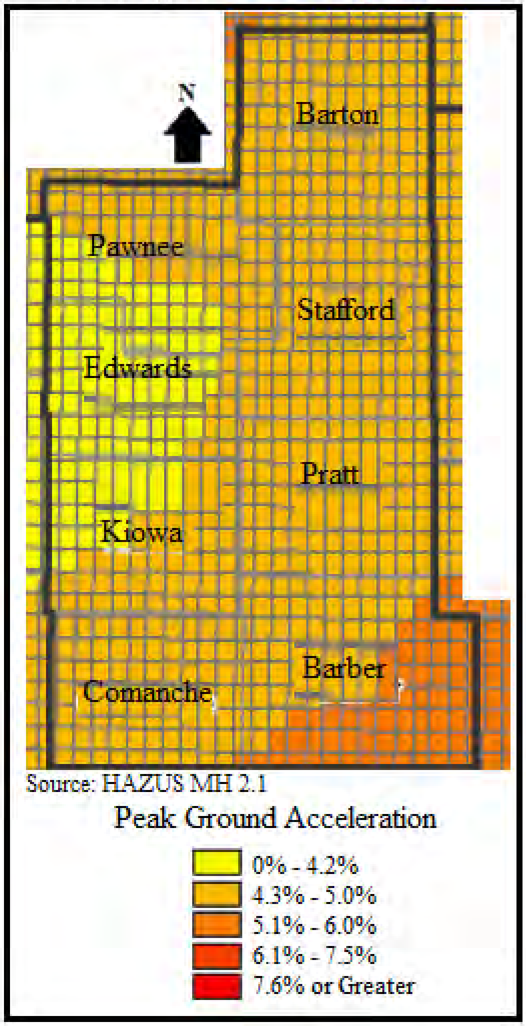
Mercalli Rating	General Effects
I. Instrumental	Generally not felt by people unless in favorable conditions.
II. Weak	Felt only by a couple people that are sensitive, especially on the upper floors of buildings. Delicately suspended objects (including chandeliers) may swing slightly.
III. Slight	Felt quite noticeably by people indoors, especially on the upper floors of buildings. Many do not recognize it as an earthquake. Standing automobiles may rock slightly. Vibration similar to the passing of a truck. Duration can be estimated. Indoor objects (including chandeliers) may shake.
IV. Moderate	Felt indoors by many to all people, and outdoors by few people. Some awakened. Dishes, windows, and doors disturbed, and walls make cracking sounds. Chandeliers and indoor objects shake noticeably. The sensation is more like a heavy truck striking building. Standing automobiles rock noticeably. Dishes and windows rattle alarmingly. Damage none.
V. Rather Strong	Felt inside by most or all, and outside. Dishes and windows may break and bells will ring. Vibrations are more like a large train passing close to a house. Possible slight damage to buildings. Liquids may spill out of glasses or open containers. None to a few people are frightened and run outdoors.

Modified Mercalli Intensity Scale Continued

Mercalli Rating	General Effects
VI. Strong	Felt by everyone, outside or inside; many frightened and run outdoors, walk unsteadily. Windows, dishes, glassware broken; books fall off shelves; some heavy furniture moved or overturned; a few instances of fallen plaster. Damage slight to moderate to poorly designed buildings, all others receive none to slight damage.
VII. Very Strong	Difficult to stand. Furniture broken. Damage light in building of good design and construction; slight to moderate in ordinarily built structures; considerable damage in poorly built or badly designed structures; some chimneys broken or heavily damaged. Noticed by people driving automobiles.
VIII. Destructive	Damage slight in structures of good design, considerable in normal buildings with a possible partial collapse. Damage great in poorly built structures. Brick buildings easily receive moderate to extremely heavy damage. Possible fall of chimneys, factory stacks, columns, monuments, walls, etc. Heavy furniture moved.
IX. Violent	General panic. Damage slight to moderate (possibly heavy) in well-designed structures. Well-designed structures thrown out of plumb. Damage moderate to great in substantial buildings, with a possible partial collapse. Some buildings may be shifted off foundations. Walls can fall down or collapse.
X. Intense	Many well-built structures destroyed, collapsed, or moderately to severely damaged. Most other structures destroyed, possibly shifted off foundation. Large landslides.
XI. Extreme	Few, if any structures remain standing. Numerous landslides, cracks and deformation of the ground.
XII. Catastrophic	Total destruction – everything is destroyed. Lines of sight and level distorted. Objects thrown into the air. The ground moves in waves or ripples. Large amounts of rock move position. Landscape altered, or leveled by several meters. Even the routes of rivers can be changed.

The following map demonstrates the ground shaking potential of a worst-case scenario 2,500-year 6.7 Magnitude earthquake. It is important to note that ground shaking potential is not only related to proximity to the fault, but also the geology involved. For example areas with high sand content are subject to higher shaking than areas with high rock content.

Ground Shaking Potential,
6.7 Magnitude Earthquake



The following table provides estimated building losses and displaced households for all counties in south Kansas as a result of a 2,500 year probabilistic 6.7 Magnitude earthquake. It should be noted that these losses are for an absolute worst-case scenario event.

Estimated Building Losses and Displaced Households due to Magnitude 6.7 Earthquake

County	Total Earthquake Losses	Displaced Households
Barber	$4,043	1
Barton	$12,535	4
Comanche	$1,217	<1
Edwards	$1,436	<1
Kiowa	$1,558	<1
Pawnee	$2,690	<1
Pratt	$5,792	2
Stafford	$2,083	<1

Regional Total	$31,354	<10

Source: HAZUS MH 2.1

Although the probability of a significant damaging earthquake is unlikely, the presence of the Humboldt fault and historical occurrences along this fault indicate that the potential does exist.

	Magnitude/Severity
Earthquake	1.50

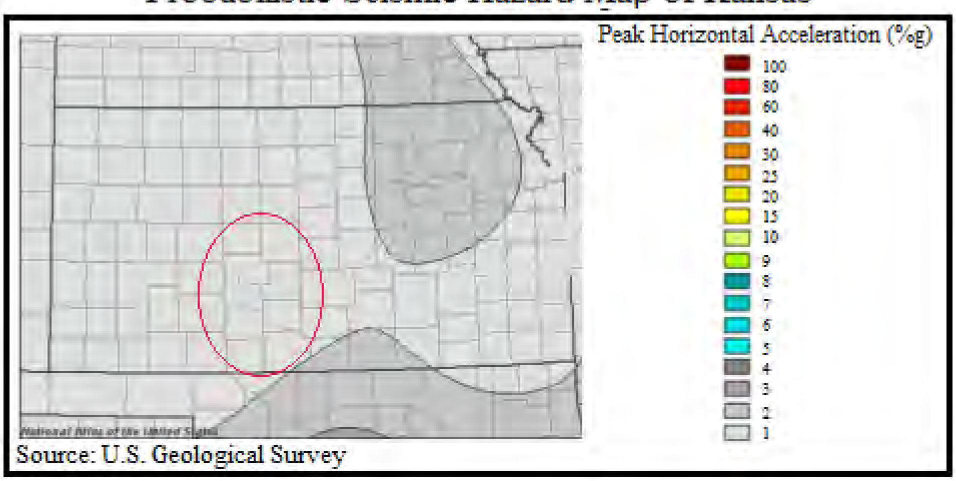
Future Development

Future development and population increase would tend to increase the likelihood of the population being impacted by an earthquake. In addition, demographic movement to major population centers with high density development would tend to increase the likelihood of the population being impacted by an earthquake. Areas with major dams or levee systems may have additional vulnerabilities. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

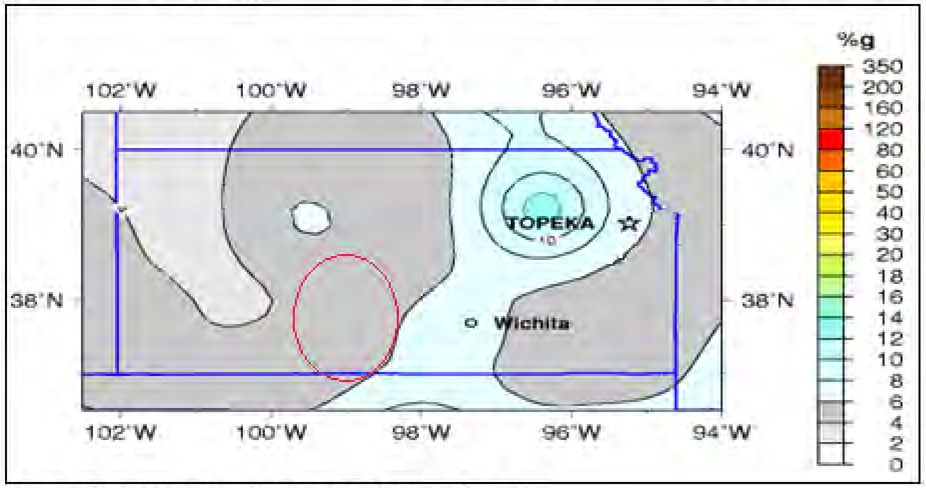
The following is a probabilistic seismic hazard map of Kansas from the USGS that depict the probability that ground motion will reach a certain level during an earthquake. The data shows peak horizontal ground acceleration (the fastest measured change in speed for a particle at ground level that is moving horizontally because of an earthquake) and shows that the shaking level that has a 10 percent chance of being exceeded over a period of 50 years.

Probabilistic Seismic Hazard Map of Kansas



The following figure presents a worst-case scenario, depicting the shaking level that has a 2 percent chance of being exceeded over a period of 50 years. Typically, significant earthquake damage occurs when accelerations are greater than 30% of gravity.

Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years



Source: National Seismic Hazard Mapping Project

Based on available data, the probability of an earthquake occurring within the south Kansas region is unlikely.

	Probability
Earthquake	1.00

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Earthquake Consequence Analysis

Subject	Ranking	Impacts of Earthquake
Health and Safety of Persons in the Area of the Incident	Minimal	Impact in the incident area expected to be minimal in the State of Kansas.
Responders	Minimal	With proper preparedness and protection, impact is expected to be minimal.
Continuity of Operations	Minimal	COOP is not expected to be activated.
Property, Facilities, and Infrastructure	Minimal	Impact to property, facilities, and infrastructure could be minimal.
Delivery of Services	Minimal	No expectation of impact on services.
Environment	Minimal	No expectation of environmental impact.
Economic Conditions	Minimal	No expected impacted.
Public Confidence in Governance	Minimal	No change in confidence

3.7.6 EXPANSIVE SOILS

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Expansive Soils	1.63	1.00	1.63	3.63	1.64

Description

A relatively widespread geologic hazard for south Kansas is the presence of soils that expand and shrink in relation to their water content. Expansive soils can cause physical damage to building foundations, roadways, and other components of the infrastructure when clay soils swell and shrink as a result of changes in moisture content. For south Kansas, the vulnerability to this hazard most frequently is associated with soils shrinking during periods of drought.

Highways, airport runways, streets, walkways and parking lots with layers of concrete and asphalt throughout south Kansas are damaged every year by the effects of expansive soils. The frequency of damage from expansive soils can be associated with the cycles of drought and heavy rainfall, which reflect changes in moisture content. Building settlements associated with drought have been noted in south Kansas for many years, particularly in buildings located on high ground, further from the water table.

	Warning Time
Expansive Soils	1.63

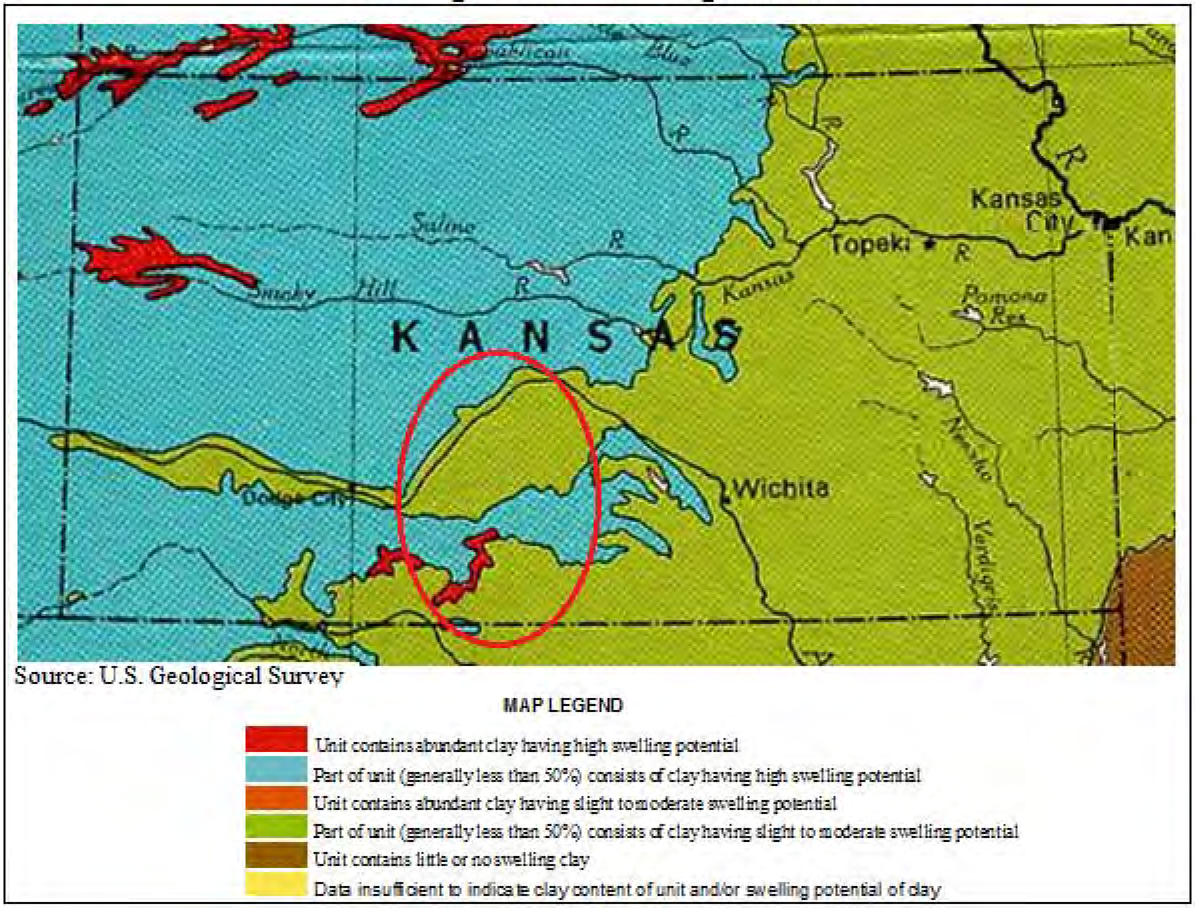
	Duration
Expansive Soils	3.63

Hazard Location

South Kansas possesses a wide array of soils with a range of permeability from moderate to low. Generally, the permeability of the soils is related to the clay content. Clay soils tend to shrink when dry and swell when wet which has large implications on underground utility infrastructure and home foundations.

The map shows the swelling potential of soils in south Kansas. All of south Kansas is located in an area where part of the soil unit consists of clay having slight to high swelling potential.

Swelling Potential of Regional Soils



Previous Occurrences and Extent

There have been no reported major regional or local expansive soil events.

Hazard Vulnerability and Impact

Expansive soils are so extensive within parts of the United States that alteration of the highway routes to avoid expansive soils is virtually impossible. The Midwest is particularly problematic for construction because of the varied mixture of clay soils. Each year in the United States, expansive soils cause billions of dollars in damage to buildings, roads, pipelines, and other structures. This is more damage than that typically caused by floods, hurricanes, tornados, and earthquakes combined. It is estimated that approximately 10 percent of the homes built on expansive soils experience significant damage. There is limited available data on this hazard and no reported occurrences.

	Magnitude/Severity
Expansive Soils	1.00

Future Development

Future development and population increase would tend to increase the likelihood of the population being impacted by expansive soil. However, damage from expansive soil to new construction is often mitigated with modern construction practices. Soil engineers and engineering geologists test soils for swell potential when designing a building's foundation. Simple observation often can reveal the presence of expansive soils and can make recommendations for septic systems, grading, earth support, drainage, foundation design, concrete slab on grade construction and site remediation. In addition, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Based on the limited distribution of soil units consisting of clay having high swelling potential, and the lack of major historical events, the probability of future hazards events is unlikely.

	Probability
Expansive Soils	1.63

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Expansive Soils Consequence Analysis

Subject	Ranking	Impacts of Expansive Soils
Health and Safety of Persons in the Area of the Incident	Minimal	Minimal impact.
Responders	Minimal	Minimal impact.
Continuity of Operations	Minimal	Minimal expectation for utilization of COOP unless structures have extensive damage.
Property, Facilities, and Infrastructure	Minimal to Moderate	Localized impact could be moderate, including structural integrity to be lost, and roadways, railways to buckle.
Delivery of Services	Minimal	Delivery of services could be impacted if infrastructure is impacted.
Environment	Moderate	Expansive soils could cause moderate damage to dams, levees, watersheds.
Economic Conditions	Minimal to Moderate	Economic impacts include rebuilding of the properties and infrastructure. Drought and extreme rain events could increase impact.
Public Confidence in Governance	Minimal	Confidence will be dependent on development trends and mitigation efforts at reducing the effect of expansive soils on new construction.

3.7.7 EXTREME TEMPERATURE

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Extreme Temperature	2.63	1.75	1.25	3.38	2.23

Description

Extreme temperature events, both hot and cold, can have severe impacts on human health and mortality, natural ecosystems, agriculture, and other economic sectors.

Extreme Temperature Definitions

Term	Definition
Extreme Heat	Extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks. Ambient air temperature is one component of heat conditions, with relative humidity being the other. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when an area of high atmospheric pressure traps moisture laden air near the ground.
Extreme Cold	Although no specific definition exists for extreme cold, an extreme cold event: can generally be defined as temperatures at or below freezing for an extended period of time. Extreme cold events are usually part of Winter Storm events but can occur during anytime of the year and can have devastating effects on agricultural production.

	Warning Time
Extreme Temperature	1.25

	Duration
Extreme Temperature	3.38

Hazard Location

The entire planning area is subject to extreme heat events and all participating jurisdictions can be affected. Regional climate data is fully discussed in Section 2.5.

Previous Occurrences and Extent

Since 1980, there have been a number of major extreme temperature events that have caused death and damage in Kansas. The following are notable heat related events for south Kansas.

Summer, 2012: A strong ridge of high pressure settled over the central portions of the U.S. beginning in June and became the dominant weather pattern for much of the Summer of 2012. This weather pattern finally broke down after the first week of August and temperatures became more seasonable. The hottest temperatures occurred on August

2nd and 4th at 107° Fahrenheit (°F). There were 6 days where the maximum temperature reached 100°F or higher and this occurred during the first week of the month. There were 20 days where the maximum temperatures reached 90°F degrees or above. Heat advisories and warnings were issued for portions of the area for the early portion of August.

Spring 2011: Central, south central and southeast Kansas experienced one of the hottest summers on record. This ranks as the fifth hottest July heat wave after 1980, 1854, 1936, and 1934.
.
January 7, 2010: An unusually cold Arctic air mass covered large areas of the state January 6th and stayed through January 9th. In addition, this Arctic air mass brought in very strong winds creating dangerous wind chills.

April 2007: The U.S. Department of Agriculture designated 68 Kansas counties primary natural disaster areas because of losses caused by unseasonably warm temperatures followed by prolonged freezing weather that occurred from April 4-10, 2007.

July 2001: Several cities experienced many days in which temperatures exceeded 100 degrees Fahrenheit. In Medicine Lodge the temperatures exceeded 100 degrees for 21 days. There were difficulties meeting increased electrical demand because of the concurrent outage of a generating station.

The following tables present NCDC data relating to extreme temperature events for the region. Please note that not all events, including many of those detailed above, may be listed in the NCDC database.

NCDC Excessive Heat Events

County	Period	Event	Number of Events	Property Damage	Crop Damage	Number of Deaths
Barber	2010-2014	Excessive Heat	0	$0	$0	0
Barton	2010-2014	Excessive Heat	2	$0	$100,000	0
Comanche	2010-2014	Excessive Heat	0	$0	$0	0
Edwards	2010-2014	Excessive Heat	0	$0	$0	0
Kiowa	2010-2014	Excessive Heat	0	$0	$0	0
Pawnee	2010-2014	Excessive Heat	0	$0	$0	0
Pratt	2010-2014	Excessive Heat	0	$0	$0	0
Stafford	2010-2014	Excessive Heat	0	$0	$0	0

Source: NCDC Storm Events Database

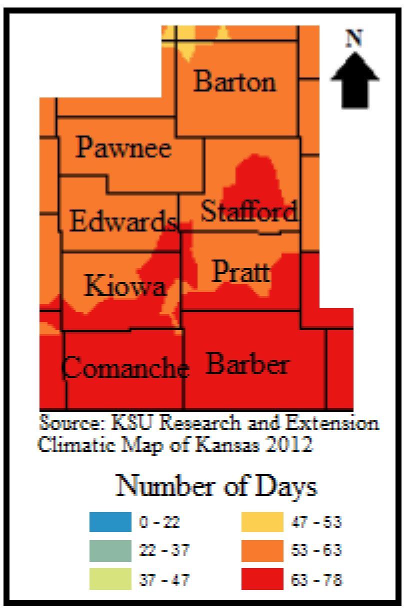
NCDC Extreme Cold Events

County	Period	Event	Number of Events	Property Damage	Crop Damage	Number of Deaths
Barber	2010-2014	Extreme Cold/ Wind Chill	0	$0	$0	0
Barton	2010-2014	Extreme Cold/ Wind Chill	0	$0	$0	0
Comanche	2010-2014	Extreme Cold/ Wind Chill	0	$0	$0	0
Edwards	2010-2014	Extreme Cold/ Wind Chill	0	$0	$0	0
Kiowa	2010-2014	Extreme Cold/ Wind Chill	0	$0	$0	0
Pawnee	2010-2014	Extreme Cold/ Wind Chill	0	$0	$0	0
Pratt	2010-2014	Extreme Cold/ Wind Chill	0	$0	$0	0
Stafford	2010-2014	Extreme Cold/ Wind Chill	0	$0	$0	0

Source: NCDC Storm Events Database

The following map show the average number of days the region experience temperatures over 90 degrees Fahrenheit from 1981 to 2010.

Average Number of Days with a High Temperature Over 90°F, 1981 to 2010



For extreme heat, the KDHE's Environmental Public Health Tracking Program has kept records of the fatalities of Kansas residents since 2000. There have been at least 144 fatalities of Kansas residents since 2000 due to heat. The year of 2011 had the most recorded fatalities with 37. According to the Homeland Security Operations Bureau of Community Health Systems Kansas Department of Health and Environment there have been 35 heat related deaths and 37 cold related deaths in the region from the period 2000 to 2012.

Temperature Related Fatalities, Statewide

Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2002	3	2.21	18	13.24
2003	5	3.68	23	16.91
2004	4	2.94	27	19.85
2005	6	4.41	33	24.26
2006	21	15.44	54	39.71
2007	11	8.09	65	47.79
2008	9	6.62	74	54.41
2009	10	7.35	84	61.76
2010	5	3.68	89	65.44
2011	37	27.21	126	92.65
2012	10	7.35	136	100

Source: Department of Health and Environment's Kansas Environmental Public Health Tracking Program

Local Events

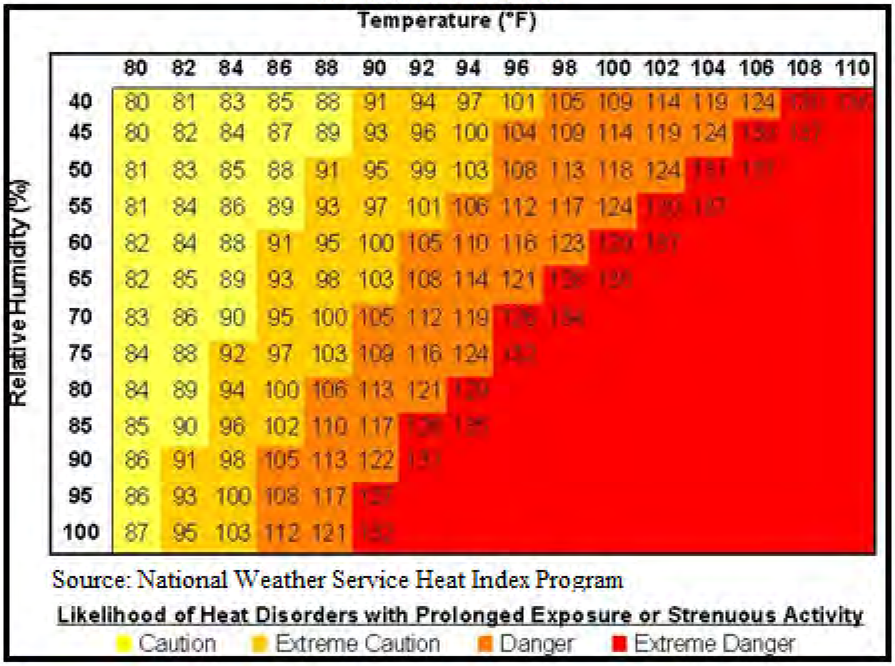
February 12, 2011: Barber County, USD #254 Barber County North: Extreme cold caused the heating system to fail and resulted in water pipes breaking. Insured losses were $5,979.

Hazard Vulnerability and Impact

The primary concerns with this hazard are human health safety issues. Specific at risk groups identified were outdoor workers, farmers, and senior citizens. Due to the potential for fatalities and the possibility for the loss of electric power due to increased strain on power generation and distribution for air conditioning, periods of extreme heat can affect the planning area.

The following Heat Index chart correlates both temperature and relative humidity to illustrate apparent, of felt, temperature.

Heat Index Chart



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Exposure to direct sun can increase Heat Index values by as much as 15° F. The zone above 105°F corresponds to a Heat Index that may cause increasingly severe heat disorders with continued exposure and/or physical activity. The following table discusses potential impacts on human health related to excessive heat.

Extreme Heat Impacts on Human Health

Heat Index (HI) Temperature	Potential Impact on Human Health
80-90° F	Fatigue possible with prolonged exposure and/or physical activity
90-105° F	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity
105-130° F	Heatstroke/sunstroke highly likely with continued exposure

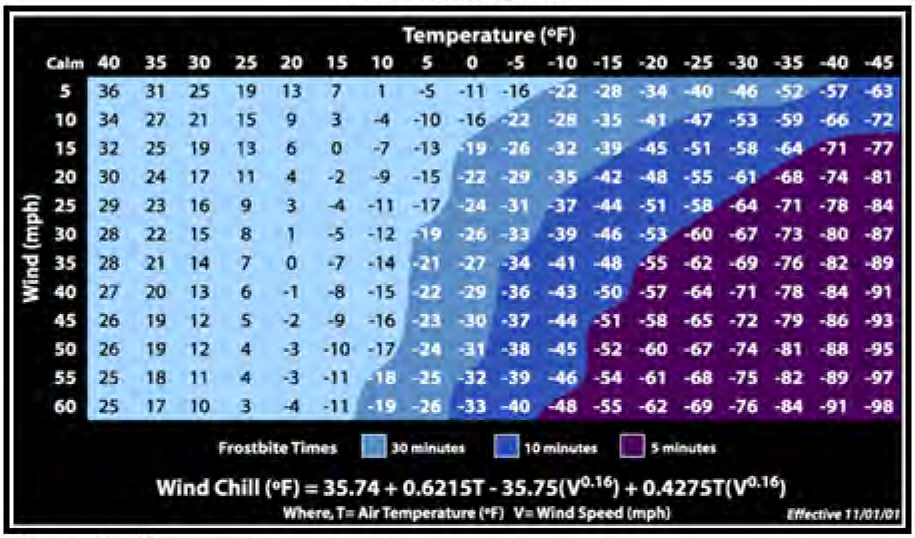
Source: National Weather Service Heat Index Program,

The National Weather Service (NWS) has a system in place to initiate alert procedures when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for issuing excessive heat alerts is when the maximum daytime Heat Index is expected to equal or exceed 105°F and the night time minimum Heat Index is 80°F or above for two or more consecutive days.

Extreme cold can cause hypothermia, an extreme lowering of the body's temperature, frostbite and death. Infants and the elderly are particularly at risk, but anyone can be affected. Other impacts of extreme cold include asphyxiation from toxic fumes from emergency heaters, household fi res, w hich c an be c aused by f ireplaces a nd em ergency h eaters, and froz en/burst water pipes. There are no specific data sources recording cold related deaths in south Kansas.

Wind can g reatly am plify t he i mpact o f co ld am bient a ir t emperatures. Th e f ollowing f igure, provided b y t he N ational W eather S ervice, shows t he re lationship of w ind s peed t o a pparent temperature an d t ypical t ime p eriods f or t he o nset o f f rostbite. Th e co mbination o f t hese elements affects the wind chill factor. The wind chill factor is the perceived temperature.

Wind Chill Chart



Temperature (°F)

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

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

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

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Source: NWS

In a ddition, extreme t emperatures may ex acerbate agricultural a nd economic l osses. The following t able pre sents agricultural l oss da ta for t he re gion for the p eriod 2002 t o 2011, the latest available data.

Total Insured Crop Insurance Paid per County from 2002-2011

County	Total Insured Crop Insurance Paid for Extreme Temperature Damages	Annualized Insured Crop Insurance Paid for Extreme Temperature Damages
Barber	$5,951,816	$595,182
Barton	$11,656,943	$1,165,694
Comanche	$1,616,942	$161,694
Edwards	$6,582,312	$658,231
Kiowa	$3,552,804	$355,280
Pawnee	$9,601,878	$960,188
Pratt	$11,587,287	$1,158,729
Stafford	$12,291,551	$1,229,155
Regional Total	$62,841,533	$6,284,153

Source: USDA Risk Management Agency

	Magnitude/Severity
Extreme Temperature	1.75

Future Development

Future development and population increase would tend to increase the likelihood of the population being impacted by extreme temperatures. Extreme temperatures tend to impact work and living conditions which may be affected due to increase demands, and potentially resultant failures of, utility systems. However, in general, the region is experiencing a population decline and a slight decline in agricultural acreage which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Although periods of extreme heat and cold occur on an annual basis, events that create a serious public health risk or threaten infrastructure capacity occur less often. An extreme heat event is more likely to occur in the months of June, July, August, and September, and an extreme cold event is more likely to occur in the months of November, December, January, February, and March. Also the EPA has projected that with climate changes in the Great Plains, temperatures will continue to increase and affect all south Kansas communities.

	Probability
Extreme Temperature	2.63

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Extreme Temperature Consequence Analysis

Subject	Ranking	Impacts of Extreme Temperature
Health and Safety of Persons in the Area of the Incident	Minimal - Severe	Depending on the duration of the event, impact is expected to be severe for unprepared and unprotected persons. Impact will be minimal to moderate for prepared and protected persons.
Responders	Minimal to Severe	Impact could be severe if proper precautions are not taken, i.e. hydration in heat, clothing in extreme cold. With proper preparedness and protection the impact would be minimal.
Continuity of Operations	Minimal	Minimal expectation for utilization of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Impact to infrastructure could be minimal to severe depending on the temperature extremes.
Delivery of Services	Minimal	Impact should be non-existent to minimal.
Environment	Severe	The impact to the environment could be severe. Extreme heat and extreme cold could seriously damage wildlife and plants, trees, crops, etc.
Economic Conditions	Minimal to Severe	Impacts to the economy will be dependent on how extreme the temperatures get, but only in the sense of whether people will venture out to spend money. Utility bills could increase causing more financial hardship.
Public Confidence in Governance	Minimal to Moderate	Confidence will be dependent on how well utilities hold up as they are stretched to provide heat and cool air, depending on the extreme. Planning and response could be challenged.

3.7.8 FLOOD

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Flood	3.25	2.88	2.50	3.13	3.01

Description

Flooding is the most frequent and costly natural hazard in the United States. During the twentieth century, floods were the leading natural disaster in the United States, representing 40 percent of all natural disasters in terms of number of lives lost, estimated at more than 10,000 deaths since 1990, and property damaged. Nearly 90% of presidential disaster declarations result from natural events where flooding was a major component. The USGS reports that nationwide, floods kill an average of 140 people each year and cause $6,000,000,000 in property damage.

Floods that threaten south Kansas are generally the result of excessive precipitation, and can be classified under three categories:

- **Flash Flood:** The product of heavy, localized precipitation in a short time period over a given location
- **Riverine Flood:** Occurs when precipitation over a given river basin for a long period of time causes the overflow of rivers, streams, lakes and drains
- **Urban Flood:** Occurs where man-made development has obstructed the natural flow of water and decreased the ability of natural groundcover to absorb and retain surface water runoff

The severity of a flooding event is generally determined by the following factors:

- The combination of stream and river basin topography and physiography
- Precipitation and weather patterns
- Soil moisture conditions
- Degree of vegetative clearing or impermeable ground cover

Riverine Floods

The NWS provides the following definitions of warnings for actual and potential flood conditions for Riverine and Urban Flooding:

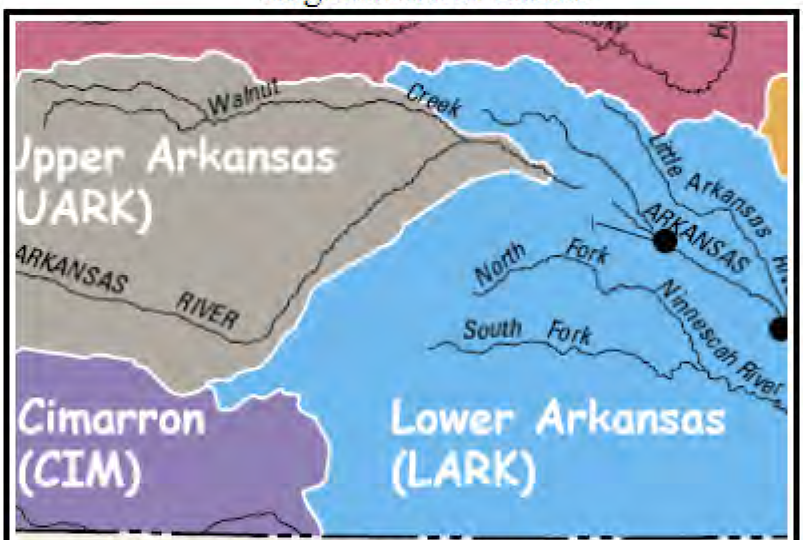
- **Flood Potential Outlook:** In hydrologic terms, a NWS outlook that is issued to alert the public of potentially heavy rainfall that could send rivers and streams into flood or aggravate an existing flood.
- **Flood Watch:** Issued to inform the public and cooperating agencies that current and developing hydro meteorological conditions are such that there is a threat of flooding, but the occurrence is neither certain nor imminent.

- **Flood Warning:** In hydrologic terms, a release by the NWS to inform the public of flooding along larger streams in which there is a serious threat to life or property. A flood warning will usually contain river stage (level) forecasts.
- **Flood Statement:** In hydrologic terms, a statement issued by the NWS to inform the public of flooding along major streams in which there is not a serious threat to life or property. It may also follow a flood warning to give later information.

Riverine flooding is defined as the overflow of rivers, streams, drains, and lakes due to excessive rainfall, rapid snowmelt or ice melt. The areas adjacent to rivers and stream banks that carry excess floodwater during rapid runoff are called floodplains. A floodplain is defined as the lowland and relatively flat area adjoining a river or stream. The terms "base flood" and "100-year flood" refer to the area in the floodplain that is subject to a one percent or greater chance of flooding in any given year. Floodplains are a larger entity called a basin, which is defined as all the land drained by a river and its branches.

A river basin is the land drained by a river and its branches. The surface waters of south Kansas flow through three river basins of the State as shown in the following figure.

Regional River Basins



Source: USGS Fact Sheet, Water Use in Kansas, 1990-2000

Flash Floods

The NWS provides the following definitions of warnings for actual and potential flood conditions for Flash Floods:

- **Flash Flood Watch**: Issued to indicate current or developing hydrologic conditions that are favorable for flash flooding in and close to the watch area, but the occurrence is neither certain or imminent.

- **Flash Flood Warning**: Issued to inform the public, emergency management and other cooperating agencies that flash flooding is in progress, imminent, or highly likely.
- **Flash Flood Statement**: In hydrologic terms, a statement by the NWS which provides follow-up information on flash flood watches and warnings.

The onset of flooding varies depending on the cause and type, with flash flooding and dam/levee failure inundation occurring typically with little or no warning time, whereas flooding caused by long periods of excessive rainfall tend to have longer durations but more gradual onset. Overall warning time is usually 6-12 hours. The duration of flood conditions is generally less than one week, but in exceptional cases can extend significantly longer.

A flash flood is an event that occurs with little or no warning where water levels rise at an extremely fast rate. Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving over the same area. Flash flooding results from intense rainfall over a brief period, sometimes combined with rapid snowmelt, ice jam release, frozen ground, saturated soil or impermeable surfaces. Flash flooding may also occur from the breaching or failure of a dam or levee.

Flash flooding is an extremely dangerous event which can reach full peak in only a few minutes and allows little or no time for protective measures to be taken by those in its path. Flash flood waters move at very high speeds with walls of water that can reach heights of 10 feet. Flash flood waters and the accompanying debris can uproot trees, roll boulders, and damage or destroy buildings, bridges, and roads. Flash flooding often results in higher loss of life, both human and animal, than slower developing river and stream flooding.

Although flash floods are somewhat unpredictable, there are factors that can point to the likelihood of flash floods occurring. Weather surveillance radar is being used to improve monitoring capabilities of intense rainfall. This, along with knowledge of the watershed characteristics, modeling techniques, monitoring, and advanced warning systems increases the warning time for flash floods.

Other Floods

In some cases, flooding may not be directly attributable to a river, stream, or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall or snowmelt, saturated ground, and inadequate drainage. With no place to go, the water will find the lowest elevations–areas that are often not in a floodplain. This type of flooding, often referred to as sheet flooding, is becoming increasingly prevalent as development outstrips the ability of the drainage infrastructure to properly carry and disperse the water flow.

In certain areas, aging storm sewer systems are not designed to carry the capacity currently needed to handle the increased storm runoff. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns. This combined with rainfall trends and rainfall extremes all demonstrate the high probability, yet generally unpredictable nature of flash flooding in the planning area.

Generally, floods are long-term events that may last for several days.

	Warning Time
Flood	2.50

	Duration
Flood	3.13

Hazard Location

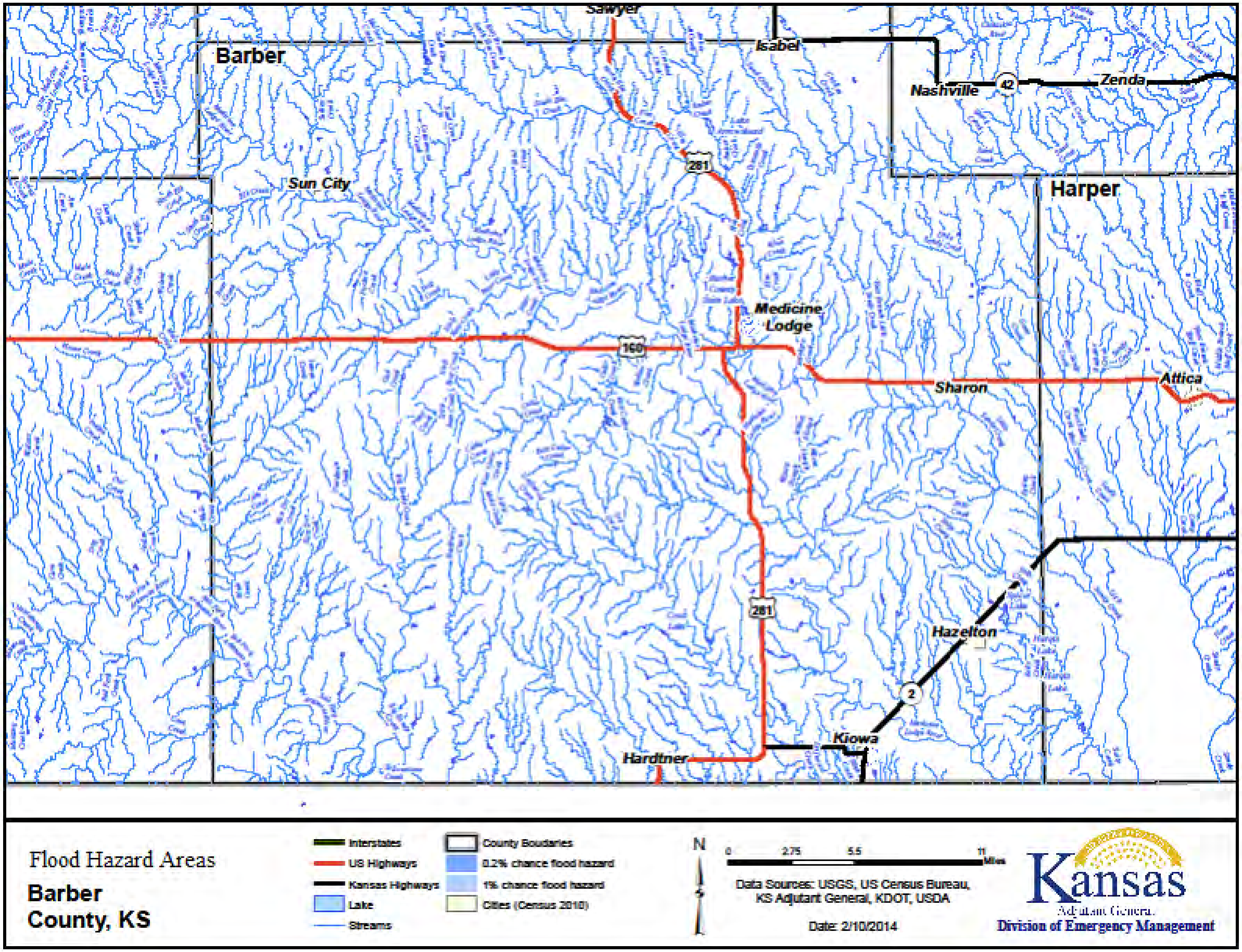
HAZUS-MH 2.1 was utilized to update the region's risk assessment for riverine flooding. Not all of the region's counties have available DFIRMS. As such, the Hazard Mitigation Planning Team decided to utilize the latest version of HAZUS, released in February 2012, as a GIS-based tool to update the Riverine Flooding Risk Assessment. HAZUS-MH 2.1 produces a flood polygon and flood depth grid that represents the base flood. While not as accurate as utilizing DFIRMs themselves, this approach ensures an "apples to apples" analysis to describe vulnerability in terms of the jurisdictions most threatened by riverine flooding, and most vulnerable to damage and loss associated with flooding events.

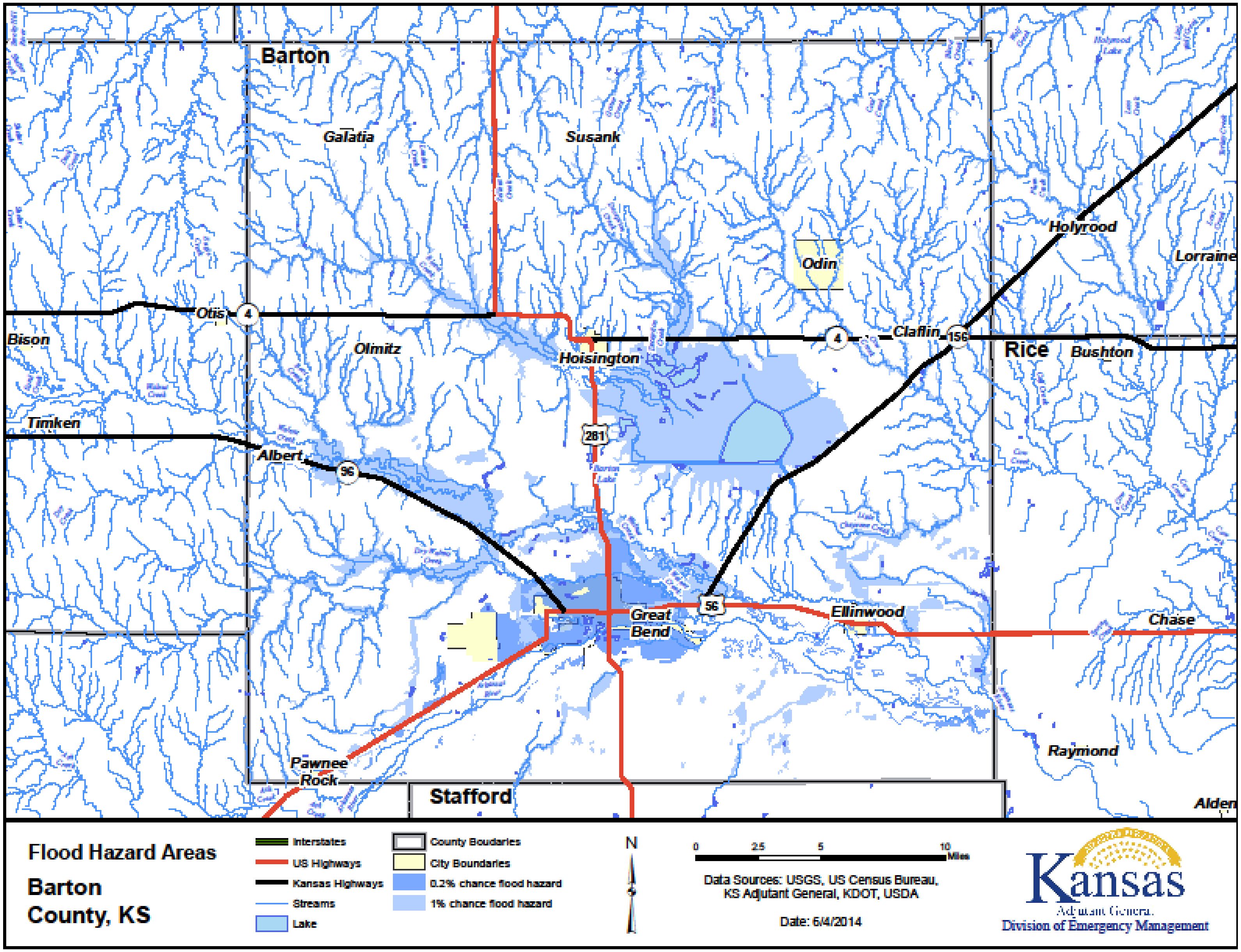
While riverine floods can and do occur at various levels, the one percent annual chance flood has been chosen as the basis for this risk assessment. This level is the accepted standard for flood insurance purposes.

Results from the HAZUS-MH 2.1 analysis will be provided throughout this section to depict floodplain areas as well as varied vulnerability and potential loss estimates. The following map provides a regional overview of the one percent annual chance floodplains in south Kansas, generated by HAZUS MH 2.1.

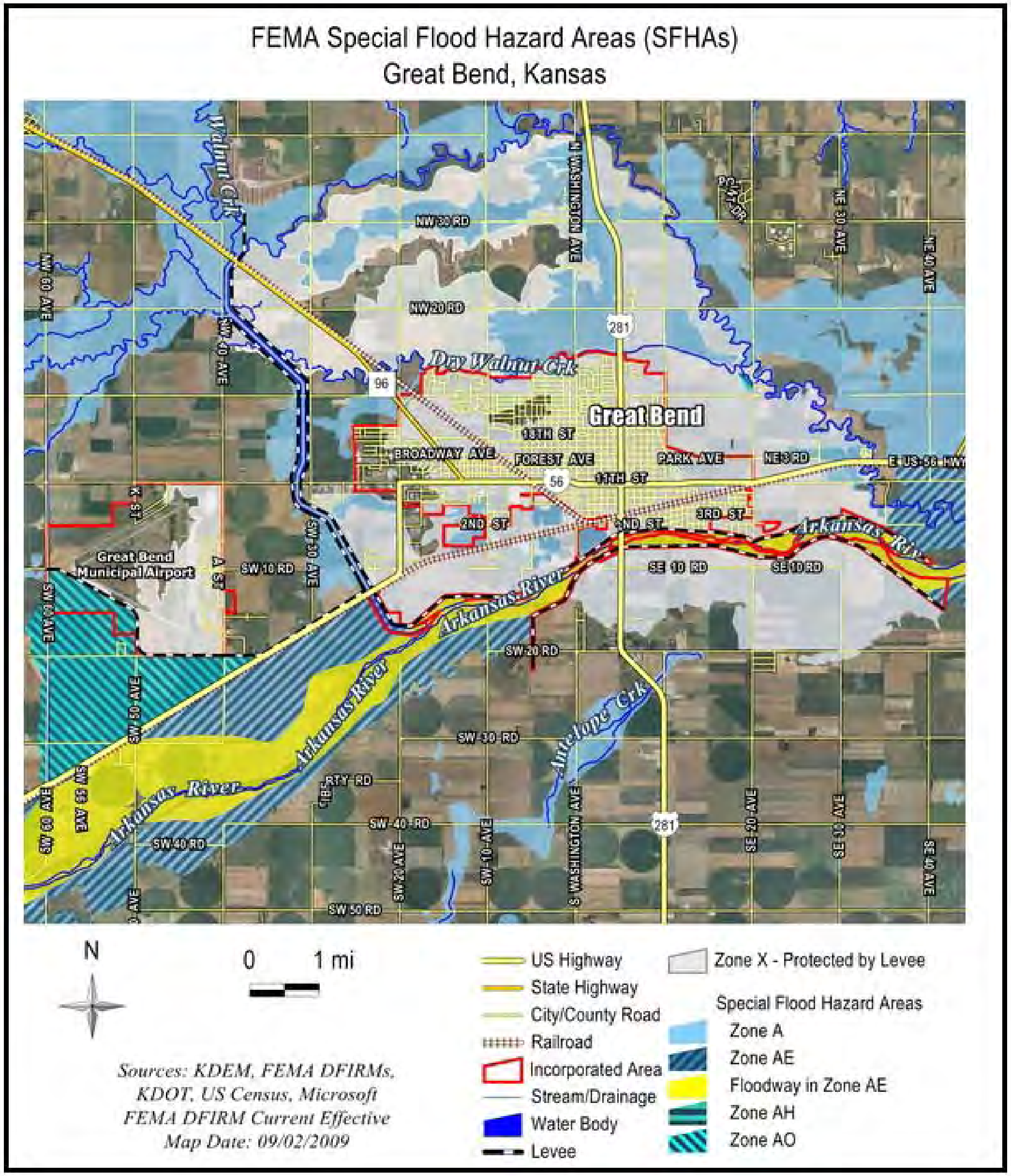
Regional HAZUS One Percent Annual Chance Floodplains

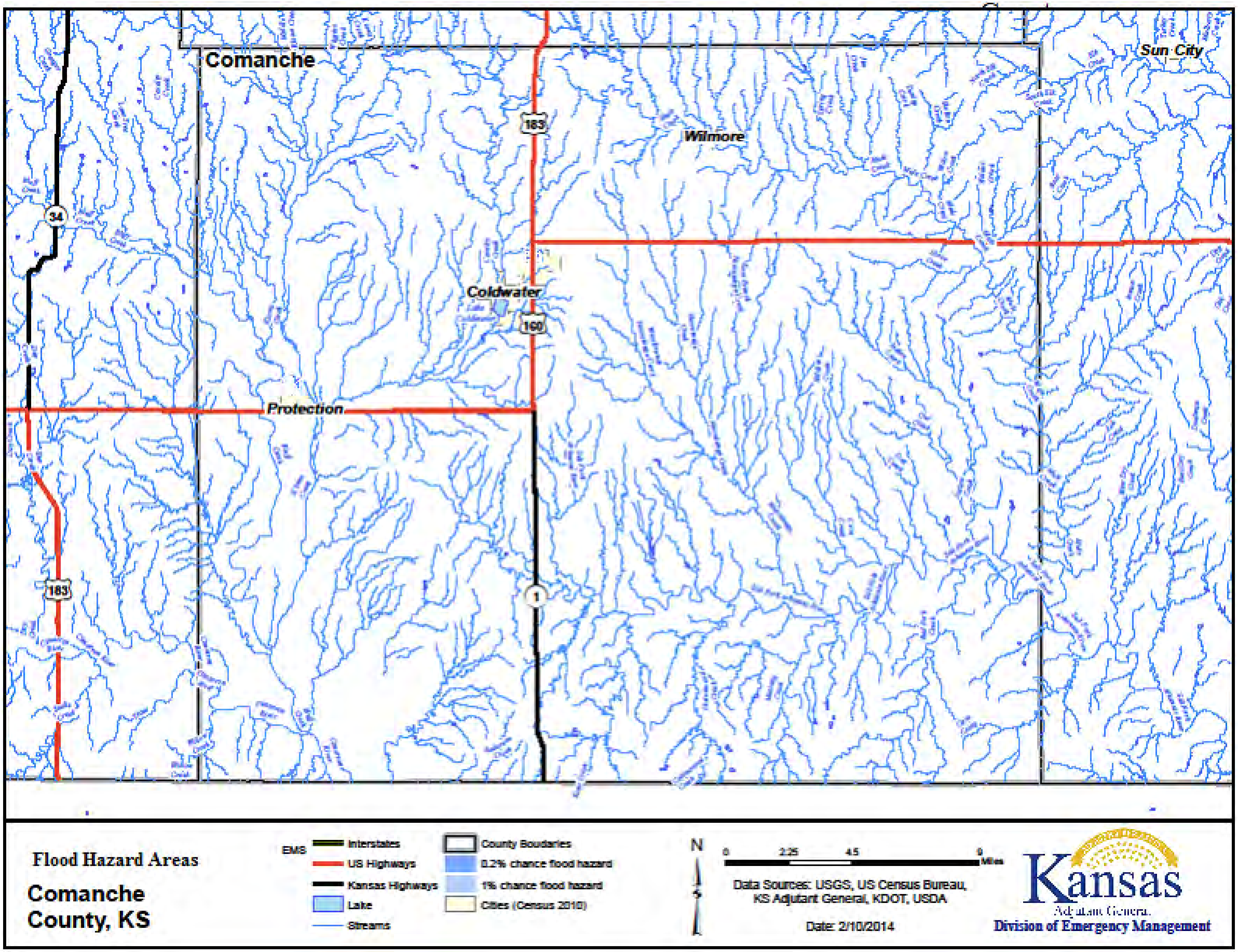
The following are available DFIRM maps for counties within south Kansas. Please note that at the time of this plan only two counties, Barton and Edwards, were fully mapped. If available, other relevant maps indicating potential flooding zones have been included.

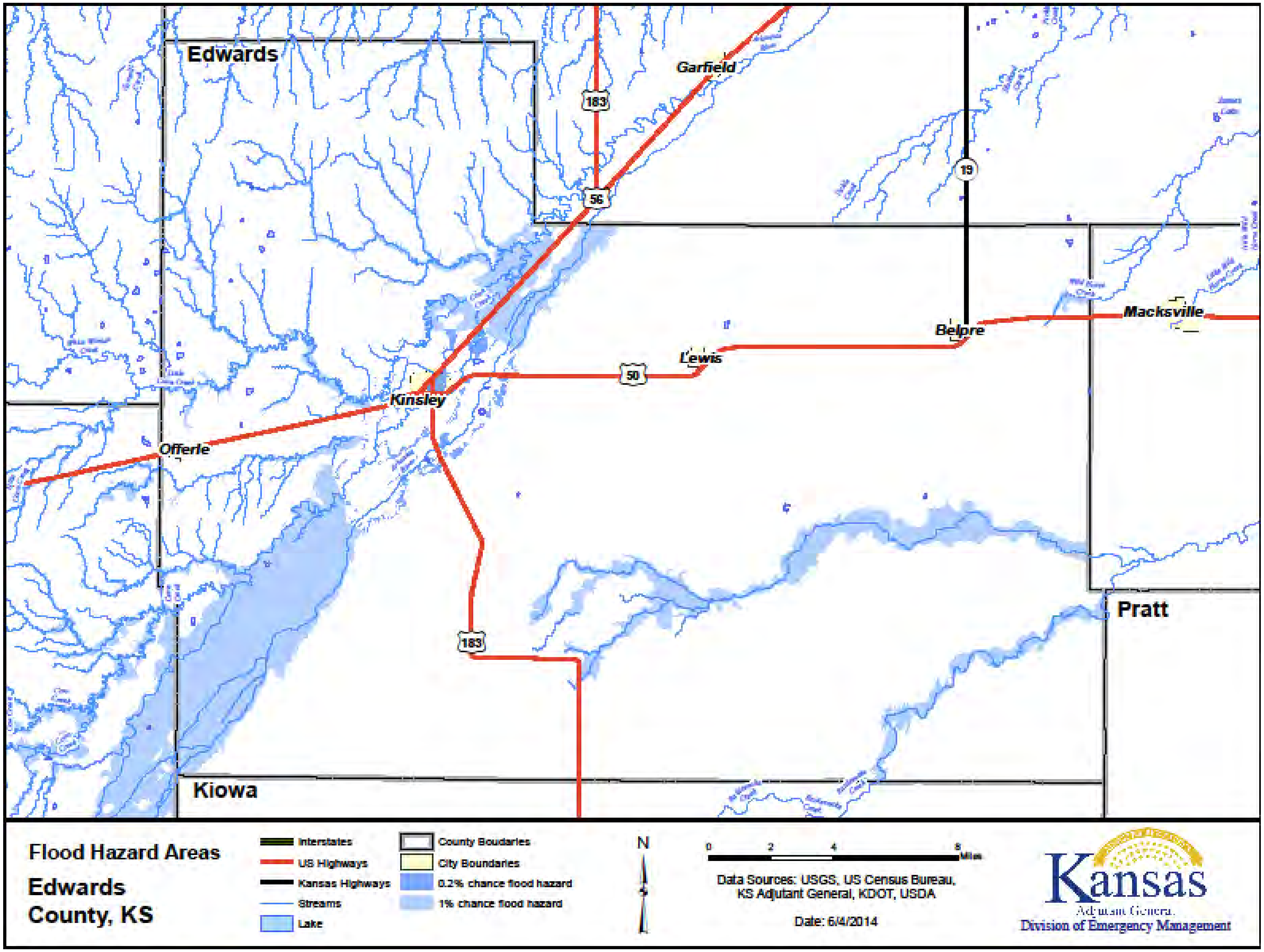

Sawyer
Barber
Isabel
Nashville
42
Zenda
281
Sun City
Harper
Medicine
Lodge
160
Sharon
Attica
281
Hazelton
2
Kiowa
Hardtner
Flood Hazard Areas
Barber
County, KS
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
0
2.75
5.5
11
Miles
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management



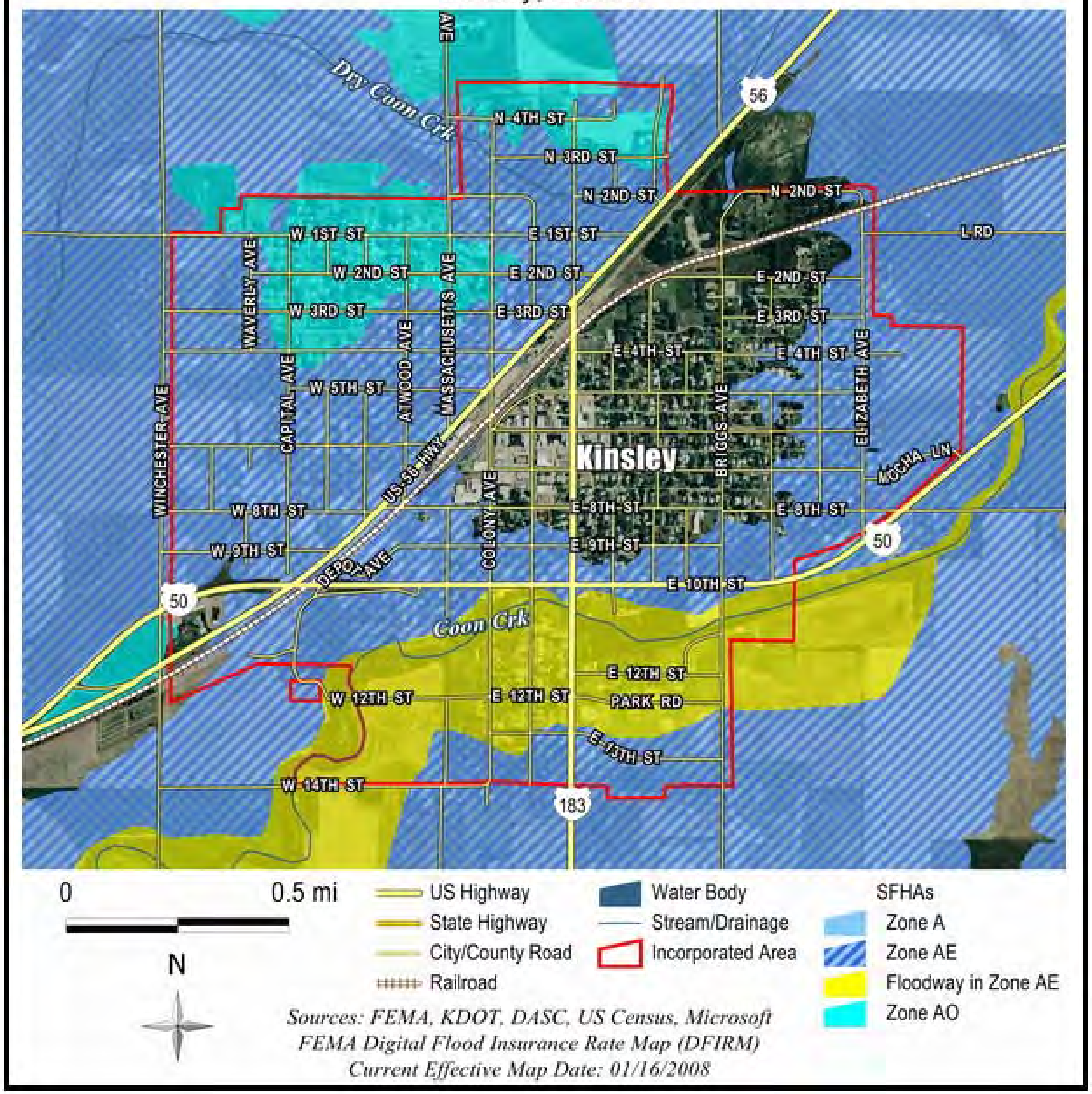
Barton
Galatia
Susank
Odin
Holyrood
Lorraine
Otis
Bison
Olmitz
Hoisington
Claflin
Rice
Bushton
Timken
Albert
Great
Bend
Ellinwood
Chase
Raymond
Pawnee
Rock
Stafford
Alden
Flood Hazard Areas
Barton
County, KS
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boudaries
City Boundaries
0.2% chance flood hazard
1% chance flood hazard
N
0 2.5 5 10 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 6/4/2014
Kansas
Division of Emergency Management

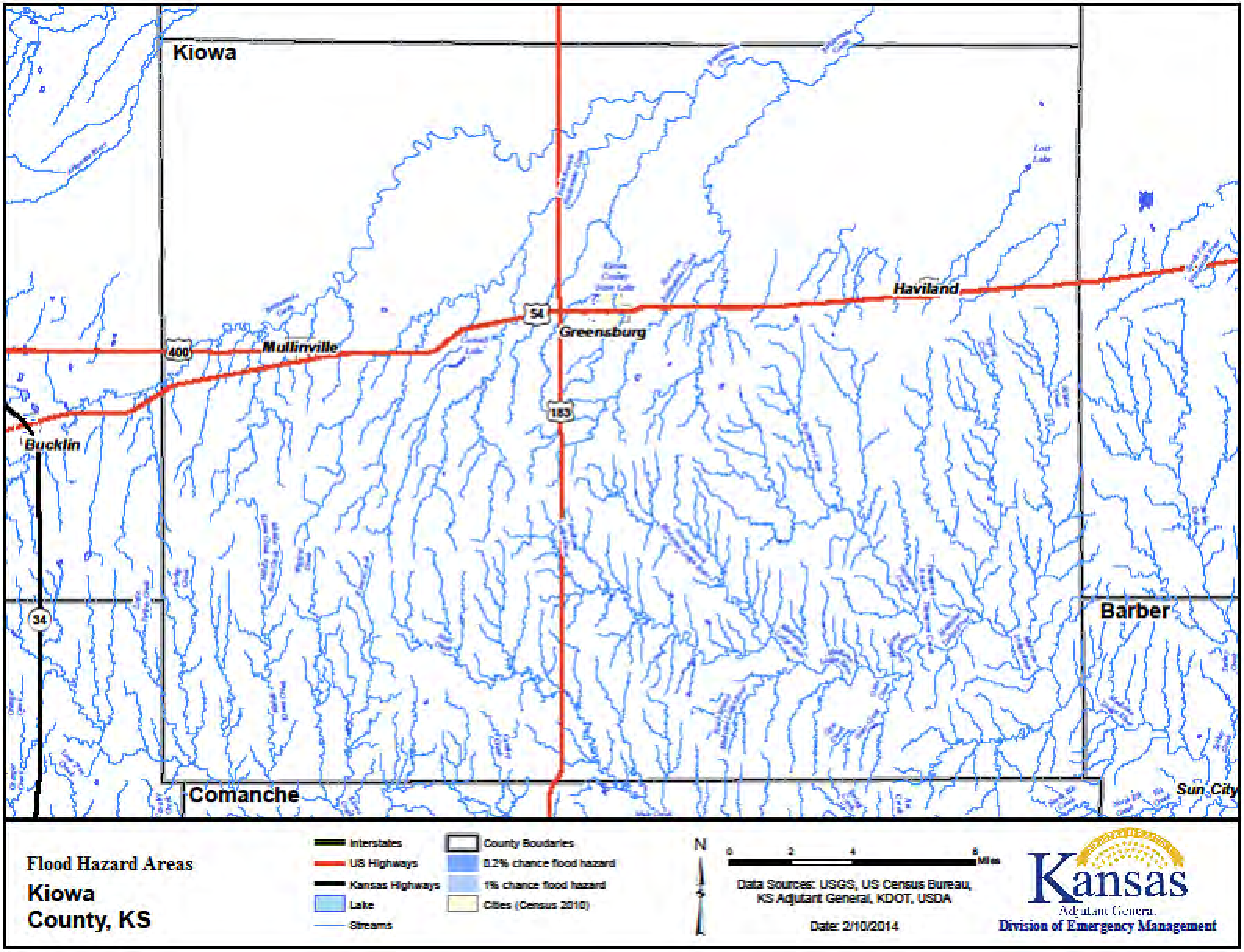

FEMA Special Flood Hazard Areas (SFHAs)
Great Bend, Kansas
Great Bend
Great Bend Municipal Airport
Walnut Crk
Dry Walnut Crk
Arkansas River
Antelope Crk
NW 30 RD
NW 20 RD
BROADWAY AVE
FOREST AVE
PARK AVE
18TH ST
10TH ST
2ND ST
3RD ST
SW 10 RD
SE 10 RD
SW 20 RD
SW 30 RD
SW 40 RD
SW 50 RD
N WASHINGTON AVE
S WASHINGTON AVE
E US-56 HWY
281
96
56
N
0 1 mi
US Highway
State Highway
City/County Road
Railroad
Incorporated Area
Stream/Drainage
Water Body
Levee
Zone X - Protected by Levee
Special Flood Hazard Areas
Zone A
Zone AE
Floodway in Zone AE
Zone AH
Zone AO
Sources: KDEM, FEMA DFIRMs, KDOT, US Census, Microsoft
FEMA DFIRM Current Effective Map Date: 09/02/2009

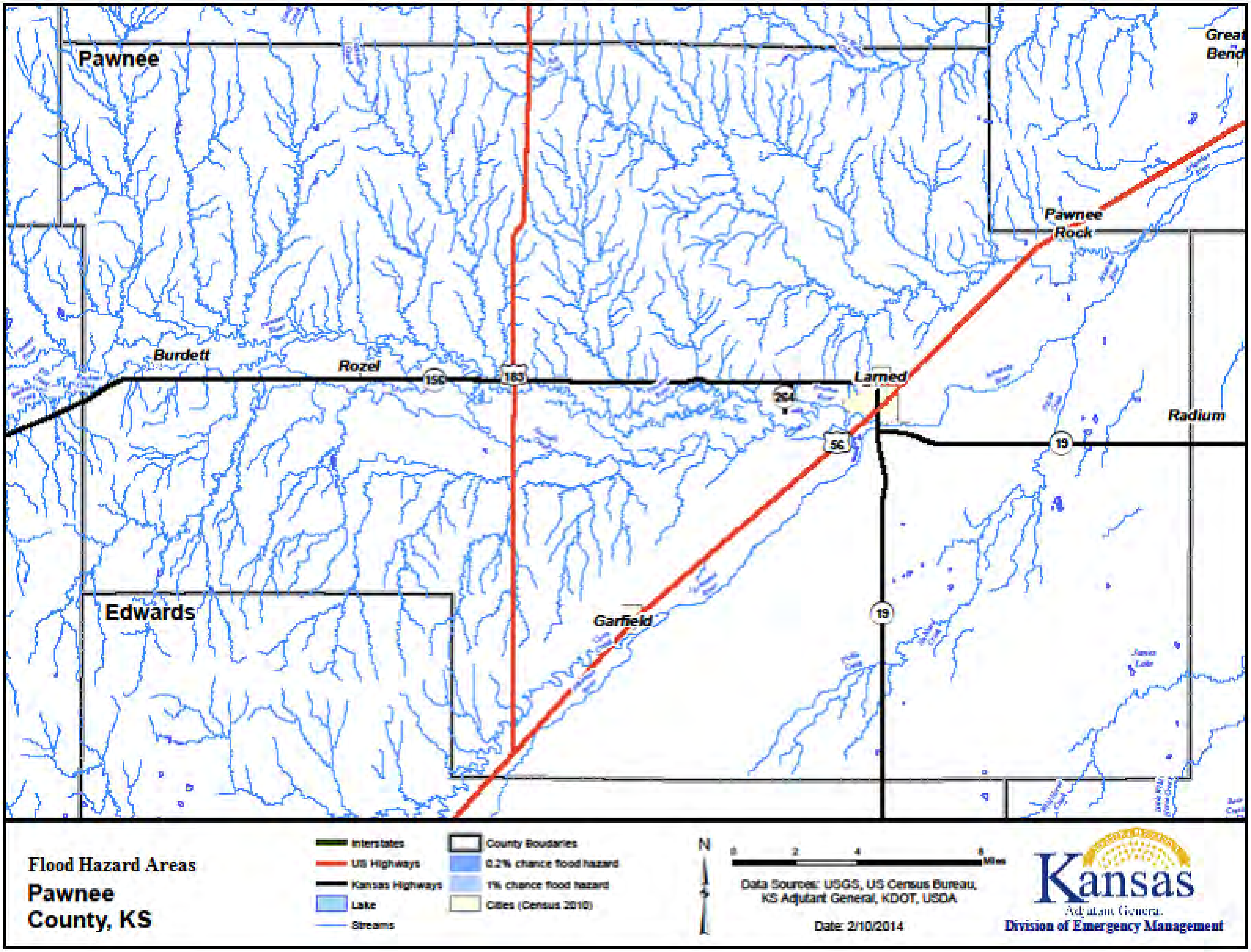

Comanche
Sun City
Wilmore
Coldwater
Protection
183
160
34
1
Flood Hazard Areas
Comanche County, KS
EMS
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
0 2.25 4.5 9 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management


Edwards
Garfield
Kinsley
Offerle
Lewis
Belpre
Macksville
Pratt
Kiowa
183
56
50
19
Flood Hazard Areas
Edwards County, KS
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boudaries
City Boundaries
0.2% chance flood hazard
1% chance flood hazard
N
0 2 4 8 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 6/4/2014
Kansas
Adjutant General
Division of Emergency Management

FEMA Special Flood Hazard Areas (SFHAs)
Kinsley, Kansas

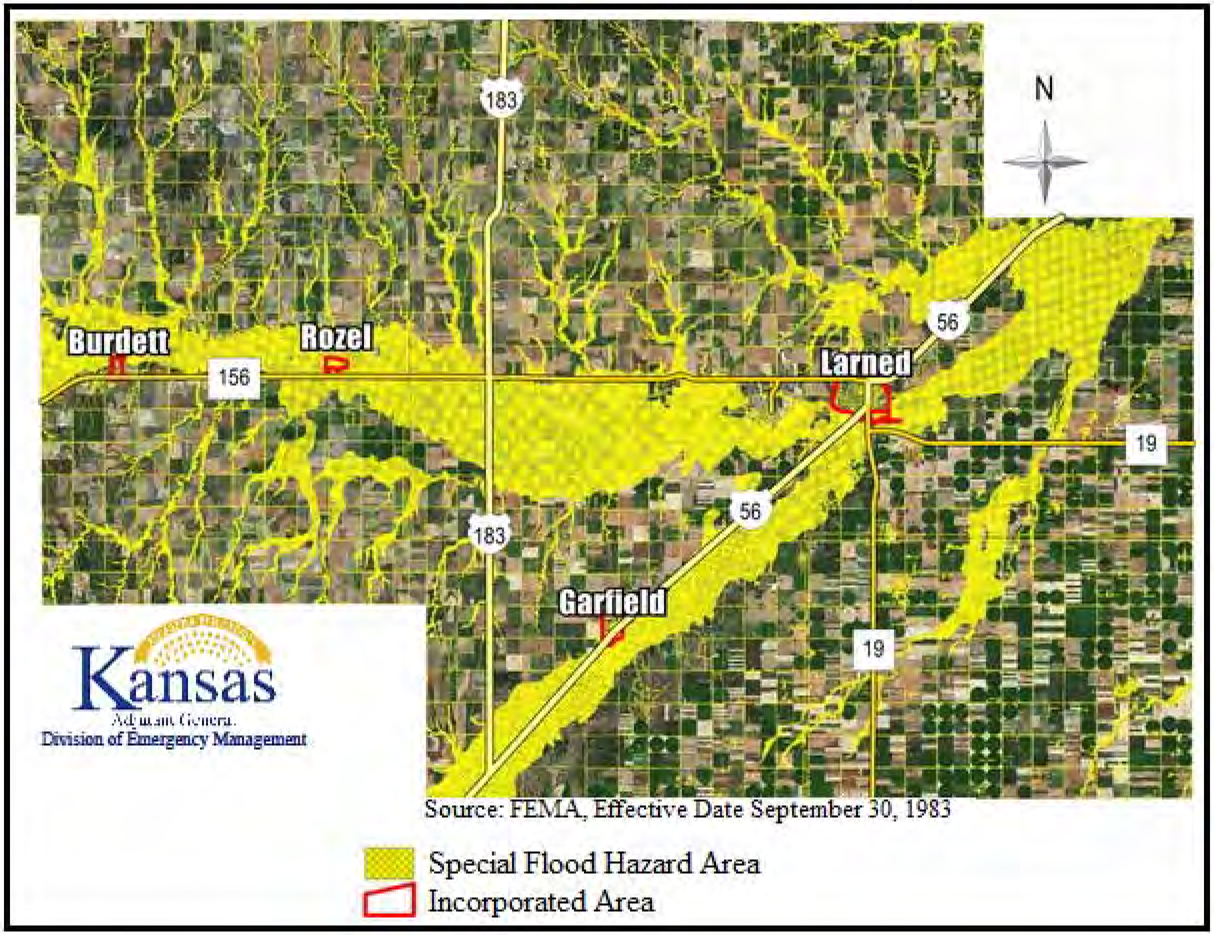


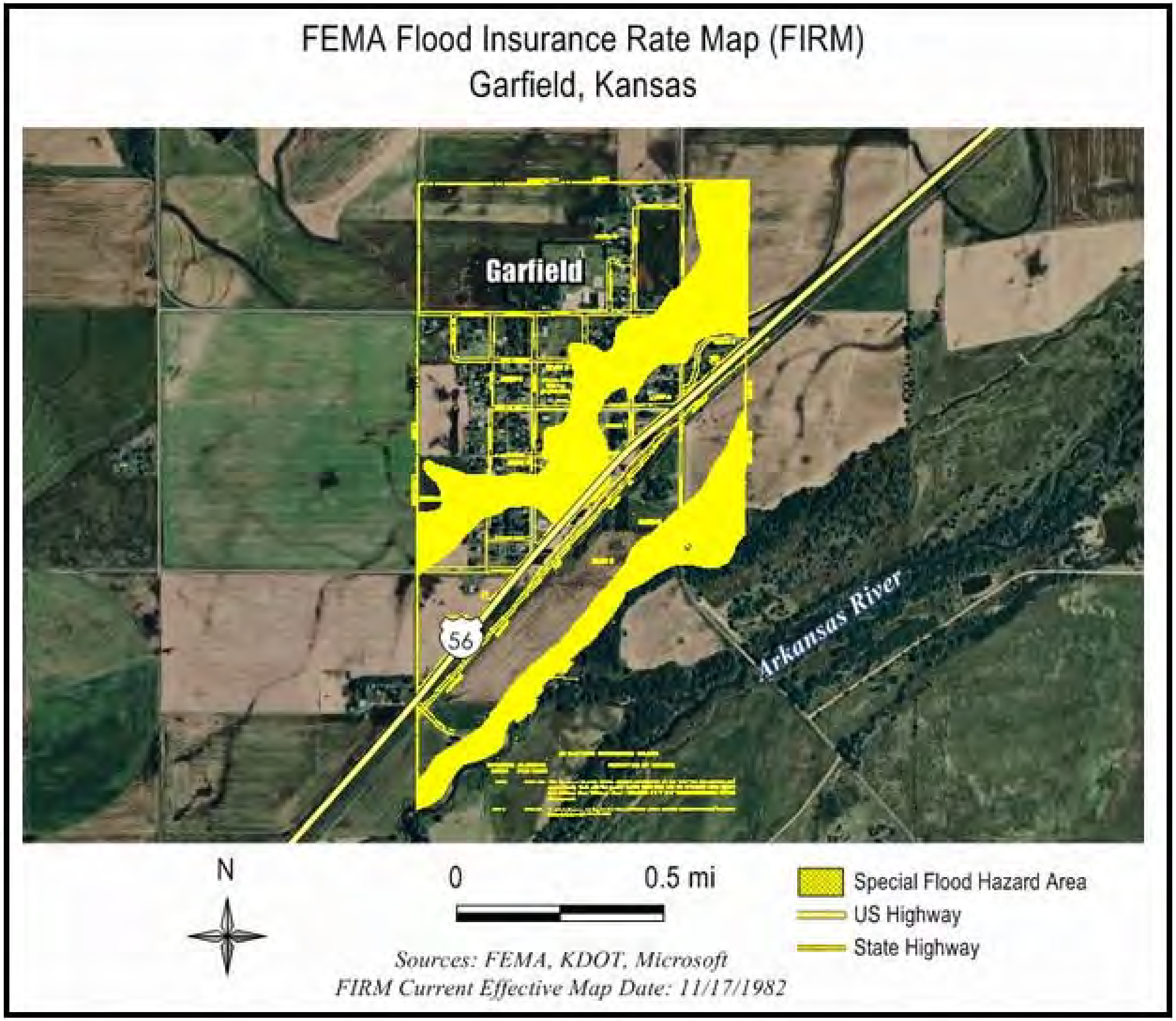

Kiowa
Haviland
Greensburg
Mullinville
Bucklin
Barber
Comanche
Sun City
54
400
183
34
Flood Hazard Areas
Kiowa
County, KS
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
0
2
4
8
Miles
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management

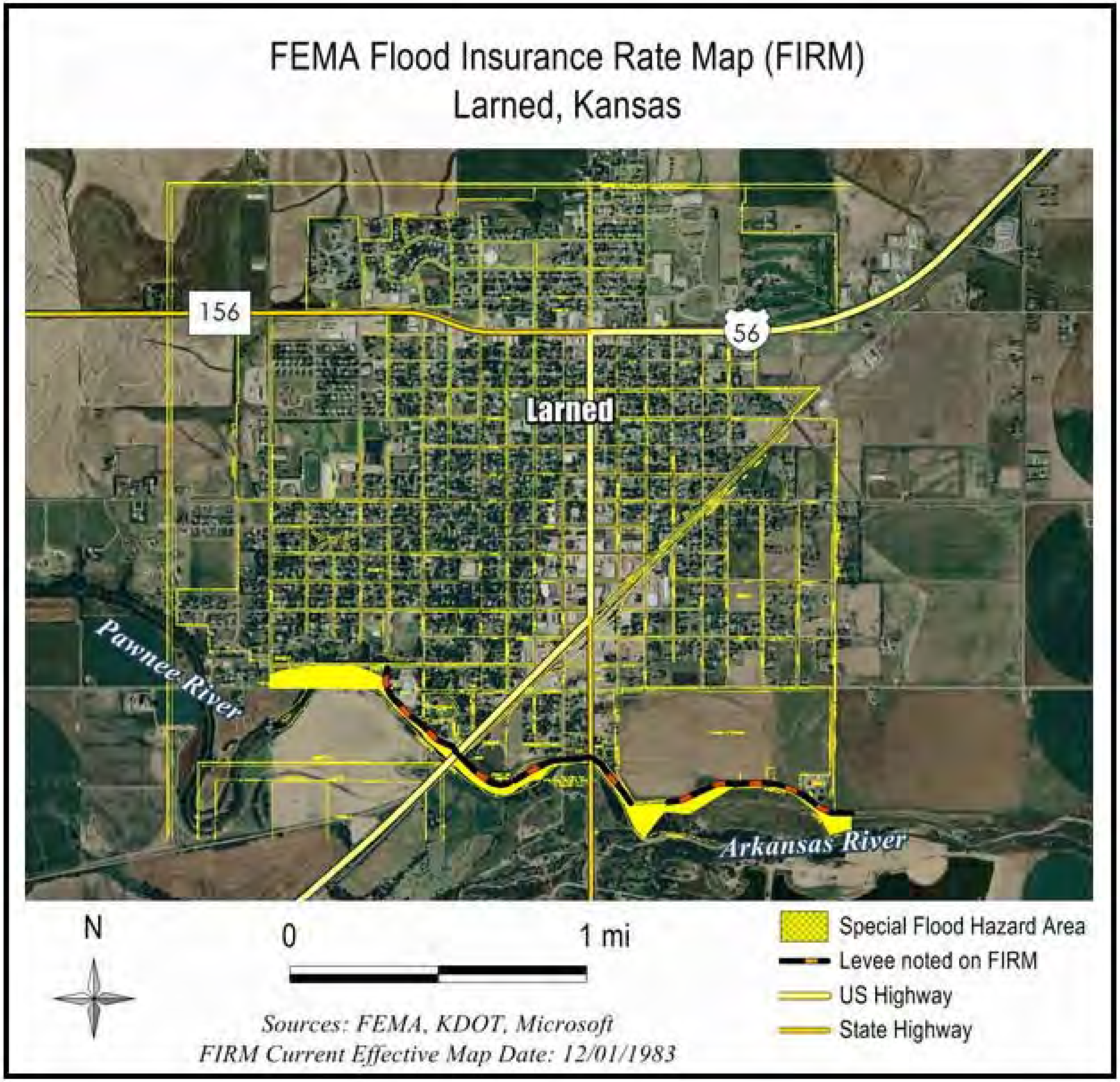


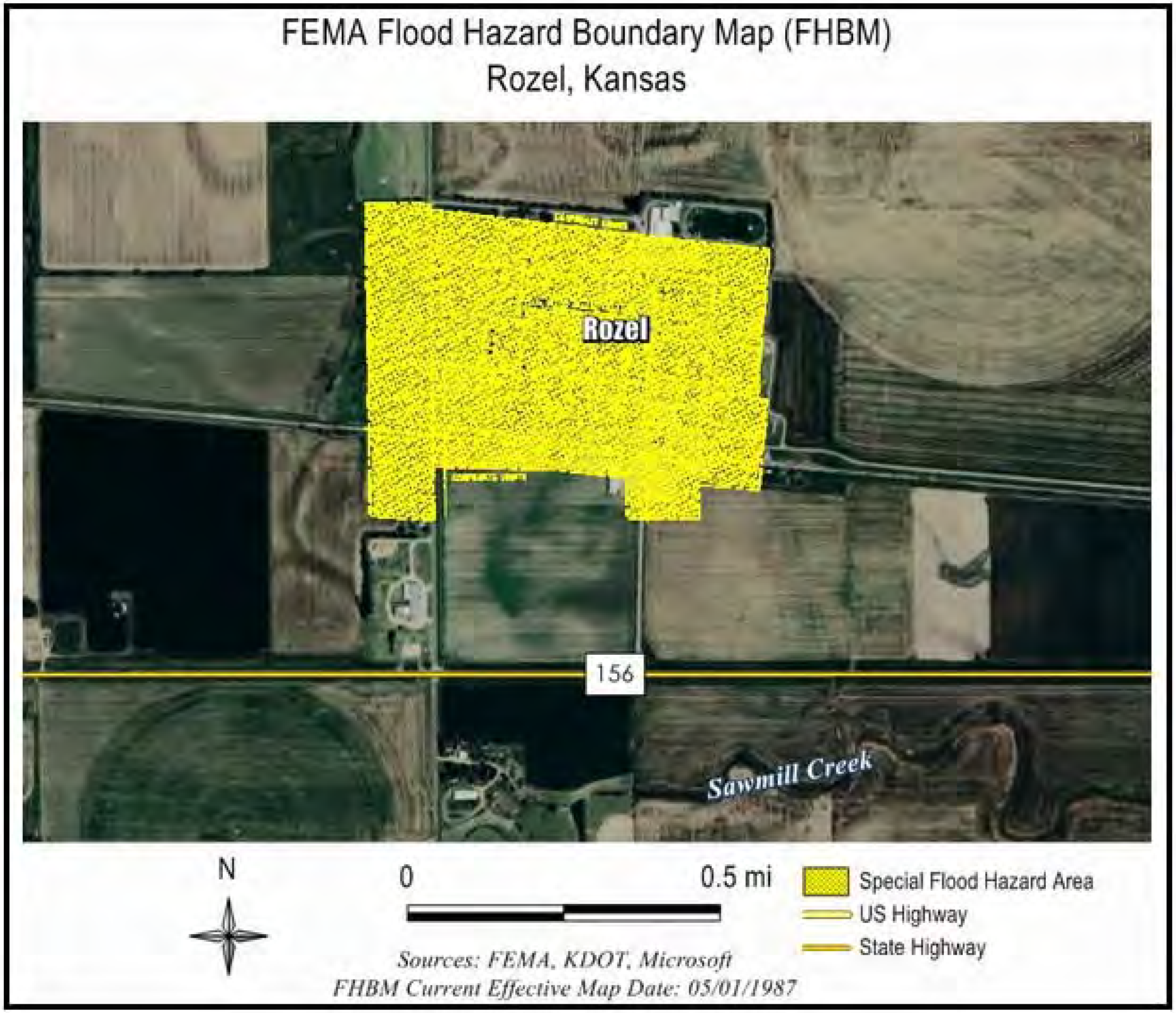
Pawnee
Great Bend
Pawnee Rock
Burdett
Rozel
Larned
Radium
Edwards
Garfield
156
183
264
56
19
19
Flood Hazard Areas
Pawnee County, KS
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
0 2 4 8 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management

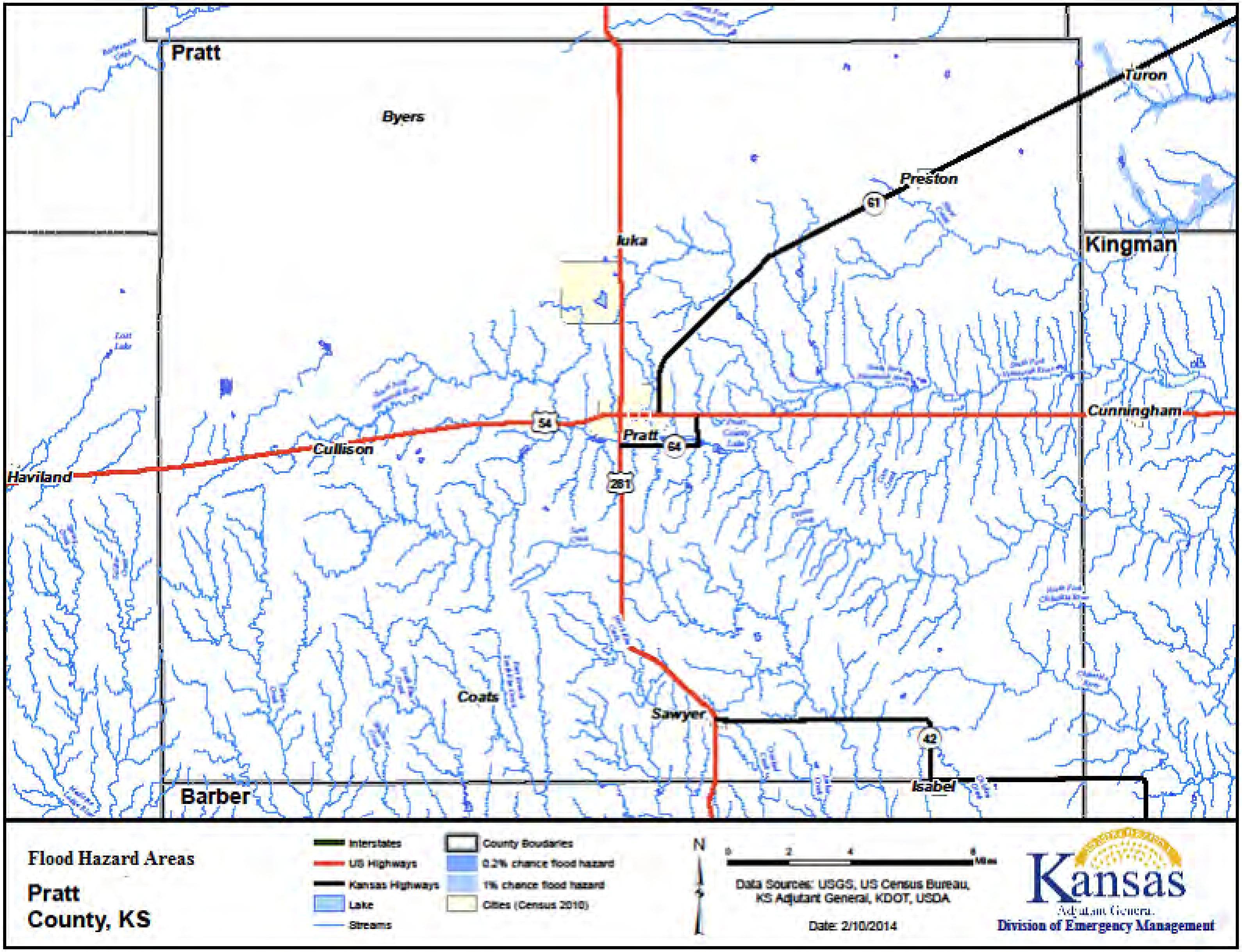
FEMA FIRM Panel, Pawnee County



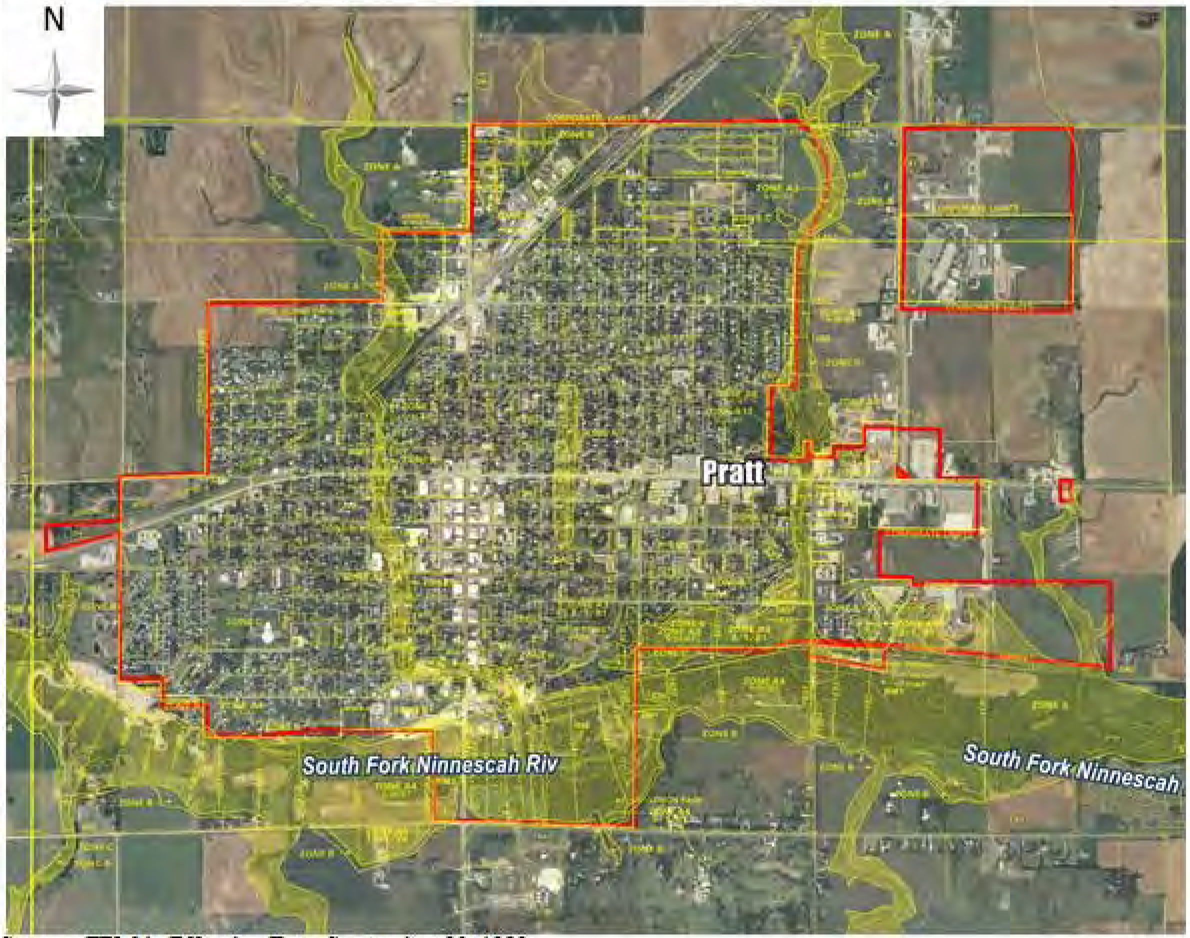

FEMA Flood Insurance Rate Map (FIRM)
Garfield, Kansas
Garfield
56
Arkansas River
N
0
0.5 mi
Special Flood Hazard Area
US Highway
State Highway
Sources: FEMA, KDOT, Microsoft
FIRM Current Effective Map Date: 11/17/1982


FEMA Flood Insurance Rate Map (FIRM)
Larned, Kansas
156
56
Larned
Pawnee River
Arkansas River
N
0
1 mi
Special Flood Hazard Area
Levee noted on FIRM
US Highway
State Highway
Sources: FEMA, KDOT, Microsoft
FIRM Current Effective Map Date: 12/01/1983


FEMA Flood Hazard Boundary Map (FHBM)
Rozel, Kansas
Rozel
156
Sawmill Creek
N
0
0.5 mi
Special Flood Hazard Area
US Highway
State Highway
Sources: FEMA, KDOT, Microsoft
FHBM Current Effective Map Date: 05/01/1987


Pratt
Byers
Preston
Turon
Kingman
Iuka
Cunningham
Pratt
Cullison
Haviland
Coats
Sawyer
Isabel
Barber
54
61
64
281
42
Flood Hazard Areas
Pratt County, KS
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management

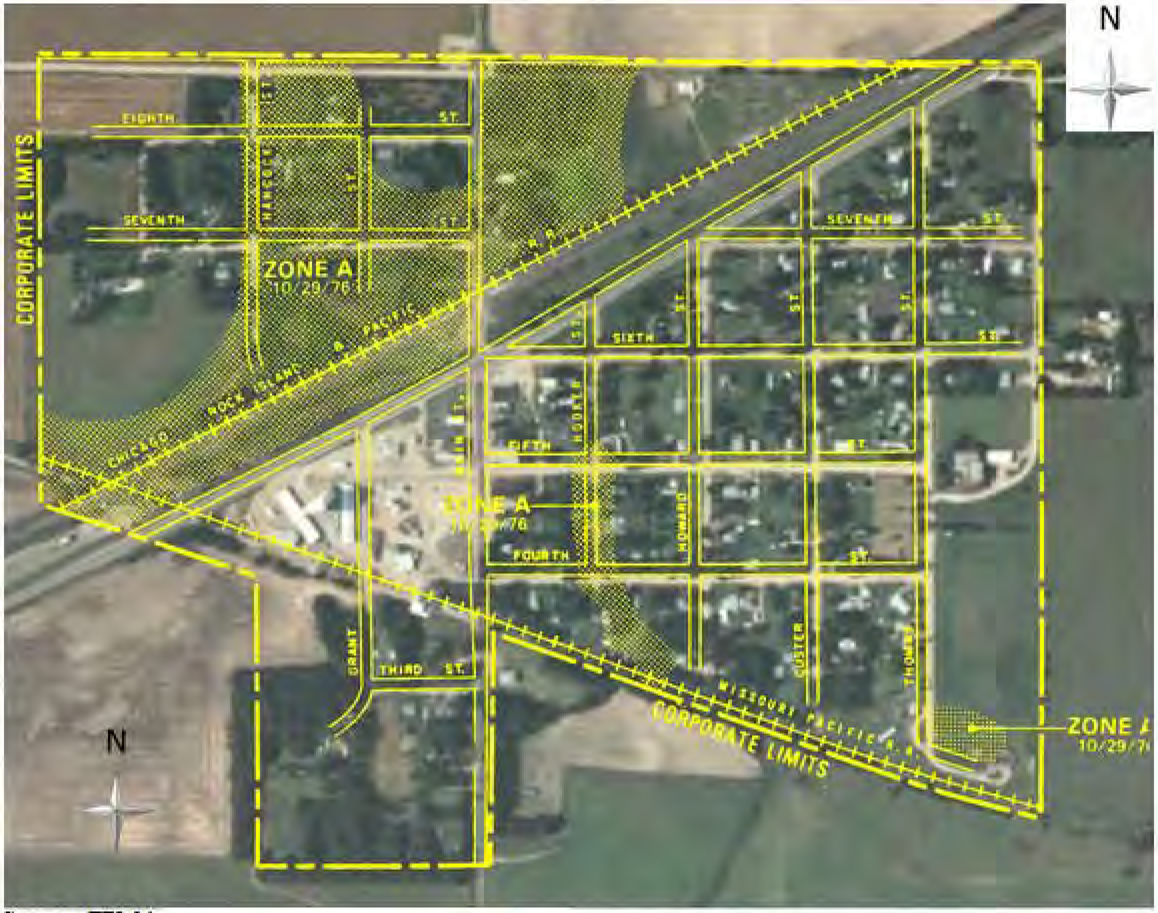
FEMA Flood Insurance Rate Map, City of Pratt, Pratt County



Source: FEMA, Effective Date September 30, 1983

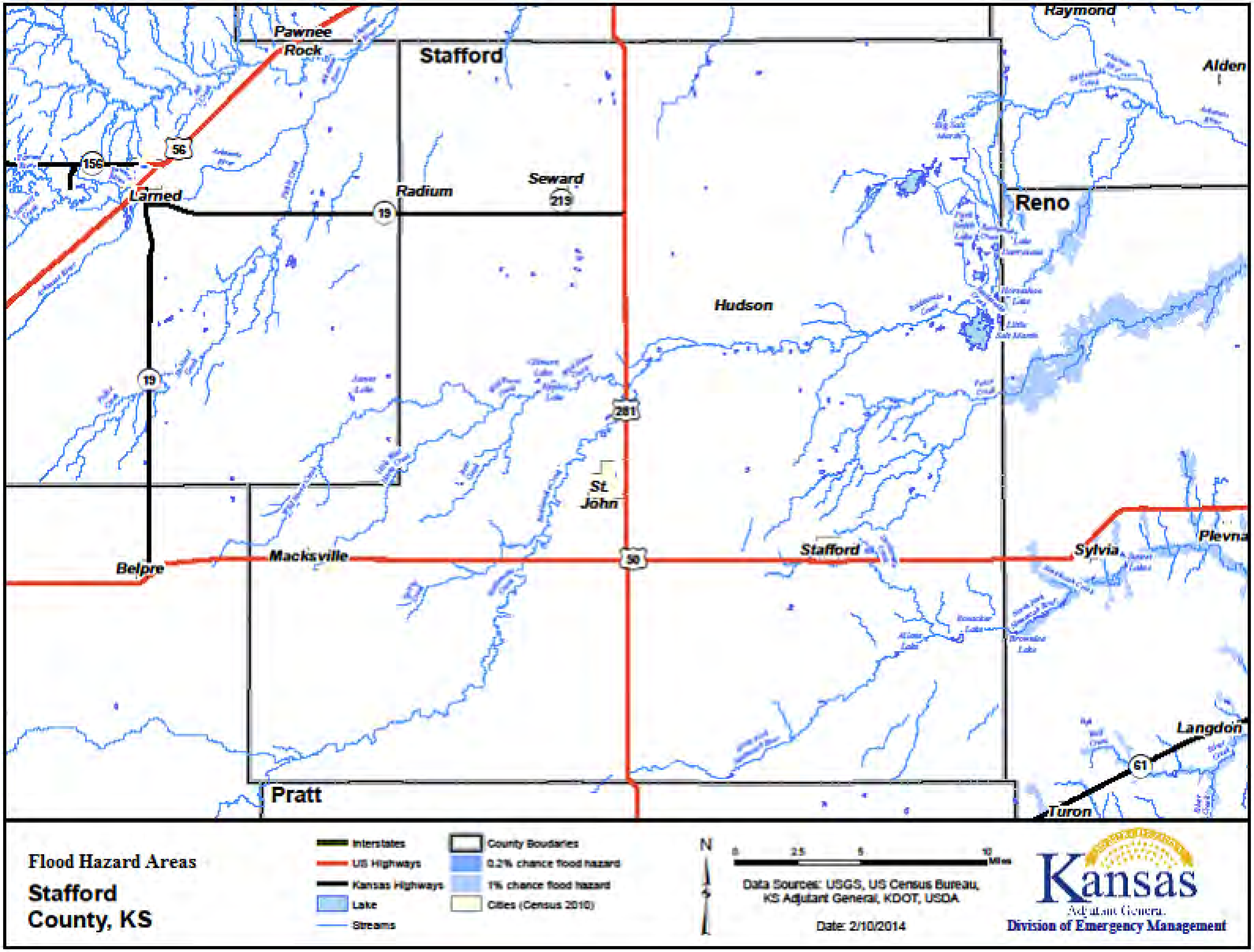
Special Flood Hazard Area
Stream/Drainage

FEMA Flood Insurance Rate Map, City of Preston, Pratt County



Source: FEMA

Special Flood Hazard Area


Raymond
Pawnee
Rock
Stafford
Alden
Larned
Radium
Seward
Reno
Hudson
St. John
Macksville
Belpre
Stafford
Sylvia
Plevna
Langdon
Turon
Pratt
Flood Hazard Areas
Stafford County, KS
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
0 2.5 5 10 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Division of Emergency Management

FEMA Flood Insurance Rate Map, City of Stafford, Stafford County

Source: FEMA, Effective Date August 26, 1980

Special Flood Hazard Area

Previous Occurrences and Extent

In the past ten years, 11 Presidential Disaster Declarations for major floods have been declared for south Kansas. Details about some of these events can be found on the following pages. Please note that some of the Presidential Disaster Declarations included flooding (primarily flash flooding) as a secondary cause of damages.

Regional Presidential Declarations Involving Flooding

Declaration Number	Declaration Date*	Disaster Description	Regional Counties Involved	Disaster Cost**
4150	10/22/2013 (7/22/2013 - 08/16/2013)	Severe Storms, Winds, Tornados and **Flooding**	Barber, Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford	-
4063	05/24/2012 (4/14-4/15/2012)	Severe Storms, Tornados, Straight-line Winds and **Flooding**	Edwards, Kiowa and Stafford	$6,923,919
4010	07/29/2011 (5/19-6/4/2011)	Severe Storms, Straight-line Winds, Tornados and **Flooding**	Barton and Stafford	$8,259,620
1932	08/10/2010 (6/7-7/21/2010)	Severe Storms, **Flooding** and Tornados	Comanche, Kiowa and Pawnee	$9,279,257
1849	06/25/2009 (4/25-5/16/2009)	Severe Storms, **Flooding**, Straight-line Winds, and Tornados	Barber and Butler	$15,013,488
1808	10/31/2008	Severe Storms, **Flooding** and Tornados	Butler	$4,167,044
1776	07/09/2008	Severe Storms, **Flooding**, and Tornados	Barber, Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford	$70,629,544
1711	7/2/2007 (6/26-30/2007)	Severe Storms and **Flooding**	Edwards and Pawnee	$40,238,600
1699	5/6/2007 (5/4/2007)	Severe Storms, Tornados, and **Flooding**	Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford	$117,565,269
1579	2/8/2005 (1/4-6/2005)	Severe Winter Storm, Heavy Rains, and **Flooding**	Barber, Comanche, Kiowa and Pratt	$106,873,672
1535	8/3/2004 (6/12-7/25/2004)	Severe Storms, **Flooding**, and Tornados	Barton and Pawnee	$12,845,892

Sources: FEMA and Kansas Division of Emergency Management

* Incident dates are in parentheses.

** Disaster costs include Public Assistance and Individual Assistance for all affected counties, including those not listed

The following provide brief discussions of the most recent Presidential Disaster Declarations for the region:

FEMA-4150-DR: Severe Storms, Winds, Tornados and Flooding – November 22, 2013 - From July 22 to August 16, 2013 severe storms, winds, tornados, and flooding caused limited damages in all regional counties. The primary impacts of this event were to public roads and bridges with an estimated $11,412,827 in damages.

FEMA-4063-DR: Severe Storms, Tornados, Straight-line Winds and Flooding - May 24, 2012 - From April 14-16, three regional counties received damages due to severe storms, tornados, straight-line winds, and flooding. Primary damages were to utilities, mainly from winds associated with this event. However, there were some flood damages, primarily from flash flooding. Total damages to public utilities were estimated to be nearly $7,000,000.

FEMA-4010-DR: Severe Storms, Straight-Line Winds, Tornados and Flooding – July 29, 2011 - From May 10 to June 4, 2011 severe storms, straight-line winds, tornados, and flooding caused damages in 25 Kansas Counties. The primary impacts of this event were to public roads and bridges with an estimated $9,800,000 in damages.

FEMA 1932-DR: Severe Storms, Flooding and Tornados - August 10, 2010 - From June 7 to July 21, 2010, severe storms, flooding, and tornados caused damages in 41 Kansas Counties. The primary impacts of this event were to public roads and bridges with an estimated $11,200,000 in damages.

FEMA-1849-DR: Severe Storms, Flooding, Straight-line Winds, and Tornados - June 25, 2009 - From April 25 to May 15, 2009 severe storms and flooding impacted Kansas. Many roads and highways were inundated.

FEMA 1808-DR: Severe Storms, Flooding, and Tornadoes - October 31, 2008 (Sept. 11-17) - During the period of September 11 -17, 2009, severe storms accompanied by tornados, lightning and torrential rains resulted in flooding and flash flooding across south central and eastern Kansas. Rainfall amounts were generally around 5 inches, Interstate 35 near Wellington was closed.

FEMA 1776-DR: Severe Storms, Flooding, and Tornados - July 9, 2008 - Beginning May 22, 2008 and continuing through June 16, 2008, severe storms across Kansas produced large hail, lightning, high winds, tornados and torrential rains. The severe weather produced widespread flooding. Several high water rescues were reported as local law and fire officials had to rescue individuals from on top of their vehicles and in one instance clinging to a tree. Street flooding was reported throughout the impacted areas.

FEMA-1711-DR: Severe Storms and Flooding - July 2, 2007 (June 26–30) - Beginning June 26 and continuing through June 30, 2007, strong storms across south central and southeast Kansas produced torrential rainfall and subsequent flooding/flash flooding. Some counties, which were still recovering from flooding in mid-May, received over a foot of rain. In Miami County, the Kansas National Guard was sent to help with a mandatory evacuation of Osawatomie, one of the hardest hit communities in eastern Kansas. The town evacuated 40% of its 4,600 residents after Pottawatomie Creek and the Marais des Cygnes River rose out of their banks.

Further descriptions and other notable flooding events are detailed below

May 5, 2007: Flooding was reported throughout Barton County. Highway 96, nine miles west of Great Bend was closed as water started flowing over the road. An observer in the area reported 3.22 inches of rain in just 3 hours. Highway 56 in Pawnee Rock was closed because of flood water. In Hoisington the intersection of 3rd Street and Main was closed because of high water. An observer reported approximately 3 inches of rain in 3 hours in that part of Barton County. Seventy to eighty homes were flooded on the north side of Ellinwood. According to Barton County Emergency Management, the county documented roughly 30 Million dollars in damage. This includes damages to private property including crop damage, damage to farm equipment, farmsteads and public roads. The Great Bend Tribune contributed to this narrative.

June 3-15, 2005: Cheyenne, Edwards, Harper, Haskell, Linn, Rush, and Stanton Counties were designated as primary disaster areas by the U.S. Department of Agriculture because of losses caused by excessive rain, flash flooding, and flooding. Twenty-nine contiguous counties were also eligible for assistance.

The following table presents NCDC identified flood events and the resulting damage totals in the region from the period 2001 - 2014.

NCDC Flood Events, 2004 - 2014

County	Number of Flash Flood Events	Number of Flood Events	Property Damages	Crop Damage	Deaths
Barber	0	56	$10,100,000	$300,100	0
Barton	8	60	$40,658,000	$301,300	0
Comanche	0	52	$10,080,000	$300,000	0
Edwards	0	54	$10,085,000	$300,000	0
Kiowa	0	52	$10,080,000	$300,000	0
Pawnee	1	58	$10,081,000	$401,000	0
Pratt	1	53	$10,080,000	$300,000	0
Stafford	1	56	$10,095,000	$300,000	0
Regional Total	11	441	$111,259,000	$2,502,400	0

Source: NCDC Storm Events Database

Local Events

August 4, 2013: In Barton County heavy rains produced flash flooding in the eastern part of the county damaging roads, bridges and residences.

August 2012: In Kiowa County a flood caused significant damage to county roads and crops.

June 10, 2010: In Pawnee County, flooding damaged local roadways.

October 23, 2008: In Pawnee County, five miles north-northwest of Ray, slow runoff produced creek flooding that ran over secondary roads for several days. There was $100,000 in crop damage and $1,000 in property damage reported for this event. No injuries were reported.

June 17, 2008: In Barber County, flooding caused by heavy rains damaged roadways.

May 23, 2008: In Pawnee County, flooding caused by heavy rains caused roads to wash out and damaged crop fields.

May 5, 2007: In the City of Great Bend, Barton County, heavy rains and flooding caused a major sewer collapse and damage to a flood control ditch.

May 5, 2007: In Barton County, an observer reported 3.22 inches of rain in three hours. Highway 56 in Pawnee Rock was closed due to flood water. In Hoisington the intersection of 3rd Street and Main was closed due to high water. An observer reported approximately three inches of rain in three hours in that part of Barton County. Seventy to eighty homes were flooded on the north side of Ellinwood. According to Barton County Emergency Management, the county documented roughly $30,000,000 in damage. This includes damages to private property including crop damage, damage to farm equipment, farmsteads and public roads. No injuries were reported for this event.

June 13, 2007: In Comanche County a road was washed out near a bridge seven miles east south east of Buttermilk. Nearly all county roads in southeast Comanche County had water on them. An estimated 3 to 5 inches of rain fell.

June 13, 2007: In Comanche County a round of severe thunderstorms moved out of far southwest Kansas and into south central Kansas. Numerous roads washed out eight miles east of Buttermilk from the 5.80 inches of rain.

July 13, 2007: In Edwards County heavy rain and runoff flooded some homes around Rozel. Property damage was reported to be $5,000 for this event. There were no reported injuries or deaths for this event.

July 13, 2007: In Pawnee County, one mile east of Garfield, Highway 56 flooded with 6 to 8 inches of water due to heavy overnight rain. $1,000 in property damage, and $1,000 in crop damage, with no injuries was reported for this event.

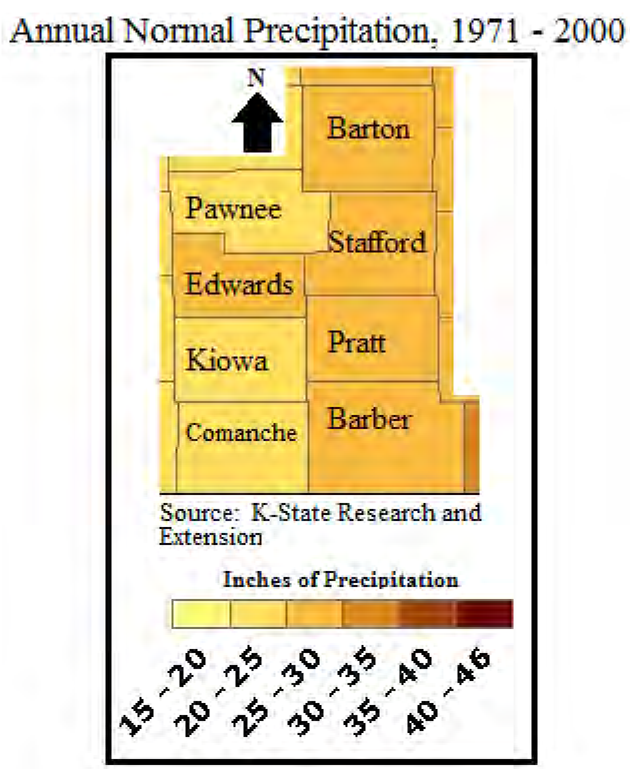
June 26, 2006: In Barton County widespread flooding occurred from Hoisington to Great Bend. High water forced the closure of Highway 281 four miles south of Hoisington for two hours. Numerous rural and city roads and intersections, especially those in and around Hoisington and Great Bend, were barricaded due to high water. Several businesses and homes received water damage. Property damage was reported to be $100,000, with no associated injuries.

May 12, 2005: In Stafford County heavy rains caused water to overflow across Highway 50 causing traffic to be diverted. There was no reported property or crop damages. Additionally, no injuries or deaths were reported for the event.

July 3, 2005: In Stafford County heavy rains caused water levels to rise one-foot above Highway 50 at a location approximately one mile west of Stafford. There was no reported property or crop damage. Additionally, there were no reported injuries or deaths for the event.

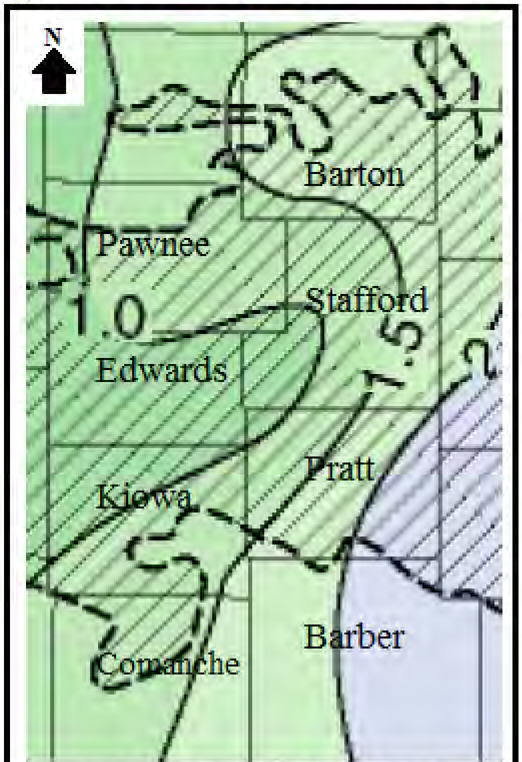
Hazard Vulnerability and Impact

Flash flooding occurs in those locations of the in the planning area that are low-lying and/or do not have adequate drainage to carry away the amount of water that falls during intense rainfall events. The average annual precipitation varies significantly across the region. Precipitation in the central part of the state averages approximately 35 inches. The following map shows how the annual normal precipitation varies across the region.



The following map shows the distribution of water runoff in south Kansas. This data indicates the approximate amount of water that does not infiltrate the ground and is potentially carried to streams and rivers. Although the climatically controlled rainfall variation is significant, average annual runoff across the state varies much more than the precipitation. The average runoff ranges from approximately one to two inches in the region. Both precipitation and runoff can impact flash flooding.

Regional Distribution of Water Runoff



Source: Surface Water in Kansas and Its Interactions with Groundwater, 2000
The areas west of the dashed line show the extent of the High Plains aquifer in Kansas

The region acquired data from the USDA's Risk Management Agency to provide crop loss data based on crop insurance payments. Data was requested for the 10-year period from 2002 to 2011 for the State of Kansas. During this period, $321,995,951 in crop insurance payments was made to Kansas farmers as a result of flood, excess moisture/precipitation/rain, and hurricane/tropical depression. This translates to $321,995,951 annually. The most damaging year during this time-frame was 2007 which coincides with Presidential Declarations 1699 and 1711 for major flooding in south Kansas. The following table provides the crop insurance payments by year for this ten-year period. Please note that this data only applies to insured crops and for the entire State. According to the *2011 Kansas Crop Insurance Profile Report* issued by the USDA Risk Management Agency 82 percent of Kansas' row crops were insured in 2011.

USDA Risk Management Agency Crop Insurance Payments Due to Flood Excess Moisture/Precipitation/Rain, and Hurricane/Tropical Depression

Year	Statewide Crop Insurance Paid
2011 Total	$16,554,331
2010 Total	$51,325,423
2009 Total	$69,363,919
2008 Total	$58,422,531
2007 Total	$86,141,405
2006 Total	$1,510,143
2005 Total	$15,082,104
2004 Total	$16,276,418
2003 Total	$4,944,342
2002 Total	$2,375,336
Statewide Total	**$321,995,951**

Source: USDA Risk Management Agency, 2012;

To determine vulnerability to flooding and the jurisdictions most threatened by flooding and most vulnerable to damage and losses, the region analyzed data from several sources including:

- NCDC Storm Events Database
- USDA Risk Management Agency Crop Loss Statistics
- HAZUS MH-2.1 100-year Food Scenario
- NFIP Flood Insurance Claims
- Repetitive Loss Properties/Severe Repetitive Loss Properties

The NCDC Storm Events Database was the primary source of data to complete the vulnerability analysis of flash flood in the State; while the HAZUS-MH 2.1 analysis was utilized to describe vulnerability to riverine flooding. Flash flooding is not considered to be a geographic hazard. Due to the large number of variables that occur in rainfall amounts and intensity, it is not possible to predict all specific locations that are vulnerable to flash flooding. However, it is known that certain low-lying areas with poor drainage are more vulnerable than areas higher in elevation with good drainage. Additionally, historical statistics of areas that have been prone to flash flooding in the past can be utilized to determine potential vulnerability to future events.

The following table provides total crop insurance payments and annualized crop insurance payments for flood damage for each county over the 10-year period from 2002 to 2011. The USDA does not differentiate damages from riverine flooding and flash flooding. As such, these losses include combined losses for both types of flooding. The crop exposure value from the 2007 Census of Agriculture is provided to provide the basis for an annualized ratio of insurance payments to total value. Please note that this data only applies to insured crops. According to the *2011 Kansas Crop Insurance Profile Report* issued by the USDA Risk Management Agency 82 percent of Kansas' row crops were insured in 2011, the latest available data that allows for correlation. The crop exposure values have not been adjusted in the table below.

Flood-Related Crop Insurance Payments Analysis, 2010-2013

County	Crop Exposure Value (2012 Census of Agriculture)	Flood-Related Crop Insurance Payments (2010-2013)	Annualized Crop Insurance Payments	Annualized Flood-Related Crop Insurance Payment Ratio
Barber	$45,420,000	$116,172	$29,043	0.06%
Barton	$96,206,000	$272,836	$68,209	0.07%
Comanche	$21,783,000	$64,700	$16,175	0.07%
Edwards	$126,933,000	$254,040	$63,510	0.05%
Kiowa	$63,956,000	$83,588	$20,897	0.03%
Pawnee	$92,111,000	$234,768	$58,692	0.06%
Pratt	$52,353,000	$511,088	$127,772	0.24%
Stafford	$74,549,000	$222,864	$55,716	0.07%
Regional Total	$573,311,000	$1,760,056	$55,002	-

Source: USDA Risk Management Agency; 2007 USDA Census of Agriculture

HAZUS-MH 2.1 One-Percent Annual Chance Food Scenario

According to the HAZUS-MH 2.1 one percent annual chance flood scenario results, there are 2,809 buildings and 9,588 people in the one percent annual chance floodplain. It is worth noting that the results for Barton County are markedly higher than all other counties within the region, accounting for 86.9% of the vulnerable building and 80.0% of population vulnerable to displacement. The following table provides the HAZUS-MH 2.1 results for the number of vulnerable buildings and population vulnerable to displacement for each county in south Kansas.

Vulnerable Buildings and Population, HAZUS One Percent Annual Chance Flood Scenario

County	Vulnerable Buildings	Population Vulnerable to Displacement
Barber	43	233
Barton	2,440	7,682
Comanche	0	43
Edwards	120	453
Kiowa	0	26
Pawnee	58	430
Pratt	0	157
Stafford	148	564
Regional Total	2,809	9,588

Source: HAZUS MH 2.1

NFIP Flood Insurance Claims Analysis

The region analyzed NFIP flood-loss data to determine areas of south Kansas with the greatest flood risk. South Kansas NFIP participation and flood loss statistics were obtained from FEMA's Policy and Claim Statistics for Flood Insurance (which provides losses from 1978 to the present). As of October 2012, 48 communities (including the counties) were NFIP participants, including four that do not have special flood hazard areas and seven that are only minimally flood-prone. The following table presents south Kansas NFIP communities.

South Kansas NFIP Communities

Community	Initial Flood Hazard Boundary Map Identified	Initial Flood Insurance Rate Map Identified	Current Effective Map Date
Barber County			
City of Kiowa	12/13/1977	09/12/75	06/03/86
City of Medicine Lodge	02/08/74	07/26/74	07/03/90
City of Sharon	11/22/1974	08/22/75	-
Barton County			
Barton County	08/02/77	08/16/88	09/02/09
City of Claflin	08/15/75	09/02/09	09/02/09(M)
City of Ellinwood	03/15/74	09/01/78	09/02/09
City of Great Bend	03/19/76	05/16/83	09/02/09
City of Hoisington	02/22/74	02/05/86	09/02/09
City of Pawnee Rock	01/10/75	01/14/77	09/02/09
City of Susank	-	09/02/09	NSFHA
Comanche County			
City of Protection	07/02/76	02/01/05	02/01/05(L)
Edwards County			
Edwards County	-	01/16/08	01/16/08
City of Kinsley	05/17/74	03/01/78	01/16/08
Kiowa County			
City of Greensburg	07/30/76	02/01/87	02/01/87(L)
City of Haviland	08/22/75	-	08/22/75
Louisburg	03/01/74	08/19/08	08/19/08
Osawatomie	01/23/74	09/19/84	08/19/08
Paola	12/14/1973	04/17/78	08/19/08
Pawnee County			
Pawnee County	10/25/1977	02/01/90	02/01/90(L)
City of Burdett	03/26/76	03/01/05	03/01/05
City of Garfield	06/04/76	11/17/1982	11/17/1982
City of Larned	02/01/74	09/29/78	12/1/1983
City of Rozel	01/03/75	05/01/87	05/01/87(L)
Pratt County			
Pratt County	-	-	-
City of Pratt	04/05/74	11/1/1978	09/30/83
City of Preston	10/29/1976	-	10/29/1976
Stafford County			
City of Stafford	03/26/76	08/26/80	08/26/80(M)

Notes: NSFHA: No Special Flood Hazard Area - All Zone C
(L): Original FIRM by letter - All Zone A, C and X
(M): No elevation determined - All Zone A, C and X
-: No Information Available

There are likely other communities in south Kansas that have flood hazard areas but have not yet been mapped by FEMA to show where those hazard areas are.

Kansas flood-loss information was pulled from FEMA's "Policy and Loss Data by Community with County and State Data," which documents losses from 1978 through August 31, 2012. There are several limitations to this data, including:

- Only losses to participating NFIP communities are represented
- Communities joined the NFIP at various times since 1978
- The number of flood insurance policies in effect may not include all structures at risk to flooding
- Some of the historical loss areas have been mitigated with property buyouts

Some properties are under-insured. The flood insurance purchase requirement is for flood insurance in the amount of federally-backed mortgages, not the entire value of the structure. Additionally, contents coverage is not required.

The following table shows the details of NFIP policy and loss statistics for each county in south Kansas. Loss statistics include losses through March 31, 2014.

Kansas NFIP Policy and Loss Statistics, As of March 31, 2014

	Number of Policies in Force	Insurance in Force	Number of Closed Losses	Total Payments
Barber County				
Medicine Lodge	10	$395,900	1	$1,219.16
Barton County				
Barton County	129	$9,433,900	10	$53,492.52
Albert	19	$1,812,200	2	$4,177.21
Ellinwood	41	$4,058,000	11	$131,951.65
Great Bend	16	$3,013,000	414	$2,220,944.32
Hoisington	19	$1,529,700	7	$32,574.40
Pawnee Rock	26	$1,197,200	6	$20,851.14
Comanche County				
Comanche County	0	$0	0	$0
Edwards County				
Kinsley	128	$9,150,100	1	$1,108.04
Kiowa County				
Greenburg	3	$269,000	0	$0

Kansas NFIP Policy and Loss Statistics, As of March 31, 2014

	Number of Policies in Force	Insurance in Force	Number of Closed Losses	Total Payments
Pawnee County				
Pawnee County	29	$1,810,900	1	$2,942.53
Burdett	1	$185,100	0	$0
Larned	3	$230,000	0	$0
Rozel	18	$1,455,800	1	$1,201.57
Pratt County				
City of Pratt	26	$4,053,700	5	$2,009.02
Stafford County				
Stafford County	0	$0	0	$0

Source: FEMA, "Policy and Loss Data by Community with County and State Data"

Repetitive Loss Analysis

A high priority in south Kansas and nationwide is the reduction of losses to repetitive loss structures. These structures strain the National Flood Insurance Fund. The NFIP defines a repetitive loss property as "any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling 10-year period, since 1978. At least two of the claims must be more than 10 days apart."

South Kansas has made mitigation of repetitive loss properties a priority use of mitigation funds. Data from KDEM indicates that south Kansas currently has no repetitive loss properties.

Severe Repetitive Loss Analysis

The Flood Insurance Reform Act of 2004 identified another category of repetitive loss, categorized as Severe Repetitive Loss (SRL). The definition of severe repetitive loss as applied to this program was established in section 1361A of the National Flood Insurance Act, as amended, 42 U.S.C. 4102a. An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

- That has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or
- For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

For both of the above, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than ten days apart.

As of 2013 there are no validated insured residential properties in south Kansas that meet the qualifications of SRL and the requirements to be considered for possible mitigation activities under FEMA's SRL criteria.

History of Severe Repetitive Loss

In addition to the verified residential, insured properties above, the NFIP tracks other categories of properties, including unverified properties, commercial properties, previously mitigated properties, and currently uninsured properties that meet the loss criteria.

As of 2013, there are no validated properties that have incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage with the amount of each claim payment exceeding $5,000 and with cumulative amounts of such claims payments exceeding $20,000; or for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

Riverine Flooding

The results of the HAZUS-MH2.1 analysis were utilized to estimate potential losses for riverine flooding. The intent of this analysis was to enable the region to estimate where flood losses could occur and the degree of severity using a consistent methodology. The HAZUS model helps quantify risk along known flood-hazard corridors as well as lesser streams and rivers that have a drainage area of ten square miles or more.

The HAZUS-MH 2.1 analysis provides the number of buildings impacted, estimates of the building repair costs, as well as the associated loss of building contents and business inventory. Building damage can also cause additional losses to a community as a whole by restricting a building's ability to function properly. Income loss data accounts for losses such as business interruption and rental income losses as well as the resources associated with damage repair and job and housing losses. These losses are calculated by HAZUS-MH 2.1 using a methodology based on the building damage estimates.

Among other factors, flood damage is related to the depth of flooding. HAZUS-MH 2.1 takes into account flood depth when modeling damage (based on FEMA's depth-damage functions). The HAZUS-MH 2.1 reports capture damage by occupancy class (in terms of square footage impacted) by damage percent classes. Occupancy classes in HAZUS-MH 2.1 include agriculture, commercial, education, government, industrial, religion, and residential. Damage percent classes are grouped by 10 percent increments 1-10 percent, 11-20 percent, etc., up to 50 percent. Buildings that sustain more than 50 percent damage are considered to be "substantially" damaged.

The displaced population is based on the inundation area. Individuals and households will be displaced from their homes even when the home has suffered little or no damage either because they were evacuated or there was no physical access to the property because of flooded roadways. Displaced people using shelters will most likely be individuals with lower incomes and those who do not have family or friends within the immediate area. HAZUS-MH 2.1 does not model flood casualties.

The following table provides the HAZUS-MH 2.1 results for vulnerable populations and the population estimated to seek short term shelter as well as the numbers of damaged and substantially damaged buildings for each south Kansas county.

HAZUS-MH 2.1 Flood Scenario Displaced Population and Number of Damaged Buildings

County	Population Vulnerable to Displacement (Number of People)	Short Term Shelter Needs (Number of People)	Vulnerable Buildings	Damaged Buildings	Substantially Damaged Buildings
Barber	233	48	43	3	0
Barton	7,682	5,815	2,440	521	58
Comanche	43	0	0	0	0
Edwards	453	134	120	12	0
Kiowa	26	0	0	0	0
Pawnee	430	122	58	0	0
Pratt	157	41	0	0	0
Stafford	564	90	148	3	0
Regional Total	9,588	6,250	2,809	539	58

Source: HAZUS-MH 2.1

The following table provides total direct building loss and income loss for each south Kansas county.

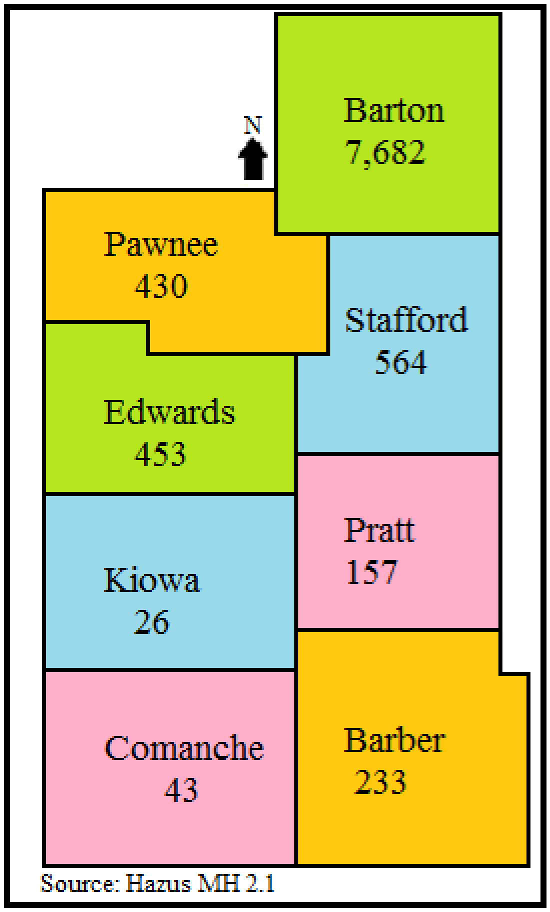
HAZUS-MH 2.1 Flood Scenario Direct Building and Income Losses

County	Structural Damage	Contents Damage	Inventory Loss	Total Direct Loss	Total Income Loss	Total Direct and Income Loss	Structure and Contents Loss Ratio
Barber	$2,725,000	$4,270,000	$330,000	$7,325,000	$17,000	$7,342,000	0.65%
Barton	$55,180,000	$116,315,000	$15,362,000	$186,857,000	$818,000	$187,675,000	3.78%
Comanche	$387,000	$203,000	$1,000	$591,000	$0	$591,000	0.09%
Edwards	$1,856,000	$3,451,000	$58,000	$5,365,000	$60,000	$5,425,000	0.88%
Kiowa	$227,000	$115,000	$0	$342,000	$0	$342,000	0.03%
Pawnee	$1,286,000	$894,000	$16,000	$2,196,000	$8,000	$2,204,000	0.12%
Pratt	$1,369,000	$1,189,000	$71,000	$2,629,000	$1,000	$2,630,000	0.10%
Stafford	$2,060,000	$5,145,000	$333,000	$7,538,000	$79,000	$7,617,000	1.04%
Regional Total	$65,090,000	$131,582,000	$16,171,000	$212,843,000	$983,000	$213,826,000	-

Source: HAZUS-MH 2.1

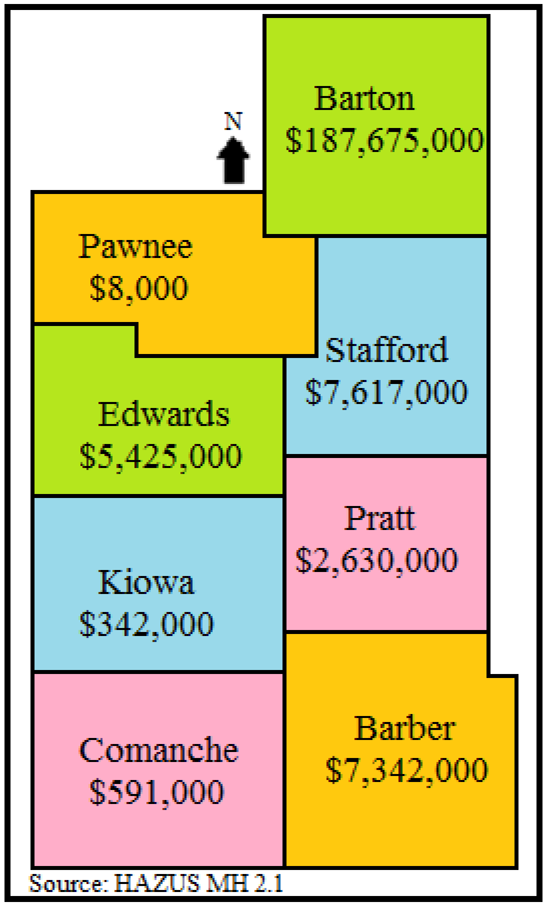
The following map depicts the potential population vulnerable to displacement

Population Vulnerable to Displacement



The following map illustrates the potential total direct building and income loss according to the HAZUS results for the region.

Total Direct Building and Income Loss



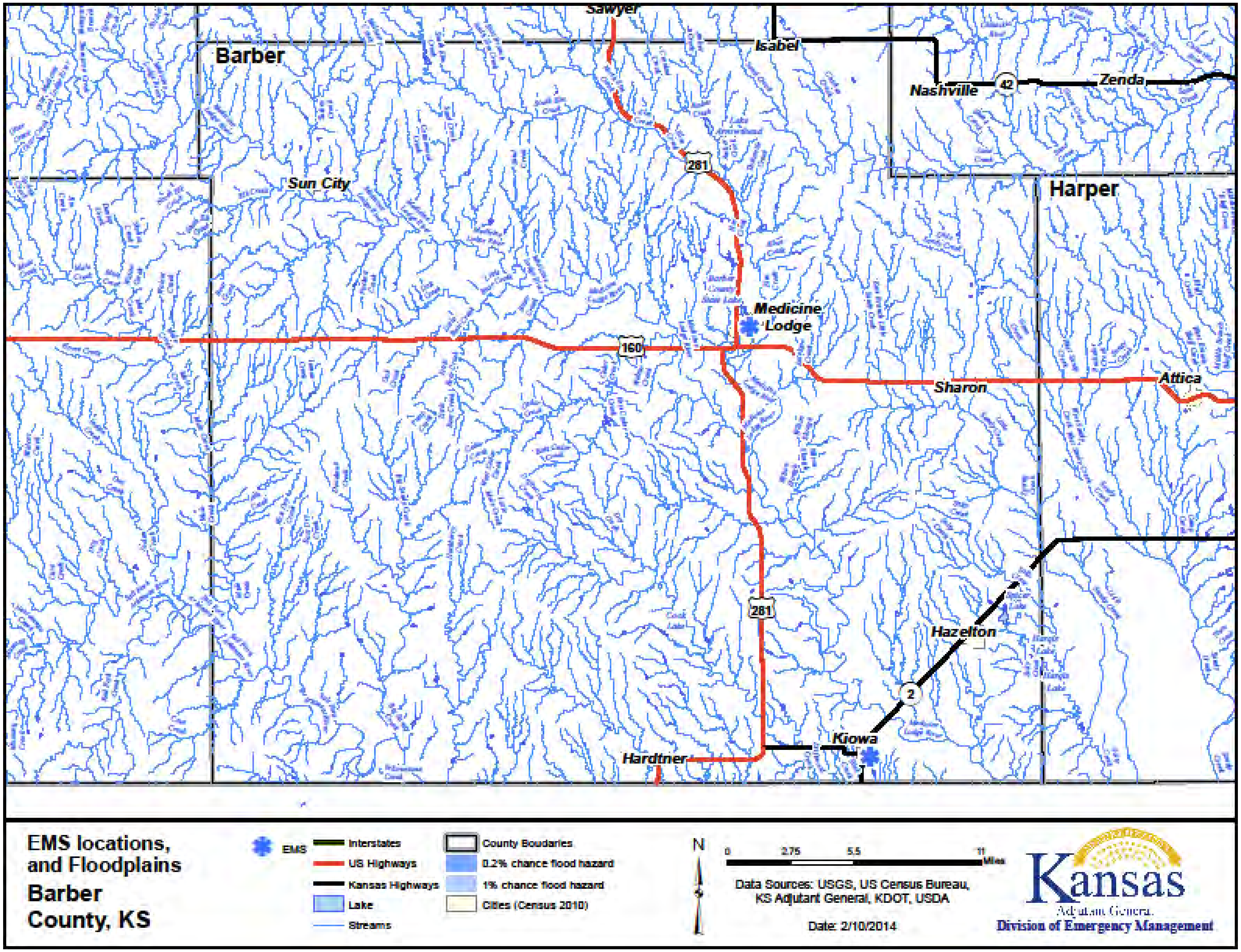
Barton County is in the top ten potentially impacted Kansas counties based on building loss, loss ratio, and displaced population indicators.

Critical Facilities in Flood Plains

The following county maps show critical facilities located in flood plains, if flood plain information was available for the county. If flood plain information was not available, the location of the facilities is shown in relation to streams and bodies of water. Identified critical facilities include:

- Schools
- Police Stations
- Fire Stations
- Hospitals (if information made available)
- Elderly care facilities (if information made available)

Please note that not all participating counties and/or jurisdictions had this data available.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Isabel
Barber
Nashville
42
Zenda
Sun City
281
Harper
Medicine Lodge
160
Sharon
Attica
281
Hazelton
2
Kiowa
Hardtner
EMS locations, and Floodplains
Barber County, KS
EMS
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
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2.75
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11
Miles
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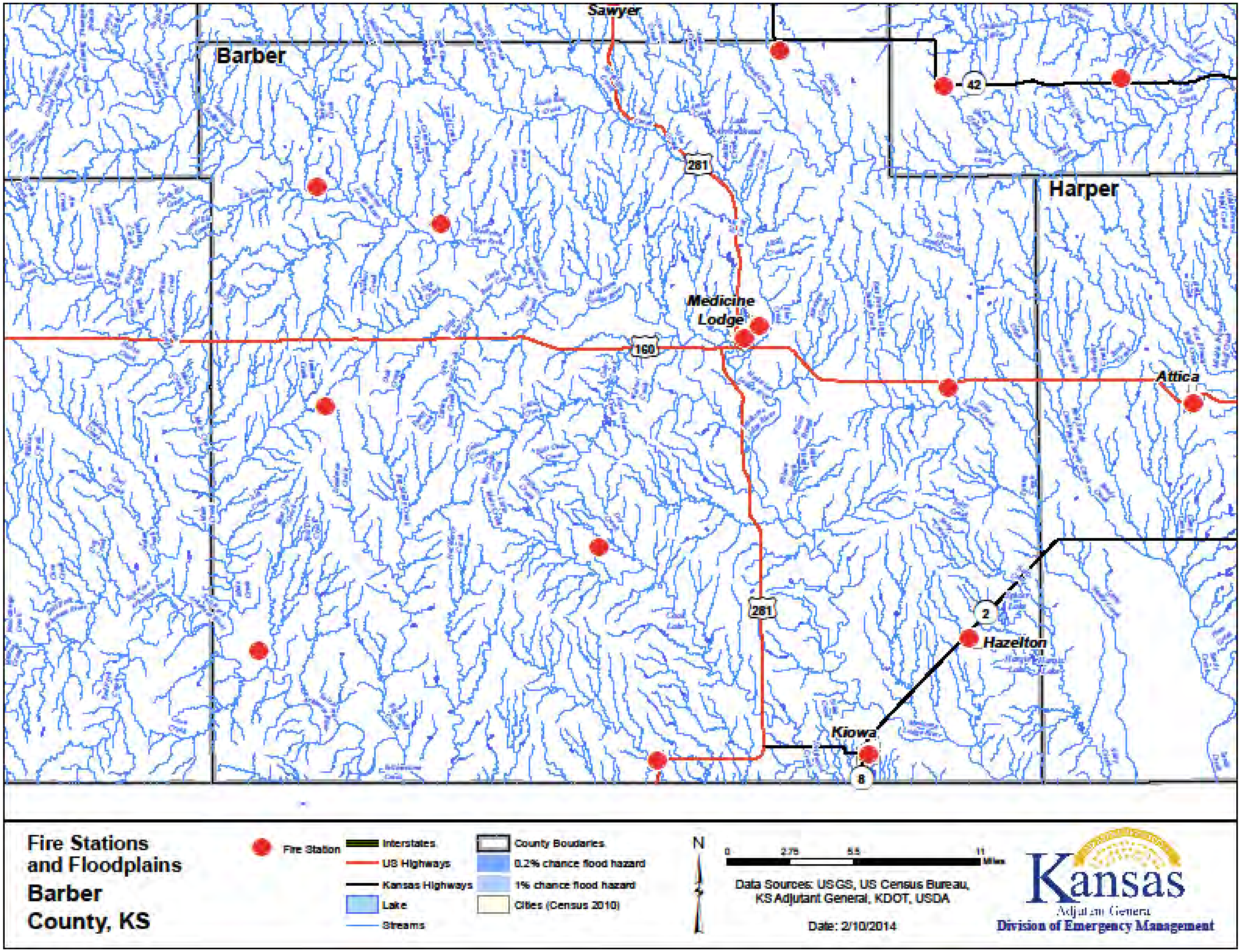
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management



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Hazelton
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Fire Stations
and Floodplains
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County, KS
Fire Station
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
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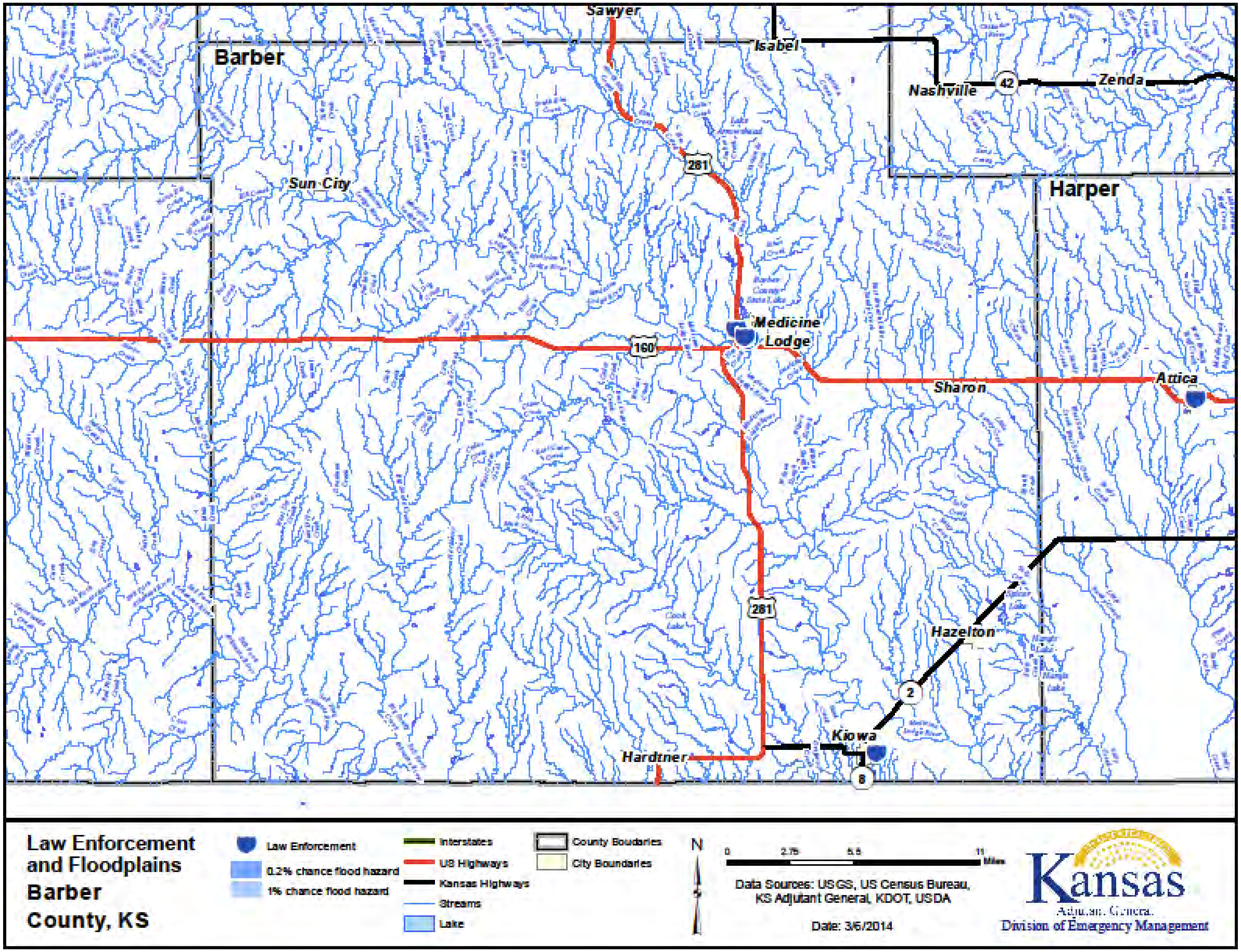
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management



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8
Law Enforcement and Floodplains
Barber County, KS
Law Enforcement
0.2% chance flood hazard
1% chance flood hazard
Interstates
US Highways
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Streams
Lake
County Boudaries
City Boundaries
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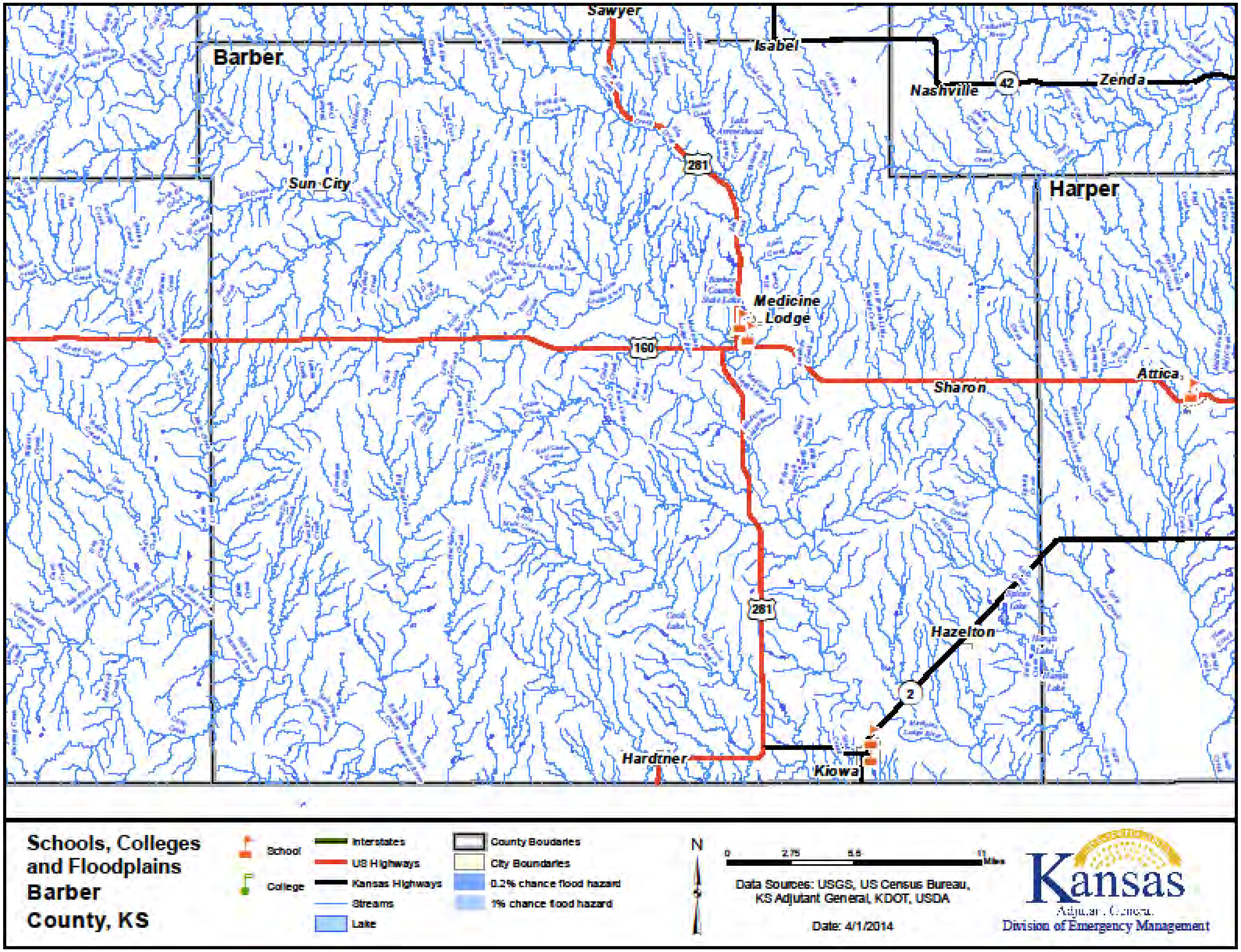
Kansas
Division of Emergency Management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Hardtner
Kiowa
Schools, Colleges and Floodplains Barber County, KS
School
College
Interstates
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Kansas Highways
Streams
Lake
County Boudaries
City Boundaries
0.2% chance flood hazard
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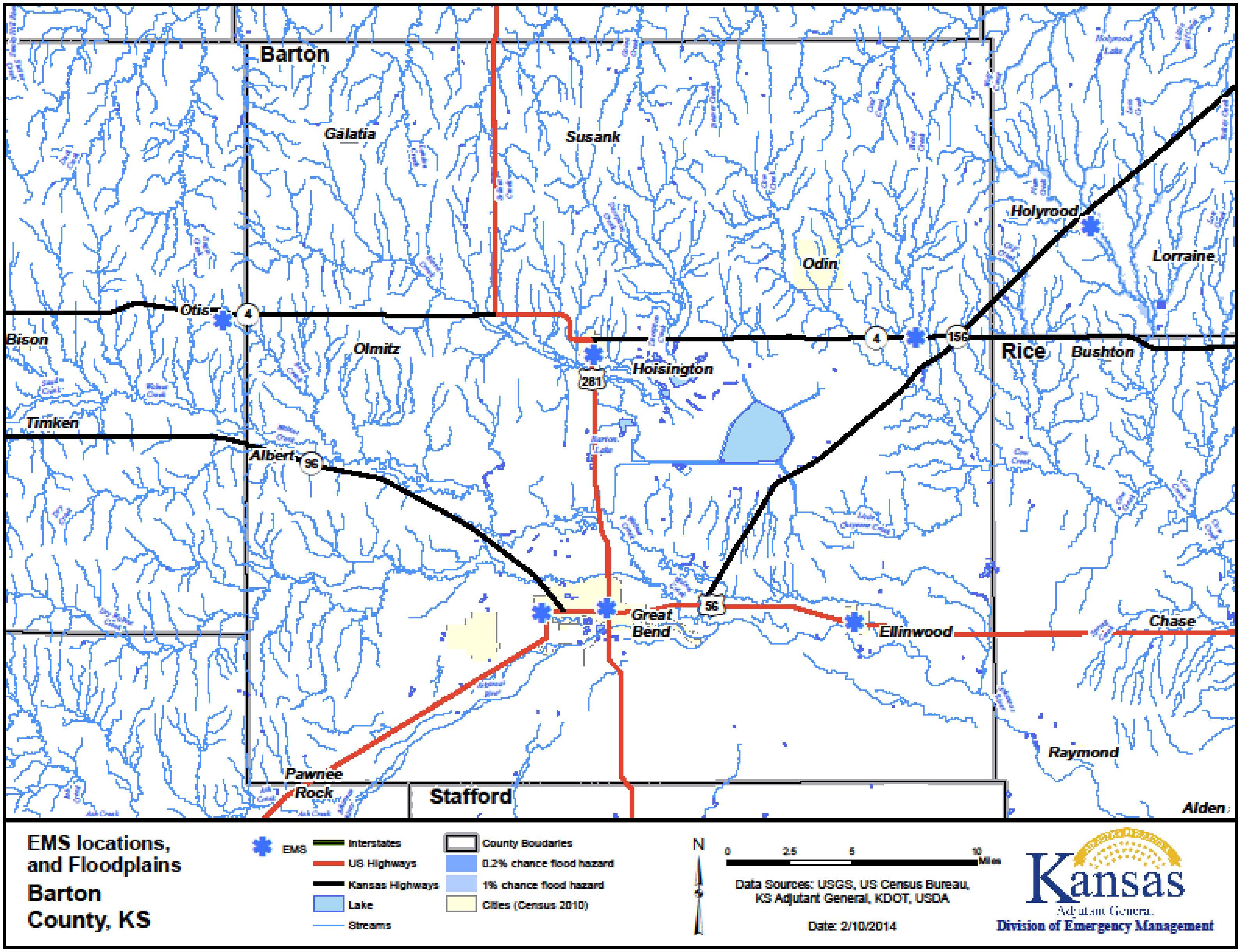
Date: 4/1/2014
Kansas
Division of Emergency Management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Rice
Bushton
Timken
Albert
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Great Bend
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Ellinwood
Chase
Raymond
Pawnee Rock
Stafford
Alden
EMS locations, and Floodplains
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Kansas
Adjutant General
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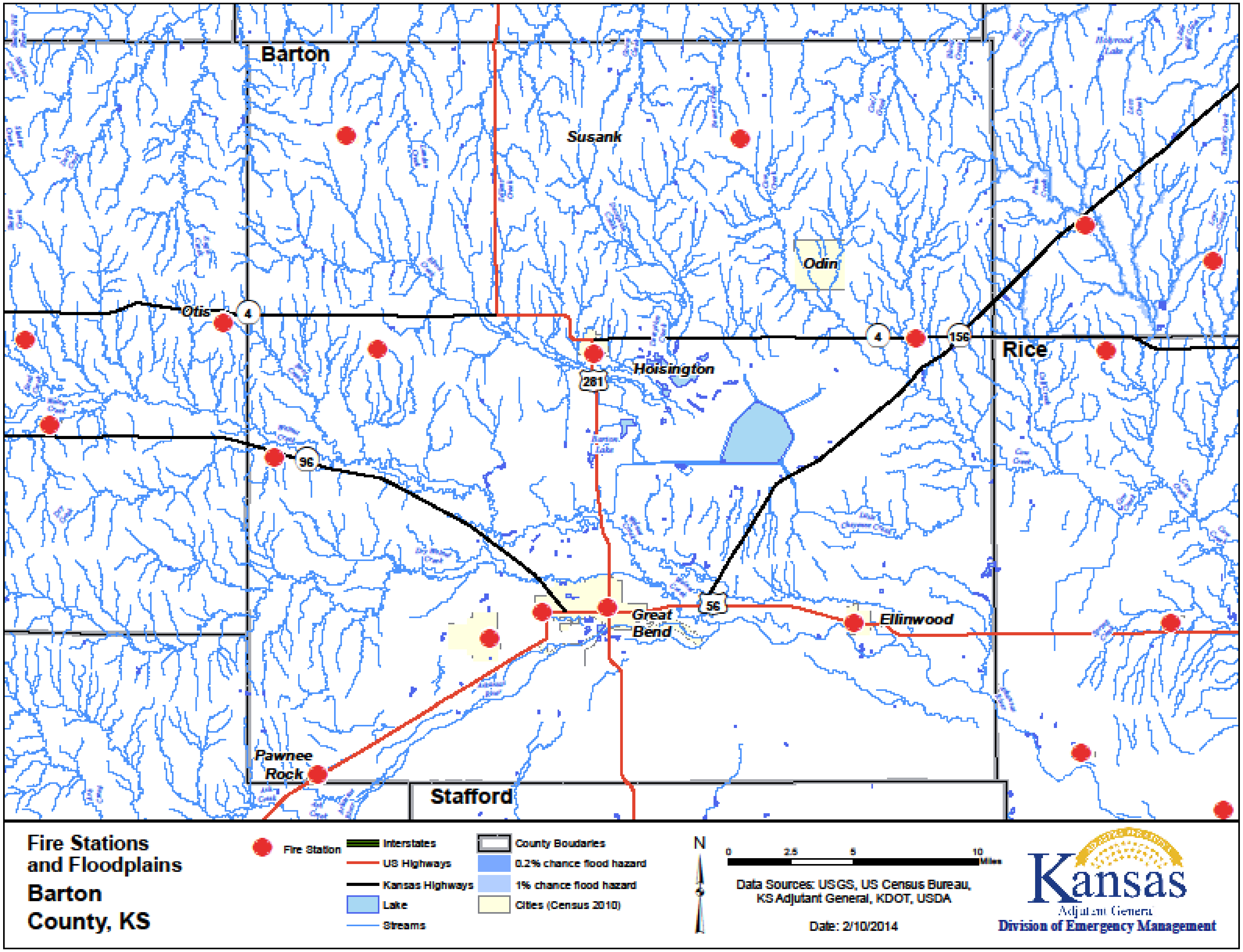

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Fire Stations and Floodplains
Barton County, KS
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US Highways
Kansas Highways
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County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
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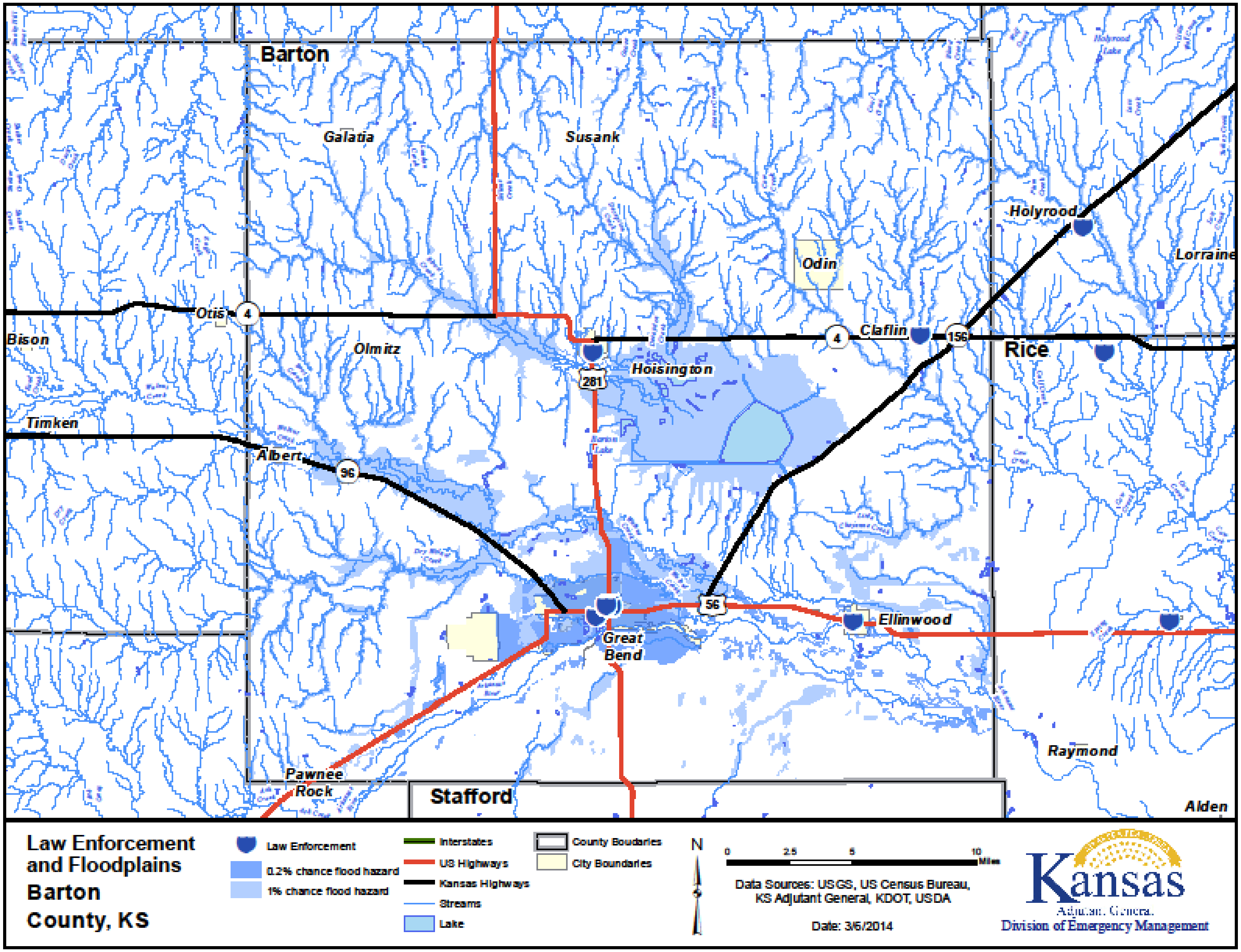
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management



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Timken
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Pawnee Rock
Stafford
Alden
Law Enforcement and Floodplains
Barton County, KS
Law Enforcement
0.2% chance flood hazard
1% chance flood hazard
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County Boudaries
City Boundaries
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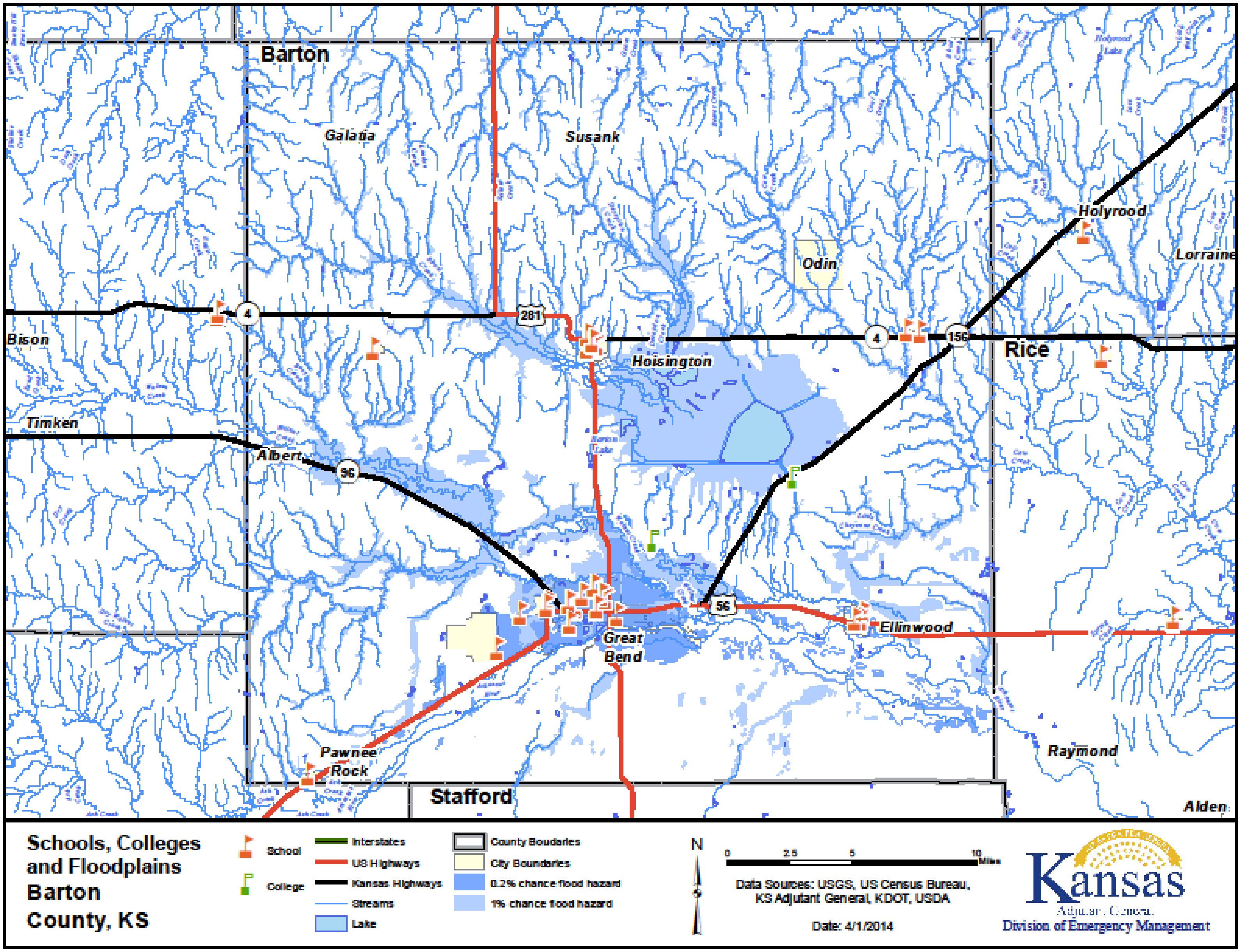
Kansas
Adjutant General
Division of Emergency Management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Schools, Colleges and Floodplains Barton County, KS
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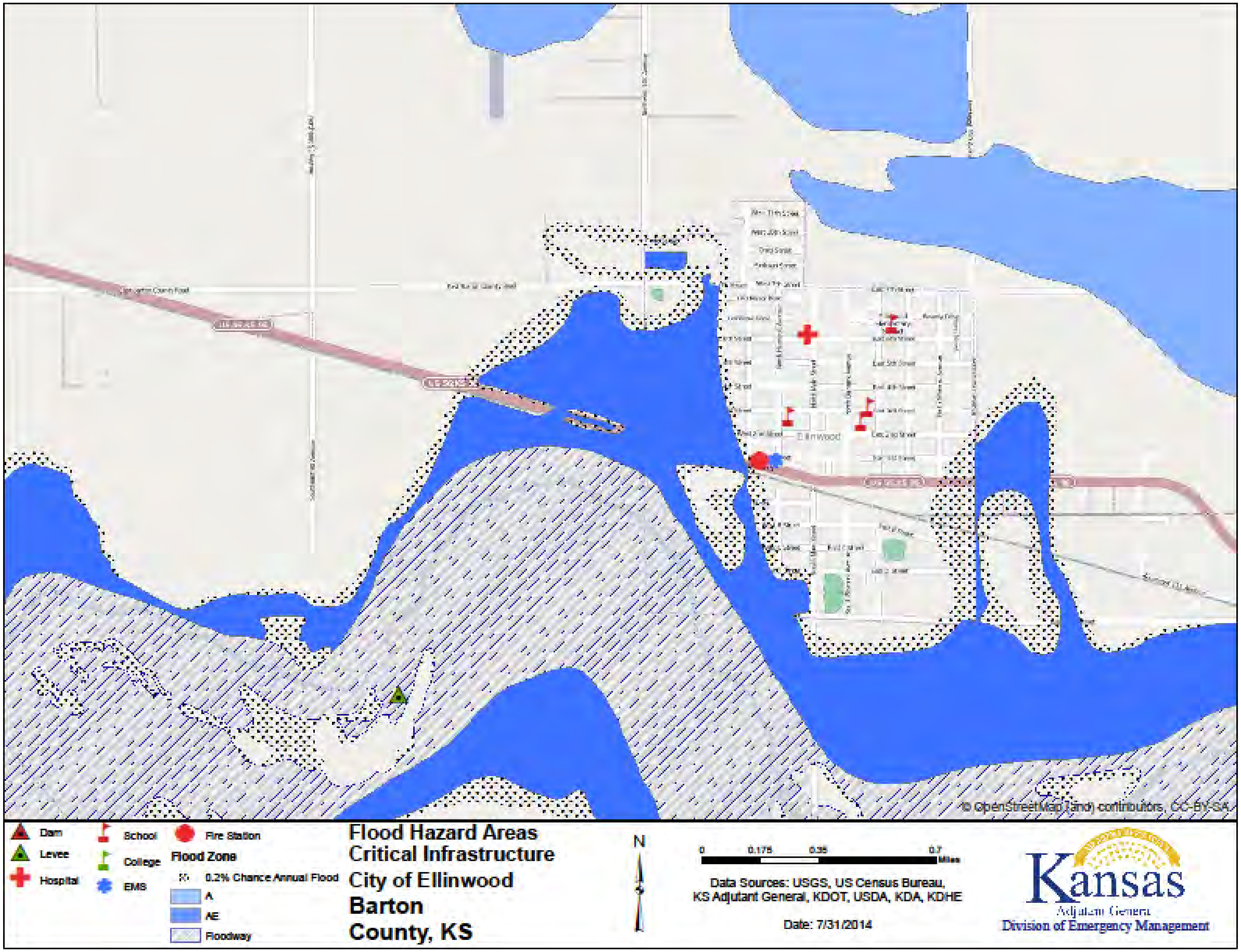
Date: 4/1/2014
Kansas
Division of Emergency Management



Dam
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Hospital
School
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EMS
Fire Station
Flood Zone
0.2% Chance Annual Flood
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Floodway
Flood Hazard Areas
Critical Infrastructure
City of Ellinwood
Barton
County, KS
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Adjutant General
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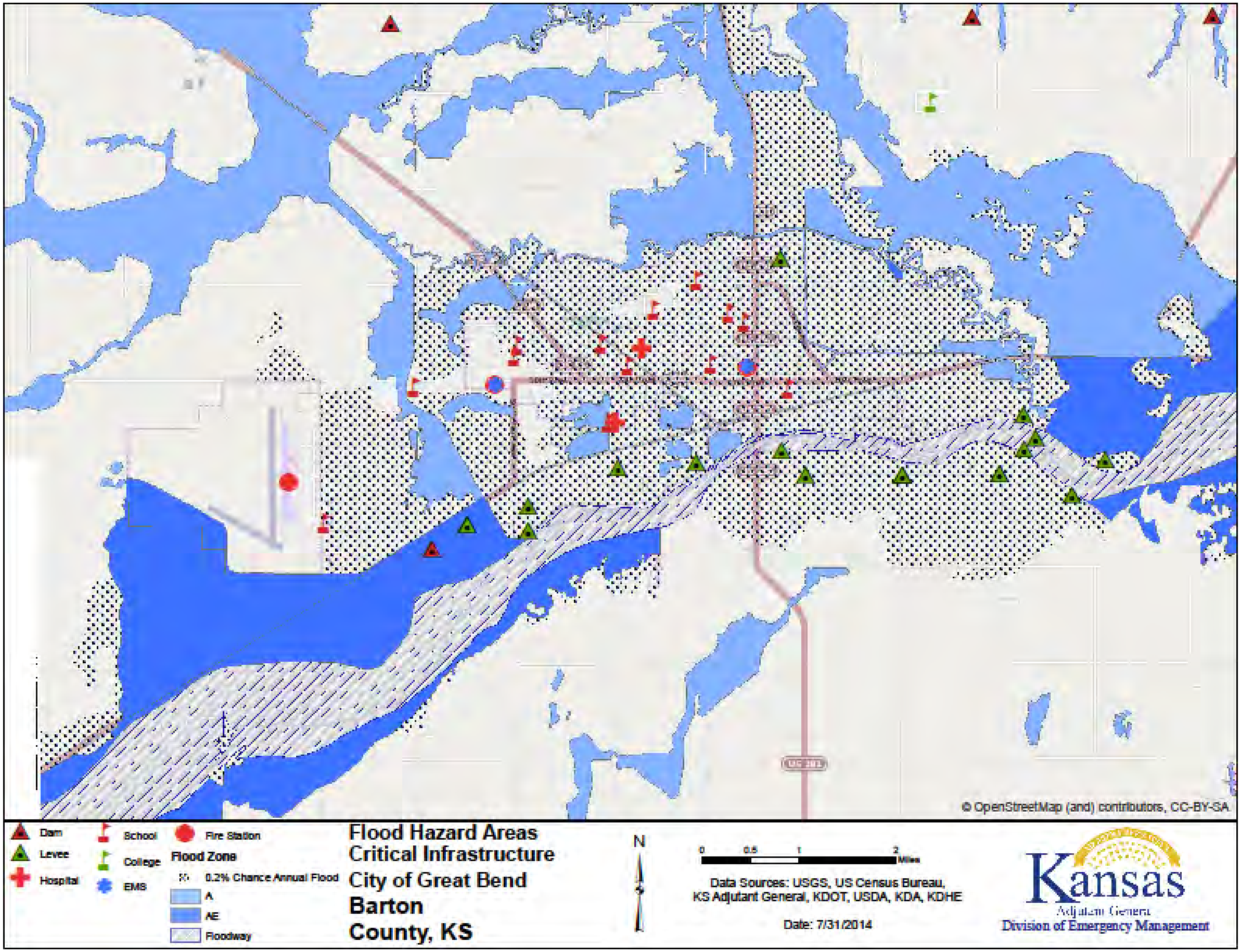
Ellinwood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Dam
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Flood Zone
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Flood Hazard Areas
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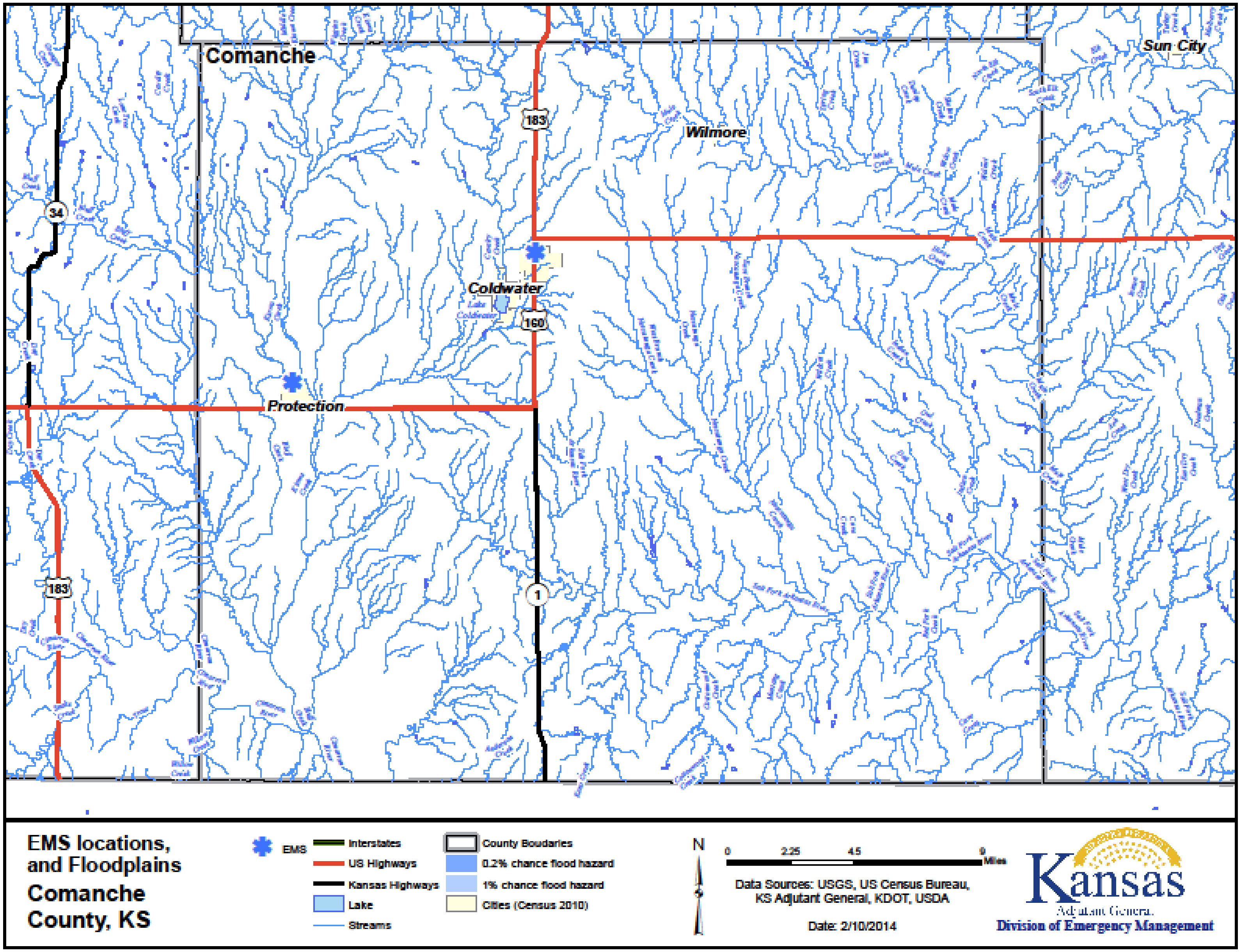
Division of Emergency Management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0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
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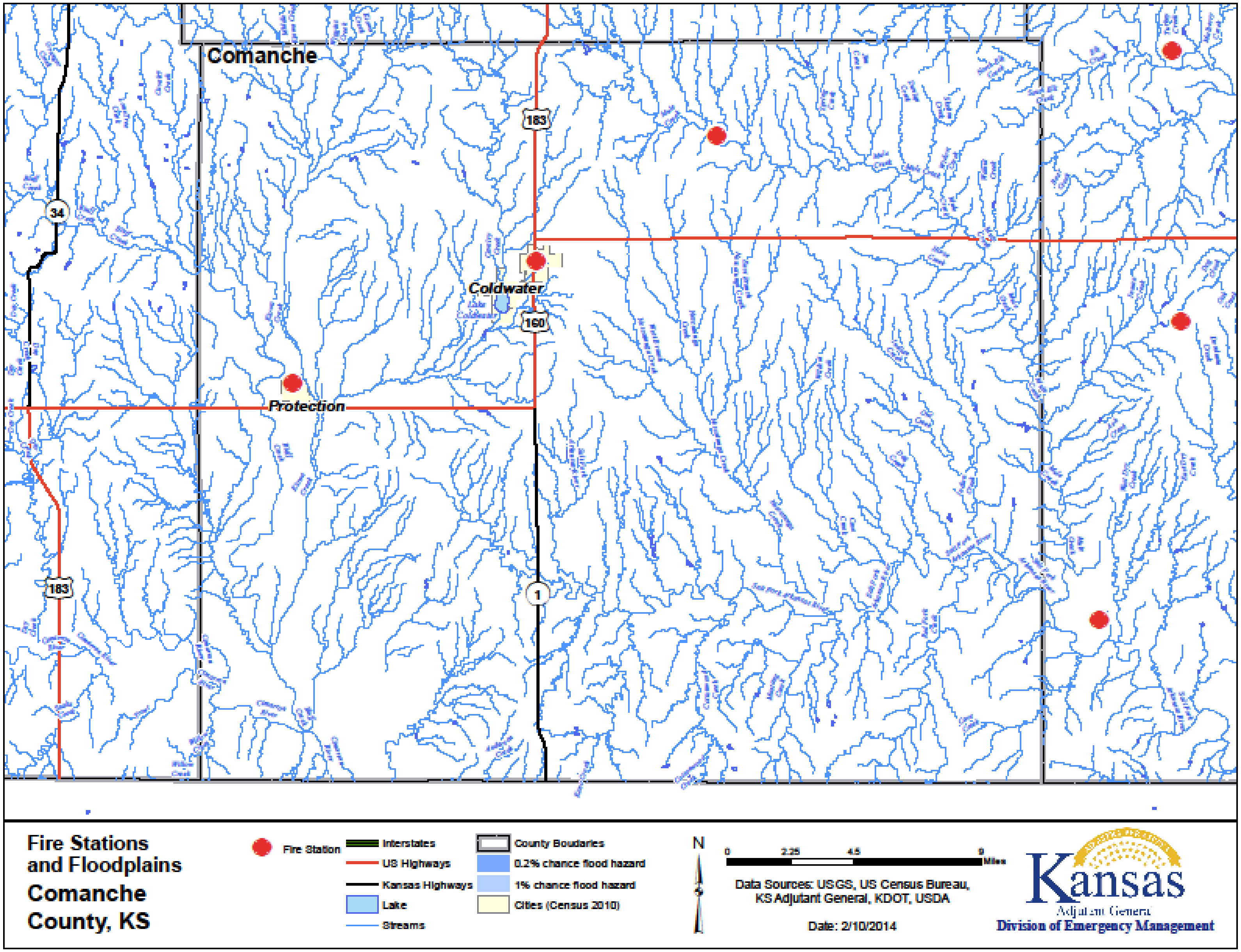
Division of Emergency Management



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Fire Stations
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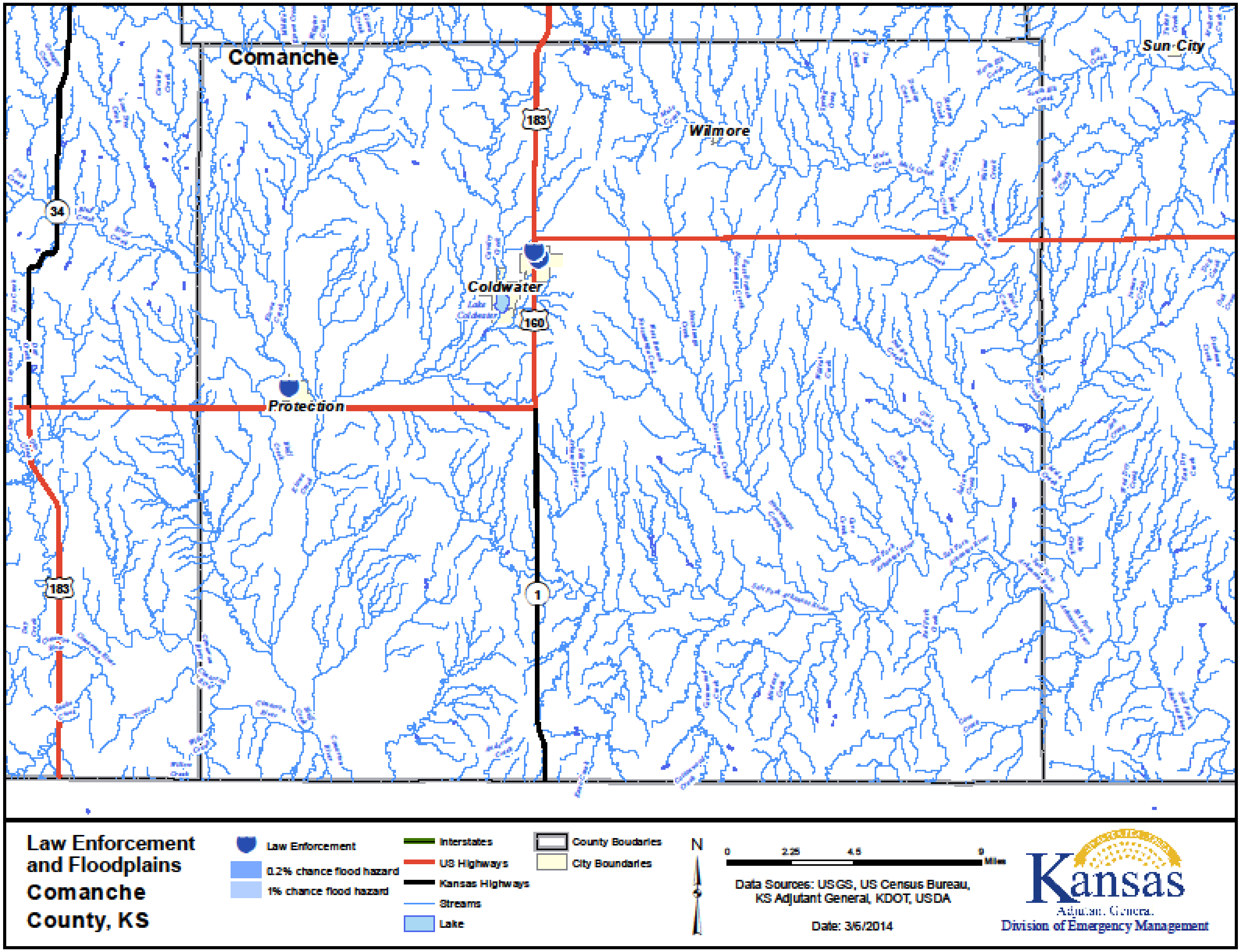
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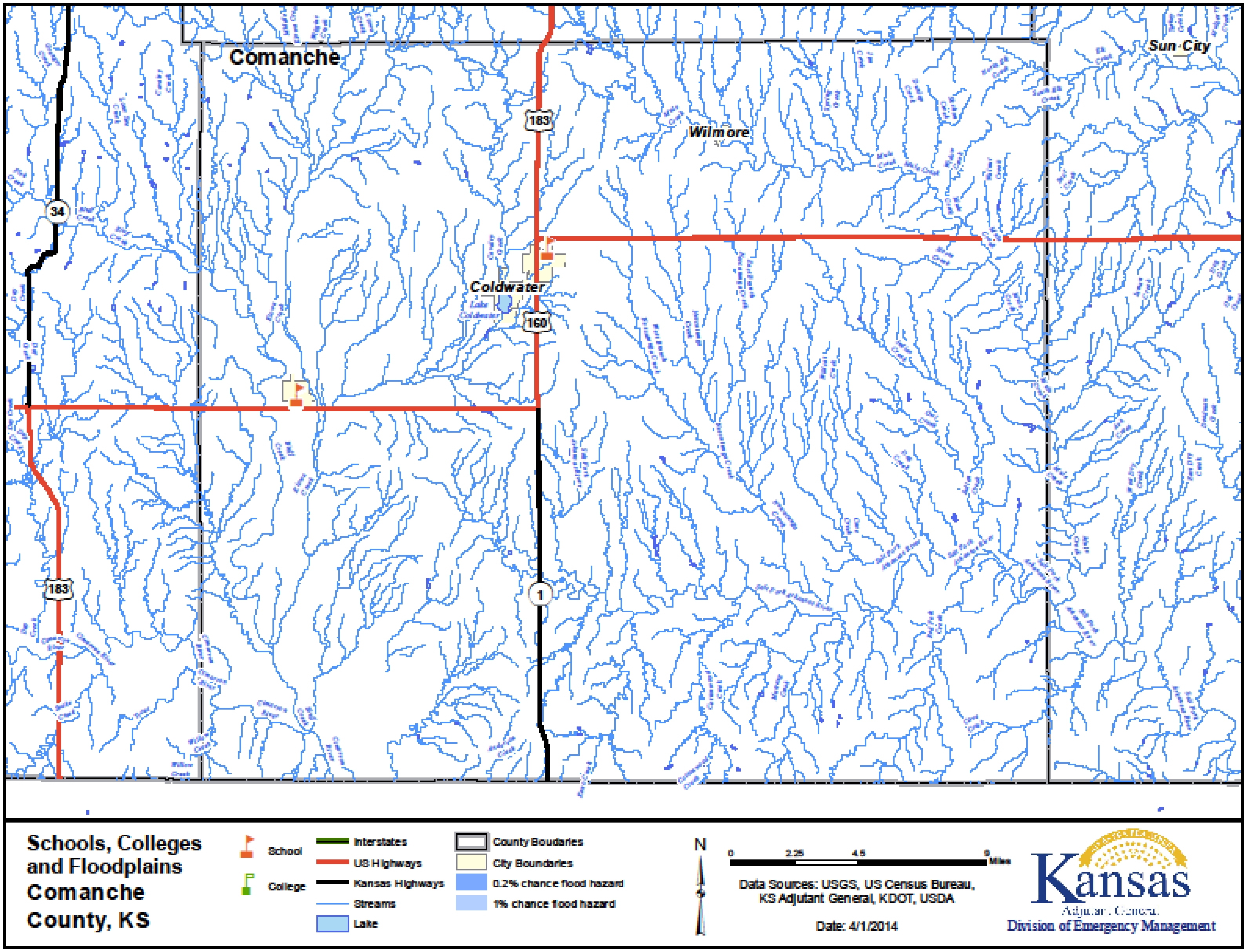
Adjutant General
Division of Emergency Management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Schools, Colleges and Floodplains Comanche County, KS
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1% chance flood hazard
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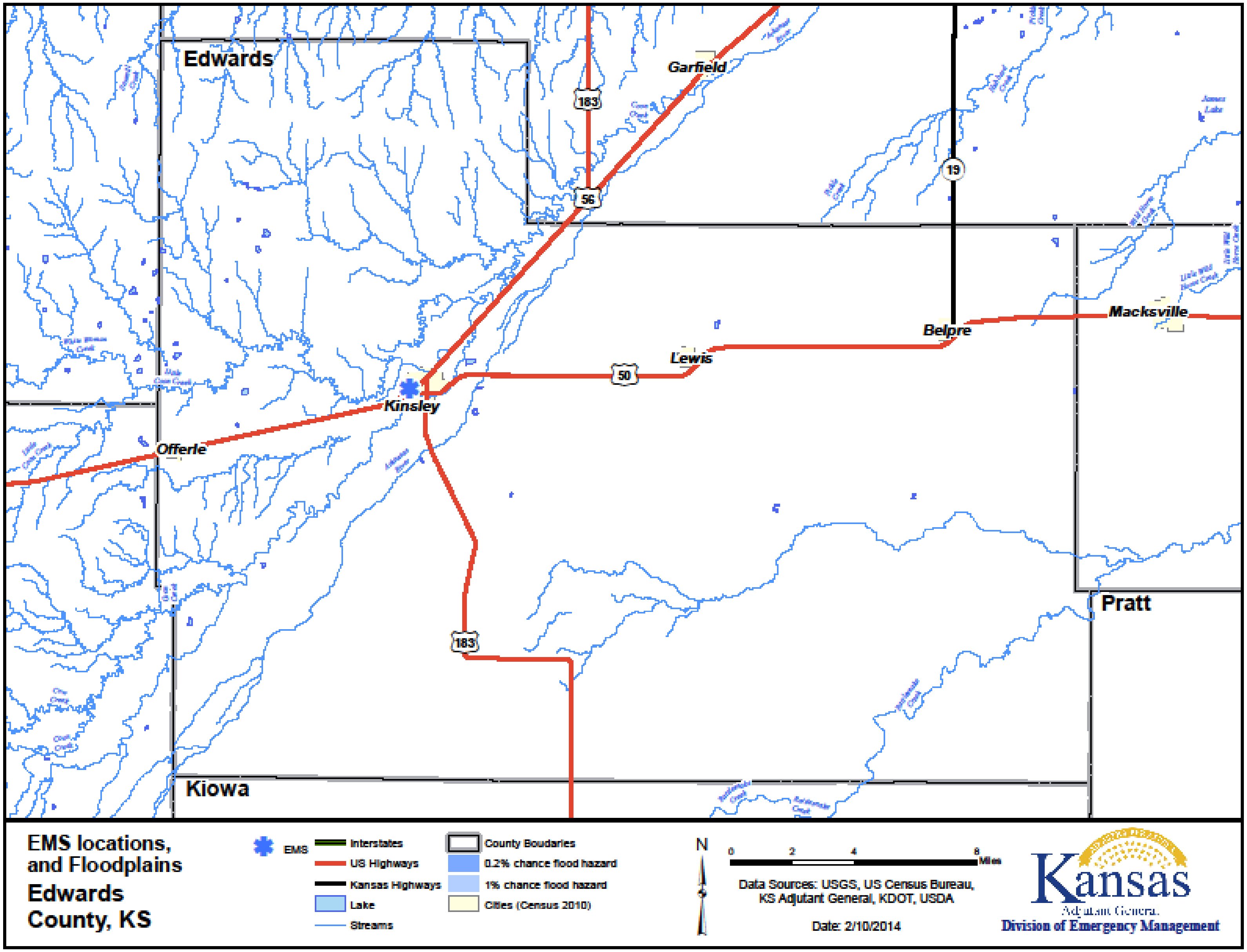
Kansas
Division of Emergency Management


Edwards
Garfield
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Belpre
Macksville
Lewis
50
Kinsley
Offerle
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Pratt
Kiowa
EMS locations,
and Floodplains
Edwards
County, KS
EMS
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
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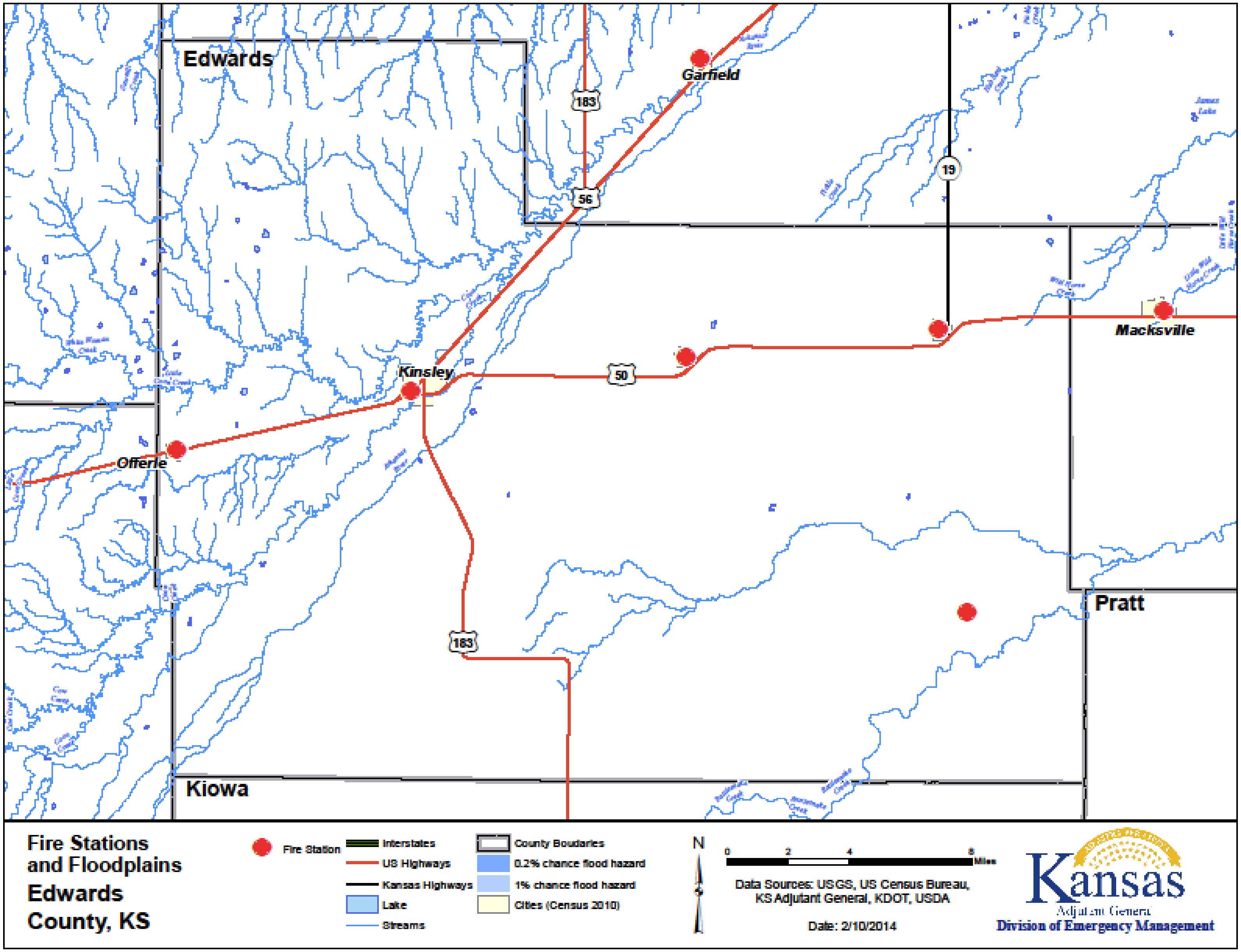
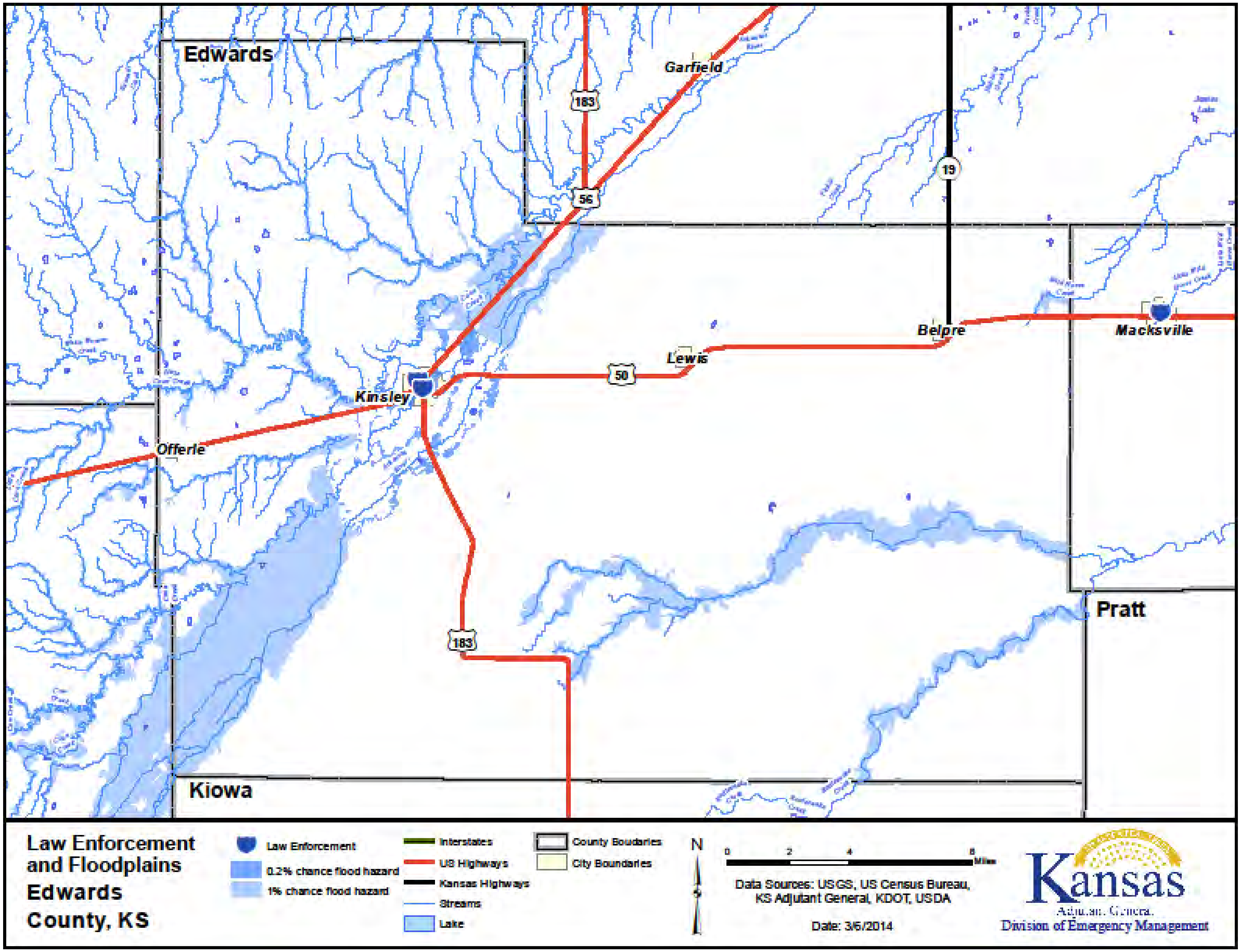
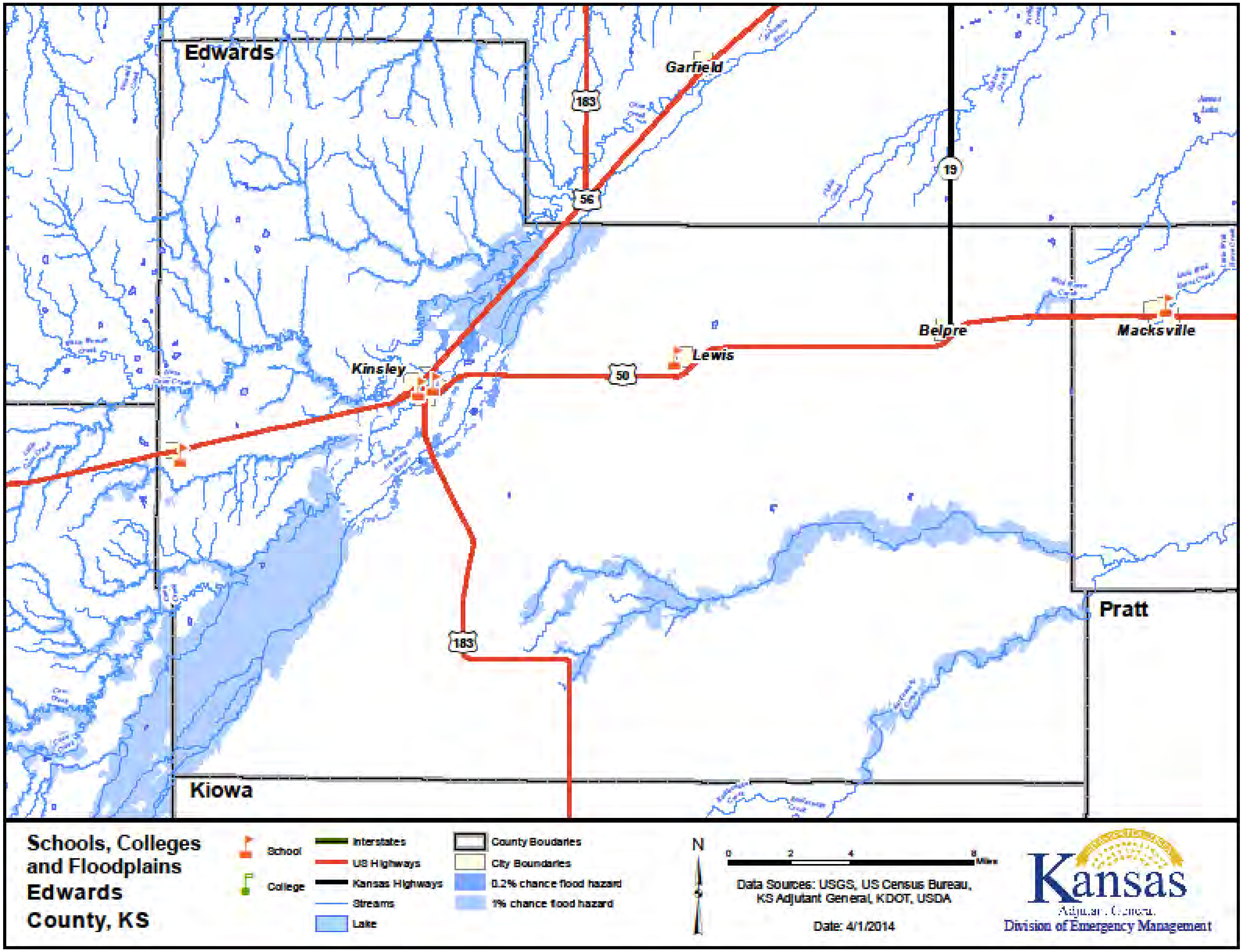
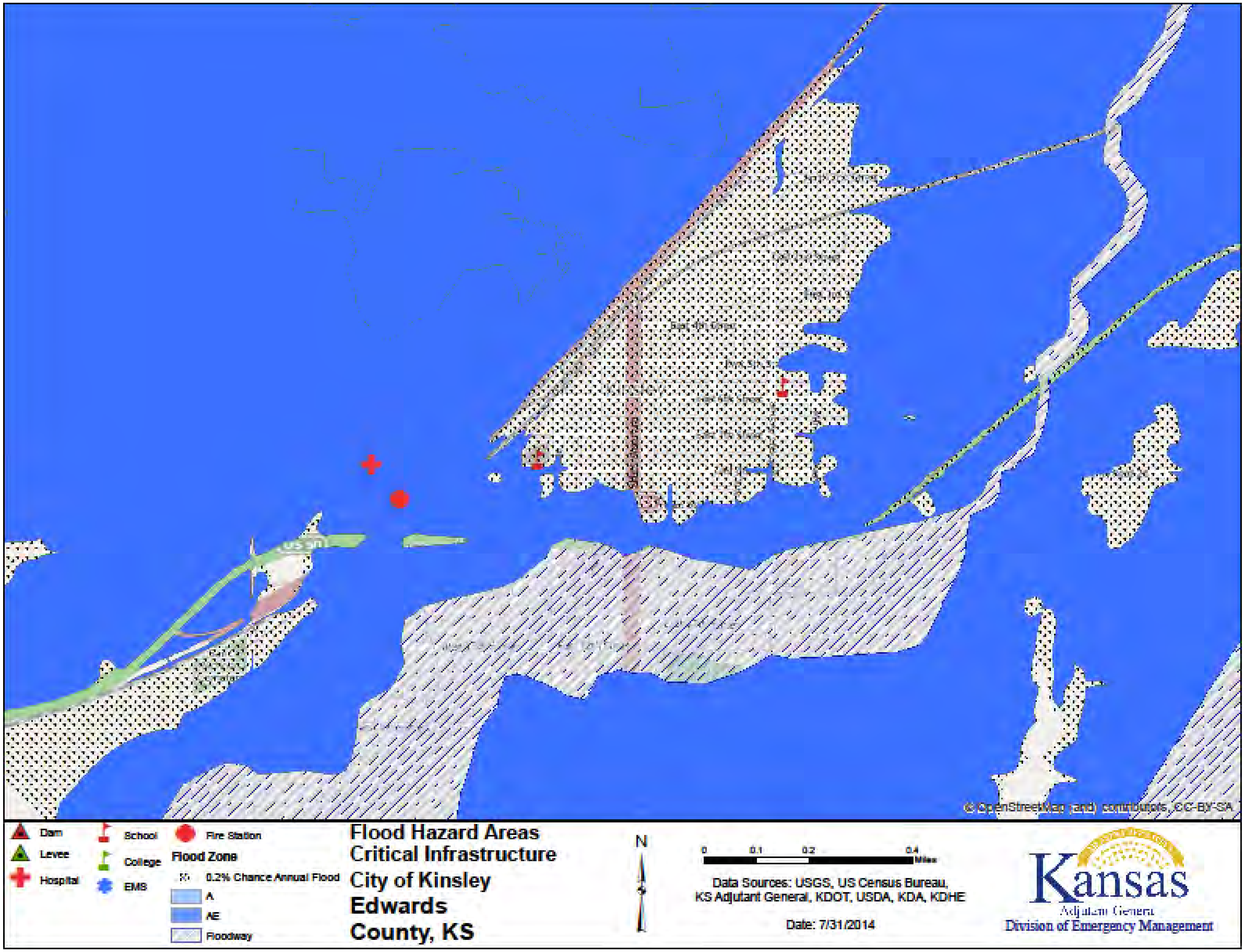
Miles
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management


Edwards
Garfield
Kinsley
Offerle
Macksville
Pratt
Kiowa
183
56
19
50
Fire Stations
and Floodplains
Edwards
County, KS
Fire Station
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Division of Emergency Management

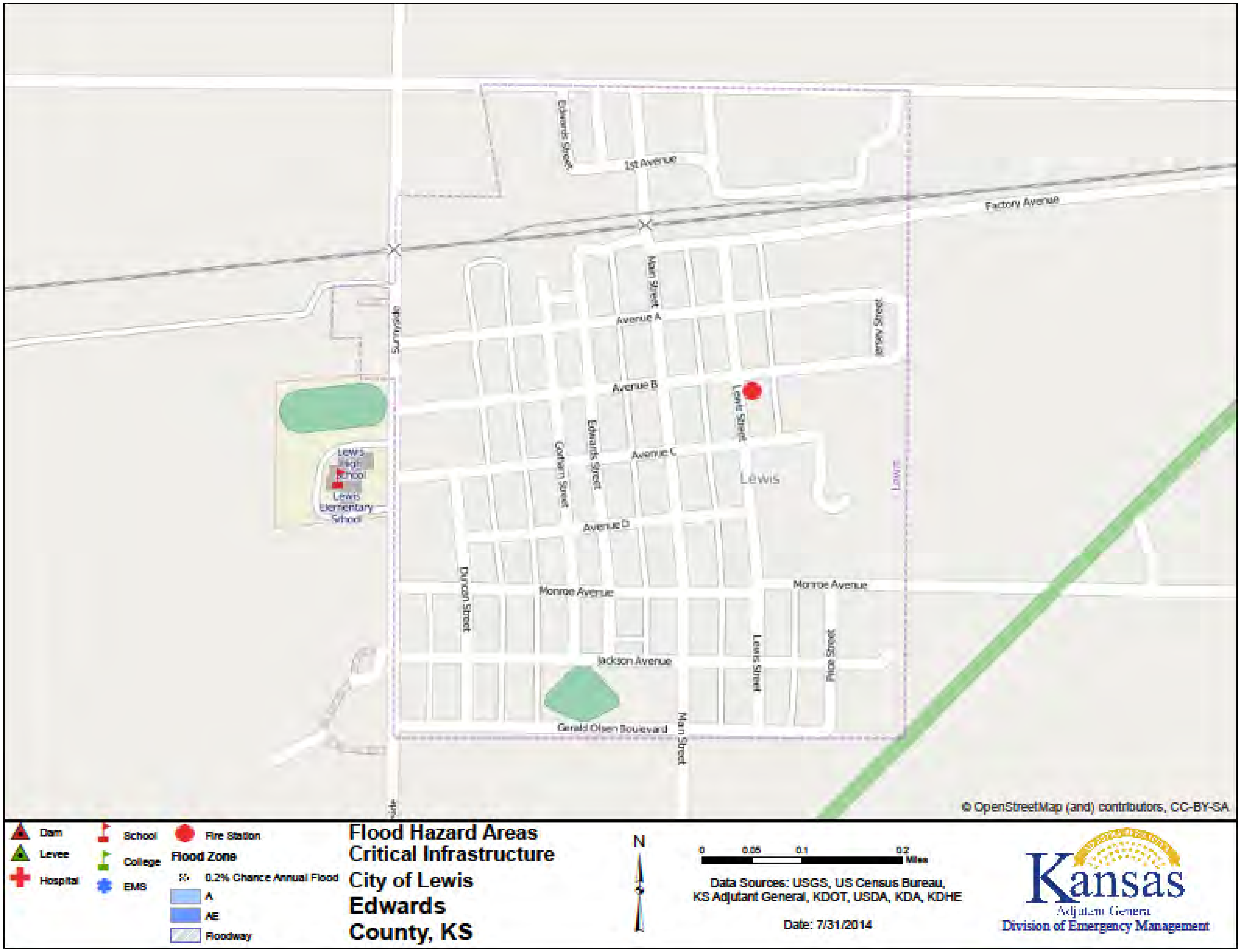

Edwards
Garfield
Belpre
Macksville
Lewis
Kinsley
Offerle
Pratt
Kiowa
183
56
19
50
Law Enforcement and Floodplains Edwards County, KS
Law Enforcement
0.2% chance flood hazard
1% chance flood hazard
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boudaries
City Boundaries
N
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 3/6/2014
Kansas
Division of Emergency Management



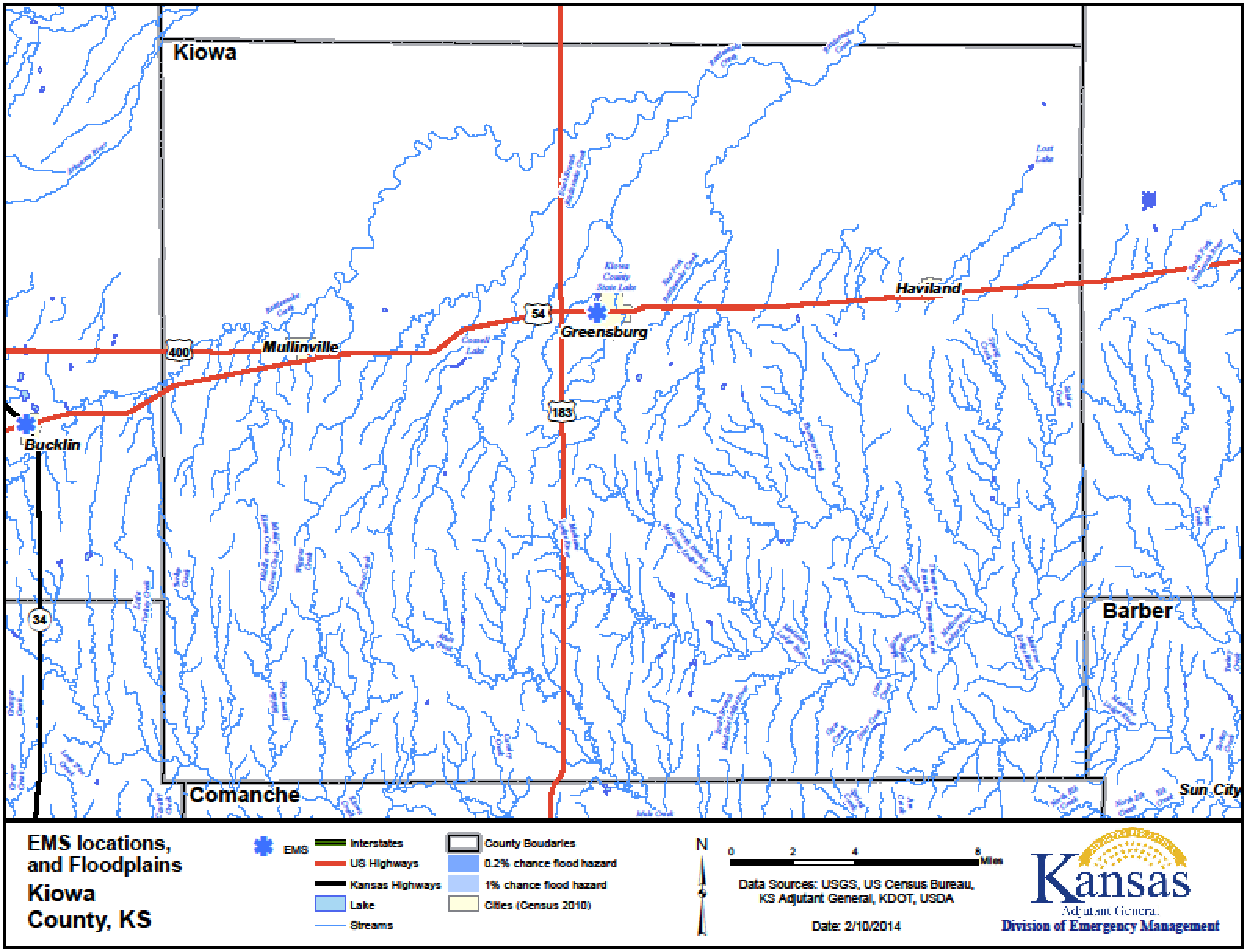
Edwards
Garfield
Kinsley
Lewis
Belpre
Macksville
Pratt
Kiowa
183
56
19
50
Schools, Colleges and Floodplains
Edwards County, KS
School
College
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boudaries
City Boundaries
0.2% chance flood hazard
1% chance flood hazard
N
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 4/1/2014
Kansas
Division of Emergency Management

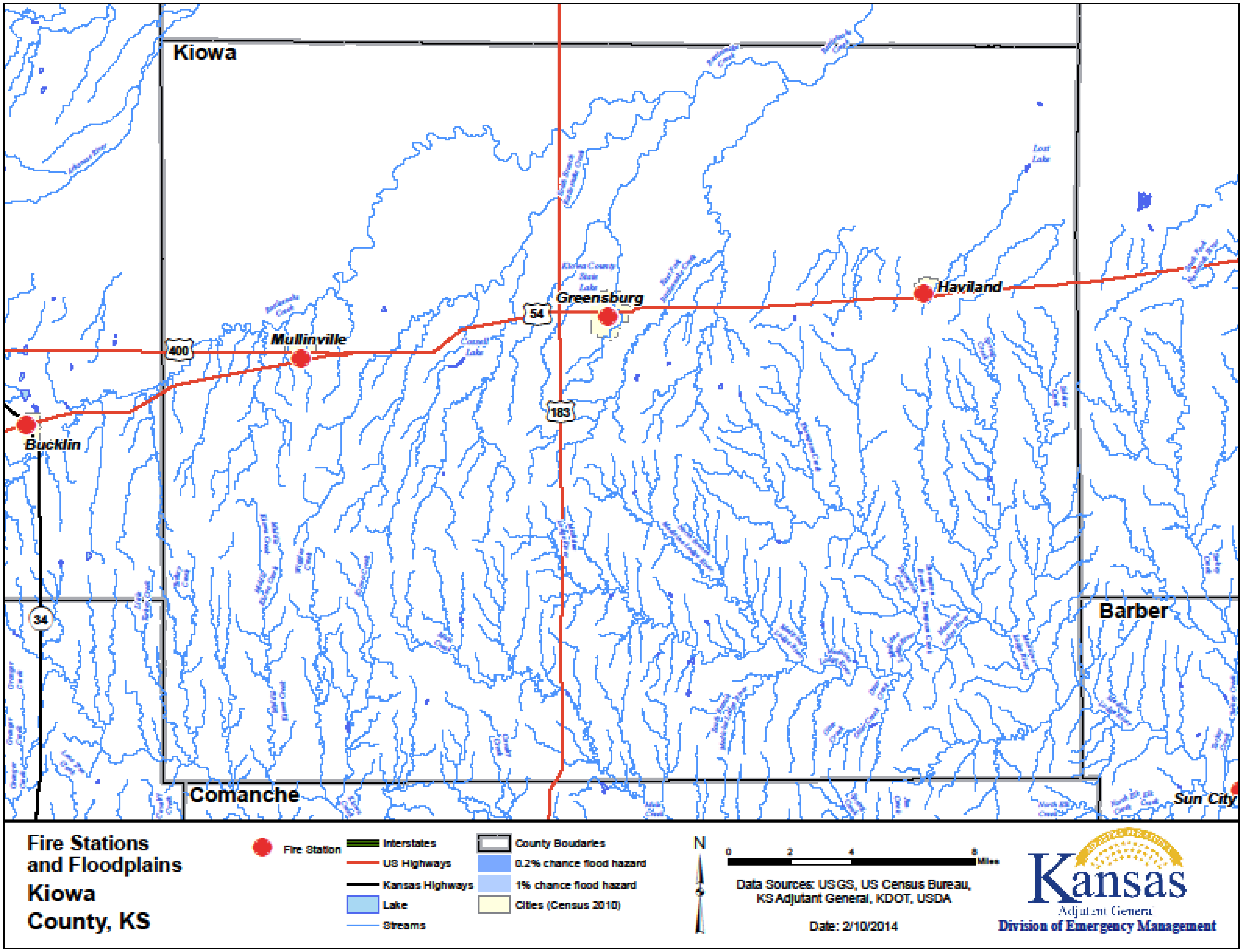


Dam
Levee
Hospital
School
College
EMS
Fire Station
Flood Zone
0.2% Chance Annual Flood
A
AE
Floodway
Flood Hazard Areas
Critical Infrastructure
City of Kinsley
Edwards
County, KS
N
0 0.1 0.2 0.4 Miles
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA, KDA, KDHE
Date: 7/31/2014
Kansas
Adjutant General
Division of Emergency Management
© OpenStreetMap (and) contributors, CC-BY-SA
US 50

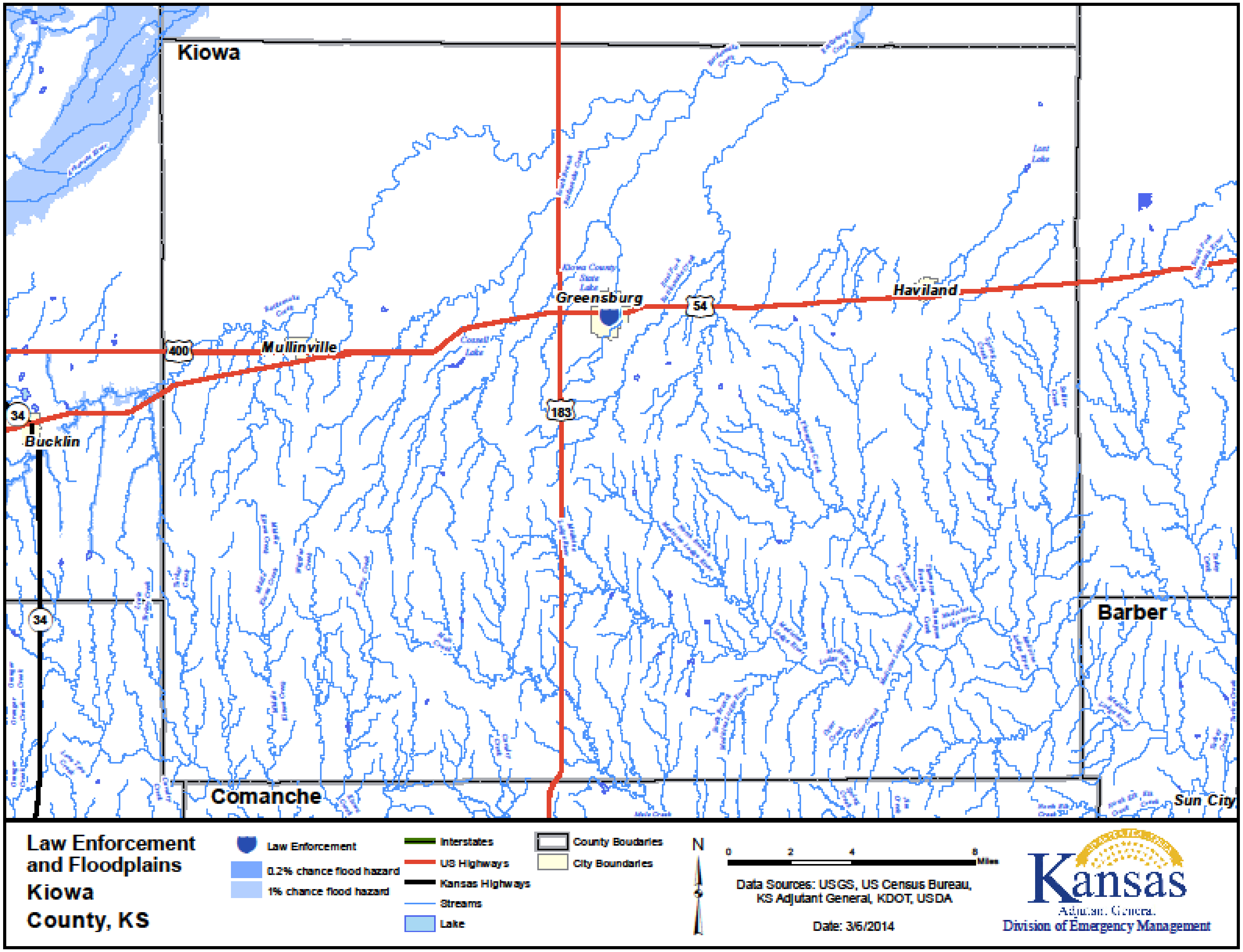

1st Avenue
Factory Avenue
Avenue A
Avenue B
Avenue C
Avenue D
Monroe Avenue
Jackson Avenue
Gerald Olsen Boulevard
Edwards Street
Main Street
Jersey Street
Lewis Street
Gorham Street
Duncan Street
Price Street
Sunnyside
Lewis
Lewis High School
Lewis Elementary School
© OpenStreetMap (and) contributors, CC-BY-SA
Dam
Levee
Hospital
School
College
EMS
Fire Station
Flood Zone
0.2% Chance Annual Flood
A
AE
Floodway
Flood Hazard Areas
Critical Infrastructure
City of Lewis
Edwards
County, KS
N
0 0.05 0.1 0.2 Miles
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA, KDA, KDHE
Date: 7/31/2014
Kansas
Adjutant General
Division of Emergency Management

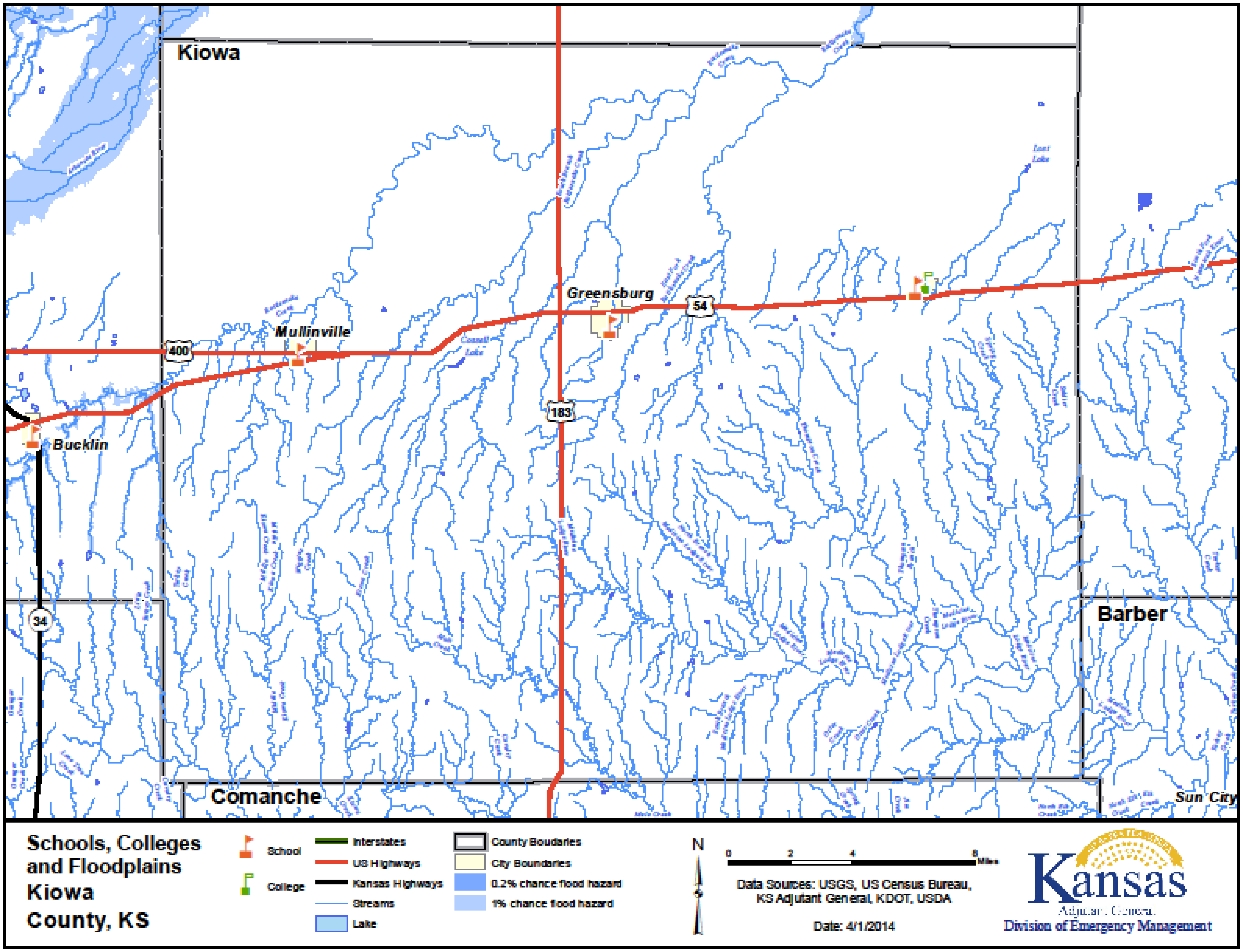
© OpenStreetMap (and) contributors, CC-BY-SA
Dam
Levee
Hospital
School
College
EMS
Fire Station
Flood Zone
0.2% Chance Annual Flood
A
AE
Floodway
Flood Hazard Areas
Critical Infrastructure
City of Offerle
Edwards
County, KS
N
0 0.05 0.1 0.2 Miles
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA, KDA, KDHE
Date: 7/31/2014
Kansas
Adjutant General
Division of Emergency Management


Kiowa
Comanche
Barber
Mullinville
Greensburg
Haviland
Bucklin
Sun City
400
54
183
34
EMS locations, and Floodplains
Kiowa County, KS
EMS
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
0 2 4 8 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management



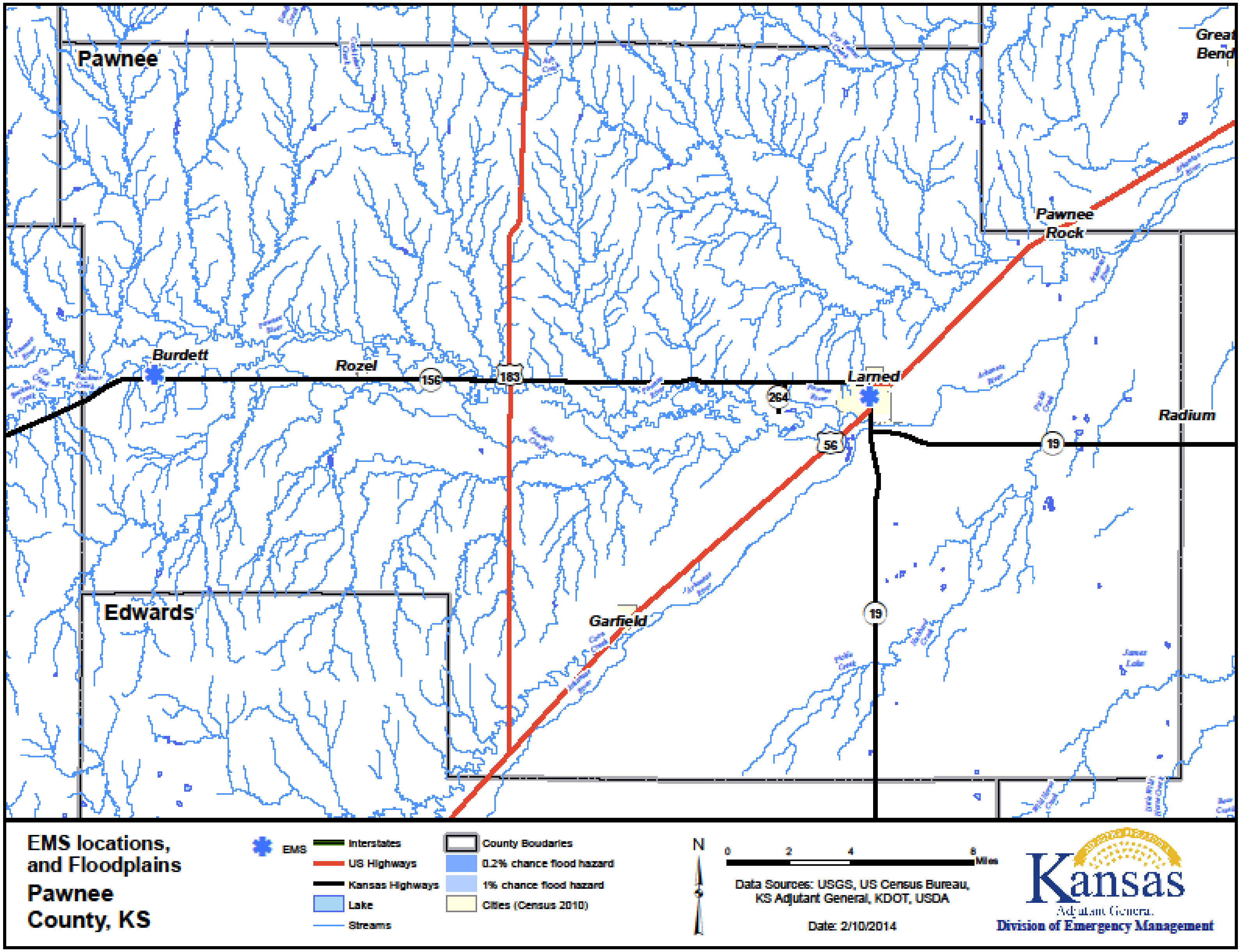
Kiowa
Comanche
Barber
Mullinville
Greensburg
Haviland
Bucklin
Sun City
400
54
183
34
Fire Stations
and Floodplains
Kiowa
County, KS
Fire Station
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
0
2
4
8
Miles
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management

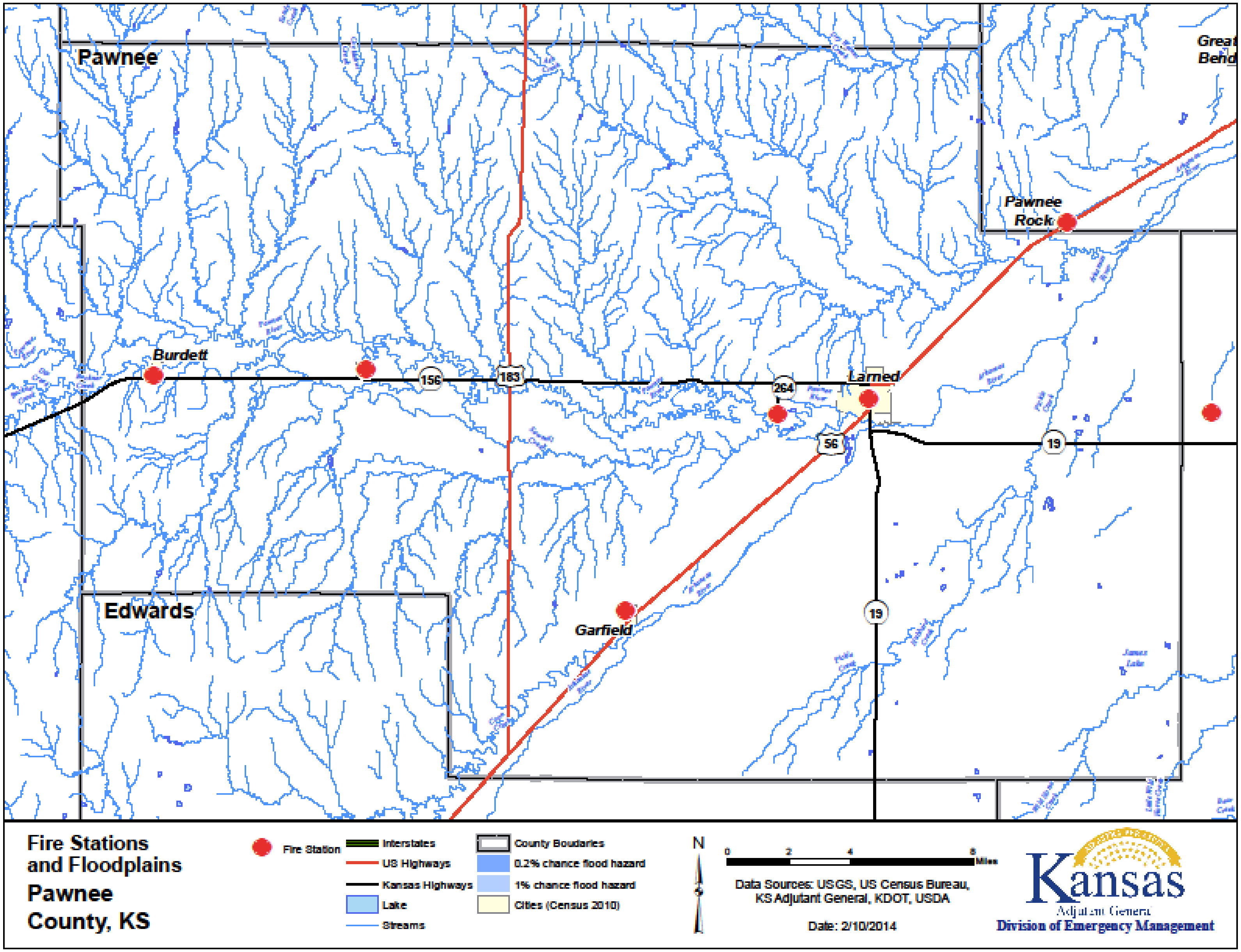

Kiowa
Greensburg
Haviland
Mullinville
Bucklin
Barber
Comanche
Sun City
400
54
34
183
Law Enforcement and Floodplains
Kiowa County, KS
Law Enforcement
0.2% chance flood hazard
1% chance flood hazard
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boudaries
City Boundaries
N
0
2
4
8
Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 3/6/2014
Kansas
Division of Emergency Management



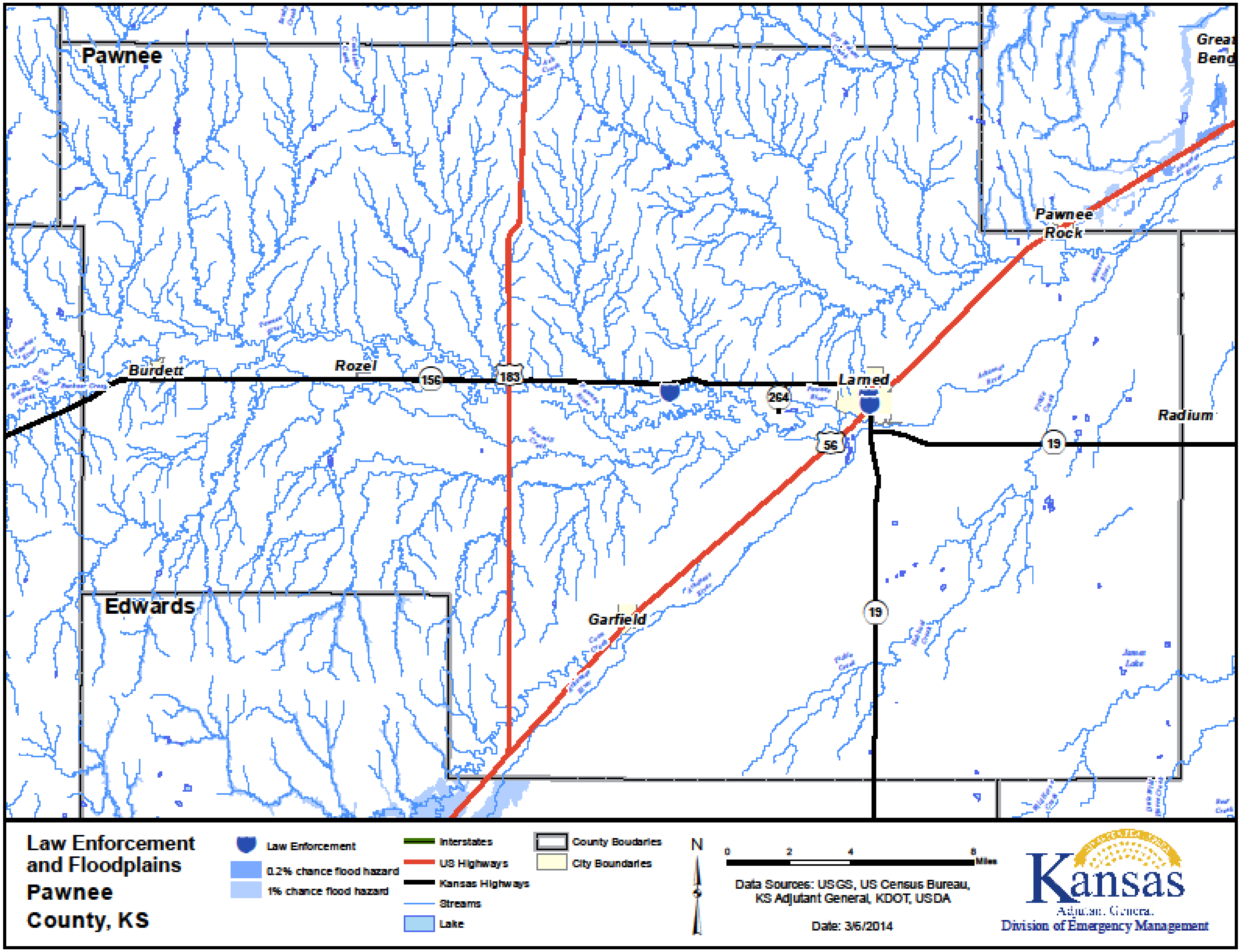
Kiowa
Greensburg
54
Mullinville
400
183
Bucklin
34
Barber
Comanche
Sun City
Schools, Colleges and Floodplains Kiowa County, KS
School
College
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boudaries
City Boundaries
0.2% chance flood hazard
1% chance flood hazard
N
0 2 4 8 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 4/1/2014
Kansas
Division of Emergency Management

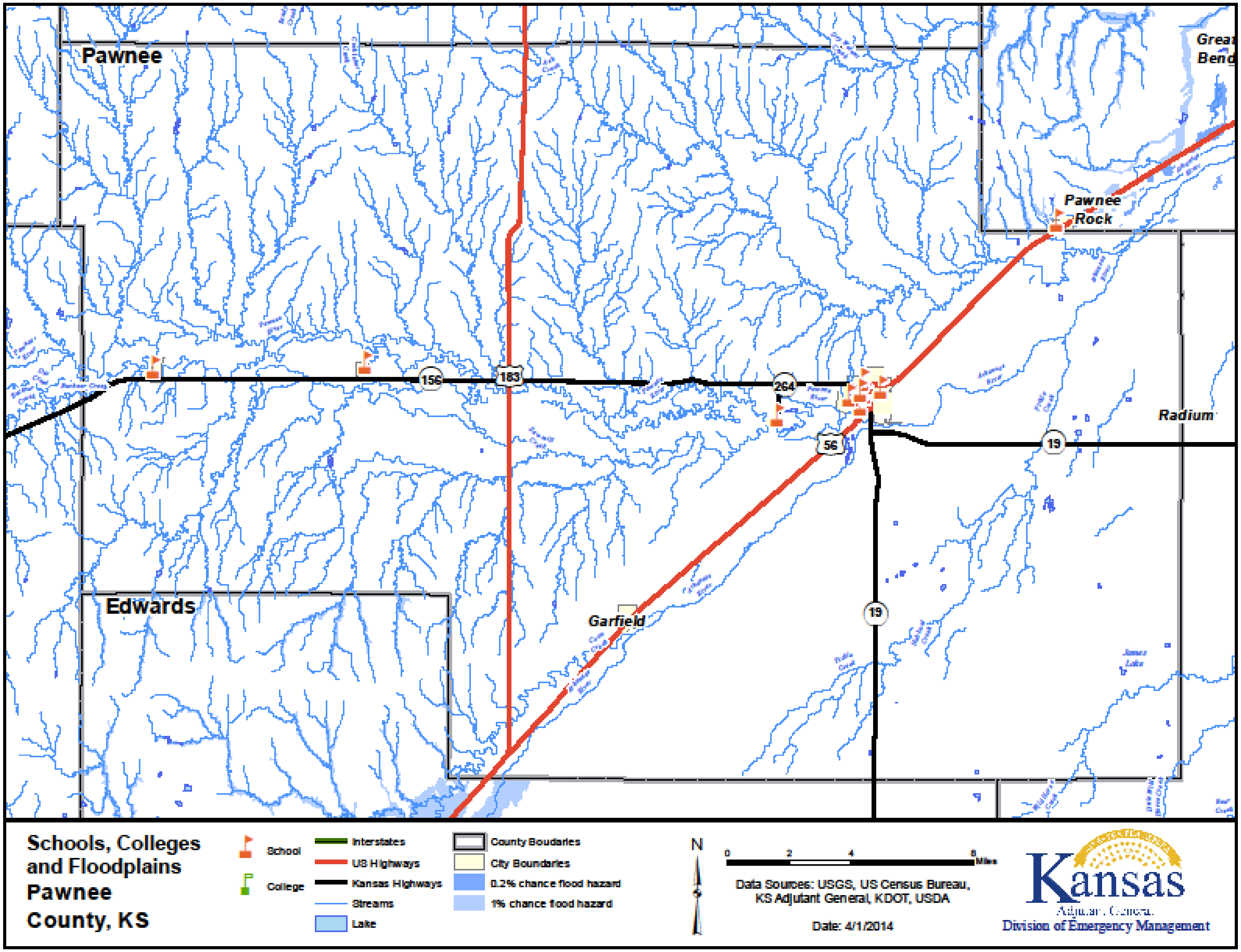

North Avenue
North Street
Oak Street
Ohio Avenue
Kansas Street
Kansas Avenue
Elm Street
Cherry Street
Wall Street
Wall Street
Washington Avenue
Washington Avenue
Pine Street
Maple Street
US 400
South Avenue
US 400
Mullinville
South Avenue
US 400
US 400
21st Century Learning Academy
Kingman Street
Park Street
US 54
© OpenStreetMap (and) contributors, CC-BY-SA
Dam
Levee
Hospital
School
College
EMS
Fire Station
Flood Zone
0.2% Chance Annual Flood
A
AE
Floodway
Flood Hazard Areas
Critical Infrastructure
City of Mullinville
Kiowa
County, KS
N
0
0.075
0.15
0.3
Miles
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA, KDA, KDHE
Date: 7/31/2014
Kansas
Adjutant General
Division of Emergency Management


Pawnee
Great Bend
Pawnee Rock
Burdett
Rozel
Larned
Radium
Edwards
Garfield
156
183
264
56
19
EMS locations, and Floodplains
Pawnee County, KS
EMS
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
0 2 4 8 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Division of Emergency Management

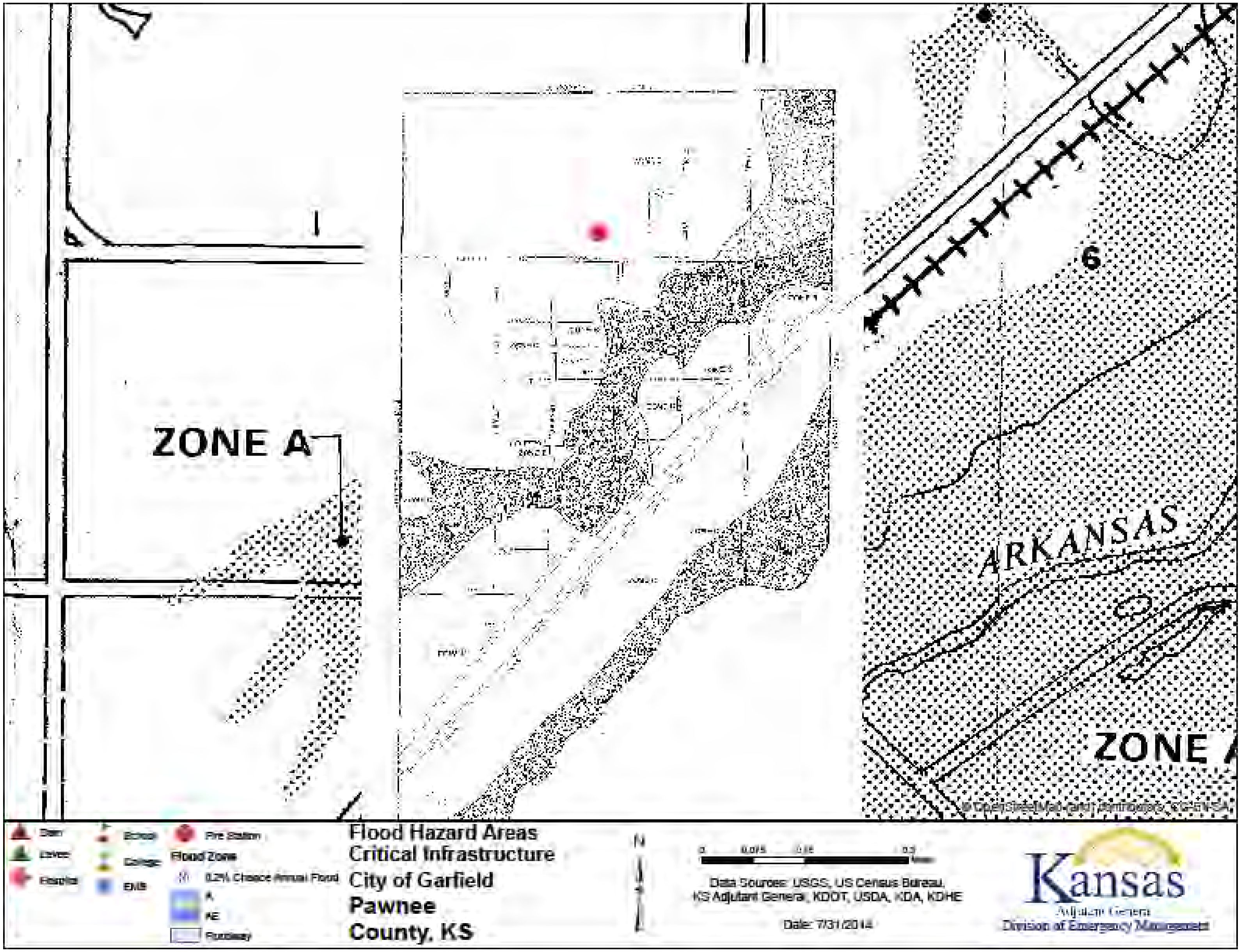


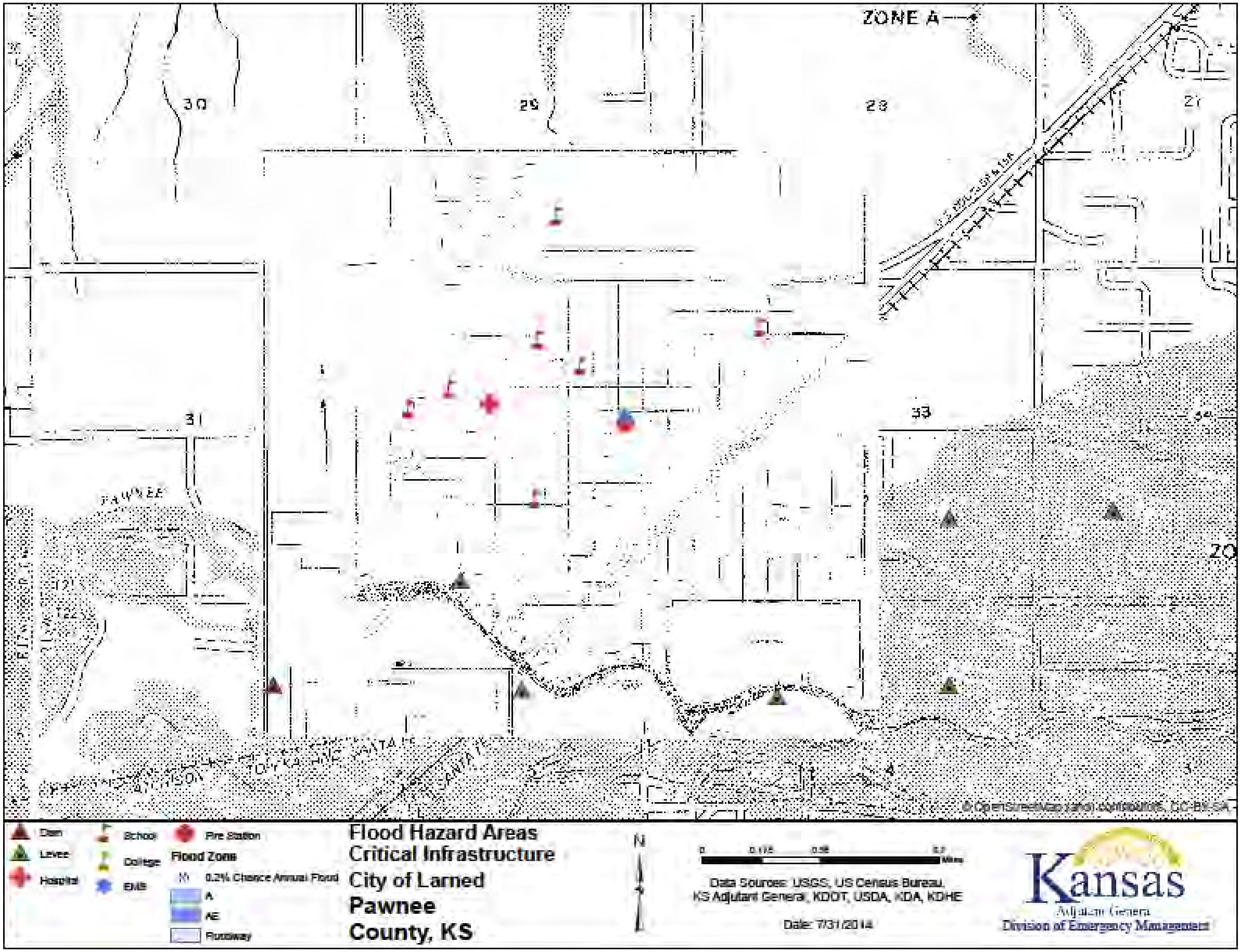
Pawnee
Great Bend
Pawnee Rock
Burdett
156
183
264
Larned
56
19
Edwards
Garfield
19
Fire Stations and Floodplains
Pawnee County, KS
Fire Station
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
0 2 4 8 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management

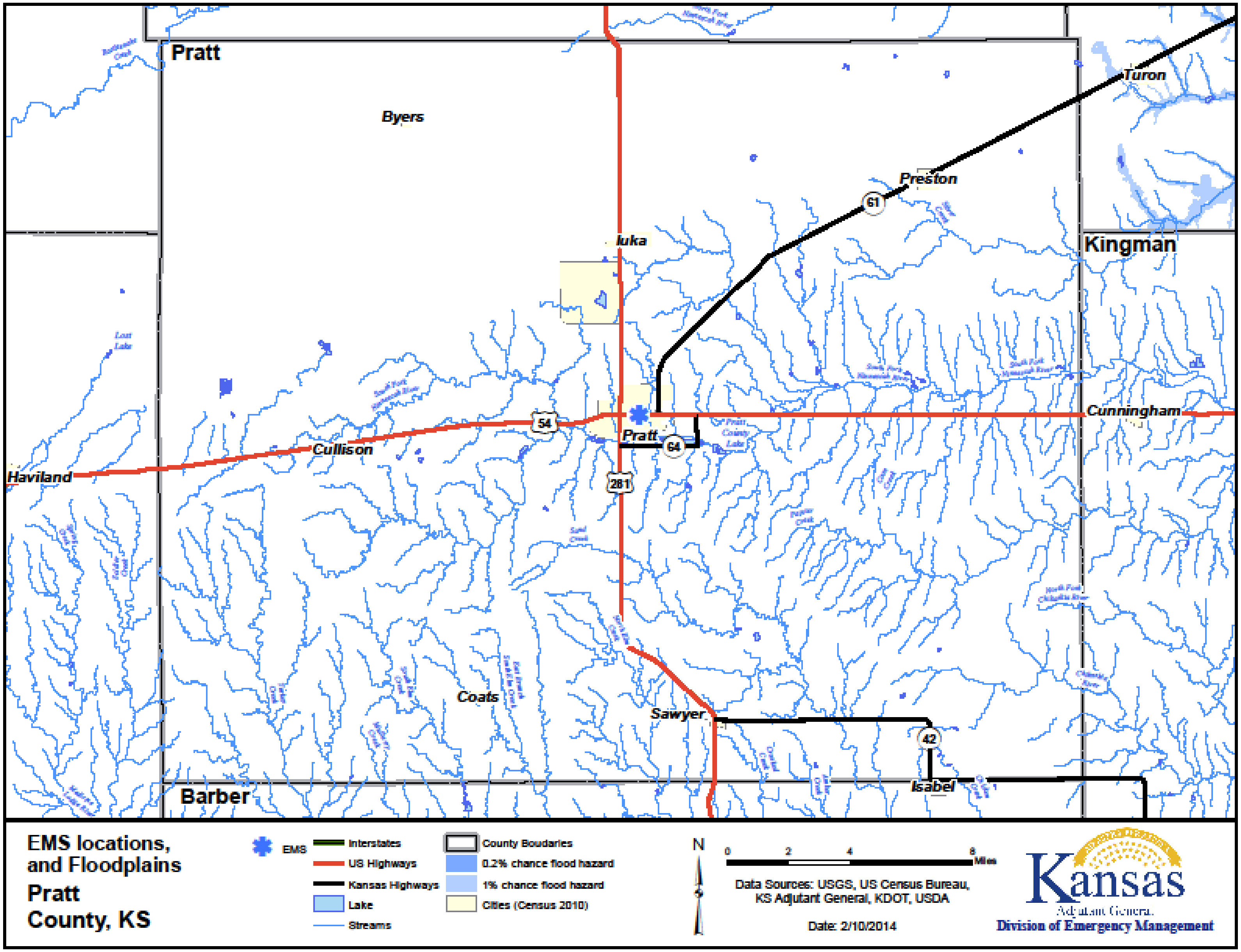

Pawnee
Edwards
Great Bend
Pawnee Rock
Burdett
Rozel
Larned
Radium
Garfield
156
183
264
56
19
19
Law Enforcement and Floodplains
Pawnee County, KS
Law Enforcement
0.2% chance flood hazard
1% chance flood hazard
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boudaries
City Boundaries
N
0 2 4 8 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 3/6/2014
Kansas
Division of Emergency Management

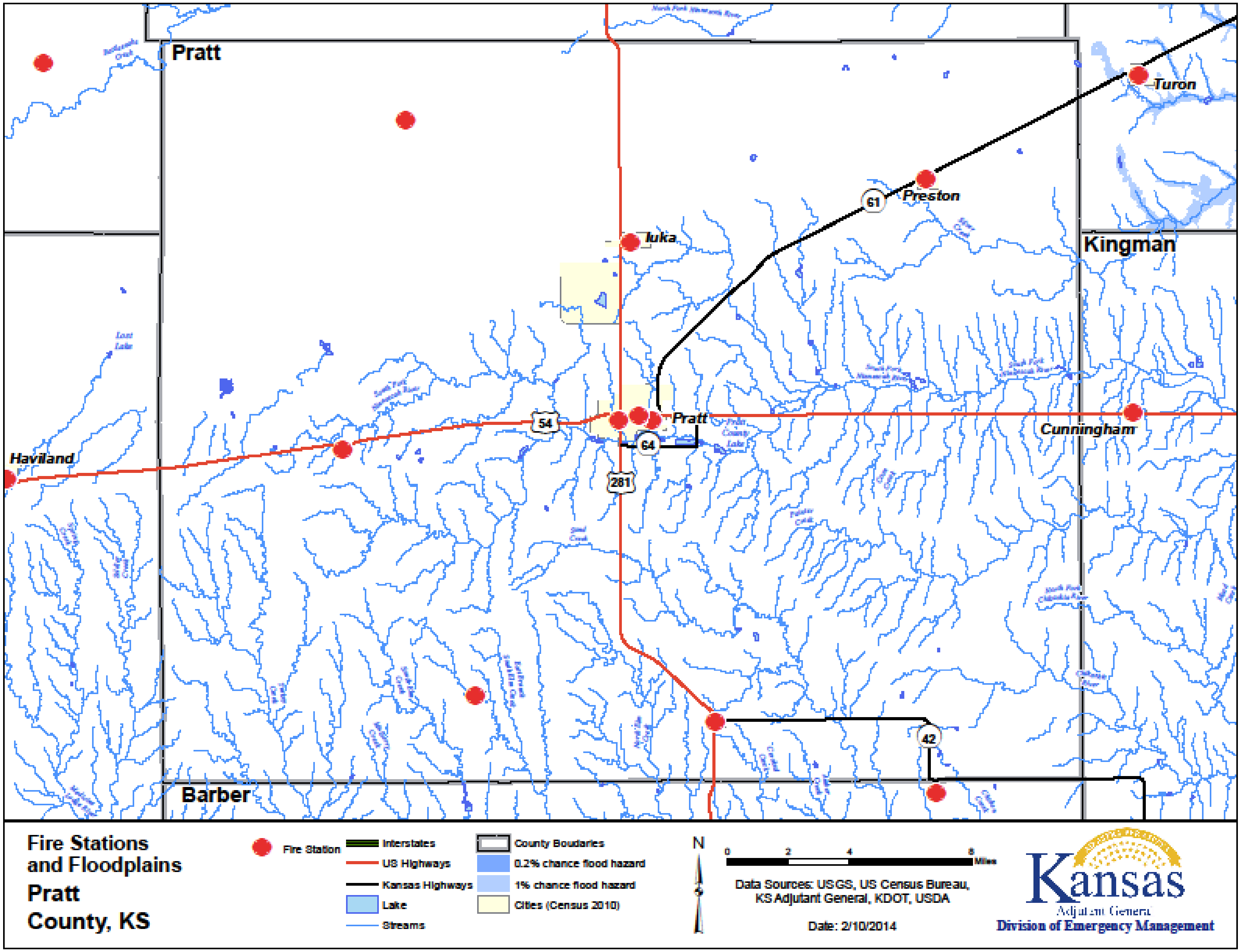


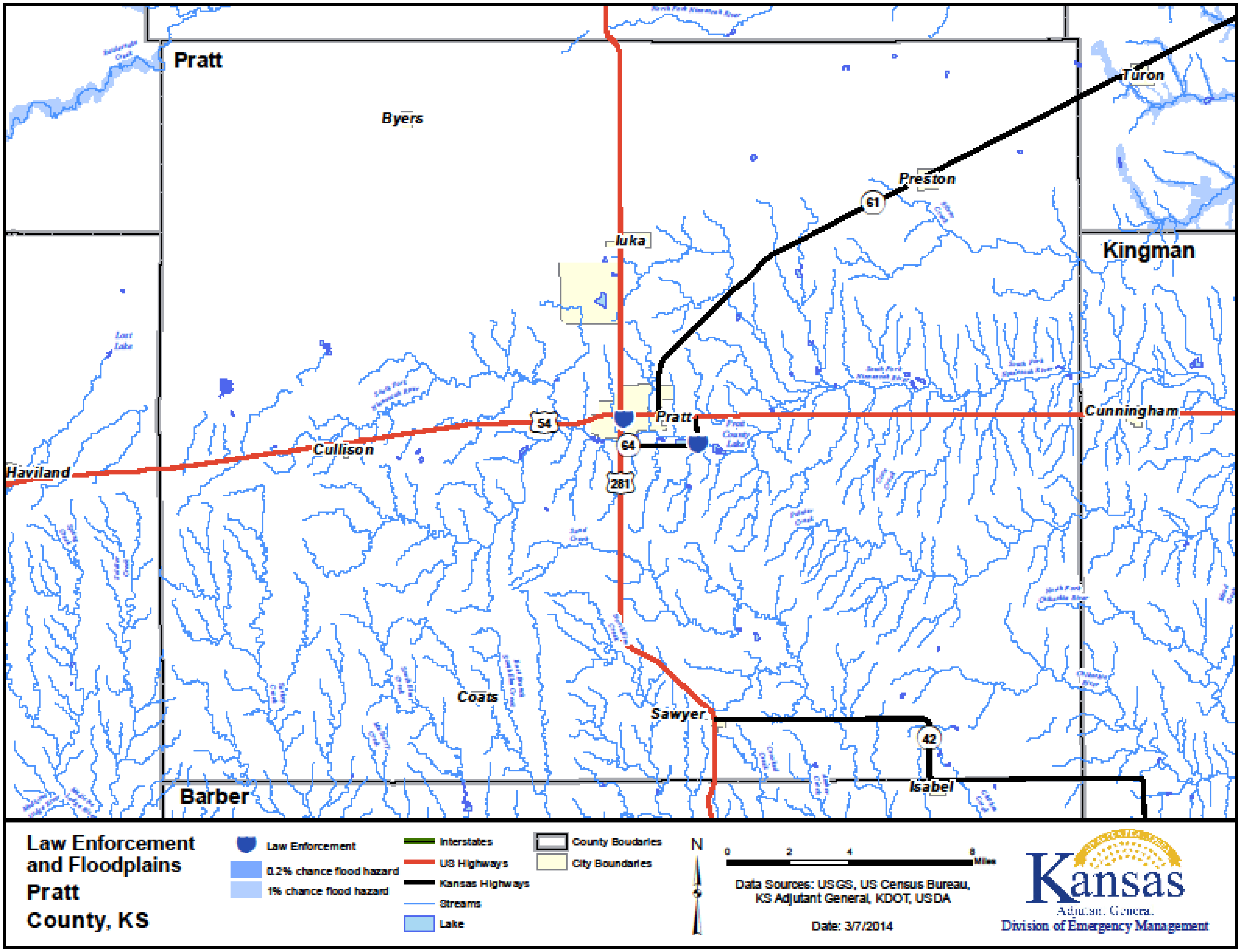
Pawnee
Great Bend
Pawnee Rock
Radium
Edwards
Garfield
156
183
264
56
19
Schools, Colleges and Floodplains Pawnee County, KS
School
College
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boudaries
City Boundaries
0.2% chance flood hazard
1% chance flood hazard
N
0 2 4 8 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 4/1/2014
Kansas
Division of Emergency Management

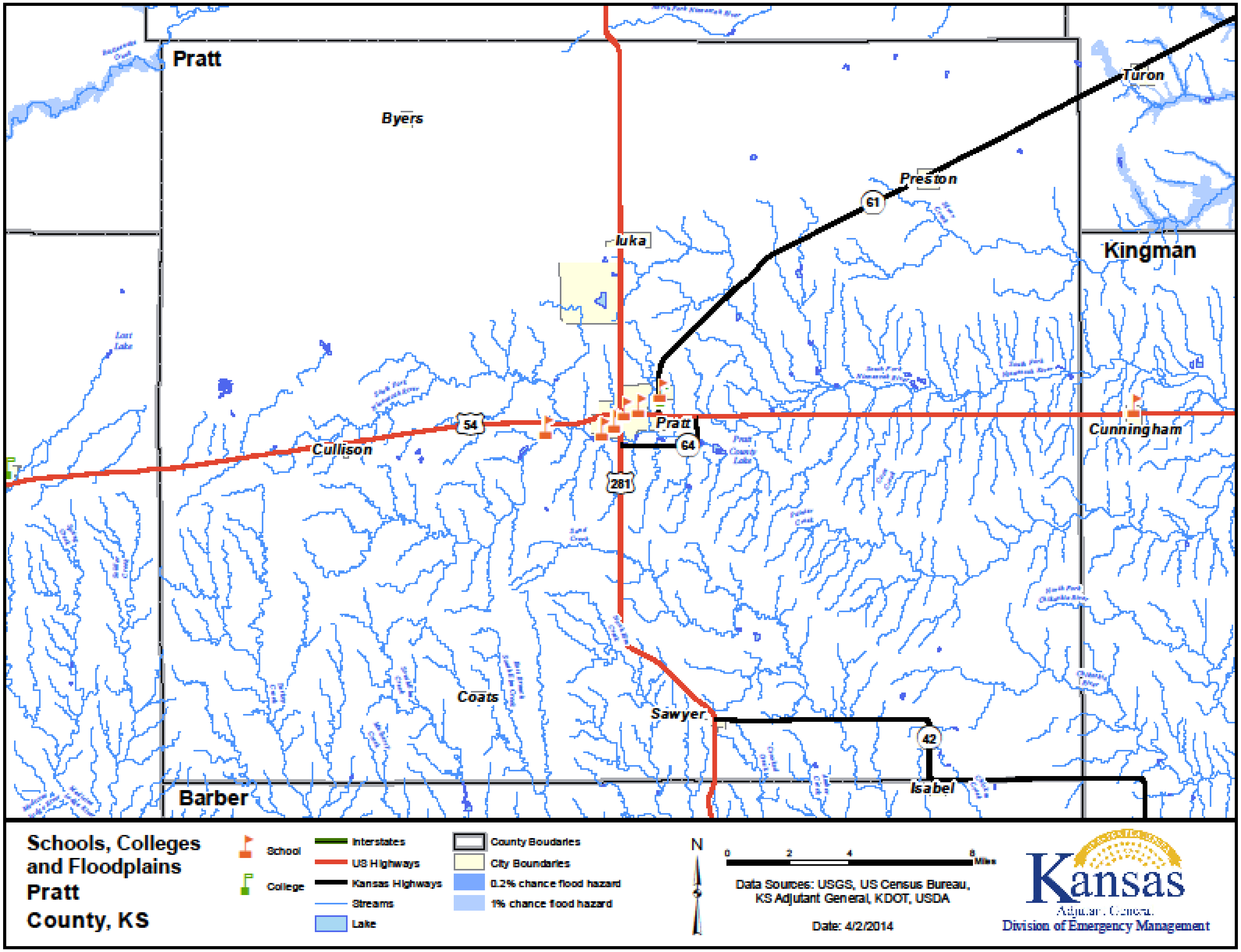

ZONE A
ARKANSAS
6
ZONE A
Dam
Levee
Hospital
School
College
EMS
Fire Station
Flood Zone
0.2% Chance Annual Flood
A
AE
Floodway
Flood Hazard Areas
Critical Infrastructure
City of Garfield
Pawnee
County, KS
N
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA, KDA, KDHE
Date: 7/31/2014
Kansas
Adjutant General
Division of Emergency Management


ZONE A
30
29
28
31
33
PAWNEE
Dam
Levee
Hospital
School
College
EMS
Fire Station
Flood Zone
0.2% Chance Annual Flood
A
AE
Floodway
Flood Hazard Areas
Critical Infrastructure
City of Larned
Pawnee
County, KS
N
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA, KDA, KDHE
Date: 7/31/2014
Kansas
Division of Emergency Management

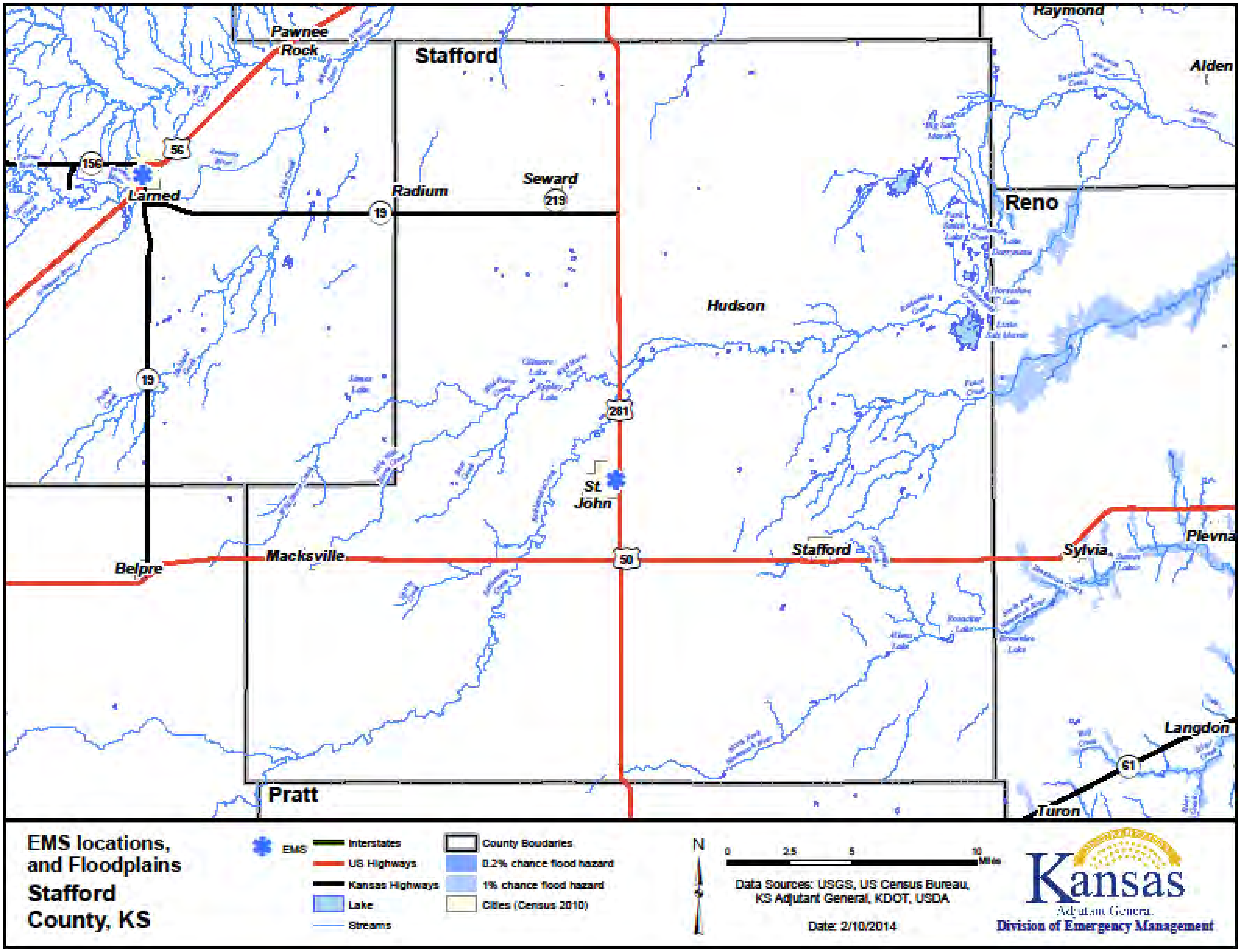

Pratt
Byers
Iuka
Preston
Turon
Kingman
Cunningham
Pratt
Cullison
Haviland
Coats
Sawyer
Isabel
Barber
54
61
64
281
42
EMS locations,
and Floodplains
Pratt
County, KS
EMS
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
0
2
4
8
Miles
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management

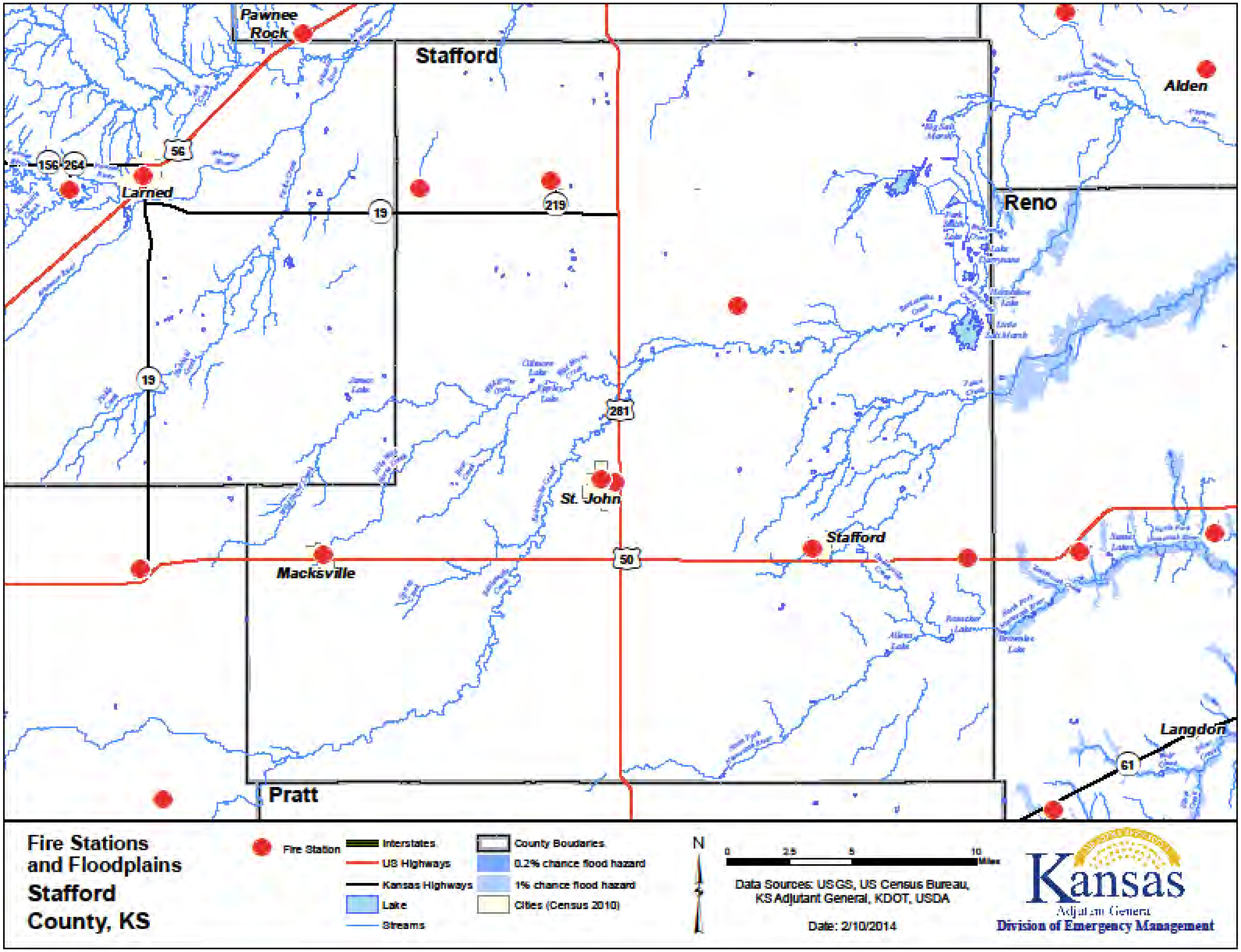

Pratt
Turon
Preston
61
Iuka
Kingman
54
Pratt
Cunningham
64
Haviland
281
42
Barber
Fire Stations
and Floodplains
Pratt
County, KS
Fire Station
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
0 2 4 8 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Adjutant General
Division of Emergency Management


Pratt
Byers
Turon
Preston
Iuka
Kingman
Pratt
Cunningham
Cullison
Haviland
Coats
Sawyer
Isabel
Barber
54
61
64
281
42
Law Enforcement and Floodplains
Pratt County, KS
Law Enforcement
0.2% chance flood hazard
1% chance flood hazard
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boudaries
City Boundaries
N
0 2 4 8 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 3/7/2014
Kansas
Division of Emergency Management

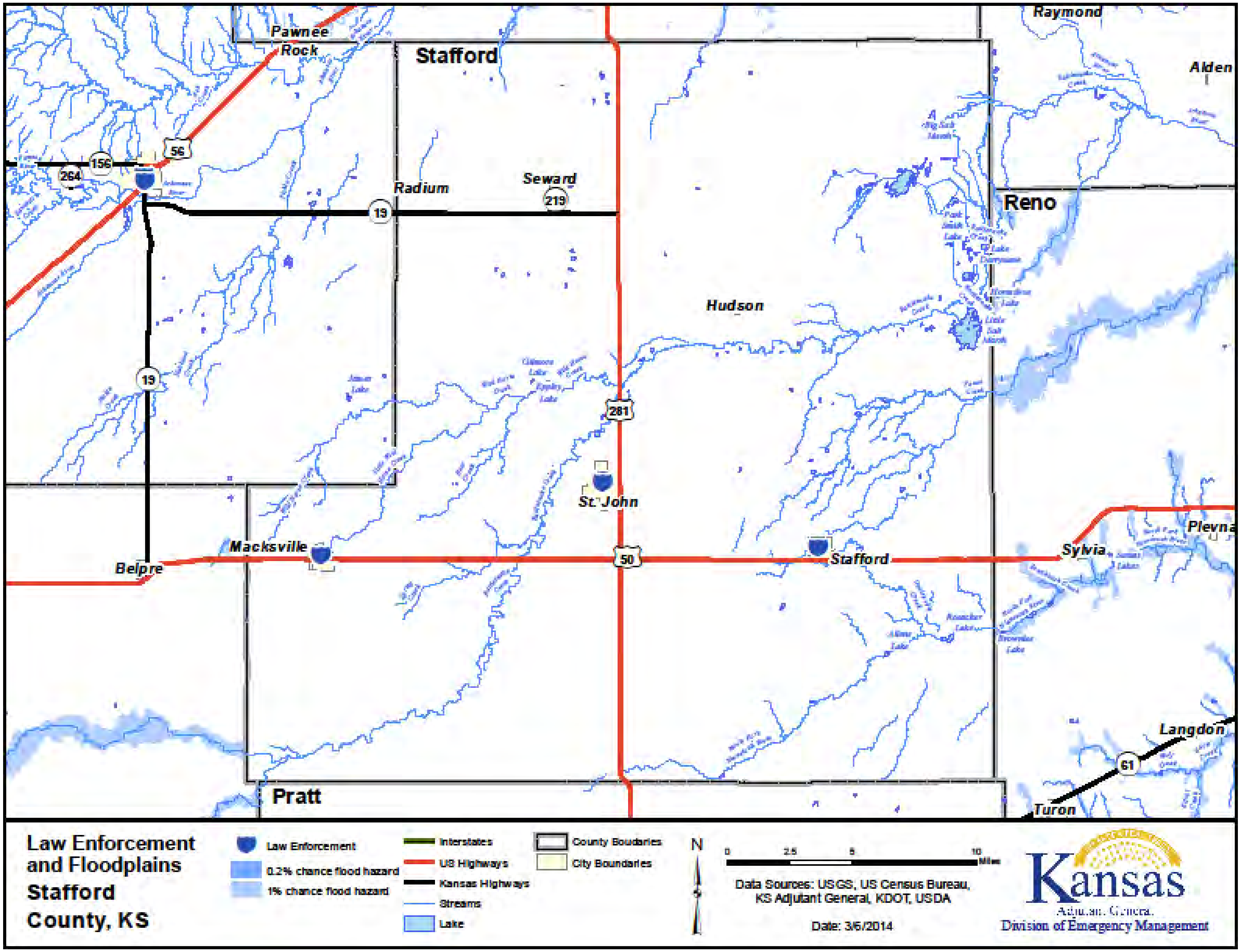


Pratt
Byers
Iuka
Preston
Turon
Kingman
Cullison
Pratt
Cunningham
Coats
Sawyer
Isabel
Barber
54
61
64
281
42
Schools, Colleges and Floodplains Pratt County, KS
School
College
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boudaries
City Boundaries
0.2% chance flood hazard
1% chance flood hazard
N
0 2 4 8 Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 4/2/2014
Kansas
Division of Emergency Management

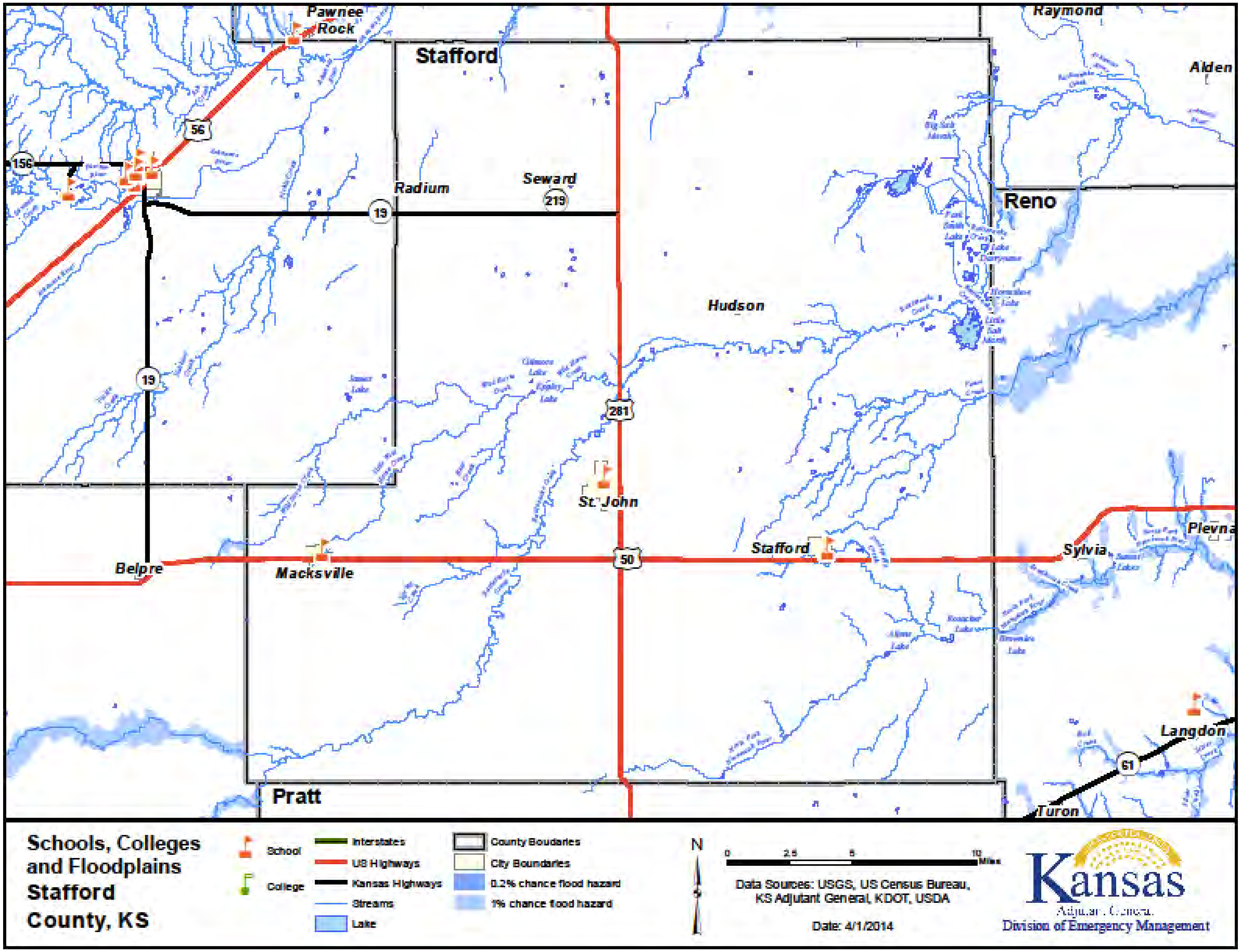

Pawnee Rock
Stafford
Raymond
Alden
Larned
Radium
Seward
Reno
Hudson
St. John
Macksville
Belpre
Stafford
Sylvia
Plevna
Langdon
Turon
Pratt
EMS locations, and Floodplains
Stafford County, KS
EMS
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Division of Emergency Management



Pawnee Rock
Stafford
Reno
Alden
Larned
St. John
Stafford
Macksville
Langdon
Pratt
Fire Stations and Floodplains
Stafford County, KS
Fire Station
Interstates
US Highways
Kansas Highways
Lake
Streams
County Boudaries
0.2% chance flood hazard
1% chance flood hazard
Cities (Census 2010)
N
Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 2/10/2014
Kansas
Division of Emergency Management



Pawnee Rock
Stafford
Raymond
Alden
Radium
Seward
Reno
Hudson
St. John
Macksville
Belpre
Stafford
Sylvia
Plevna
Langdon
Turon
Pratt
56
156
264
19
219
281
50
61
Law Enforcement and Floodplains
Stafford County, KS
Law Enforcement
0.2% chance flood hazard
1% chance flood hazard
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boundaries
City Boundaries
N
0
2.5
5
10
Miles
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 3/6/2014
Kansas
Division of Emergency Management


Pawnee Rock
Stafford
Raymond
Alden
Radium
Seward
Reno
Hudson
St. John
Stafford
Sylvia
Plevna
Belpre
Macksville
Langdon
Pratt
Turon
Schools, Colleges and Floodplains Stafford County, KS
School
College
Interstates
US Highways
Kansas Highways
Streams
Lake
County Boudaries
City Boundaries
0.2% chance flood hazard
1% chance flood hazard
N
Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA
Date: 4/1/2014
Kansas
Division of Emergency Management

8th Street
8th Street
7th Street
6th Street
5th Street
4th Street
3rd Street
2nd Street
Lincoln Avenue
Seward Avenue
Main Street
Hayes Avenue
Northwest 30th Avenue
Northwest 150th Street
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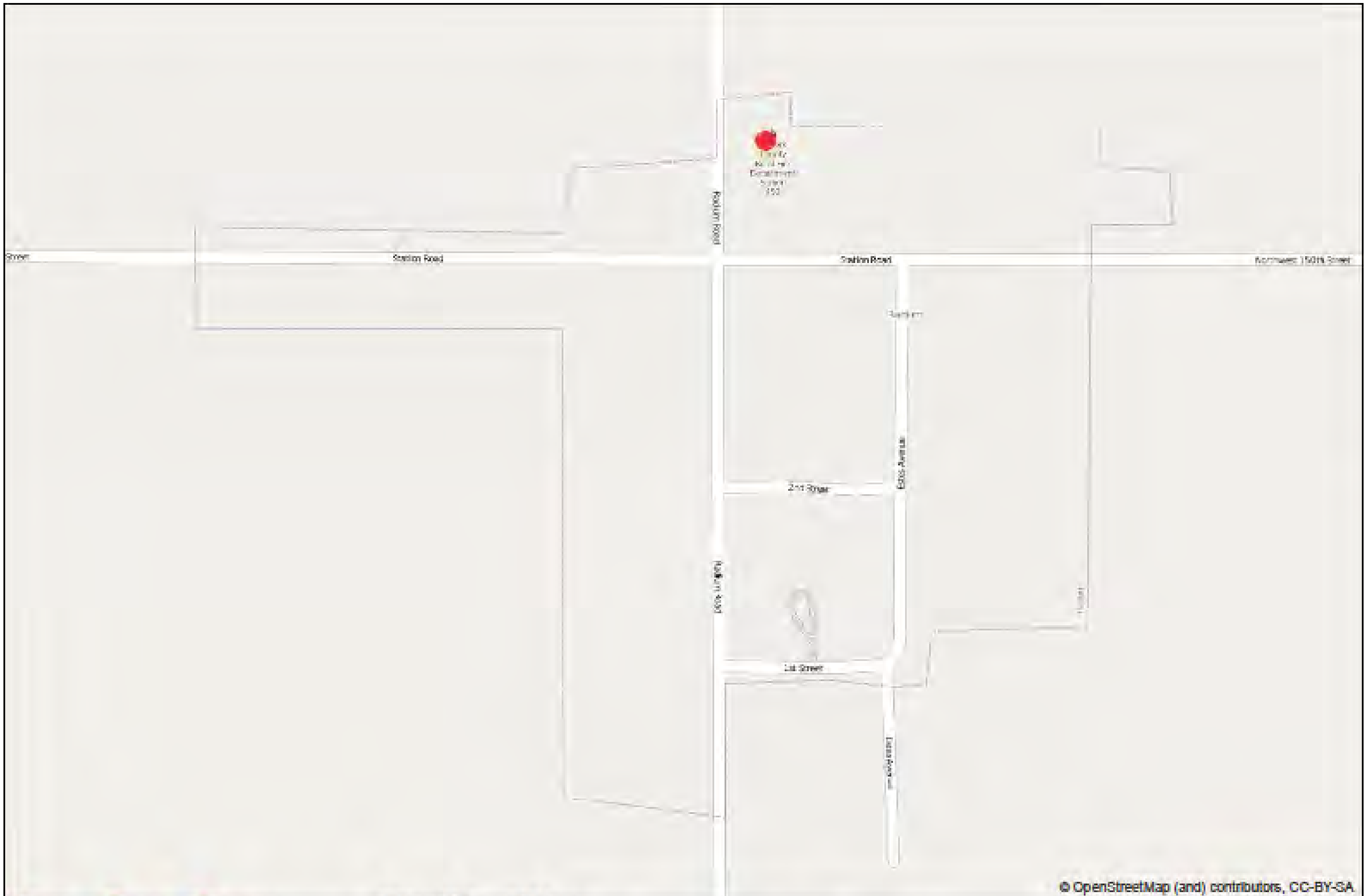
Dam
Levee
Hospital
School
College
EMS
Fire Station
Flood Zone
0.2% Chance Annual Flood
A
AE
Floodway
Flood Hazard Areas
Critical Infrastructure
City of Seward
Stafford
County, KS
N
0
0.0475
0.095
0.19
Miles
Data Sources: USGS, US Census Bureau,
KS Adjutant General, KDOT, USDA, KDA, KDHE
Date: 7/31/2014
Kansas
Adjutant General
Division of Emergency Management



Dam
Levee
Hospital
School
College
EMS
Fire Station
Flood Zone
0.2% Chance Annual Flood
A
AE
Floodway

Flood Hazard Areas
Critical Infrastructure
City of Radium
Stafford
County, KS

N

0 0.025 0.05 0.1 Miles

Data Sources: USGS, US Census Bureau, KS Adjutant General, KDOT, USDA, KDA, KDHE

Date: 7/31/2014

Kansas
Adjutant General
Division of Emergency Management

	Magnitude/Severity
Flood	2.88

Local Concerns

The following detail specific local concerns as related to flooding:

- In Barber County properties located in or near the floodplains are the most vulnerable to flood events. The City of Medicine Lodge has some businesses, critical facilities, elderly, and low income families located in flood hazard area. The types of residential structures include brick and mortar, wood, and modular homes.
- In Barton County, the City of Albert, including most of the residential and commercial facilities, is in located in the flood zone, with Zone AH covering most of the southern portion of the town and Zone AE for the northern portion. The eastern corporate limits of the City of Ellinwood are designated Zone AE, with some Zone A in the southeast corner of the town. The majority of the City of Great Bend lies within Zone X, protected by levee, and is classified as outside the 100-year floodplain while smaller, unimproved areas of the city are located within Zone A. The City of Hoisington has a Zone AH flood area located within the city limits, which trends north to south along the western boundary of the town. The City of Pawnee Rock has residential and commercial improvements located within a Zone AH. The City of Claflin has one small flood area, less than one percent of the corporate limits, located along the extreme western boundary of the town.
- In Edwards County, the City of Kinsley is located within an identified flood areas, including Zones A, AE, AO.
- In Pawnee County, the City of Burdett has two primary flood zones, both Zone A, one in the northern portion of the city and one in the southeast corner of the corporate limits. The City of Garfield has two primary flood zones, one Zone A lying southeast of the Santa Fe rail line following Old Coon Creek and one Zones A, A2, and B zones northwest of the railroad tracks in proximity to Garfield Drain. The entirety of the corporate limits of the City of Rozel is a Zone A flood area. The City of Larned has one primary flood zone along the Pawnee River, including Zones A6, B and C.
- In Pratt County, the City of Pratt has several flood hazard areas within the town including one on the west side town identified as Big Ditch, one along the Valley View Ditch, and one in the central portion of town between School and Fourth Streets. The City of Preston has an identified flood hazard Zone A located northwest of the Chicago Rock Island and Pacific Railroad tracks and a small area in the southeast corner of the town bordering the city limits identified as Zone A. USD 382's Pratt High School is located in an identified SFHA Zone A. USD 382 does not currently have flood insurance for its facilities.

Future Development

Continuing land development in south Kansas could place more people and property in flood-prone areas, unless floodplain management is implemented. It is not known how much development is occurring in flood hazard areas, but for communities in these counties that participate in the NFIP, any development in the floodplain should be built according to its corresponding floodplain management ordinance.

Modeling completed by HAZUS-MH 2.1 indicates that $213,826,000 in total direct building loss and income loss is vulnerable to flooding, with 9,588 persons vulnerable to displacement. However, regional population totals are estimated to decrease from 61,087 persons in 2013 to 42,250 by 2040. These decreases may be complemented as many of the flood prone cities have enacted floodplain ordinances limiting development in hazardous areas and/or are members of the NFIP.

In addition, according to the State's minimum standards, the first floor elevations of residential property must be a minimum of one foot above the base flood elevation. For non-residential properties, the standard is to either elevate or flood proof to one foot above the base flood elevation.

The Department of Agriculture, Division of Water Resources conducts Community Assistance Contacts which offer assistance to the participating communities and assess the floodplain program. Community Assistance Visits which are similar to full audits, are also conducted by the Division of Water Resources in order to ensure communities are in compliance with the floodplain management program.

Probability of Future Hazard Events

Based on the NCDC historical data available from 2004 to 2014, there were 452 flood and flash flood events in the region. On average, this equates to 45 events per year, with 2014 being an incomplete year as of this plan. And while past occurrences are no guarantee of future occurrences, considering that there are flood and flash flood occurring every year regionally, it is reasonable to determine that the overall probability of future flooding occurrence is likely.

	Probability
Flood	3.25

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Flood Consequence Analysis

Subject	Ranking	Impacts of Flood
Health and Safety of Persons in the Area of the Incident	Severe	Impact dependent on the level of flood waters. Individuals further away from the incident area are at a lower risk. Casualties are dependent on warning time.
Responders	Minimal	Impact to responders is expected to be minimal unless responders live within the affected area.
Continuity of Operations	Minimal to Severe	Temporary relocation may be necessary if inundation affects government facilities.
Property, Facilities, and Infrastructure	Severe	Localized impact could be severe in the inundation area of the incident to facilities and infrastructure. The further away from the incident area the damage lessens.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to the flood waters.
Environment	Severe	Impact will be severe for impacted area. Impact will lessen with distance.
Economic Conditions	Minimal to Severe	Impacts to the economy depend on the area flooded, depth of water, and the amount of time it takes for the water to recede.
Public Confidence in Governance	Minimal to Severe	Perception of whether the flood could have been prevented, warning time, and response and recovery time will greatly impact the public's confidence.

3.7.9 HAILSTORM

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Hailstorm	4.00	2.78	3.38	1.00	3.24

Description

According to the NOAA hail is precipitation that is formed when updrafts in thunderstorms carry raindrops upw ard i nto e xtremely c old a reas of t he a tmosphere c ausing t hem t o fre eze. T he raindrops form into small frozen droplets and then continue to grow as they come into contact with super-cooled water which will freeze on contact with the frozen rain droplet. This frozen rain droplet can continue to grow and form hail. As long as the updraft forces can support or suspend the weight of the hailstone, hail can continue to grow. At the time when the updraft can no longer support the hailstone, it will fall down to the earth.

In the United States, hail causes more than $1 billion in damage to property, crops and livestock each year. Because of the large agricultural industry in south Kansas, crop damage and livestock losses due to hail are of great concern to the region. Even relatively small hail can cause serious damage to crops and trees. Vehicles, roofs of buildings and homes, and landscaping are the other things most commonly damaged by hail. Hail has been known to cause injury and the occasional fatality to humans, often associated with traffic accidents.

	Warning Time
Hailstorm	3.38

	Duration
Hailstorm	1.00

Hazard Location

Hailstorms oc cur ov er broa d geographic regions. Th e en tire p lanning ar ea, i ncluding al l participating jurisdictions, is at risk to hailstorms.

Previous Occurrences and Local Events

The following detail notable regional hail events.

May 11, 2014: Pawnee Count, USD #466 - Pawnee Heights: Golf ball s ized h ail damaged school roofs, windows and vehicles causing $140,000 in insured losses.

Spring, 2013: Pratt County, USD #438 - Skyline Schools: A windstorm/hailstorm caused a damages to the roof and gutters resulting in $74,666 in insured losses.

August 12, 2011: Barber County, USD #254 - Barber County North: A hailstorm caused a damages to the roof and A/C unit of the shop building.

November 2011: Barton County, Hoisington: A large hail storm caused significant damage to residential and commercial properties.

April 26, 2009: Thunderstorms developed during the late morning and continued into the afternoon as they moved southeast across the region. Hail and wind reports were numerous along with heavy rainfall which produced some flooding.

June 3, 2008: A large storm entered Kiowa County from the north, out of Edwards County The storm broke numerous windows and totaled vehicles.

April 20, 2005 - Great Bend reported 3 inch hail. There were no injuries or crop damage associated with this event, but there was $500,000 in property damage.

July 3, 2005: The City of Offerle in Comanche County reported hail that measured two-inches in diameter.

July 16, 2007: Hail measuring 1.75 inches in diameter damaged vehicles in the region during the early morning hours prior to sunrise. There was a reported $15,000 in property damage.

The following table details NCDC hail event information.

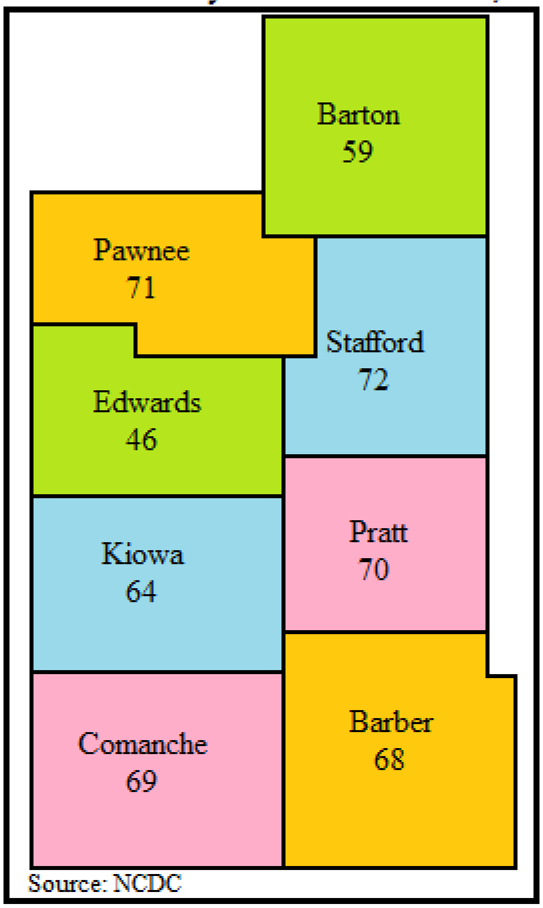
NCDC Hail Events, 2004 - 2014

County	Number of Days with Hail Events	Maximum Amount, in Inches	Property Damages	Crop Damages
Barber	68	4.00	$0	$0
Barton	59	4.25	$500,000	$2,415,000
Comanche	69	2.75	$0	$0
Edwards	46	2.75	$0	$0
Kiowa	64	2.75	$0	$0
Pawnee	71	3.50	$15,000	$0
Pratt	70	2.50	$20,000	$0
Stafford	72	3.00	$0	$0
Regional Total	519	3.2 (Average)	$535,000	$2,415,000

Source: NCDC Storm Events Database

The following map show the number of days with hail events in each county from 2004 - 2014, as per NCDC data.

NCDC Number of Days with Hail Events, 2004 - 2014



Hazard Vulnerability and Impact

Based on information provided by the Tornado and Storm Research Organization, the following table describes typical damage impacts of the various sizes of hail.

Tornado and Storm Research Organization Hail Damage Descriptions

Intensity Category	Diameter (inches)	Size Description	Typical Damage Impacts
Hard Hail	0.2-0.4	Pea	No damage
Potentially Damaging	0.4-0.6	Mothball	Slight general damage to plants, crops
Significant	0.6-0.8	Marble, grape	Significant damage to crop and vegetation
Severe	0.8-1.2	Walnut	Severe damage to crops, damage to glass and plastic, paint and wood scored
Severe	1.2-1.6	Pigeon's egg > squash ball	Widespread glass damage, vehicle bodywork damage
Destructive	1.6-2.0	Golf ball > Pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
Destructive	2.0-2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
Destructive	2.4-3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
Super Hailstorms	3.6-3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
Super Hailstorms	4.0+	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: Tornado and Storm Research Organization

The following are the data sources for the rating factors: Social Vulnerability Index for Kansas counties from the Hazards and Vulnerability Research Institute at the University of South Carolina, NCDC storm events (2004 – 2014), U.S. Census Bureau (2012), USDA's Census of Agriculture (2012) and USDA Risk Management Agency (2010 – 2014). Please note that the data on crop losses only applies to insured crops. According to the *2011 Kansas Crop Insurance Profile Report* issued by the USDA Risk Management Agency 82 percent of Kansas' row crops were insured in 2011.

It was determined that since hail is a common occurrence in Kansas, that using historical events and property damages from 2010 forward provides adequate events to describe the hail hazard in south Kansas. Additionally, please note that data for 2014 runs through June 1, making it an incomplete year.

Vulnerability Factor Amounts for Hail

County	SoVI Rating (1-5)	Prior Events 2004-2014	Property Damages	Annualized Property Damages	Total Building Exposure ($000)	Population Density	Crop Exposure (2012 Census of Agriculture)	Crop Insurance Paid for Hail (2010-2013)	Annualized Crop Insurance Paid
Barber	4	68	$0	$0	$388,136	4	$45,420,000	$417,700	$104,425
Barton	3	59	$500,000	$50,000	$1,772,118	21	$96,206,000	$1,439,884	$359,971
Comanche	5	69	$0	$0	$135,138	2	$21,783,000	$185,388	$46,347
Edwards	4	46	$0	$0	$232,382	5	$126,933,000	$1,054,360	$263,590
Kiowa	4	64	$0	$0	$237,655	3	$63,956,000	$1,695,988	$423,997
Pawnee	5	71	$15,000	$1,500	$449,592	9	$92,111,000	$1,326,716	$331,679
Pratt	3	70	$20,000	$2,000	$689,239	13	$52,353,000	$1,585,936	$396,484
Stafford	4	72	$0	$0	$295,331	6	$74,549,000	$1,521,052	$380,263
Regional Total	-	519	$535,000	$53,500	$4,199,591	8	$573,311,000	$9,227,024	$2,306,756

Using the above information, a value of 1-10 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for comparison and to determine the greatest vulnerable counties. The Social Vulnerability Index is in a range of 1 - 5. To give Social Vulnerability Index the same weight as the other factors, the numbers were multiplied by two.

Hail Data Rating Determination

Ratings	Social Vulnerability	NCDC Prior Events	Annualized Property Damage	Building Exposure Valuation	Population Density *	Crop Exposure	Annualized Crop Loss
1		18 - 55	0 - $10,000	$117,421 - $4,492,825	1.6 - 116.3	0 - $18,548,500	0 - $100,000
2	1	56 - 90	$10,001 - $50,000	$4,492,826 - $8,868,229	116.4 - 231.1	$18,548,501 - $32,126,000	$100,001 - $300,000
3		91 - 125	$50,001 - $100,000	$8,868,230 - $13,243,634	231.2 - 345.9	$32,126,001 - $45,703,500	$300,000 - $500,000
4	2	126 - 160	$100,001 - $300,000	$13,243,635 - $17,619,039	346 - 460.7	$45,703,501 - $59,281,000	$500,001 - $700,000
5		161 - 195	$300,001 - $500,000	$17,619,040 - $21,994,444	460.8 - 575.5	$59,281,001 - $72,858,500	$700,001 - $900,000
6	3	196 - 230	$500,001 - $700,000	$21,994,445 - $26,369,848	575.6 - 690.3	$72,858,501 - $86,436,000	$900,001 - $1,100,000
7		231 - 265	$700,001 - $900,000	$26,369,849 - $30,745,253	690.4 - 805.1	$86,436,001 - $100,013,500	$1,100,001 - $1,300,000
8	4	266 - 300	$900,001 - $1,100,000	$30,745,254 - $35,120,658	805.2 - 919.9	$100,031,501 - $113,591,000	$1,300,001 - $1,700,000
9		301 - 335	$1,000,001 - $4,000,000	$35,120,659 - $39,496,062	920- 1,034.7	$113,591,001 - $127,168,500	$1,700,001 - $2,100,000
10	5	336 - 370	$4,000,000 - $32,012,357	$39,496,063 - $43,871,468	1,034.8 - 1,149.6	$127,168,501 - $140,746,000	$2,100,000 - $2,300,000

Based on the above ratings system, ranges were applied to each county to determine their potential vulnerability. The following related the scoring to a vulnerability assessment:

- **Low:** Score range of 9 -14
- **Medium-Low:** Score range of 15 - 21
- **Medium:** Score range of 22 - 28
- **Medium-High:** Score range of 29 - 35
- **High:** Score range of 36 - 41

Vulnerability of Regional Counties to Hail

County	SoVi Rating	NCDC Prior Event Rating	Annualized Property Damage Rating	Bldg Exposure Valuation Rating	Population Density Rating	Crop Exposure Rating	Annualized Crop Loss Rating	Overall Vulnerability Rating	Hail Vulnerability
Barber	8	2	1	1	1	3	2	18	Medium-Low
Barton	6	2	2	1	1	7	3	22	Medium
Comanche	10	2	1	1	1	2	1	18	Low-Low
Edwards	8	1	1	1	1	9	2	23	Medium
Kiowa	8	2	1	1	1	5	3	21	Medium-Low
Pawnee	10	2	2	1	1	7	3	26	Medium
Pratt	6	2	1	1	1	4	3	18	Medium-Low
Stafford	8	2	1	1	1	6	3	22	Medium

	Magnitude/Severity
Hailstorm	2.78

Future Development

Future development of agricultural resources and/or increases in population would tend to increase the risk of this hazard. Agriculture has a more significant role and the bigger potential for an economic impact resulting from hail events. Regional counties with a large agricultural base would be more susceptible to hail damage if agricultural development is expanded. However, in general, the region is experiencing a population decline and a slight decrease in agricultural acreage which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Severe thunderstorms that create hail events are a common occurrence throughout south Kansas. According to the NCDC database, there were 519 days with hail events in south Kansas between 2004 and 2014, or an average of 52 events per year. Based on this information, there is a high probability that at least one hail event could occur in south Kansas in any given year.

	Probability
Hailstorm	4.00

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Hail Consequence Analysis

Subject	Ranking	Impacts of Hailstorm
Health and Safety of Persons in the Area of the Incident	Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas depending on whether individuals are caught outside during the event.
Responders	Minimal	Impact to responders is expected to be non-existent to minimal.
Continuity of Operations	Minimal to Moderate	Temporary relocation may be necessary if government facilities experience damage.
Property, Facilities, and Infrastructure	Severe	Localized impact could be severe to facilities and infrastructure in the incident area. Utility lines, roads, residential and business properties will be most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	Impact could be severe for the immediate impacted area, depending on the size of the event. Impact will lessen as distance increases from the immediate incident area.
Economic Conditions	Minimal to Severe	Local economy and finances may be adversely affected, depending on damages sustained.
Public Confidence in Governance	Minimal to Moderate	Response and recovery will be in question if not timely and effective. Warning systems in place and the timeliness of those warnings could be questioned.

3.7.10 HAZARDOUS MATERIALS

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Hazardous Materials	1.25	2.13	4.00	2.13	2.01

Description

Hazardous materials and waste are a concern for south Kansas because a sudden accidental or intentional release of such materials can be dangerous to human health, to nearby property, and to the quality of the environment. Such releases may come from both fixed sources, such as a manufacturing or storage facility, or from a transportation source, such as a truck or pipeline. Generally, with a fixed facility, the hazards are pre-identified, and the facility is required by law to prepare a risk management plan and provide a copy to the Local Emergency Planning Committee (LEPC) and local fire departments. Accidental releases may be due to equipment failure, human error, or a natural or manmade hazard event.

Agricultural facilities throughout south Kansas are likely to have dangerous materials present that could pose a threat to surrounding populations in the event of an emergency or disaster. Facilities that store or use chemicals considered unusually dangerous to human safety are required by Section 112R of the Clear Air Act Amendments to assess the potential impacts of an accidental release of the chemical at their facility and to prepare risk management plan (RMP). Of particular interest to south Kansas is that ammonia is one of the covered hazardous materials. Numerous south Kansas ammonia storage and distribution facilities have filed an RMP with the U.S. Environmental Protection Agency (EPA). A database with information about south Kansas facilities that have RMPs is available through the EPA.

The primary agency responsible for hazardous materials within the State of Kansas is the KDHE, Division of Environment. The Kansas Response Plan, Emergency Support Function #10 – Oil and Hazardous Materials is another resource for response information.

	Warning Time
Hazardous Materials	4.00

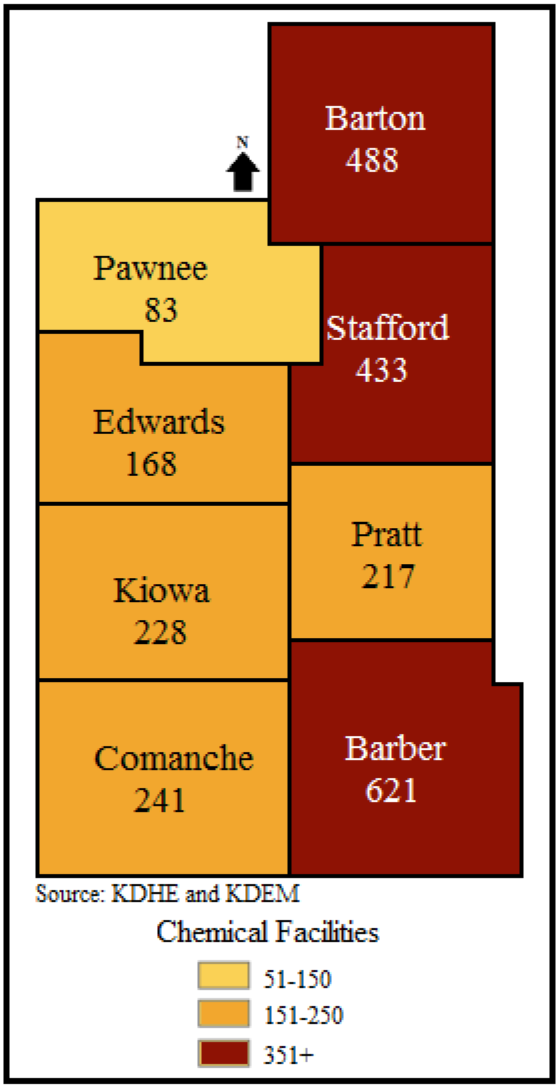
	Duration
Hazardous Materials	2.13

Hazard Location

Hazardous materials pose a threat to communities in south Kansas. Localities where hazardous materials are fabricated, processed, and stored as well as those where hazardous waste is treated, stored, and disposed of are most at risk for hazardous materials incidents. Additionally, localities along transportation corridors that carry these materials to their final destinations are also at risk.

In 2011, there were 2,479 facilities housing hazardous chemicals in south Kansas identified by the Community Right to Know Act. The number of facilities is illustrated in the following figure.

Number of Facilities Housing Hazardous Chemical

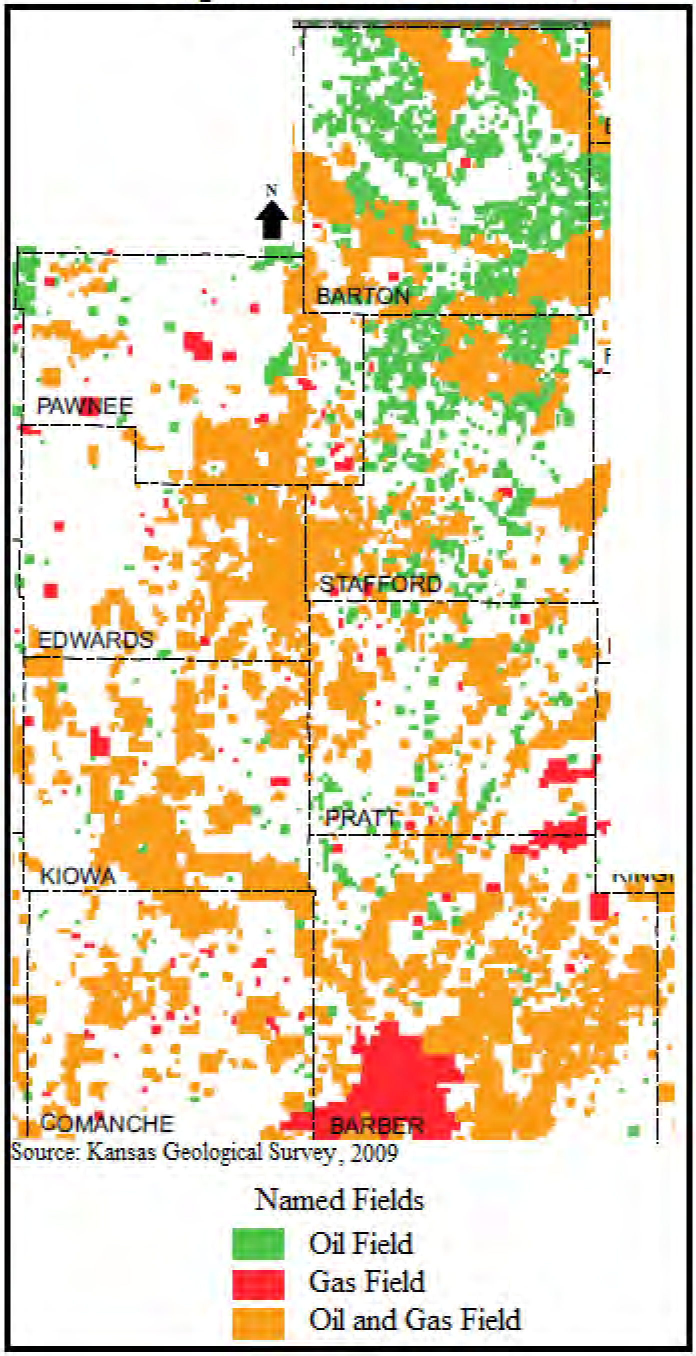


The EPA has indicated that there is one Superfund site in south Kansas, identified as Plating, Inc in Great Bend, Barton County. A Superfund site is an uncontrolled or abandoned location where hazardous waste is located which may affect local ecosystems and/or people. The Site is currently being assessed.

Pipelines and Production Fields

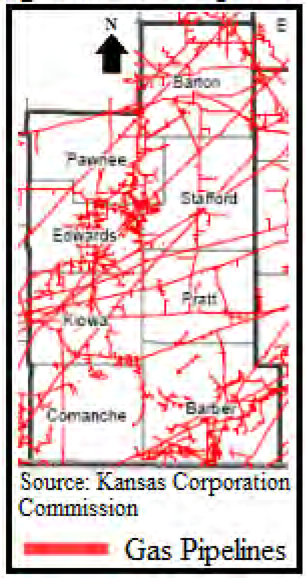
The following figures show production field locations, natural gas and oil pipelines in south Kansas.

Regional Oil and Gas Fields.

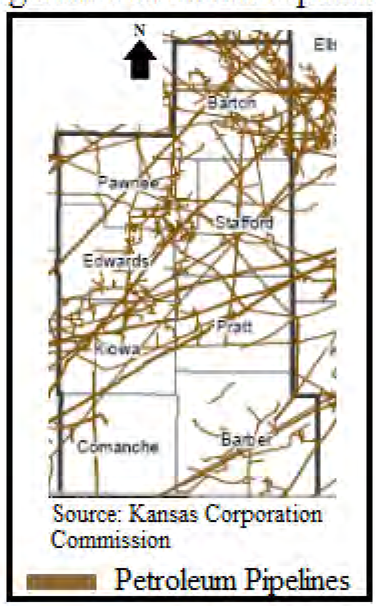


Source: Kansas Geological Survey, 2009

Regional Gas Pipelines



Regional Petroleum Pipelines



The following table details the amount of gas and liquid pipeline miles per county in south Kansas.

2011 Pipeline Mileage

County	Gas Miles	Liquid Miles
Barber	88	90
Barton	275	121
Comanche	80	91
Edwards	211	16
Kiowa	434	165
Pawnee	132	73
Pratt	262	190
Stafford	251	150
Regional Total	1,733	896

Source: United States Department of Transportation Pipeline and Hazardous Materials Safety Administration

Previous Occurrences and Extent

Regionally, hazardous materials accidents are infrequent events. The following details notable hazardous material events.

> **September 8, 2003:** A train derailment in Barber County required the precautionary evacuation of people within a one-mile area. The train carried a hazardous material which was not identified and 6,000 gallons of diesel fuel spilled from the locomotive, but was contained.

Hazard Vulnerability and Impact

According to the KDEM, Technological Hazards Section there are 52 facilities subject to the Risk Management Plan requirements in south Kansas as of December 2012. However, there are no facilities ranked on the Risk Management Plan's Worst Case Scenario list.

In estimating potential losses, the most significant loss potential with hazardous materials incidents concerns people. Special populations are particularly vulnerable to the impacts of a hazardous materials incident because of the potential difficulties involved in the evacuation. The following shows the number of special population facilities in each county that is located within ½ mile of a chemical facility. The locations of colleges, educational and correctional institution facilities is from the Kansas Data Access & Support Center (DASC), health facilities is from FEMA's HAZ US-MH 2.1 , aging facilities is from KDEM and child care facilities is from KDHE. A comparison was completed with the latitude and longitude of the facilities with the hazardous chemical facilities in Kansas.

Number of Special Population Facilities within One-Half Mile of a Chemical Facility

County	Health Facilities	Colleges	Educational Facilities	Aging Facilities	Child Care	Correctional Institutions
Barber	1	0	4	1	14	1
Barton	1	0	14	6	72	1
Comanche	1	0	3	1	8	0
Edwards	1	0	2	1	3	1
Kiowa	1	1	8	2	5	1
Pawnee	0	0	8	2	18	1
Pratt	0	0	5	2	25	1
Stafford	1	0	2	1	3	0
Regional Total	6	1	46	16	148	6

Source: DASC, HAZUS, KDHE, and KDEM

The following table lists the number of hazardous materials incidents, injuries, fatalities and people evacuated from the public and facilities by county in south Kansas over the 10-year period of 2003-2012.

Number of Hazardous Material Incidents, Injuries, Fatalities and Evacuations, 2003-2012

Incident County	Incidents	Injuries	Fatalities	People Evacuated
Barber	5	0	0	2
Barton	14	0	0	0
Comanche	4	0	0	0
Edwards	1	0	0	0
Kiowa	33	0	0	0
Pawnee	3	10	5	20
Pratt	30	7	3	260
Stafford	14	3	0	20
Regional Total	104	20	8	302

Source: Kansas Division of Emergency Management, Technological Hazards Section

For spill and releases, in general, the spiller is responsible to report to all the appropriate agencies depending on the material and volume spilled. To satisfy the requirement of Kansas Regulation K.A.R. 28-48 all spills that impact the soils or waters must be reported to the KDHE or in the case that it originates from an oil or gas production leases, be reported to the Kansas Corporation Commission. If the release is not contained or threatens the health or safety of the local population, the LEPC within the county of the release, must be notified first by dialing 911. Hazardous materials spills and air releases that meet federal reportable quantities and oil and petroleum spills over 110 gallons must also be reported to KDEM.

The following shows that the major cause of hazardous material incidents from 2003-2012.

Causes of Hazardous Materials Incidents in Kansas, 2003-2012

Year	Explosion	Fire	Spill	Equipment Failure	Operator Error	Natural	Dumping	Other
2003	6	14	194	191	29	6	2	51
2004	5	10	58	355	31	2	1	315
2005	1	5	49	181	21	2	6	0
2006	0	3	46	214	18	1	3	89
2007	1	6	41	238	13	3	0	94
2008	3	7	59	168	27	9	1	110
2009	1	7	142	207	25	14	4	112
2010	2	7	234	120	20	2	2	105
2011	1	6	154	91	10	3	2	21
2012	1	8	153	69	23	1	3	94
Total	21	73	1130	1834	217	43	24	991
10 Year Average	2.1	7.3	113	183.4	21.7	4.3	2.4	99.1

Source: Kansas Division of Emergency Management, Technological Hazards Section

The "Managing the Risk: 2011 Kansas Commission on Emergency Planning and Response Annual Report" shows the number of hazardous material releases reported to all three Kansas agencies of KDEM, the KDHE and the KCC.

Reports from the U.S. Department of Transportation's Pipeline & Hazardous Materials Safety Administration provides detail and incident history for the pipeline systems in south Kansas between 2001 and 2012. Significant incidents are those incidents reported by pipeline operators with any of the following conditions met:

- Fatality or injury requiring in-patient hospitalization
- $50,000 or more in total costs, measured in 1984 dollars
- Highly volatile liquid releases of five or more barrels or other liquid releases of 50 or more barrels
- Liquid releases resulting in an unintentional fire or explosion

According to these reports there were seven incidents that caused no deaths or injuries and $836,436 in damages over the 12 year period (2001-2012). The following table gives the incident details.

Regional Pipeline Incidents, 2001 - 2012

County	Total Natural Gas Transmission Incidents	Total Natural Gas Distribution Incidents	Total Hazardous Liquid Incidents	Total Fatalities	Total Injuries	Total Damage	Gross Barrels Lost	Total Barrels Recovered
Barber	0	0	0	0	0	0	0	0
Barton	0	0	0	0	0	0	0	0
Comanche	0	0	2	0	0	$483,046	11	11
Edwards	-	-	-	-	-	-	-	-
Kiowa	0	1	1	0	0	$327,274	3,415	3,415
Pawnee	0	0	0	0	0	0	0	0
Pratt	0	0	0	0	0	0	0	0
Stafford	0	0	3	0	0	$26,116	473	351
Regional Total	0	1	6	0	0	$836,436	3,899	3,777

Source: U.S. Department of Transportation's Pipeline & Hazardous Materials Safety Administration
-: Data unavailable

In general, it is difficult to quantify potential losses of hazardous materials events due to the many variables and human elements. For example, a spill of a toxic airborne chemical in a populated area could have great potential for loss of life while a spill of a very small amount of a chemical in a rural agricultural area would be much less costly and possible limited to remediation of soil. Therefore, for the purposes of this plan, the loss estimates will take into account a hypothetical scenario. Please note that the hypothetical scenario is included for illustrative purposes only.

The impact of this type of disaster will likely be localized to the immediate area surrounding the incident. The initial concern will be for people and then the environment. If contamination occurs, the spiller is responsible for the cleanup actions and will work close with local responders, KDHE, KCC, KDEM, and EPA to ensure that cleanup is done safely and in accordance with federal and state laws.

For discussion purposes, the materials needed for a spill at a fixed facility at an easily remediated area are listed in the following table. The costs for the cleanup are estimated from the current State of Kansas Unified HazMat Response Program statewide contract # 35167.

Hypothetical Cost Estimate For Hazardous Materials Spill Remediation

Classification	Rates Per Hour/Unit	Number of Hours/Units	Total Cost
Project Manager	$90.00	24	$2,160
Health & Safety Supervisor	$86.00	24	$2,064
Environmental Tech	$50.00	12	$600
Foreman	$55.00	24	$1,320
Equipment Operator	$56.50	24	$1,356
Laborer	$45.00	24	$1,080
Truck, 4 wheel drive	$680/wk	1	$680
Backhoe, Case 416B	$320.00/day	2	$640
Forklift, 3 ton all terrain	$160.00/day	2	$320
Skimmer	$250.00/day	2	$500
Pump, 4"	$80.00/day	3	$240
Drums, chemical, 17H or E	$90.00	25	$2,250
Drums, 95 gallon	$295.00	25	$7,375
Vermiculite per bag	$15.00	6	$90
Acid Suits	$70.00/each	6	$420
Gloves	$4.00/pair	30	$120
Total			$21,215

Source: State of Kansas Unified HazMat Response Program statewide contract # 35167

	Magnitude/Severity
Hazardous Materials	2.13

Future Development

People, livestock and vegetation in close proximity to facilities fabricating, processing and storing as well as those where hazardous waste is treated, stored and disposed of are most at risk for hazardous materials incidents. Additionally, localities along transportation corridors that carry these materials to their final destinations are at risk. Populations downstream, downwind and downhill of a released substance are particularly vulnerable. Depending on the characteristics of the substance released, a larger area may be in danger from explosion, absorption, injection or inhalation. Occupants of areas previously contaminated by a persistent material may also be harmed either directly or through consumption of contaminated food and water. As the infrastructure and population of urban centers of south Kansas increases, along with the number and type of hazardous chemicals stored and transported through the region, the amount of potential losses could increase. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Based on the limited historical occurrence future major events is unlikely. However, if the infrastructure and population of south Kansas reverses trends and begins to increase, or there is an increase in the number and type of hazardous chemicals stored and transported through the region, the amount of potential losses could increase.

	Probability
Hazardous Materials	1.25

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Hazardous Material Event Consequence Analysis

Subject	Ranking	Impacts of Hazardous Material Event
Health and Safety of Persons in the Area of the Incident	Severe	Impact of the immediate area could be severe for affected areas.
Responders	Severe	Impact to responders is expected to be severe.
Continuity of Operations	Minimal to Moderate	Temporary relocation may be necessary if government facilities experience damage.
Property, Facilities, and Infrastructure	Severe	Localized impact could be severe in the incident area. Streams, open bodies of water, aquifers, roads, residential and business properties will be most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities.
Environment	Severe	Impact could be severe for the immediate area. Impact will lessen with distance.
Economic Conditions	Minimal to Severe	Local economy and finances may be adversely affected, depending on damages.
Public Confidence in Governance	Minimal to Moderate	Response and recovery will be in question if not timely and effective. Warning systems and the timeliness of those warnings could be questioned.

3.7.11 Land Subsidence

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Land Subsidence	1.38	1.00	1.75	3.63	1.54

Description

Land subsidence is caused when the ground above manmade or natural voids collapses. Subsidence can be related to mine collapse, water and oil withdrawal, or natural causes such as shrinking of expansive soils, salt dissolution (which may also be related to mining activities), and cave collapses. The surface depression is known as a sinkhole. If sinkholes appear beneath developed areas, damage or destruction of buildings, roads and rails, or other infrastructure can result. The rate of subsidence, which ranges from gradual to catastrophic, correlates to its risk to public safety and property damage.

The development of sinkhole and subsidence areas can be grouped into three major categories:

- Natural dissolution of soluble minerals
- Extraction of minerals by either solution mining or shaft mining
- Downward drainage of fresh water, via a drill hole or unplugged oil or gas well which penetrates a soluble mineral formation and has an outlet for the solution cavity water to be disposed.

Major materials or minerals present in south Kansas that are associated with subsidence and sinkhole development include salt, limestone and dolomite, gypsum, coal, lead and zinc. Some isolated incidents of subsidence have been associated with high volume pumping of water wells.

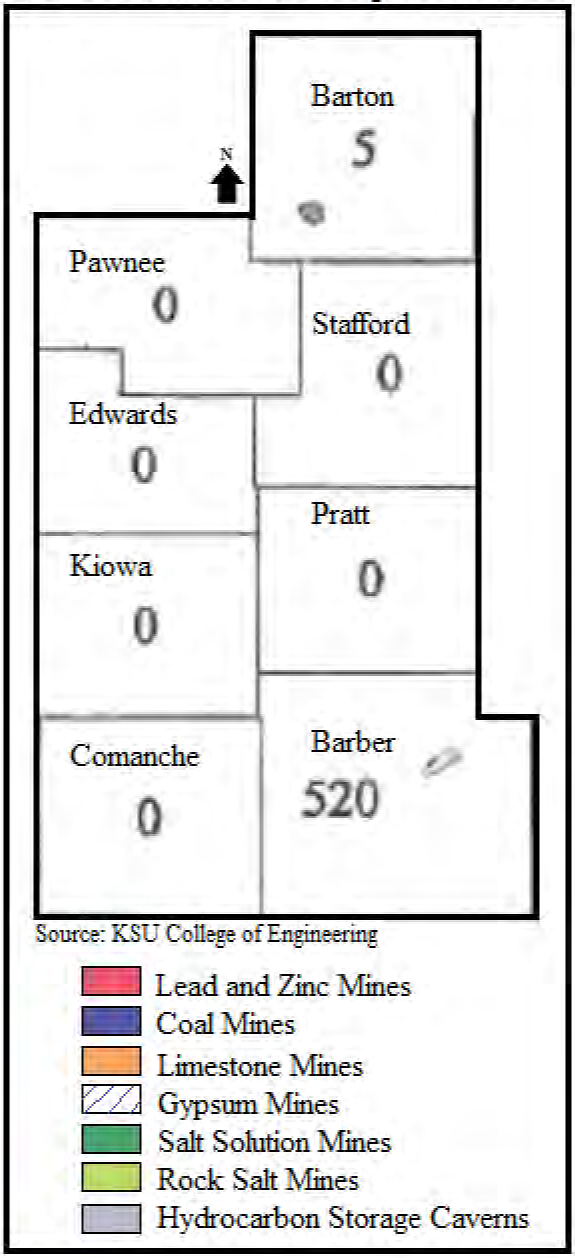
	Warning Time
Land Subsidence	1.75

	Duration
Land Subsidence	3.63

Hazard Location

The Kansas Department of Health and Environment in 2006 prepared a report on "Subsurface Void Space and Sinkhole/Subsidence Area Inventory for the State of Kansas." The report inventoried subsurface void space from oil and gas exploration and production, natural sources, shaft mining, and solution mining. The total void space inventory for all sources in the state is 119,136 acres. The distribution of total acres and major cause of void spaces are shown for each county in the following map.

Total Subsurface Void Space in Acres

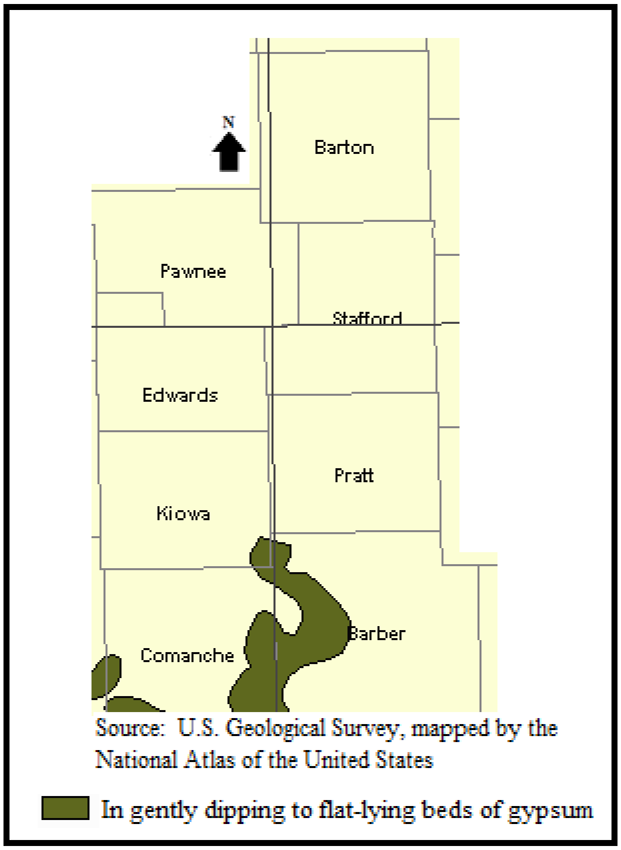


Source: KSU College of Engineering

Areas of karst, a terrain or type of topography generally underlain by soluble rocks, such as limestone, gypsum, and dolomite, in which the topography is chiefly formed by dissolving the rock, are also particularly prone to sinkholes.

The following map illustrates the location of karst features and features analogous to karst in south Kansas. The green areas shown in the map show fissures, tubes, and caves generally less than 1,000 feet long with 50 feet or less vertical extent in gently dipping to flat-lying carbonate rock. Brown areas have similar features in gently dipping to flat lying gypsum beds. Light pink colored areas are features analogous to karst with fissures and voids present to a depth of 250 feet or more in areas of subsidence from piping in thick unconsolidated material. Darker pink areas contain fissures and voids (analogous to karst) to a depth of 50 feet. There are limited documented problems associated with natural limestone subsidence and sinkholes in south Kansas.

Regional Karst Features



Previous Occurrences and Extent

No notable incidents of land subsidence have been recorded for the region.

Hazard Vulnerability and Impact

Data was obtained from KDHE for the following:

- Lead and Zinc Mines that required filling
- Coal Subsidence Projects
- Coal Emergency Program Projects

This emergency program provides for the remediation of sites which are an immediate threat to the health and safety of the general public. There are no identified projects for regional counties.

With the known number of acres in each risk category for each county with documented subsurface void spaces, a weighted vulnerability calculation was completed. Acreage in risk Category I (High Risk) received a multiplier of three, acreage in risk Category II (Moderate Risk) received a multiplier of two and acreage in risk Category III (Low Risk) received a multiplier of one.

A high risk classification indicates one or more of the following: the source material very soluble, source material thickness may leave large voids, depth of source material less than 100 feet, mining operations have left a large vertical void space (4 - 300 feet), mining operations have large vertical shafts or bore holes associated with the mining techniques, mined area has a large void space to pillar ratio, void space in the mine has filled with water, mine floor susceptible to collapse or loading failure, cap rock not competent for long term support, mine pillars susceptible to deterioration and future collapse, mine roof less than 60 feet in thickness, bedrock material comprising the mine roof is not competent material for long-term stability, horizontal or inclined mine shafts with shallow or thin overburden, and areas in the subsurface where support pillars in columns have been mined or removed.

A moderate risk classification indicates one or more of the following: depth of mine floor greater than 125 feet, void space to pillar ration (80 to 90%), vertical opening 4 feet or greater, water filled void increases subsidence risk, overlying bedrock material very competent, numerous mine shafts or boreholes associated with mining technique, and support columns or pillars susceptible to serious deterioration when void space is filled with water.

A low risk classification indicates one or more of the following: small vertical void space, void space to pillar ratio good (75 to 80%), vertical shafts and bore holes are in good condition, depth of mined material relatively deep, +/- 150 feet, competent cap rock over void space, long wall mining method allows slow subsidence with minimal vertical opening; surface subsidence is minimal to undetected, mine opening is dry, no pillar deterioration, and mine area has little risk of sudden subsidence.

Subsurface Void Space Vulnerability Analysis

County	Gypsum Category II	Salt Solution Category II	Weighted Calculation
Barber	500	0	1,040
Barton	0	5	10
Regional Total	500	5	1,050

Source: KDHE, "Subsurface Void Space and Sinkhole/Subsidence Area Inventory for the State of Kansas" 2006. Data tabulated and assigned weighted scores in individual categories.

	Magnitude/Severity
Land Subsidence	1.00

Future Development

Future development would tend to increase the risk of this hazard, especially on areas of known subsidence or with subsidence potential. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Based on historical records, land subsidence events occur in south Kansas on a very sporadic basis and result in minimal impact. However, due to underlying surface conditions and activities a small probability of future events exists.

	Probability
Land Subsidence	1.38

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Land Subsidence Consequence Analysis

Subject	Ranking	Impacts of Land Subsidence
Health and Safety of Persons in the Area of the Incident	Moderate to Severe	Local impact expected to be moderate to severe for the incident area.
Responders	Minimal	Impact to responders would be minimal.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP, unless a facility is impacted.
Property, Facilities, and Infrastructure	Severe	Localized impact to facilities and infrastructure in the incident area has the potential to do severe damage.
Delivery of Services	Minimal	Impacts to the delivery of services could be severe if roads/utilities are affected. Otherwise impact would be non-existent to minimal.
Environment	Minimal	Impact to the area would be minimal.
Economic Conditions	Minimal	Impacts to the economy will depend on the severity of the damage.
Public Confidence in Governance	Minimal to Severe	Local development policies will be questioned.

3.7.12 LANDSLIDE

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Landslide	1.13	1.00	3.63	1.38	1.49

Description

A landslide is the downhill movement of masses of soil and rock by gravity. The basic ingredients for landslides are gravity, susceptible soil or rock, sloping ground, and water. Typically, as the slope angle increases, so does the potential for landslides. Anything that increases the slope angle can trigger a landslide, including a stream actively eroding a hill or construction practices. Landslides may occur when soil on hillsides is saturated following extended periods of rainfall or snow melt, and may also be caused by:

- Earthquakes
- Fire (and resulting loss of vegetation)
- Excavation and mining
- Irrigation
- Construction activities

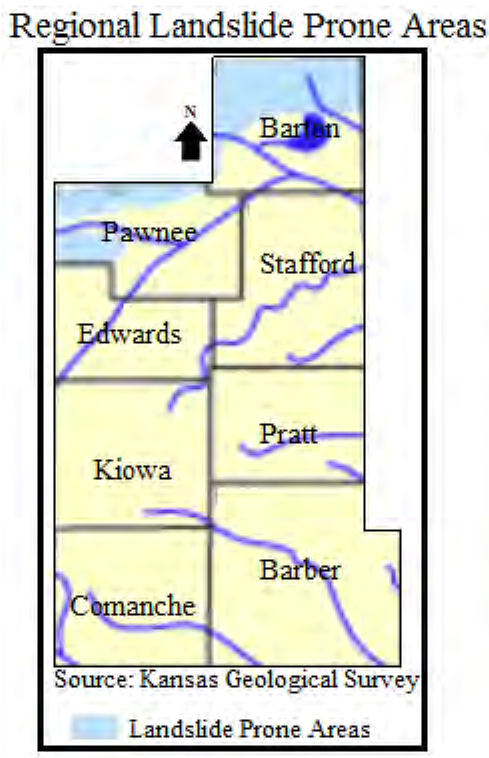
Landslides can damage or destroy structures, roadways, and utilities as well as block roadways with debris.

	Warning Time
Landslide	3.63

	Duration
Landslide	1.38

Hazard Location

Areas prone to landslides can cover broad geographic regions, but occurrences are generally localized. The entire planning area, including all participating jurisdictions, is potentially at risk to landslides. However, landslides require an earth or rock covered slope. The following map by the Kansas Geological Survey identifies slide prone areas in the region.



Inquiries with the Kansas Geological Survey indicated that no records were kept concerning landslide occurrences.

Previous Occurrences and Extent

There have been no notable recorded landslide events in south Kansas.

Hazard Vulnerability and Impact

Losses due to landslides in south Kansas will continue in those areas of the region that are prone to this hazard. Landslide losses are primarily related to damage to property. However, if a sudden landslide impacts an inhabited structure, injuries or deaths could occur. Historically, landslides in south Kansas have been isolated events impacting a few properties or a particular area. Often, damages in terms of estimated losses are not reported. Additionally, there is not a repository for damages to be reported, other than NCDC. The NCDC database does not include any previous landslide events in Kansas. This is likely because the events are generally isolated and do not impact large areas.

If construction is occurring in or near landslide hazard areas, more structures/population will be at risk to damage/injury from landslides. The effects of landslides on people and structures can be lessened by total avoidance of landslide hazard areas or by restricting, prohibiting, or imposing conditions on hazard-zone activity. The hazard from landslides can be reduced by avoiding construction on steep slopes and existing landslides, or by stabilizing the slopes. Stability increases when ground water is prevented from rising in the landslide mass by covering the landslide with an impermeable membrane, directing surface water away from the landslide, draining ground water away from the landslide, and minimizing surface irrigation. Slope stability is also increased when a retaining structure and/ or the weight of a soil/rock berm are placed at the toe of the landslide or when mass is removed from the top of the slope.

It is not possible at this time to determine quantitative estimates for potential losses associated with the landslide hazard as there is no centralized data source upon which to base analysis.

	Magnitude/Severity
Landslide	1.00

Future Development

Future development in landslide prone areas would tend to increase the risk of this hazard. However, areas that have been identified with a landslide risk in the region tend to have stable populations showing little increase in development. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

There have been no reported landslide events in the region in the past 10 years. This would equate to approximately zero events per year. As such, it is unlikely that a future landslide event will cause a measurable impact.

	Probability
Landslide	1.13

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Landslide Consequence Analysis

Subject	Ranking	Impacts of Landslide
Health and Safety of Persons in the Area of the Incident	Moderate to Severe	Localized impact could be moderate to severe for the incident area.
Responders	Minimal	Impact to responders would be minimal.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP, unless a facility is impacted.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area has the potential to do severe damage if they are on, or in, the area of the landslide.
Delivery of Services	Minimal	Impacts to the delivery of services could be severe if roads/utilities are affected. Otherwise impact would be non-existent to minimal.
Environment	Minimal	Impact to the area would be minimal other than the immediate area.
Economic Conditions	Minimal	Impacts to the economy will depend on the severity of the damage, i.e., are roads blocked, did any businesses get caught in the landslide.
Public Confidence in Governance	Minimal to Severe	Local development policies will be questioned.

3.7.13 LIGHTNING

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Lightning	2.50	1.38	3.25	1.00	2.13

Description

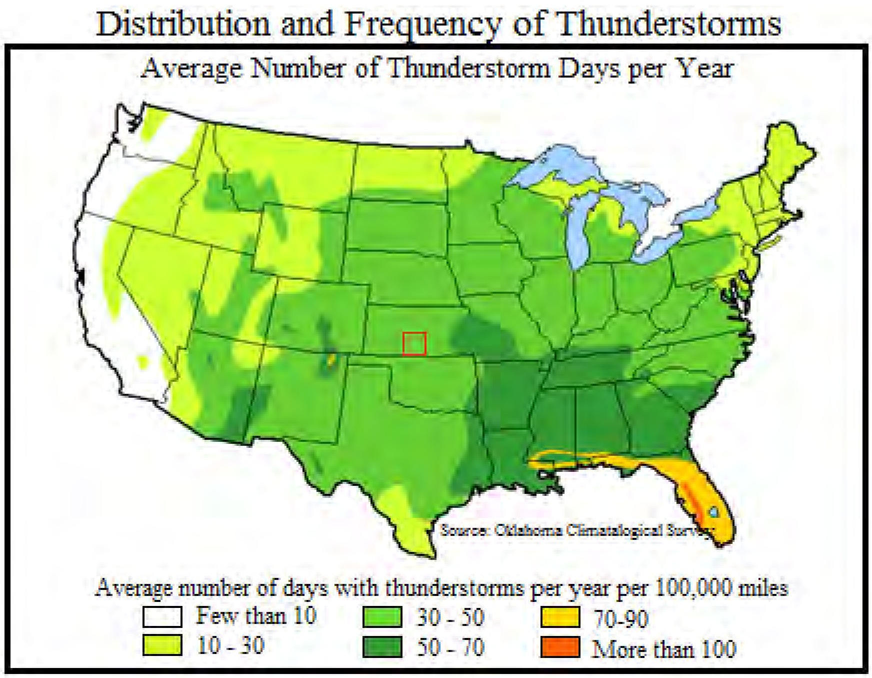
Lightning is a discharge of atmospheric electricity that is triggered by a buildup of differing charges within a cloud. According to the NWS, lightning is one of the most underrated severe weather hazards and is the second deadliest weather killer in the United States. Of the estimated 1,000 people who are struck by lightning each year in the United States, only 10 percent are killed, but survivors may suffer life-long disabilities.

	Warning Time
Lightning	3.25

	Duration
Lightning	1.00

Hazard Location

Severe thunderstorms strike south Kansas regularly, with accompanying lightning that can cause injury, death, property damage and wildfires. The widespread and frequent nature of thunderstorms makes lightning a relatively common occurrence. Of particular concern to south Kansas is protection of facilities and communications systems that are important to emergency response operations, protection of public health and maintenance of the region's economy. Most of south Kansas has an average 30-50 thunderstorm days per year.



Lightning occurs over broad geographic regions. The entire planning area, including all participating jurisdictions, is at risk to lightning.

Previous Occurrences and Extent

Information measured by the National Lightning Detection Network between 1997 and 2011 ranks Kansas 16th among the continental states in terms of cloud-to-ground flash densities with 934,368 flashes per year (11.4 flashes per square mile). According to the NCDC Storm Events database, there were 20 lightning events in south Kansas between 2004 and 2014 resulting in $15,000 in property damage. The NCDC receives storm data from the NWS, which receives information from a variety of sources, which include but are not limited to county, state, and federal emergency management officials, local law enforcement officials, Skywarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry and the general public. Reporting of events and the historic events detailed here are likely not a true reflection of all the damaging lightning strikes.

NCDC Lightning Events 2003 - 2013

County	Total Events	Property Damage	Crop Damage	Deaths
Barber	1	$0	$0	0
Barton	1	$15,000	$0	0
Comanche	0	$0	$0	0
Edwards	0	$0	$0	0
Kiowa	0	$0	$0	0
Pawnee	0	$0	$0	0
Pratt	0	$0	$0	0
Stafford	0	$0	$0	0
Regional Total	2	$15,000	$0	0

Source: NCDC Storm Events Database, http://www.ncdc.noaa.gov/stormevents/

According to the USDA's Risk Management Agency the annualized crop insurance paid due to damages from lighting strikes for the period between 2010 and 2013 was $41,482. It is worth noting that in many cases the USDA classifies lightning as "other," lumping disparate events together. As such, it is impossible accurately determine an insurance paid figure, and the figure noted above is solely an estimate.

Based on NCDC data, showing $15,000 in damages over the 10 year period from 2004 to 2014, with 2014 data representing to date totals only, south Kansas can expect approximately $1,500 in lightning-related losses each year.

According to the NCDC, there have been no reported deaths and one reported injury from lightning in south Kansas from 2004 to 2014.

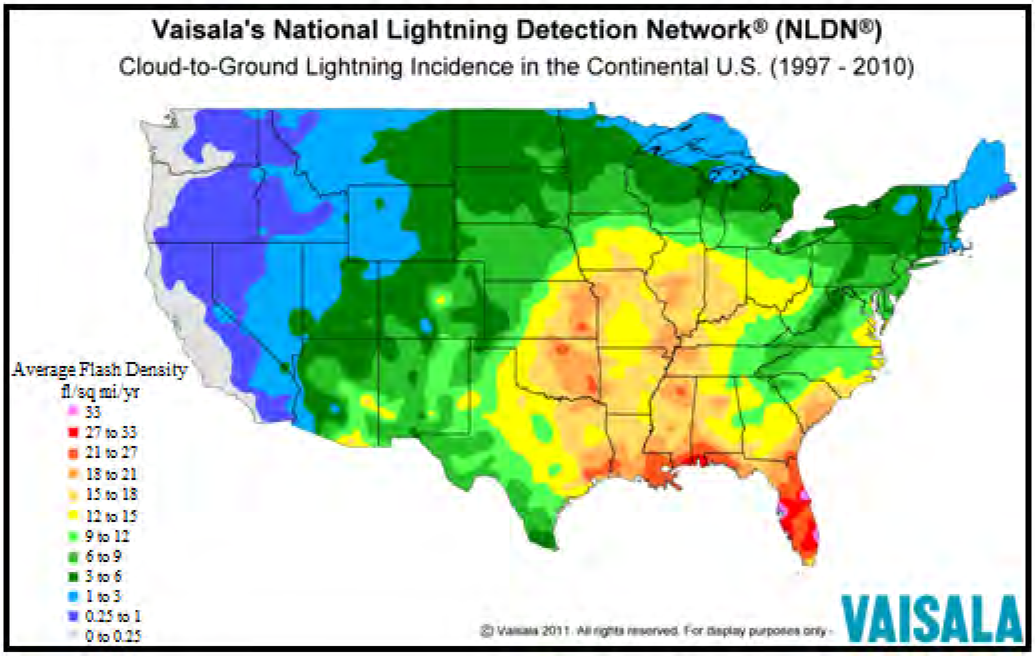
Local Events

Notable local lightning events include:

> **2012: Barton County, Rural Water District #1:** A lightning strike caused infrastructure damages, resulting in insured losses.

Hazard Vulnerability and Impact

In general, the frequency of occurrence of lightning is similar to the pattern of thunderstorm frequency. Data suggests that there are 18 to 27 flashes per square mile per year in south Kansas. The following figure, which is based on data from 1997 to 2010, shows that the distribution of lightning throughout the U.S.



The statistical analysis method was used to refine and assess the relative vulnerability of each of region's counties to lightning. The region assigned ratings to pertinent factors including social vulnerability index, prior events, prior annualized property damage, building exposure valuation, population density and crop exposure (annualized crop losses were not used since USDA did not have insured crop loss amounts to use in the tabulation).

The following information was used for this analysis:

- Social Vulnerability Index for Kansas from the Hazards and Vulnerability Research Institute at the University of South Carolina
- National Climatic Data Center storm events 2004 – 2014
- U.S. Census Bureau (2012)
- USDA's Census of Agriculture (2012).

Vulnerability Factor Amounts for Lightning

County	SoVI Rating (1-5)	Prior Events 2004-2014	Property Damages	Annualized Property Damages	Total Building Exposure ($000)	Population Density	Crop Exposure (2012 Census of Agriculture)
Barber	4	1	$0	$0	$388,136	4	$45,420,000
Barton	3	1	$15,000	$1,500	$1,772,118	21	$96,206,000
Comanche	5	0	$0	$0	$135,138	2	$21,783,000
Edwards	4	0	$0	$0	$232,382	5	$126,933,000
Kiowa	4	0	$0	$0	$237,655	3	$63,956,000
Pawnee	5	0	$0	$0	$449,592	9	$92,111,000
Pratt	3	0	$0	$0	$689,239	13	$52,353,000
Stafford	4	0	$0	$0	$295,331	6	$74,549,000
Regional Total	-	2	$15,000	$1,500	$4,199,591	8	$573,311,000

Using the above information, a value of 1-10 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for comparison and to determine the greatest vulnerable counties. The Social Vulnerability Index is in a range of 1 - 5. To give Social Vulnerability Index the same weight as the other factors, the numbers were multiplied by two.

Lightning Data Rating Determination

Ratings	Social Vulnerability	NCDC Prior Events	Annualized Property Damage	Building Exposure Valuation	Population Density *	Crop Exposure
1		1	$143 - $3,600	$117,421 - $4,492,825	1.6 - 116.3	0 - $18,548,500
2	1	2	$3,601 - $7,200	$4,492,826 - $8,868,229	116.4 - 231.1	$18,548,501 - $32,126,000
3		3	$7,201 - $10,800	$8,868,230 - $13,243,634	231.2 - 345.9	$32,126,001 - $45,703,500
4	2	4	$10,801 - $14,400	$13,243,635 - $17,619,039	346 - 460.7	$45,703,501 - $59,281,000
5		5	$14,401 - $18,000	$17,619,040 - $21,994,444	460.8 - 575.5	$59,281,001 - $72,858,500
6	3	6	$18,001 - $21,600	$21,994,445 - $26,369,848	575.6 - 690.3	$72,858,501 - $86,436,000
7		n/a	$21,601 - $ 25,200	$26,369,849 - $30,745,253	690.4 - 805.1	$86,436,001 - $100,013,500
8	4	n/a	$25,201 - $28,000	$30,745,254 - $35,120,658	805.2 - 919.9	$100,031,501 - $113,591,000
9		n/a	$28,801 - $33,000	$35,120,659 - $39,496,062	920- 1,034.7	$113,591,001 - $127,168,500
10	5	n/a	$33,001 and up	$39,496,063 - $43,871,468	1,034.8 - 1,149.6	$127,168,501 - $140,746,000

Note: n/a relates to not applicable because no county had more than 5 prior events

Based on the above ratings system, ranges were applied to each county to determine their potential vulnerability. The following related the scoring to a vulnerability assessment:

- **Low:** Score range of 7 -13
- **Medium-Low:** Score range of 14 - 18
- **Medium:** Score range of 19 - 23
- **Medium-High:** Score range of 24 - 28
- **High:** Score range of 29 - 34

Vulnerability of Kansas Counties to Lightning

County	SoVi Rating	NCDC Prior Event Rating	Annualized Property Damage Rating	Bldg Exposure Valuation Rating	Population Density Rating	Crop Exposure Rating	Overall Vulnerability Rating	Lightning Vulnerability
Barber	8	1	0	1	1	4	15	Medium-Low
Barton	6	1	1	1	1	7	17	Medium-Low
Comanche	10	0	0	1	1	2	14	Medium-Low
Edwards	8	0	0	1	1	9	19	Medium
Kiowa	8	0	0	1	1	5	15	Medium-Low
Pawnee	10	0	0	1	1	7	19	Medium
Pratt	6	0	0	1	1	4	12	Low
Stafford	8	0	0	1	1	6	16	Medium-Low

	Magnitude/Severity
Lightning	1.38

Future Development

Future development would tend to increase the risk of this hazard. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Severe thunderstorms and the associated lightning events will continue to cause damage to anything exposed to the weather elements. Lightning can damage many types of infrastructure, including electric lines/poles/transformers, telephone lines and radio communication equipment. These pieces of infrastructure are needed by both first response agencies and the general community to ensure safe transport, habitable homes and good communications abilities.

Residential and business properties are liable to receive damage either as a result of a lightning strike causing a fire or other type of direct damage or by overloading electronic equipment. The latter concern is especially important to business and government, which rely on computers and other electronic equipment for day to day operations. Virtually all structures and electrical components in south Kansas are vulnerable to lightning. Fires, electrical fires, electricity loss and damage to equipment are a few of the problems associated with lightning strikes.

Any increase in development will lead to a greater exposure to this hazard.

	Probability
Lightning	2.50

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Lightning Consequence Analysis

Subject	Ranking	Impacts of Lightning
Health and Safety of Persons in the Area of the Incident	Minimal to Moderate	Impact to the health and safety of persons could be minimal to moderate if within the incident area.
Responders	Minimal	Impact to responders is expected to be minimal unless responders live within the affected area.
Continuity of Operations	Minimal	Temporary relocation may be necessary if government facilities experience damage.
Property, Facilities, and Infrastructure	Minimal to Severe	Impact could be severe if property, facilities or infrastructure take a direct hit which could result in fire or destruction.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Minimal to Severe	Impact will be isolated, yet severe to any trees, animals, etc., that takes a direct hit, or is in the path of any fire that may be generated due to the lighting strike.
Economic Conditions	Minimal	Local economy impact should be fairly minimal, unless the lightening causes fires which damage businesses and stops revenue.
Public Confidence in Governance	Minimal	Response and recovery will be in question if not timely and effective, specifically if electricity and other utilities are affected.

3.7.14 Major Disease Outbreak

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Major Disease Outbreak	1.38	2.88	1.00	4.00	2.03

Description

Infectious diseases are human illnesses caused by microscopic agents, including viruses, bacteria, parasites, and fungi or by their toxins. They may be spread by direct contact with an infected person or animal, ingesting contaminated food or water, vectors such as mosquitoes or ticks, contact with contaminated surroundings such as animal droppings, infected droplets, or by aerosolization.

While there are a number of biological diseases/agents that are of concern to south Kansas, the following categories of disease are being addressed in this plan: vaccine preventable disease, food borne disease, and community associated infections as having significant recurring impact on the morbidity of south Kansans. The following descriptions are general and it should be noted that individuals may experience more or less severe consequences based upon their own circumstances.

Vaccine Preventable:

- **Measles:** a respiratory disease caused by a virus spread through the air by breathing, coughing or sneezing. It is so contagious that any child who is exposed to it and is not immune will probably get the disease.

- **Mumps:** a contagious disease that causes fever, headache, muscle aches, tiredness, and loss of appetite, and is followed by swelling of salivary glands. Most people with mumps recover fully.

- **Pertussis:** a highly communicable, vaccine-preventable disease that is typically results in severe coughing, whooping, and vomiting. Major complications are most common among infants and young children and include hypoxia, apnea, pneumonia, seizures, encephalopathy, and malnutrition. Young children can die from pertussis, with most deaths occur among unvaccinated children or children too young to be vaccinated.

- **Influenza:** a viral infection of the nose, throat, bronchial tubes, and lungs. There are two main types of virus, A and B, with each type including many different strain which tend to change each year. Influenza is highly contagious and is easily transmitted through contact with droplets from the nose and throat of an infected person during coughing and sneezing.

- **Pandemic Influenza:** A pandemic influenza is a influenza virus that causes a global outbreak of serious illness. A influenza pandemic occurs when a new virus emerges for which people have little or no immunity, and for which there is no vaccine. Infection rate and mortality may be markedly higher than a normal influenza.

Food Borne Disease:

- **Norovirus:** a group of related viruses that cause acute gastroenteritis in humans, including diarrhea, vomiting, and stomach pain. Noroviruses are transmitted primarily through the fecal-oral route, either by consumption of fecal contaminated food or water or by direct person-to-person spread.

- **Salmonellosis:** an infection with bacteria that causes diarrhea, fever, and abdominal cramps. The illness usually lasts four to seven days, and most persons recover without treatment.

	Warning Time
Major Disease Outbreak	1.00

	Duration
Major Disease Outbreak	4.00

Hazard Location

The entire planning area is susceptible to a disease outbreak. However, more densely populated areas are more susceptible to the diseases that are transmitted person to person.

Previous Occurrences and Extent

There have been four a pandemics in the past century that have impacted south Kansas:

1918–19: Spanish flu (H1N1): This flu is estimated to have sickened 20-40% of the world's population, causing the death of 500,000 Americans. Recently, the origin of the pandemic was traced to an outbreak of influenza in Haskell County, Kansas, in January 1918. By the end of 1918, the Kansas death toll was around 12,000.

1957–58: Asian flu (H2N2): This virus was quickly identified because of advances in technology, and a vaccine was produced. In total, there were about 70,000 deaths in the United States. Information about how this pandemic affected south Kansas was not available.

1968–69: Hong Kong flu (H3N2): This strain caused approximately 34,000 deaths in the United States. It was first detected in Hong Kong in early 1968 and spread to the United States later that year.

2009 H1N1 Influenza: The 2009 H1N1 Pandemic Influenza began in Kansas with the first identified case on April 24, 2009. Kansas was the third state to positively identify this novel strain of influenza.

South Kansas is also impacted by a variety of communicable and non-communicable diseases. The following tables provide the numbers of reportable diseases by county from 2002 to 2013. Not all diseases are listed.

2002 - 2013 Reportable Diseases

County	Amebiasis	Arboviral Disease	Botulism	Campylobacteriosis	Cholera	Cryptosporidiosis	Ehrlichiosis/Anaplasmosis	Giardiasis	H. influenzae, invasive	Hemolytic Uremic Syndrome (HUS)	Hepatitis A	Hepatitis B, acute	Hepatitis C, acute	Legionellosis	Listeriosis
Barber	0	0	0	6	0	0	0	0	0	0	0	0	1	0	0
Barton	0	9	0	11	0	10	0	2	1	0	0	1	0	0	0
Comanche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edwards	0	3	0	4	0	0	0	0	0	0	0	0	1	0	0
Kiowa	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Pawnee	0	0	0	5	0	1	0	1	0	0	0	0	1	0	0
Pratt	0	1	0	4	0	0	0	2	0	0	0	0	0	1	0
Stafford	0	5	0	2	0	0	0	1	0	0	0	0	0	0	0
Regional Total	0	19	0	32	0	11	0	6	1	0	0	1	3	1	0

Source: Kansas Department of Health and Environment

2002 - 2013 Reportable Diseases Continued

County	Lyme Disease	Malaria	Meningitis, non-HiB, non-Neisseria	Meningococcal Disease	Mumps	Pertussis	Rabies, animal	Salmonellosis	Shiga toxin-producing E. coli	Shigellosis	Strep., Group A, invasive	Strep. pneumoniae, invasive	TSE or Prion Disease	Tuberculosis, active	Tularemia	Typhoid Fever	Varicella
Barber	0	0	0	0	0	2	0	1	1	0	0	1	0	0	0	0	3
Barton	0	0	0	0	1	5	1	11	9	3	0	1	0	0	0	0	11
Comanche	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Edwards	0	0	0	0	0	0	1	3	3	0	1	0	0	0	0	0	1
Kiowa	0	0	0	0	0	0	1	1	1	1	0	0	1	0	0	0	1
Pawnee	0	0	0	0	0	12	0	7	2	0	0	1	0	0	0	0	5
Pratt	0	1	0	0	0	0	1	3	5	0	2	0	0	0	0	0	2
Stafford	0	0	0	0	0	3	0	6	2	0	0	1	0	0	0	0	10
Regional Total	0	1	0	0	1	22	4	32	23	5	3	4	1	0	0	0	33

Source: Kansas Department of Health and Environment

Hazard Vulnerability and Impact

All people within the south Kansas region would be susceptible to a major disease outbreak. As the type of disease cannot be known in advance it is impossible to predict if any segment of the population would be a greater risk. However, the following generalities may be made:

- Population density will affect the rate of spread of a transmissible pathogen
- The young and old are usually more susceptible to deleterious effects of disease
- Access to medical care will impact the outcomes for infected individuals
- The novelty of the disease will impact availability of treatments and vaccines
- Inherent immunity may be present in some populations

As evidenced by annual infectious disease summaries (http://www.kdheks.gov/epi/index.html) and reports of investigations (http://www.kdheks.gov/epi/outbreaks.htm) completed by the KDHE Bureau of Epidemiology and Public Health Informatics, many south Kansas counties experience one or multiple disease outbreaks each year. Potential casualty losses are anticipated to be greatest in counties with higher populations, higher pediatric populations and higher elderly populations. Health professional shortage areas and rural areas are more susceptible to having limited medical capabilities and by extension are more susceptible to the possibility of being overwhelmed because of a large surge of patients seeking care.

Although infectious diseases do not respect geographic boundaries, several populations in south Kansas are at specific risk to infectious diseases. Communicable diseases are most likely to spread quickly in institutional settings such as dormitories, long-term care facilities, day care facilities, and schools.

The HMPC ranked the disease outbreak as catastrophic based on a pandemic scenario. The magnitude of an infectious disease outbreak is related to the ability of the public health and medical communities to stop the spread of the disease. Most disease outbreaks that cause catastrophic numbers of deaths are infectious in nature, meaning that they are spread from person to person. The key to reducing the catastrophic nature of the event is to stop the spread of disease. This is generally done in three ways:

- Identification and isolation of the ill
- Quarantine of those exposed to the illness
- Education of the public about methods to prevent transmission.

The public health and health care providers in south Kansas routinely utilize all three methods to reduce morbidity and mortality from infectious disease. However, the capacity of the health care system is limited. For example, local health departments have specific pandemic influenza response plans, and mass prophylaxis plans, but most departments have only a few staff members. Most local health departments would need to rely on volunteers, pre-scripted messages and procedures and the cooperation of the public in order to respond effectively to a large scale pandemic. Similarly, hospitals in south Kansas have emergency response and pandemic influenza plans, but little excess capacity exists to care for and/or isolate hundreds, even thousands of patients. Because of these limitations in personnel and equipment, the health care community is planning to utilize “community containment” measures. These measures which could include closure of schools, day cares and other public events would have far-reaching economic impacts on the community and might shutdown facilities for 30 days or more. Closure of the day cares or schools would have a serious impact on business as parents might not be able to find child care elsewhere.

According to "The Annual Impact of Seasonal Influenza in the US: Measuring Disease Burden and Costs" by NA Molinari, nationally the economic burden of influenza medical costs, medical costs plus lost earnings, and the total economic burden were $10.4 billion, $26.8 billion and $87.1 billion respectively. The financial burden of healthcare-associated infections nationally has been estimated at $33 billion annually. There is no data currently available on the economic impact of previous illness in south Kansas. Using pandemic influenza as the worst case scenario for estimating potential losses, the Kansas Department of Health and Environment’s Pandemic Influenza Planning includes the following vulnerability estimates. It has been estimated that a medium-level pandemic could cause, in Kansas:

- Between 229,203 and 534,807 persons may require outpatient care
- Between 5,016 and 11,706 may require hospitalization
- Between 1,163 and 2,714 individuals may die

The majority of these deaths and hospitalizations would occur in more highly populated counties.

The U.S. Centers for Disease Control and Prevention (CDC) estimates 76 million people suffer food borne illnesses each year in the United States, accounting for 325,000 hospitalizations and more than 5,000 deaths. Food borne disease is extremely costly. Health experts estimate that the yearly cost of all food borne diseases in this country is $5 to $6 billion in direct medical expenses and lost productivity. Infections with the bacteria *Salmonella* alone account for $1 billion yearly in direct and indirect medical costs.

	Magnitude/Severity
Major Disease Outbreak	2.88

Future Development

Future development and population increases would tend to increase the risk of this hazard due to the potential for a more rapid spread of an agent or disease. Additionally, the further development of transportation infrastructure would increase the risk of a major disease event due to an influx of travelers to the region. As the population of Kansas ages, the vulnerability to this hazard is likely to increase. The impacts and potential losses are largely economic and are dependent on the type, extent, and duration of the illness. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Each year, the Kansas KDHE produces a report that details the legally "reportable diseases" in each county in Kansas. While over time this report can serve as a predictor of the likelihood of future disease, it is impossible to predict outbreaks. Based on the relatively limited/controlled outbreak history in the state the possibility of a large-scale major disease outbreak is unlikely

	Probability
Major Disease Outbreak	1.38

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Major Disease Outbreak Consequence Analysis

Subject	Ranking	Impacts of Major Disease Outbreak
Health and Safety of Persons in the Area of the Incident	Severe	Impact over a widespread area could be severe depending on type of outbreak and whether it is a communicable disease. Casualties are dependent on warning systems, warning times and the availability of vaccines, antidotes, & medical svc.
Responders	Severe	Impact to responders could be severe, especially if they reside in the area and or their type of exposure during response. With proper precautions and safety nets in place the impact is lessened.
Continuity of Operations	Minimal	Continuity of Operations will be greatly dependent on availability of healthy individuals. COOP is not expected to be exercised.
Property, Facilities, and Infrastructure	Minimal	Access to facilities and infrastructure could be affected until decontamination is completed
Delivery of Services	Minimal	Delivery of services could be affected if there are road blocks or mass hysteria of any level.
Environment	Severe	Impact could be severe for the immediate impacted area depending on the source of the outbreak. Impact could have far-reaching implications if disease is transferable between humans and animals or to wildlife.
Economic Conditions	Severe	Impacts to the economy could be severe if the disease is communicable. Loss of tourism, revenue, and business as usual will greatly affect the local economy and the state as a whole.
Public Confidence in Governance	Severe	Response and recovery will be in question if not timely and effective. Availability of medical supplies, vaccines, and treatments will come into question.

3.7.15 RADIOLOGICAL EVENT

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Radiological Event	1.00	1.00	3.63	4.00	1.69

Description

An accident involving radioactive materials could occur from a variety of sources, including nuclear reactors, transportation accidents, industrial and medical uses and lost or stolen sources. Radiological accidents could cause injury or death, contaminate property and valuable environmental resources, as well as disrupt the functioning of communities and their economies.

	Warning Time
Radiological Event	3.63

	Duration
Radiological Event	4.00

Hazard Location

The entire planning region is at risk from a radiological event due to transportation accidents.

Previous Occurrences and Extent

There are no reported radiological events for south Kansas.

Hazard Vulnerability and Impact

There are over 300 licensees of various sizes for radioactive material within the State of Kansas. In general, the major usage of radioactive materials in south Kansas are for medical diagnostics and therapy, soil density testing in the construction industry, and in radiography cameras in pipeline construction and repair.

It is common for materials, including pharmaceuticals, industrial sources and nuclear fuel rods destined to nuclear reactors, to be transported across south Kansas highways and railroads. Areas near interstates and major highways have an increased risk of transportation accidents. Remote areas also have to account for long response times from hazardous materials and health physics personnel.

Counties within the 50-mile Emergency Planning Zone for commercial nuclear power plants have a slightly higher radiological risk than other counties within the region, but the potential for an incident is extremely low. Federal regulations require emergency planning for the area within up to a 50-mile radius of a nuclear power plant. The potential danger from an accident is exposure to radiation. This exposure could come from the release of radioactive material from the plant into the environment, usually characterized by a plume of radioactive gases and particles. The major hazards to people in the vicinity of the plume are radiation exposure to the body from the cloud and particles deposited on the ground, inhalation of radioactive materials and ingestion of radioactive materials.

During all lawful operations of radioactive materials, the licensee is responsible for ensuring that the area around the source material is cordoned off or shielding is used to prevent unnecessary exposures. Inspections of practices and security measures are regularly conducted to ensure compliance and conformity to regulations in order to protect the public. The frequency of inspections can be adjusted in response to perceived risk. Public risk can be reduced by minimizing the duration of exposure, shielding the source material and maximizing the distance from the source.

	Magnitude/Severity
Radiological Event	1.00

Future Development

Additional development along transportation corridors would likely increase the potential exposure of the nearby population to a radiological event. Additionally, greater loads on the highways and rail corridors could increase the chances of an accident involving a radiological transport vehicle. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Based on the lack of major or recurring notable radiological events in south Kansas during the last 10 years the probability of an event occurring is unlikely within the next ten years.

	Probability
Radiological Event	1.00

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Radiological Event Consequence Analysis

Subject	Ranking	Impacts of Radiological Event
Health and Safety of Persons in the Area of the Incident	Severe	Impact expected to be severe for persons within the incident area. Protection capabilities and warning times will greatly affect the severity.
Responders	Severe	Impact to responders could be severe if not trained and properly equipped. Responders that are properly trained and equipped will have a low to moderate impact.
Continuity of Operations	Minimal to Severe	Temporary relocation could be necessary if government facilities are in close proximity to the incident area. This temporary relocation could become significant depending on clean-up.
Property, Facilities, and Infrastructure	Severe	Impact within the incident area could be severe to property, facilities, and infrastructure.
Delivery of Services	Minimal to Severe	Delivery of services could be affected within and around the affected area.
Environment	Severe	Localized impact within the incident area could be severe to native plants, wildlife and natural habitats. Clean up and remediation will be required.
Economic Conditions	Minimal to Severe	Economic conditions could be adversely affected and dependent upon time and length of clean up and investigation.
Public Confidence in Governance	Minimal to Severe	Impact will be dependent on whether or not the incident could have been avoided by government or non-government entities, clean-up and investigation times, and outcomes.

3.7.16 SOIL EROSION AND DUST

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Soil Erosion & Dust	2.38	1.38	1.00	4.00	2.03

Description

Soil erosion and dust are both ongoing problems for south Kansas. Both can cause significant loss of valuable agricultural soils, damage crops, harm environmental resources and have adverse economic impacts. Soil erosion in south Kansas is largely associated with periods of drought, when winds are able to move tremendous quantities of exposed dry soil (wind erosion), and flooding (stream bank erosion). Improper agricultural and grazing practices can also contribute to soil erosion.

The United States is losing soil 10 times faster than the natural replenishment rate, and related production losses cost the country about $37.6 billion each year. On average, wind erosion is responsible for about 40 percent of this loss and can increase markedly in drought years. Wind erosion physically removes the lighter, less dense soil constituents such as organic matter, clays and silts. Thus it removes the most fertile part of the soil and lowers soil productivity, which can result in lower crop yields or poorer grade pastures and increase economic costs.

Stream bank erosion, which can remove agricultural land and damage or destroy roads and bridges and utility lines, occurs each year, particularly in the spring when high runoff is most common. A large proportion of all eroded soil material ends up in rivers, streams and lakes, which makes waterways more prone to flooding and contamination and reduces water supply storage space.

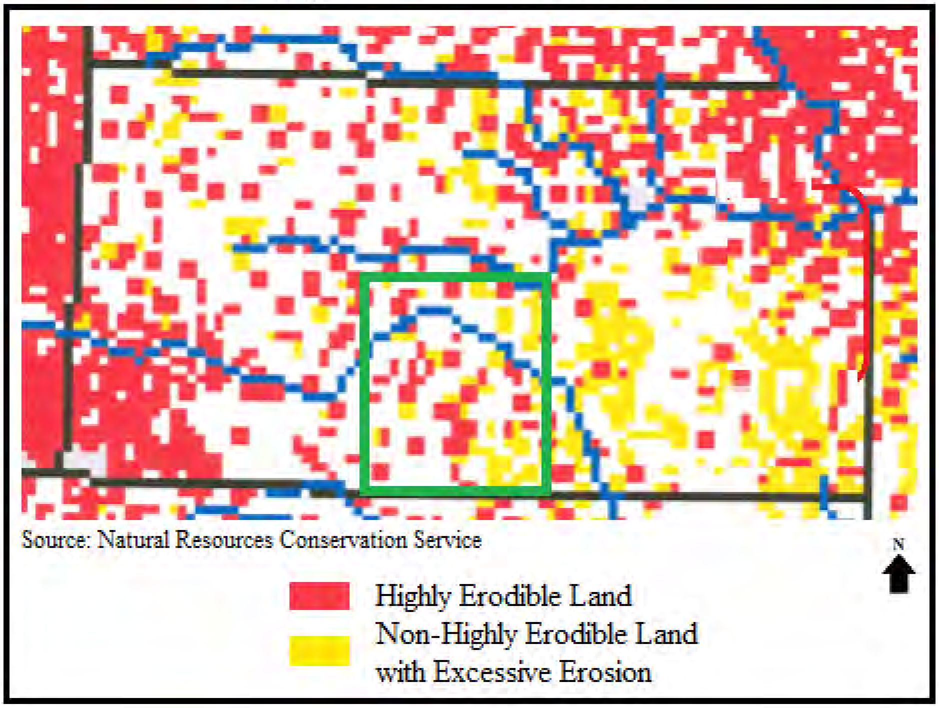
	Warning Time
Soil Erosion & Dust	1.00

	Duration
Soil Erosion & Dust	4.00

Hazard Location

The following figure shows areas of excessive erosion of farmland in Kansas based on a 1997 analysis. Each red dot represents 5,000 acres of highly erodible land, and each yellow dot represents 5,000 acres of non-highly erodible land with excessive erosion above the tolerable soil erosion rate. While south Kansas has smaller areas of highly erodible land, the entire area is susceptible to soil erosion and dust.

Regional Farmland Erosion



Previous Occurrences

The most prominent soil erosion and dust event in south Kansas, known as the Dust Bowl, occurred across the mid-western United States from 1930-1936. South Kansas is situated to the east of the most severely impacted region (100 million acre across Oklahoma, the Texas panhandle, New Mexico, eastern Colorado and western Kansas) but was nonetheless significantly affected. Sustained drought, loss of native prairie and the agricultural practices of the time were primary causes for this unmitigated disaster. During the Dust Bowl years millions of tons of fertile soils were lost as well as a significant percentage of the region's population via migration, dust pneumonia and malnutrition. More recently, the Kansas State Hazard Mitigation Plan reports that during the 1970s and in the spring of 1996 wind erosion seriously damaged agricultural land throughout the Great Plains.

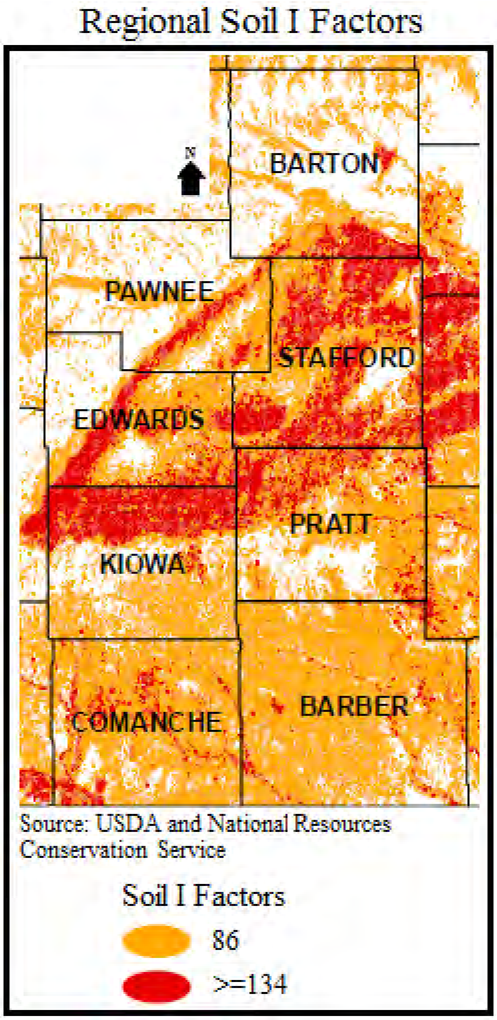
Notable historical erosion events include:

2007: According to the 2007 Natural Resources Inventory (NRI) by the Natural Resources Conservation Service, Kansas lost 1.734 tons per acre to wind erosion on cultivated cropland.

1930s: Kansas is well known for its role in the 1930s Dust Bowl, in which the Central Plains states suffered drought and resulting wind erosion for about a decade. It is estimated that 21.5 million acres were lost during this time.

Hazard Vulnerability and Impact

The map below indicates all south Kansas soils that have an "I" value, or wind erodibility index, of 86 or greater. In general, the higher the I value, the more susceptible it is to wind erosion. These are soils that should be further evaluated before recommending the use of emergency tillage or not. The evaluation of these soils will need to take into account the predominate particle size (i.e. classification of "sandy" would cause the soil to have characteristics more like a 134 soil), as well as the ability for the soil to form a stable clod.



There have not been any state-wide studies to estimate the dollar value of top soil lost to soil erosion and dust.

The 2007 Natural Resources Inventory by the Natural Resources Conservation Service shows the historical estimates for tons per acres soil lost annually for cultivated cropland, non-cultivated cropland and pastureland. This estimate can continue as potential soil losses in Kansas.

Kansas Average Wind Erosion in Tons per Acre per Year by Broad Cover/Use

Broad Cover/Use	1982	1987	1992	1997	2002	2007
Cultivated Cropland	2.747	2.963	2.062	1.482	1.463	1.734
Pastureland	0.009	0.016	0.022	0.015	0.019	0.034

Source: 2007 National Resources Inventory, April 22, 2010

Note: Estimated average annual wind erosion is tons per acre per year with margins of error.

The following table presents regional acreage data for cropland and pastureland .

Regional Acreage Data (2012)

	Acreage
Total Cropland Acres	2,350,603
Total Pasture Acres	1,474,729

Source: USDA National Agricultural Statistics Service

Based on the statewide wind erosion average figures and the total cropland and pasture acreage for the region, the following can be extrapolated for the south Kansas.

Regional Estimated Soil Tonnage Lost To Wind Erosion, 1982 - 2007

	1982	1987	1992	1997	2002	2007
Estimated Regional Tonnage Lost to Wind Erosion, Cultivated Cropland	6,457,106	6,964,837	4,846,943	3,483,594	3,438,932	4,075,946
Estimated Regional Tonnage Lost to Wind Erosion, Pastureland	13,273	23,596	32,444	22,121	28,020	50,141

Calculated using USDA and 2007 National Resources Inventory data

Soil erosion has also affected the regional federal reservoirs, with erosion depositing large quantities of sediment in these reservoirs, impacting water supply and quality as well as flood storage. Because of differing climatic conditions, land uses, and physical attributes in the various watersheds, sedimentation rates vary among the reservoirs. In 2001, the KWO completed a report that projected the affect of sedimentation on state-owned storage in federal reservoirs. While there are no major reservoirs in the region it is worth noting that by the year 2040 sedimentation was projected to reduce the total amount of state-owned storage from 1.2 million acre-feet to roughly 857,000 acre-feet, a rate of loss of 6,260 acre-feet per year.

	Magnitude/Severity
Soil Erosion & Dust	1.38

Future Development

Future development of agricultural resources and/or increases in population would tend to increase the risk of this hazard. However the region is experiencing a slight decrease in agricultural acreage trending toward static which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

While the occurrence of this hazard is on-going, based on data concerning historical occurrences and data on regional growth and development trends in agriculture and livestock, the probability of occasional future occurrences of this hazard causing a greater measurable impact is possible.

	Probability
Soil Erosion & Dust	2.38

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Soil Erosion and Dust Consequence Analysis

Subject	Ranking	Impacts of Soil Erosion and Dust
Health and Safety of Persons in the Area of the Incident	Minimal	Impact tends to be agricultural; however, dust can be a danger to susceptible individuals in the form of air pollutants.
Responders	Minimal	With proper preparedness and protection, impact to the responders is expected to be minimal.
Continuity of Operations	Minimal	Minimal expectation for utilization of the COOP.
Property, Facilities, and Infrastructure	Minimal to Moderate	Impact to property, facilities, and infrastructure could be severe, depending on the site of the soil erosion. This could adversely affect utility poles/lines, and facilities. Dust can also adversely affect machinery, air conditioners, etc.
Delivery of Services	Minimal	Impact on the delivery of services should be non-existent to minimal, unless roads and utilities are affected.
Environment	Severe	The impact to the environment could be severe. Soil erosion and dust can severely affect farming, ranching, wildlife and plants due to production losses and habitat changes.
Economic Conditions	Minimal	Impacts to the economy will be dependent on how extreme the soil erosion and dust are. Potentially it could severely affect crop yield and productivity. Seedling survival and growth is stressed by erosion and dust, as is the top soil which agriculture is dependent on.
Public Confidence in Governance	Minimal	Planning, response, and recovery may be questioned if not timely and effective.

3.7.17 TERRORISM, AGRI-TERRORISM

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Terrorism, Agri-Terrorism	1.00	2.00	3.63	1.38	1.73

Description

The United States does not have a standardized definition of terrorism that is agreed upon by all agencies. The Federal Bureau of Investigation generally defines terrorism as:

> "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives."

The USA Patriot Act expanded this definition to include domestic terrorism, defined as:

> "acts dangerous to human life that are a violation of the criminal laws of the United States or of any State" intended to "intimidate or coerce a civilian population," "influence the policy of a government by intimidation or coercion" or "affect the conduct of a government by mass destruction, assassination, or kidnapping" that are conducted primarily within the jurisdiction of the United States."

The Homeland Security Act of 2002, which created the Department of Homeland Security, extended the definition of terrorism further by including any act that:

> "involves an act that dangerous to human life or potentially destructive to critical infrastructure or key resources, and is a violation of the criminal laws of the United States or of any state or other subdivision of the United States and appears to be intended to intimidate or coerce a civilian population to influence the policy of a government by intimidation or coercion, or to affect the conduct of a government by mass destruction, assassination, or kidnapping"

The statement "potentially destructive to critical infrastructure or key resources" indicates that the act does not need to be dangerous to human life for it to be considered an act of terrorism. Terrorists may use a range of possible actions, including:

- Chemical attacks
- Biological attacks
- Radiological attacks
- Nuclear attacks
- Cyber-terrorism
- Agri-terrorism

	Warning Time
Terrorism, Agri-Terrorism	3.63

	Duration
Terrorism, Agri-Terrorism	1.38

Hazard Location

Kansas is home to a wide variety of criminal extremist groups. The Southern Poverty Law Center reported that in 2012, there were three active hate groups in Kansas: one neo-Nazi group, the National Socialist Movement in Lansing, one racist skinhead group, the Midland Hammerskins in Wichita, and one anti-homosexual group, the Westboro Baptist Church in Topeka. Other groups, such as the Animal Liberation Front, Earth Liberation Front, and People for the Ethical Treatment of Animal may have sympathizers in the region. Although no major terrorist acts have been attributed to any of these latter groups, their involvement in violent acts is meant to disrupt governmental functions and cannot be discounted.

Previous Occurrences

There have been no incidents or events reported in the region.

Hazard Vulnerability and Impact

Of particular concern to south Kansas is agri-terrorism Agri-terrorism consists of acts to intentionally contaminate, ruin, or otherwise make agricultural products unfit or dangerous for consumption or further use. The introduction of a biological agent into an animal or crop would be financially devastating and would have a major impact on the food supply of the state region , state and nation. Potential terrorists' targets for livestock disease introduction would be concentration points, such as the region's licensed feedlots and livestock markets. Additionally, Kansas has over 120 agricultural crop-dusters, many of which are configured for chemical spraying.

It is not possible to calculate a specific vulnerability for each county in south Kansas. However, because of the desire for publicity following attacks, it is more likely that counties with greater population densities would be the target of attacks. Sparsely populated rural counties are less desirable targets for publicity-seeking terrorists. It is expected that the likelihood of attack is directly related to population density or more likely to an event that is occurring or to a specific location of importance to the attacker. For example, a large venue event, such as a sporting event attended by tens of thousands of people might be considered a desirable target. Most large public venues occur in densely populated areas since those areas are able to provide the infrastructure support (hotels, eateries, etc) for large numbers of people.

Potential losses from Terrorism/Agri-Terrorism include all infrastructure, critical facilities, crops, humans and animals. The degree of impact would be directly related to the type of incident and the target. Potential losses could include cost of repair or replacement of damaged facilities, lost economic opportunities for businesses, loss of human life, injuries to persons, loss of food supplies, disruption of the food supply chain, and immediate damage to the surrounding environment. Secondary effects of infrastructure failure could include public safety hazards, spread of disease, increased morbidity and mortality among the local and distant populations, public panic and long-lasting damage to the environment. Terrorism events are rare occurrences and specific amounts of estimated losses for previous occurrences are not available due to the complexity and multiple variables associated with these types of hazards. In some instances, information about these events is secure and unavailable to the public in order to maintain national security and prevent future attacks.

In general, it is difficult to quantify potential losses of terrorism due to the many variables and human elements and lack of historical precedence. Therefore, for the purposes of this plan, the loss estimates will take into account three hypothetical scenarios. The estimated impact of each event was calculated using the Electronic Mass Casualty Assessment and Planning Scenarios developed by Johns Hopkins University. The Electronic Mass Casualty Assessment and Planning Scenarios system usually rates the of worried well as equal to 9 times the number of infected cases.

Please note that the hypothetical scenarios are included for illustrative purposes only.

Scenario #1: Mustard Gas Release

Event: Mustard gas is released from a light aircraft onto a local downtown area during a heavily attended event. The agent directly contaminates the downtown area and the immediate surrounding area. This attack would cause harm to humans and could render portions of the downtown unusable for a short time period in order to allow for a costly clean-up. There might also be a fear by the public of long-term contamination of the stadium and subsequent boycott of games resulting in a loss of revenue and tourism dollars.

Event Assumptions: For this scenario the number of people in the downtown area is 5,000. The agent used, mustard gas, is extremely toxic and may damage eyes, skin and respiratory tract with death sometimes resulting from secondary respiratory infections. Death rate from exposure estimated to be 3%. The estimated decontamination cost is $12 person. For this scenario it is assumed that all persons with skin injuries will require decontamination.

Results: The following table presents the estimated human and economic impacts of the scenario.

Estimated Impact of Scenario #1, Mustard Gas Release

Impact	Post Exposure Onset Time	Effect
Severe Eye Injuries (1-2 hours)	1 -2 Hours	3,750 persons
Severe Airway Injuries (1-2 hours)	1 - 2 Hours	3,750 persons
Severe Skin Injuries (2 hrs to days)	2 Hours to Days	4,500 persons
Deaths	Immediate to Days	100 persons
Cost of Decontamination	N/A	$60,000

Scenario #2: Pneumonic Plague

Event: Two canisters containing aerosolized pneumonic plague bacteria are opened in public bathrooms of a heavily populated building. Each release location will directly infect 110 people; hence, the number of release locations dictates the initial infected population. The secondary infection rate of two is used to calculate the total infected population. This attack method would not cause damages to buildings or other infrastructure, only to human populations.

Event Assumptions:

Each canister contains 650 milliliters of pneumonic plague bacteria. The type of infectious agent used is identified on Day 4. After identification, the fatality rate is 10% for new cases. Pneumonic plague has a 1-15 percent mortality rate in treated cases and a 40-60 percent mortality rate in untreated cases.

Results: The following table presents the estimated human impacts of the scenario.

Estimated Impact of Scenario #2, Pneumonic Plague Release

Impact	Effect
Initial Infected Population	220 persons
Secondary Infected Population	440 persons
Deaths (7% of Infected)	46

Scenario #3: Improvised Explosive Device

Event: An improvised explosive device utilizing an ammonium nitrate/fuel oil (ANFO) mixture is carried in a panel van to a parking area around a local event. Potential losses with this type of scenario include both human and structural assets.

Event Assumptions:

The quantity of ANFO used is 1,000 pounds. The population density of the lot is assumed to be 1 person per every 25 square feet. The Lethal Air Blast Range for such a vehicle is estimated to be 50 feet according to the Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF) Standards. The Falling Glass Hazard distance is estimated at 600 feet according to BATF Explosive Standards. In this event, damage would occur to vehicles and structures. The exact amount of these damages is difficult to predict because of the large numbers of factors, including the type of structures nearby and the amount of insurance held by vehicle owners. It is estimated that the average replacement cost for a vehicle is $20,000 and the average repair cost for damaged vehicles would be $4,000.

Results: The following table presents the estimated human impacts of the scenario.

Estimated Impact of Scenario #3, Improvised Explosive Device

Impact	Effect
Deaths	551 persons
Trauma Injuries	961 persons
Urgent Care Injuries	11,935
Injuries not Requiring Hospitalization	4,736
Repair Costs for 25 Vehicles	$100,000
Replacement Costs for 25 Vehicles	$500,000

	Magnitude/Severity
Terrorism, Agri-Terrorism	2.00

Future Development

In general, acts of terrorism have historically been conducted in major population centers or on targets of high significance within the United States. If more large public events are held in south Kansas, more potential may exist for these venues to become targets of attack. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

With human-caused hazards such as this that can have multiple variables involved, increases in development are not necessarily always factors in determining risk, although the physical cost of the event may increase with the increased or newly developed areas.

Probability of Future Hazard Events

By nature, acts of terrorism are difficult to foresee. However, based on historic events the probability of future major regional terrorist attacks is unlikely.

	Probability
Terrorism, Agri-Terrorism	1.00

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Terrorism, Agri-Terrorism Consequence Analysis

Subject	Ranking	Impacts of Terrorism, Agri-Terrorism
Health and Safety of Persons in the Area of the Incident	Severe	Impact could be severe for persons in the incident area.
Responders	Minimal to Severe	Impact to responders could be severe if not trained and properly equipped. Responders that are properly trained and equipped will have a low to moderate impact.
Continuity of Operations	Minimal to Severe	Depending on damage to facilities/personnel in the incident area, re-location may be necessary and lines of succession execution.
Property, Facilities, and Infrastructure	Severe	Impact within the incident area could be severe for explosion, moderate to low for Hazmat.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if communications, road and railways, and facilities incur damage.
Environment	Minimal to Severe	Localized impact within the incident area could be severe depending on the type of incident.
Economic Conditions	Minimal to Severe	Economic conditions could be adversely affected and dependent upon time and length of clean up and investigation.
Public Confidence in Governance	Minimal to Severe	Impact dependent on if the incident could have been avoided by government entities, clean-up, investigation times and outcomes.

3.7.18 TORNADO

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Tornado	3.50	3.25	4.00	1.13	3.26

Description

The NWS defines a tornado as "a violently rotating column of air extending from a thunderstorm to the ground." Tornados are the most violent of all atmospheric storms and are capable of tremendous destruction. Wind speeds can exceed 250 mph, and damage paths can be more than one mile wide and 50 miles long.

Although tornados have been documented on every continent, they occur most frequently in the United States east of the Rocky Mountains. South Kansas is situated in an area that is generally known as "Tornado Alley." Climatological conditions are such that warm and cold air masses meet in the center of the country to create conditions of great instability and fast moving air at high pressure that can ultimately result in formation of tornado funnels.

In south Kansas, most tornados and tornado-related deaths and injuries occur during the months of April, May, and June. However, tornados have struck in every month. Similarly, while most tornados occur between 3:00 p.m. and 9:00 p.m., a tornado can strike at any time.

Tornados are classified according to the Enhanced Fujita (EF) Scale. The EF scale ranks tornados according to wind speed and the resulting damage caused. This system is an update to the original Fujita Scale, and was implemented on February 1, 2007. The following table illustrates the changes in the scaling systems.

Fujita Scale and Enhanced Fujita Scale Comparison

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

Source: NWS

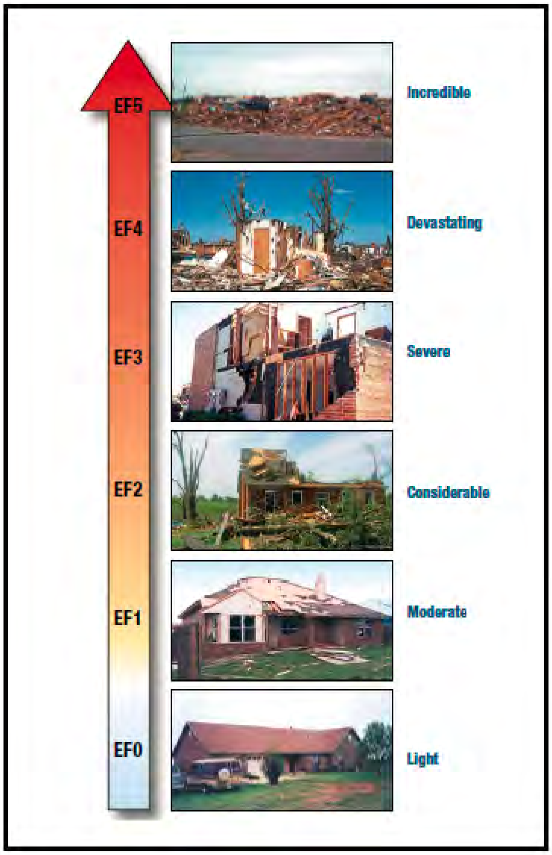
The wind speeds for the EF scale and damage descriptions are based on information from the NOAA Storm Prediction Center. The damage descriptions are summaries. For the actual EF scale it is necessary to look up the damage indicator (type of structure damaged) and refer to the degrees of damage associated with that indicator.

Enhanced Fujita Scale

Scale	Wind Speed (mph)	Relative Frequency	Potential Damage
EF0	65-85	53.5%	Light. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornados with no reported damage (i.e. those that remain in open fields) are always rated EF0.
EF1	86-110	31.6%	Moderate. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	10.7%	Considerable. Roofs torn off well constructed houses; foundations of frame homes shifted; mobile homes complete destroyed; large trees snapped or uprooted; light object missiles generated; cars lifted off ground.
EF3	136-165	3.4%	Severe. Entire stores 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	166-200	0.7%	Devastating. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	>200	<0.1%	Explosive. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 300 ft.; steel reinforced concrete structure badly damaged; high rise buildings have significant structural deformation; incredible phenomena will occur.

Source: NOAA Storm Prediction Center

The f ollowing p icture, p rovided b y FEMA, v isually i ndicates expected d amage f rom ea ch tornado type.



Source: FEMA, Taking Shelter From the Storm, 2008

The best lead time for a tornado is about 30 minutes. Tornados have been known to change paths very rapidly, thus limiting the time in which to take shelter. Tornados may not be visible on the ground due to evening hours, blowing dust or driving rain and hail. Therefore, there is very little, or no, warning of when a specific tornado may be on the ground.

	Warning Time
Tornado	4.00

	Duration
Tornado	1.13

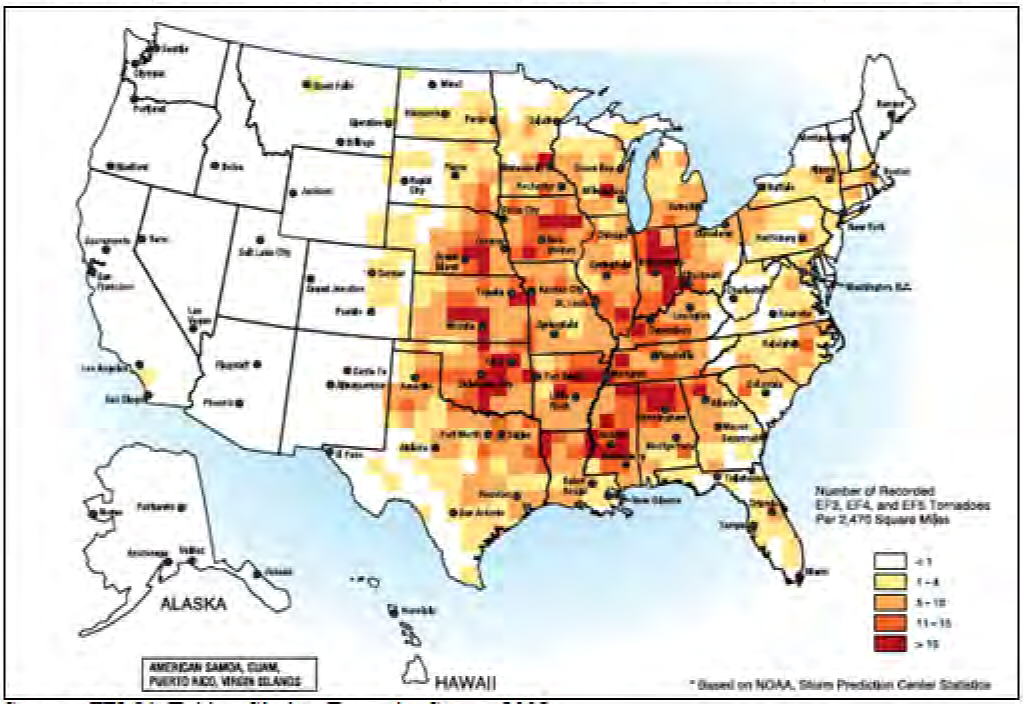
Hazard Location

Although tornados have been documented on every continent, they occur most frequently in the United States east of the Rocky Mountains. South Kansas is situated in an area that is generally known as Tornado Alley.

While tornados can occur in all areas of the State of Kansas, historically, some areas of the state have been more susceptible to this type of damaging storm. All of south Kansas, including all of the participating jurisdictions, is at risk to tornados.

The following figure illustrates the number of F3, F4, and F5 tornados recorded in the United States between 1950 and 2006. Each colored block indicates an area of approximately 2,470 square miles. Data from the map indicates the south Kansas region falls within areas that range from 5-10 to >15 recorded events.

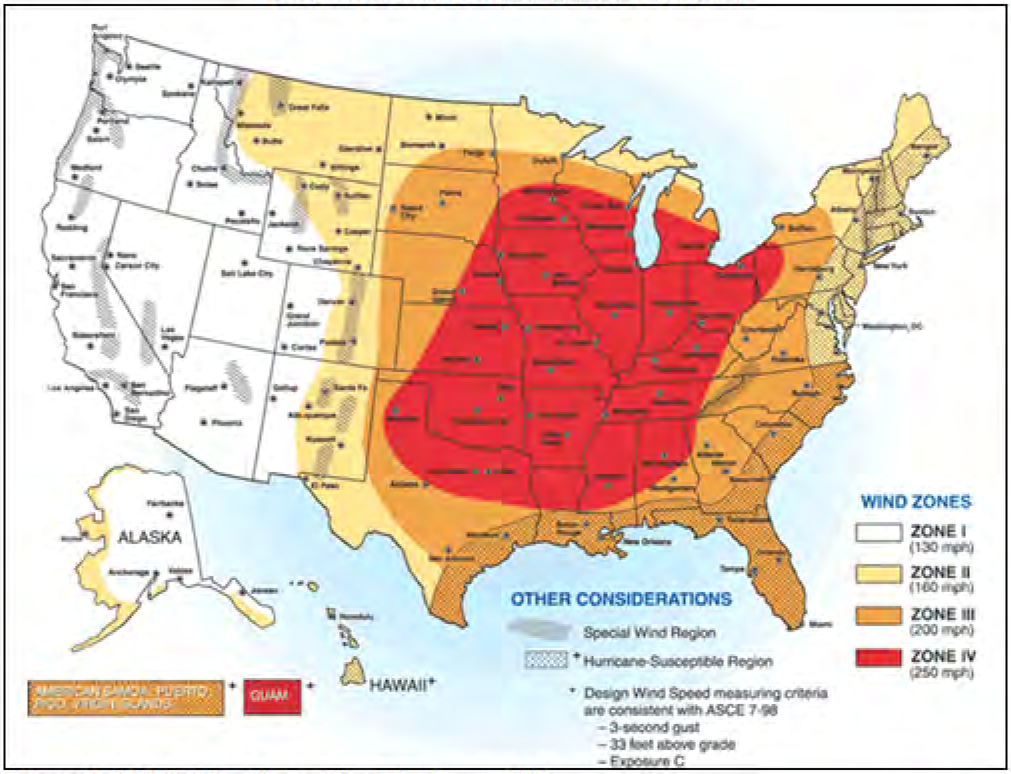
Tornado Activity in the United States
Summary of Recorded EF3, EF4, and EF5 Tornados, 1950-2006



Source: FEMA Taking Shelter From the Storm, 2008

Additionally, the following figure shows that south Kansas is in Wind Zone IV, indicating that the area has the strongest and most frequent tornado activity.

Wind Zones in the United States



Source: FEMA Taking Shelter From the Storm, 2008

By using the data derived from the above maps and the risk rating table from FEMA, it is possible to see that south Kansas is in a high risk area for tornados.

Area Risk Rating

		Wind Zone			
Number of Tornados Per 2,470 Square Miles		I	II	III	IV
	<1	Low Risk	Low Risk	Low Risk	Moderate Risk
	1-4	Low Risk	Moderate Risk	High Risk	High Risk
	5-10	Low Risk	Moderate Risk	High Risk	High Risk
	11-15	High Risk	High Risk	High Risk	High Risk
	>15	High Risk	High Risk	High Risk	High Risk

Source: Taking Shelter from the Storm, FEMA, 2008

Previous Occurrences and Extent

In the past ten years, tornados have impacted south Kansas repeatedly, including nine Presidential Disaster Declarations since 2004. Details about some of these events as well as the Presidential Disaster Declarations that included tornados can be found on the following pages.

Kansas Presidential Declarations Involving Tornados

Declaration Number	Declaration Date*	Disaster Description	Regional Counties Involved	Disaster Cost**
4150	10/22/2013 (7/22/2013 - 08/16/2013)	Severe Storms, Winds, **Tornados** and Flooding	Barber, Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford	$11,412,827
4063	05/24/2012 (4/14-4/15/2012)	Severe Storms, **Tornados**, Straight-line Winds and Flooding	Edwards, Kiowa and Stafford	$6,923,919
4010	07/29/2011 (5/19-6/4/2011)	Severe Storms, Straight-line Winds, **Tornados** and Flooding	Barton and Stafford	$8,259,620
1932	08/10/2010 (6/7-7/21/2010)	Severe Storms, Flooding and **Tornados**	Comanche, Kiowa and Pawnee	$9,279,257
1849	06/25/2009 (4/25-5/16/2009)	Severe Storms, Flooding, Straight-line Winds, and **Tornados**	Barber and Butler	$15,013,488
1808	10/31/2008	Severe Storms, Flooding, and **Tornados**	Butler	$4,167,044
1776	7/9/2008	Severe Storms, Flooding, and **Tornados**	Barber, Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford	$70,629,544
1699	5/6/2007 (5/4/2007)	Severe Storms, **Tornados**, and Flooding	Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford	$117,565,269
1535	8/3/2004 (6/12-7/25/2004)	Severe Storms, Flooding, and **Tornados**	Barton and Pawnee	$12,845,892

Sources: FEMA and Kansas Division of Emergency Management
* Incident dates are in parentheses.
** Disaster costs include Public Assistance and Individual Assistance and may include additional, unlisted counties

The following are brief descriptions of some of the above referenced tornado events:

FEMA-4150-DR: Severe Storms, Straight-line Winds, Tornados and Flooding – October 22, 2013 (July 22 to August 16, 2013): Severe storms affected the area with heavy rainfall causing flash flooding, high winds and tornados. The primary impact of this event was to roads and bridges, with a total public assistance cost estimate at $11,412,827.

FEMA-4063-DR: Severe Storms, Tornados, Straight-line Winds and Flooding – May 24, 2012 (April 14 to April 15, 2012): Multiple supercell thunderstorms affected central Kansas on April 14th. There was significant damage to homes and infrastructure.

FEMA-4010-DR: Severe Storms, Straight-line Winds, Tornados and Flooding – July 29, 2011 (May 19 to June 4, 2011): Supercell thunderstorms developed in advance of a cold front and dry line during the late afternoon of Saturday May 21st. Several of the supercell thunderstorms produced tornados..

FEMA-1932-DR: Severe Storms, Flooding and Tornados – August 10, 2010 (June 7 to July 21, 2010): There were thunderstorms that developed tornados during this timeframe, but no widespread tornado damage. The majority of the declaration damage was from flooding to public roads and bridges.

FEMA-1849-DR: Severe Storms, Flooding, Straight-line Winds and Tornados – June 25, 2009 (April 25 to May 16, 2009): On Aril 29th, severe thunderstorms produced very large hail and 5 tornados.

FEMA-1808-DR: Severe Storms, Tornados and Flooding - October 31, 2008 (September 11 to September 17, 2008): On October 22, 2008, Governor Kathleen Sebelius requested a major disaster declaration because of severe storms accompanied by tornados, lightning and torrential rains resulting in flooding and flash flooding during the period of September 11-18, 2008.

FEMA-1776-DR: Severe Storms, Flooding and Tornados - July 9, 2008 (May 22 to June 16, 2008): A series of intense supercell thunderstorms moved north across northwest Kansas during the afternoon and early evening hours of May 23rd. Long-track tornados, flash flooding, large hail and damaging winds were reported.

FEMA-1699-DR: Severe Storms, Tornados and Flooding - May 6, 2007 (May 4, 2007): A 1.7 mile-wide EF5 tornado with wind estimated at 205 mph struck Greensburg in Kiowa County, destroying approximately 90 percent of the town and severely damaging the remaining 10 percent. Tornado sirens sounded in the City twenty minutes before the tornado struck, and a tornado emergency was issued, undoubtedly saving many lives in the town of 1,580. Nevertheless, the storm killed 12 people, 10 in Greensburg, one in Pratt, and one in Stafford, and hospitalized 13 others.

The following provide further descriptions and other notable tornado events.

June 15, 2009: This tornado turned over four pivot irrigation sprinklers and destroyed two 80,000 bushel grain bins in Edwards County. In addition, a 500,000 bushel bin was heavily damaged. One of the 80k bins traveled nearly a mile. There was extensive rear flank downdraft damage in the vicinity of this tornado.

October 26, 2006: Twenty-eight tornados were reported in southwest Kansas, specifically the counties of Ford, Grant, Clark, Gray, Comanche, and Meade. Only two of the storms caused damage, which was relatively minor.

August 19, 2005: A tornado caused estimated $500,000 damage to Great Bend Airport where hangars were unroofed and an unspecified number of aircraft were overturned. A second touchdown in the Great Bend area caused $250,000 in damage to two farmsteads.

November 10, 1995: A tornado moved across Barton County, causing one million dollars in damage. One hundred and sixty homes were destroyed, and at least 1,000 sheep were killed. Debris was carried 85 miles and hundreds of dead ducks fell from the sky 25 miles northeast of the end of the tornado path.

The following table shows NCDC information for the 10 years from 2004 to 2014, with 2014 being an incomplete year. Additionally, the strongest rated tornado event is indicated.

NCDC Tornado Events, 2004-2014

County	Number of Days with Tornados	Strongest Tornado Event	Deaths	Total Property Damage	Crop Damage
Barber	7	F1	0	$10,000	$0
Barton	16	F1	0	$4,444,000	$0
Comanche	10	EF1	0	$0	$0
Edwards	8	EF3	0	$3,480,000	$50,000
Kiowa	10	EF5	0	$250,000,000	$0
Pawnee	7	EF4	0	$335,000	$0
Pratt	11	EF3	3	$65,000	$0
Stafford	9	EF3	3	$65,000	$0
Regional Total	78	EF5	6	$258,399,000	$50,000

Source: NCDC Storm Events Database

Local Events

The following detail locally reported events:

April 14, 2012: St. John, Stafford County: A tornado caused damages to both electric and wastewater utilities.

2007: Barton County, Claflin: An tornado damaged city property at the city pool, including trees. In addition, various local businesses were damaged.

Hazard Vulnerability and Impact

To refine and access the relative vulnerability of each of south Kansas' counties to tornados, ratings were assigned to pertinent factors at the county level. These factors are: social vulnerability index, prior events, prior annualized property damage, building exposure valuation, population density, crop exposure and annualized crop loss. Then a rating value of 1 -10 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for comparison and to determine the most vulnerable counties.

Tornados that touch-down can create a unique path of destruction. So using the prior events as a factor can give the perception that a county has a higher overall vulnerability to tornados.

The following information was used for this analysis:

- Social Vulnerability Index for Kansas from the Hazards and Vulnerability Research Institute at the University of South Carolina
- National Climatic Data Center storm events 2004 – 2014
- U.S. Census Bureau (2012)
- USDA's Census of Agriculture (20012)
- USDA Risk Management Agency (2010 – 2013)

Regional Counties Tornado Vulnerability Factors

County	SoVI Rating	Prior Events 2004-2014	Property Damages	Annualized Property Damage	Total Building Exposure ($000)	Population Density	Crop Exposure (2012 USDA Census of Agriculture)	Crop Loss Insurance Paid	Annualized Crop Loss Insurance Paid
Barber	4	7	$10,000	$1,000	$388,136	4	$45,420,000	$0	$0
Barton	3	16	$4,444,000	$444,400	$1,772,118	21	$96,206,000	$0	$0
Comanche	5	10	$0	$0	$135,138	2	$21,783,000	$0	$0
Edwards	4	8	$3,480,000	$348,000	$232,382	5	$126,933,000	$6,176	$1,544
Kiowa	4	10	$250,000,000	$2,500,000	$237,655	3	$63,956,000	$0	$0
Pawnee	5	7	$335,000	$33,500	$449,592	9	$92,111,000	$7,388	$1,847
Pratt	3	11	$65,000	$6,500	$689,239	13	$52,353,000	$0	$0
Stafford	4	9	$65,000	$6,500	$295,331	6	$74,549,000	$0	$0
Regional Total	-	78	$8,649,000	$864,900	$4,199,591	8	$573,311,000	$13,546	$3,391

Using the above information, a value of 1-10 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for comparison and to determine the greatest vulnerable counties. The Social Vulnerability Index is in a range of 1 - 5. To give Social Vulnerability Index the same weight as the other factors, the numbers were multiplied by two.

Ranges for Tornado Vulnerability Ratings

Ratings	Social Vulnerability	Prior Events	Annualized Property Damage	Building Exposure Valuation	Population Density *	Crop Exposure	Annualized Crop Loss Insurance Paid
1		3 - 7	$500 - $500,000	$117,421 - $4,492,825	1.6 - 116.3	0 - $18,548,500	$0 - $1,000
2	1	8 - 12	$500,001 - $1,000,000	$4,492,826 - $8,868,229	116.4 - 231.1	$18,548,501 - $32,126,000	$1,001 - $2,000
3		13 - 17	$1,000,001 - $1,300,000	$8,868,230 - $13,243,634	231.2 - 345.9	$32,126,001 - $45,703,500	$2,001 - $3,000
4	2	18 - 22	$1,300,001 - $2,000,000	$13,243,635 - $17,619,039	346 - 460.7	$45,703,501 - $59,281,000	$3,001 - $4,000
5		23 - 27	$2,000,001 - $3,000,000	$17,619,040 - $21,994,444	460.8 - 575.5	$59,281,001 - $72,858,500	$4,0001- $5,000
6	3	28 - 32	$3,000,001 - $4,000,000	$21,994,445 - $26,369,848	575.6 - 690.3	$72,858,501 - $86,436,000	$5,001 - $6,000
7		33 - 37	$4,000,001 - $7,000,000	$26,369,849 - $30,745,253	690.4 - 805.1	$86,436,001 - $100,013,500	$6,001 - $7,000
8	4	38 - 42	$8,000,001 - $11,000,000	$30,745,254 - $35,120,658	805.2 - 919.9	$100,031,501 - $113,591,000	$7,001 - $8,000
9		43 - 47	$11,000,001 - $13,000,000	$35,120,659 - $39,496,062	920- 1,034.7	$113,591,001 - $127,168,500	$8,001 - $9,000
10	5	48 - 54	Above $13,000,001	$39,496,063 - $43,871,468	1,034.8 - 1,149.6	$127,168,501 - $140,746,000	$9,001 and up

Based on the above ratings system, ranges were applied to each county to determine their potential vulnerability. The following related the scoring to a vulnerability assessment:

- **Medium:** Score range of 9 - 19
- **Medium-High:** Score range of 20 - 29
- **High:** Score range of 30 - 40

Vulnerability of Regional Counties to Tornados

County	SoVi Rating	Prior Event Rating	Annualized Property Damage Rating	Bldg Exposure Valuation Rating	Population Density Rating	Crop Exposure Rating	Annualized Crop Insurance Rating	Overall Vulnerability Rating	Tornado Vulnerability
Barber	8	1	1	1	1	4	0	16	Medium
Barton	6	3	1	1	1	7	0	19	Medium
Comanche	10	2	1	1	1	2	0	17	Medium
Edwards	8	2	1	1	1	9	2	24	Medium-High
Kiowa	8	2	10	1	1	5	0	27	Medium-High
Pawnee	10	1	1	1	1	7	2	23	Medium-High
Pratt	6	2	1	1	1	4	0	15	Medium
Stafford	8	2	1	1	1	6	0	19	Medium

Between 2001 and 2010 51 percent of those killed by tornados were living in mobile homes, according to the NOAA. The *2012 Kansas Severe Weather Awareness Week* reports people living in mobile homes are killed by tornados at a rate 20 times higher than people living in permanent homes. The following table represents the number of mobile homes per county, and the percentage of total housing stock.

Percentage of Mobile Homes per Regional County

County	Number of Housing Units	Number of Mobile Homes	Percentage Mobile Homes
Barber	2,754	254	9.22%
Barton	12,636	1,105	8.74%
Comanche	1,039	45	4.33%
Edwards	1,627	79	4.86%
Kiowa	1,230	57	4.63%
Pawnee	3,151	157	4.98%
Pratt	4,499	300	6.67%
Stafford	2,310	172	7.45%
Regional Total	29,246	2,178	7.45%

Sources: United States Census Bureau (2012) and U.S. Census Bureau American Community Survey(2008-2012)

	Magnitude/Severity
Tornado	3.25

Future Development

Future development, increases in population and additional development of agricultural resources and would tend to increase the risk of this hazard. New development anywhere in south Kansas will be susceptible to tornado impacts. New manufactured housing development will be most susceptible to damage, particularly if not anchored properly. The extent of new manufactured housing development is not known. However, in general, the region is experiencing a population decline, from 61,087 persons in 2013 to a projected 45,250 persons in 2040, which could potentially lessen the potential impact on property and people from a future event.

Probability of Future Hazard Events

According to the NCDC, there were 78 tornados in south Kansas between 2004 and 2014. Based on this information, the probability that at least one tornado will occur in south Kansas in any given year is high.

The following calculations of probability are used for illustrative purposes only. The calculations were sourced from the FEMA Benefit-Cost Analysis Reengineering Tornado Safe Room Module Methodology Report, Version 4.5 Final, Dated May 2009. Revisions to the calculation methodology include using the entire area of the county as opposed to the 80 km by 80 km cell sized. Additionally, tornados reported on the Fujita Scale were converted to the Enhanced Fujita Scale using available data. Finally, probabilities were not calculated for EF class tornados with zero occurrence.

The following equation was used to determine probabilities equation:

Prob. Tornado(EF) = (EF count * EF area) / (Cell area * Years)

Where:

- EF count = Estimate tornado count for EF class from mapping
- EF area = Area of tornado for EF class in km2
- Cell area = Area of analysis cell, county size in KM2
- Years = Years of record from 2003 to 2013 or 11 years

The outcome represents the probability of a tornado occurring within the designated area at a point in time. The lower the number, the lower the probability of occurrence.

Mean Tornado Length and Width

EF Class	Length (km2)	Width (km2)	EF Area
EF0	1.4	0.0284	0.03976
EF1	4.7	0.064	0.3008
EF2	10.7	0.1259	1.34713
EF3	22.5	0.2636	5.931
EF4	43.6	0.4607	20.08652
EF5	54.6	0.5555	30.3303

The following table details the illustrative calculated probability for the occurrence of a tornado in each regional county.

Illustrative Calculated Probability of Tornado

County	Approximate Area (KM2)	Tornado Rating (EF Scale)	Tornado Area (KM2)	Number of Occurrences	Number of Years	Probability
Barber	2,937	0	0.03976	6	10	0.0000081224
		1	0.30080	2	10	0.0000204831
		2	1.34713	1	10	0.0000458666
Barton	2,31,5	0	0.03976	21	10	0.0000360602
		1	0.30080	8	10	0.0001039275
Comanche	2,046	0	0.03976	9	10	0.0000174889
		1	0.30080	5	10	0.0000735057
		2	1.34713	1	10	0.0000658389
		3	5.931	1	10	0.0002898685
Edwards	1,611	0	0.03976	7	10	0.0000172764
		1	0.30080	7	10	0.0001307031
		2	1.34713	4	10	0.0003344871
		3	5.931	3	10	0.0011044830
Kiowa	1,896	0	0.03976	16	10	0.0000335549
		1	0.30080	6	10	0.0000951959
		2	1.34713	2	10	0.0001421113
		3	5.931	1	10	0.0003128363
		5	30.3303	1	10	0.0015998006
Pawnee	1,955	0	0.03976	5	10	0.0000101665
		1	0.30080	6	10	0.0000922959
		4	20.08652	1	10	0.0010272070
Pratt	1,906	0	0.03976	11	10	0.0000229436
		1	0.30080	5	10	0.0000788988
		2	1.34713	3	10	0.0002120085
		3	5.931	2	10	0.0006222721
Stafford	2,059	0	0.03976	8	10	0.0000154479
		1	0.30080	9	10	0.0001314781
		2	1.34713	4	10	0.0002616993
		3	5.931	4	10	0.0011521818

	Probability
Tornado	3.50

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Tornado Consequence Analysis

Subject	Ranking	Impacts of Tornado
Health and Safety of Persons in the Area of the Incident	Severe	Impact of the immediate area could be severe depending on whether individuals were able to seek shelter and get out of the trajectory of the tornado. Casualties are dependent on warning systems and warning times.
Responders	Minimal	Impact to responders is expected to be minimal unless responders live within the affected area.
Continuity of Operations	Minimal to Severe	Temporary to permanent relocation may be necessary if government facilities experience damage.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact could be severe in the trajectory path. Roads, buildings, and communications could be adversely affected. Damage could be severe.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained. Depending on the incident size the damage could be severe.
Environment	Minimal to Severe	Impact will be severe for the immediate impacted area. Impact will lessen as distance increases from the immediate incident area.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the trajectory of the tornado. If a jurisdiction takes a direct hit then the economic conditions will be severe. With an indirect hit the impact could be low to severe.
Public Confidence in Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Warning systems and warning time will also be questioned.

3.7.19 UTILITY/INFRASTRUCTURE FAILURE

	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Utility/Infrastructure Failure	2.78	2.00	4.00	3.00	2.75

Description

Critical infrastructure involves several different types of facilities and systems including:

- Electric power
- Transportation routes
- Natural gas and oil pipelines
- Water and sewer systems, storage networks
- Internet/telecommunications systems

Failure of utilities or infrastructure components in south Kansas can seriously impact public health, functioning of communities and the region's economy. Disruptions to utilities can occur from many of the hazards detailed in this plan, but the most likely causes include:

- Floods
- Lightning
- Tornados and Windstorms
- Winter Storms

In addition to being impacted by another listed hazard, utilities and infrastructure can fail as a result of faulty equipment, lack of maintenance, degradation over time, or accidental damage.

	Warning Time
Utility / Infrastructure Failure	4.00

	Duration
Utility / Infrastructure Failure	3.00

Hazard Location

All of south Kansas is at risk for utility and/or infrastructure failure. The following sections discuss the major utilities in further detail.

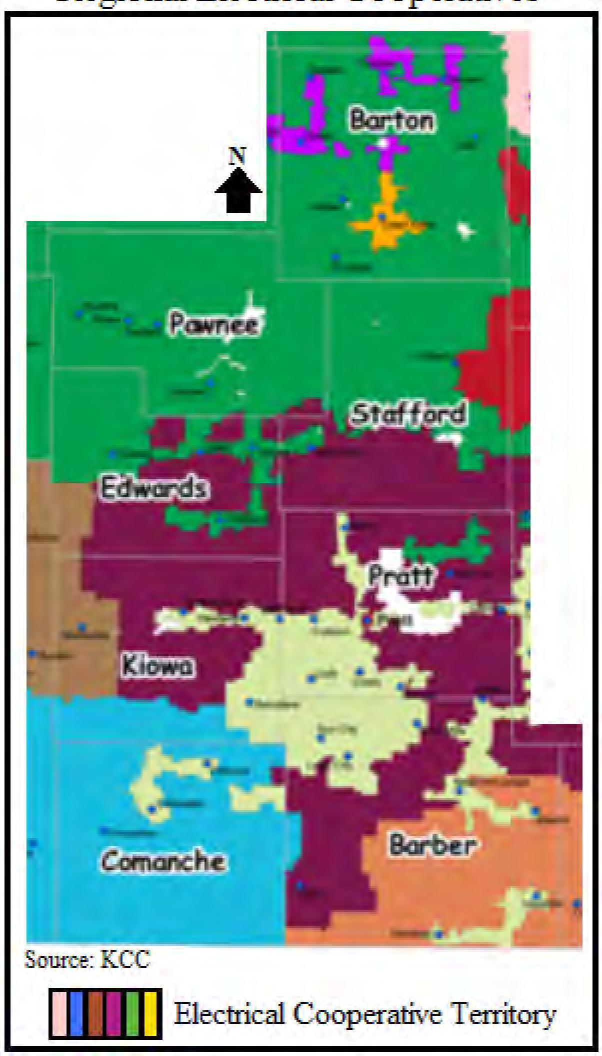
Electric Power

The most common hazards analyzed in this plan that may disrupt the power supply are flood, lightning, tornado, windstorm, and winter weather. In addition, extreme heat can disrupt power supply when air conditioning use spikes during heat waves resulting in brownouts or rolling blackouts.

Electricity in south Kansas is provided by either investor-owned utilities or rural electric cooperatives (RECs). Electric utilities in Kansas are regulated by both the KCC and the Federal Energy Regulatory Commission.

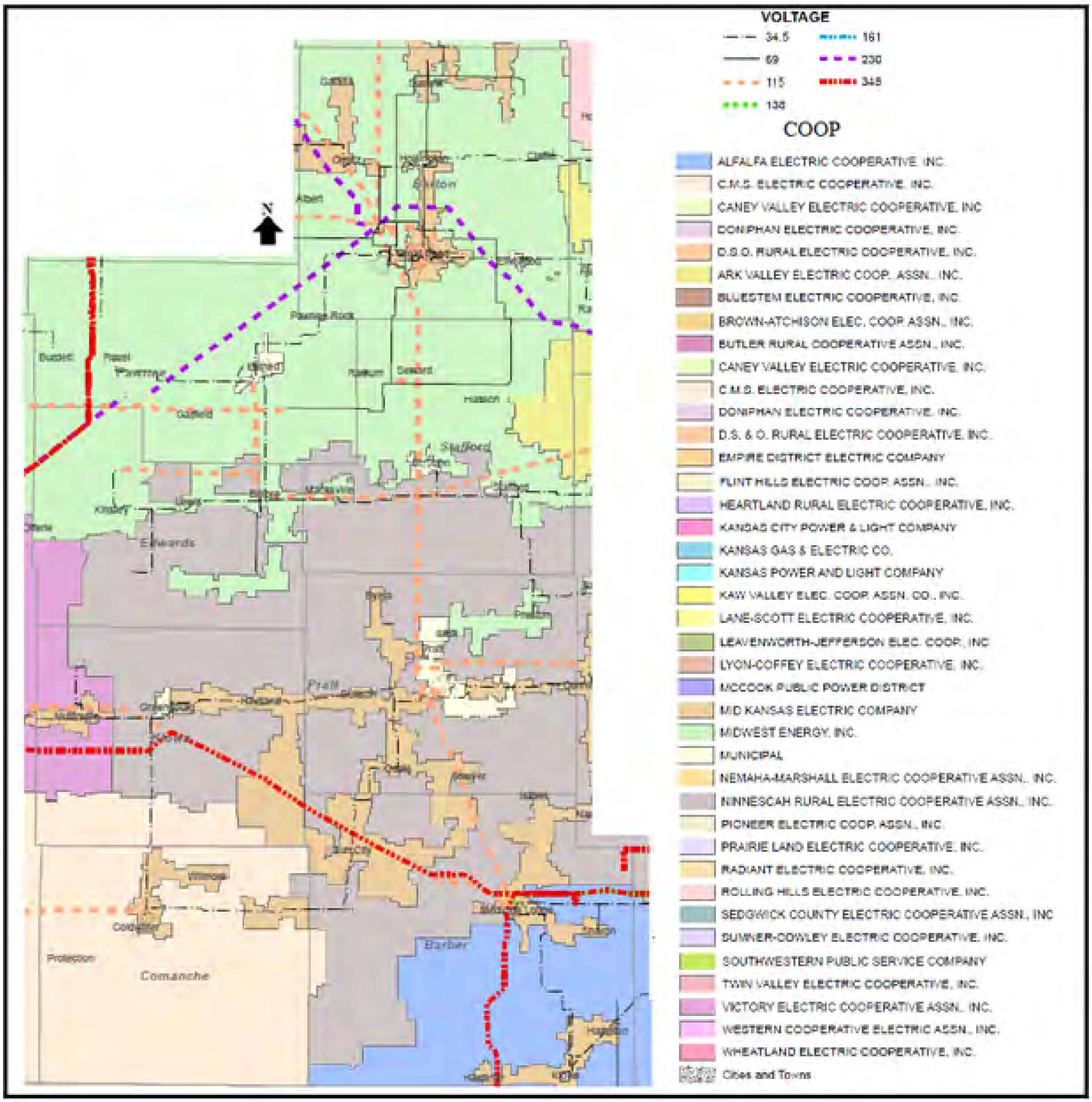
RECs are not-for-profit, member-owned electric utilities. Distribution cooperatives deliver electricity to consumers. Generation and transmission cooperatives generate and transmit electricity to distribution co-ops. Kansas RECs are governed by a board of trustees elected from the membership. Most Kansas RECs were set up under the Kansas Electric Cooperative Act, which, together with the federal Rural Electrification Act of 1934, made electric power available to rural customers. The majority of the region is covered by Midwest Energy (green), Ninnescah Electrical Cooperative (purple), CMS Electric Cooperative (light blue) and Alfalfa Electric Cooperative (pink-orange). Additional information may be found at www.kec.org/servicearea_map.html. The following map shows the coverage are of regional RECs:

Regional Electrical Cooperatives

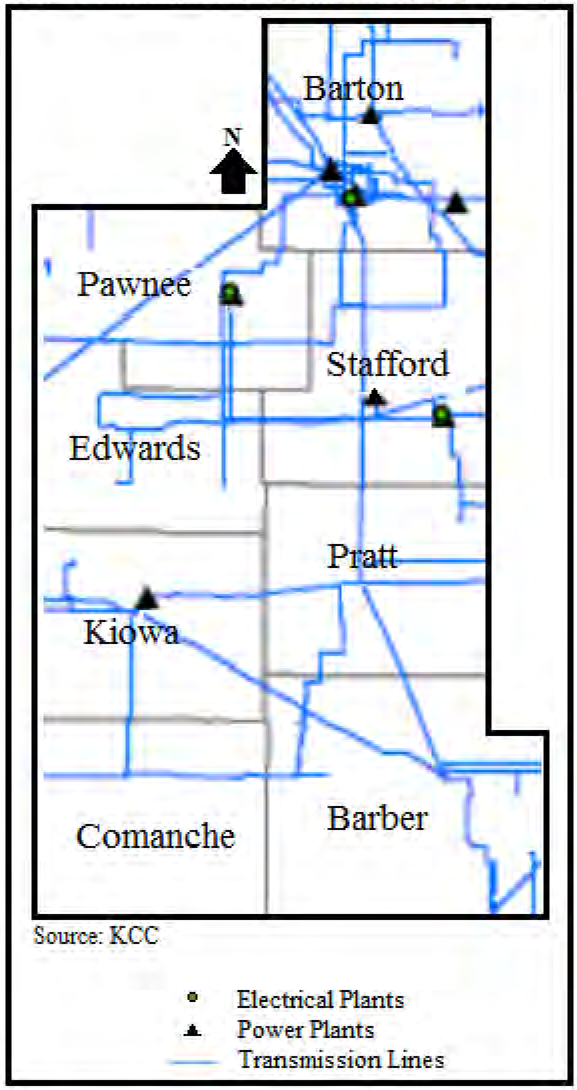


The following maps indicate the locations of electric certified areas, transmission lines and power plants in south Kansas.

Electric Certified Areas and Transmission Lines



Electrical Transmission Lines and Power Plants

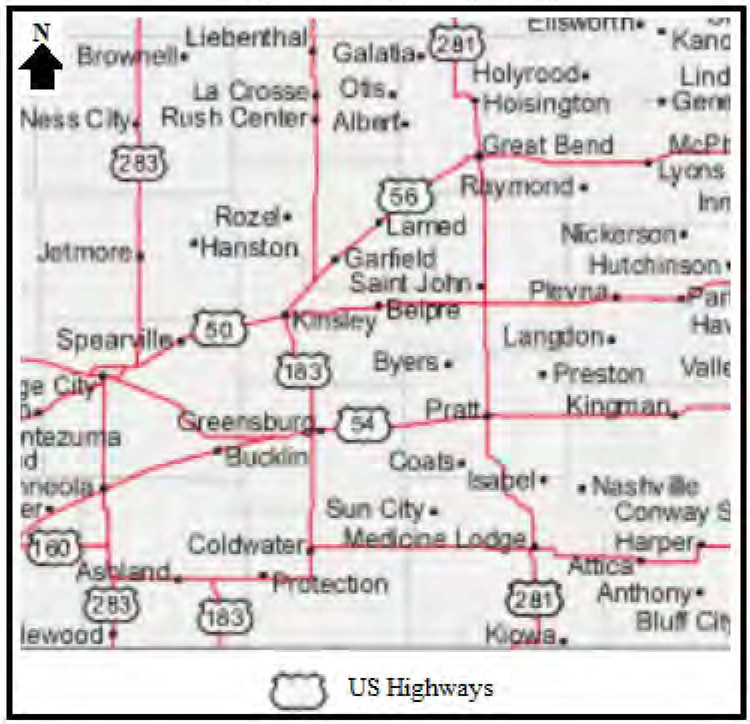


Transportation Routes

Transportation routes can also be impacted by many of the hazards discussed in this plan. The primary hazards that impact transportation are flood, hazardous materials, and winter weather. Flood events can make roads and bridges impassible due to high water. Flood waters can also erode or scour road beds and bridge abutments. Highway and railroad accidents that involve hazardous materials can impact transportation routes through closures and/or evacuations. Winter weather frequently impacts transportation as roads become treacherous or impassible due to ice and snow. Other hazards that impact transportation routes include dam and levee failures if routes are in inundation areas, extreme temperatures that can cause damage to pavement, land subsidence that can damage roads/railroads, landslides that can cause debris and rock falls onto roadways, terrorism that can target routes, tornados that can directly damage infrastructure or deposit debris in routes, wildfires that can cause decreased visibility on transportation routes due to smoke, and windstorms that can cause vehicle accidents or overturning.

The following figure shows the highways in south Kansas.

Regional Highway Map



Natural Gas and Oil Pipelines

Hazards that can impact natural gas and oil pipelines include earthquakes, expansive soils, land subsidence, landslide, and terrorism. Natural gas and oil pipelines have been previously discussed.

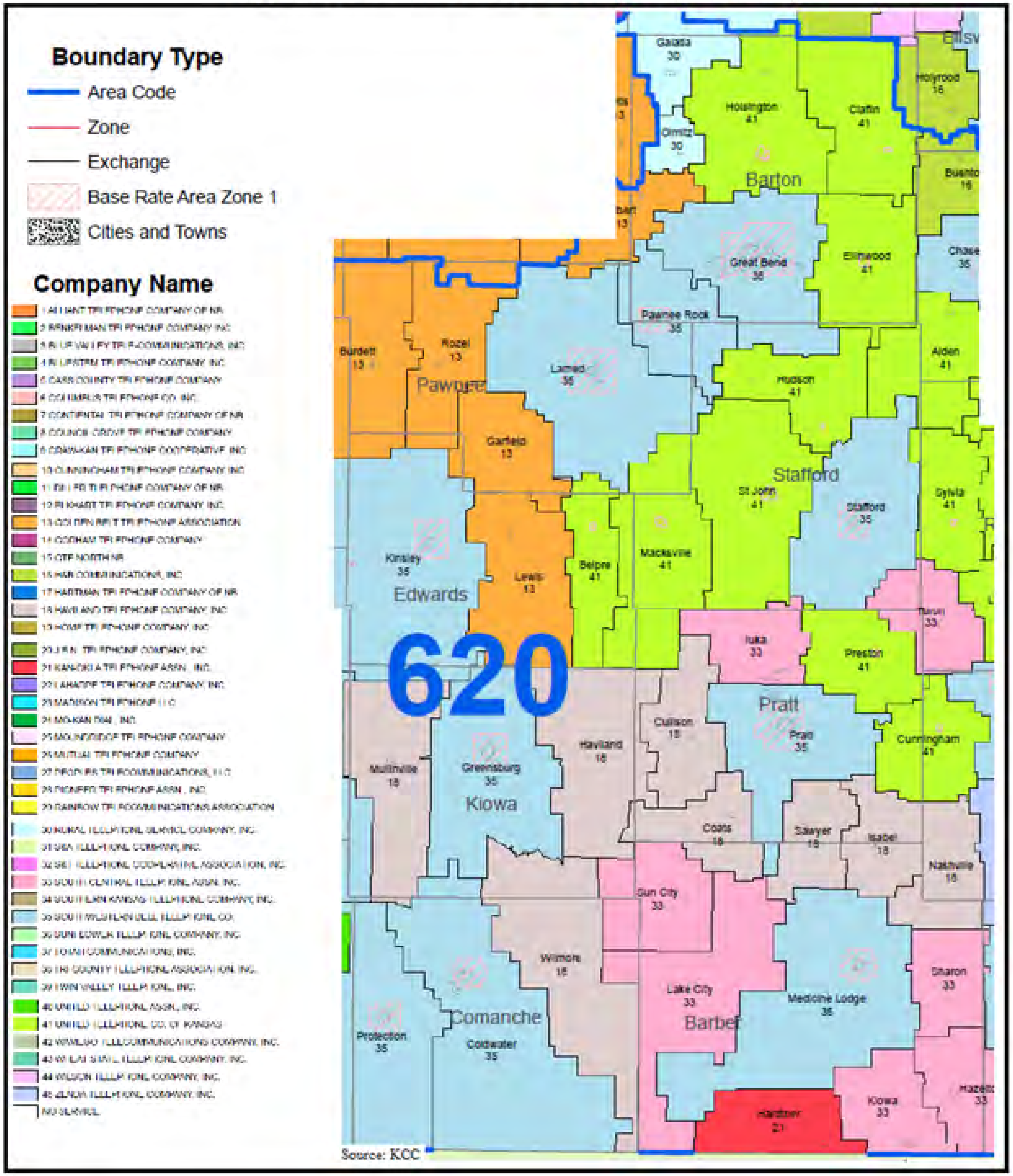
Water and Sewer Systems

The primary hazards that can impact water supply systems include drought, floods, hazardous materials, and terrorism. Water district boundary maps were provided in section 2.16.

Internet and Telecommunications

Internet and telecommunications infrastructure can be impacted by floods, lightning, tornados, windstorms, and winter weather. Land line phone lines often utilize the same poles as electric lines, so when weather events such as windstorm or winter weather cause lines to break both electricity and telephone services may experience outages. With the increasing utilization of cellular phones, hazard events such as tornado that can damage cellular repeaters can cause outages. In addition, during any hazard event, internet and telecommunications systems can become overwhelmed due to the surge in call and usage volume. The following map indicates telephone service providers in south Kansas, with further details available at www.kcc.state.ks.us/maps/ks_telephone_certified_areas.pdf.

Regional Certified Areas of Telephone Exchanges



Previous Occurrences and Extent

Each year disruptions to utility services ranging from minor to serious are a secondary result of other hazard events including drought, flood, tornado, windstorm, winter storm, lightning, and extreme heat. The following provide discussions of previous events that resulted in a utility or infrastructure failure.

FEMA-4010-DR: Severe Storms, Straight-line Winds, Tornados, and Flooding: July 29, 2011: From May 10 to June 4, 2011 severe storms, straight-line winds, tornados, and flooding caused damages in 25 Kansas Counties. The primary impacts of this event were to public roads and bridges with an estimated $9,800,000 in damages.

FEMA-1932-DR: Severe Storms, Flooding, and Tornados: August 10, 2010: From June 7 to July 21, 2010, severe storms, flooding, and tornados caused damages in 41 Kansas Counties. The primary impacts of this event were to public roads and bridges with an estimated $11,200,000 in damages.

FEMA-1741-DR: February, 2008 (December 6 -19, 2007) : An ice storm caused numerous power outages and approximately 130,000 Kansas customers were without power. FEMA's Public Assistance costs were $355,651,857 for this disaster.

FEMA-1626-DR: January 26, 2006 (November 27 -28, 2005) : Much of the state was affected by this storm. Winds of 40 to 60 mph combined with two to seven inches of snow resulted in a blizzard, which raged across parts of north central Kansas. The wind whipped the snow into drifts 10 to 15 feet high in some places. Interstate 70 was closed west of Russell, and numerous other highways were impassable during the storm. There were several reports of auto accidents, including a 25-car pileup, and sporadic power outages. At least three auto-related deaths were attributed to the storm. FEMA's Public Assistance costs were $50,281,517 for this disaster.

Hazard Vulnerability and Impact

While every community in the region is at risk to utility/infrastructure failure, the vulnerability is somewhat mitigated in south Kansas due to the lower population density, development, and economic activities in large portions of the region that would be disrupted by a major infrastructure failure event. However, regional counties with major cities, such as Topeka, and high population densities, including Shawnee County, would be at greater risk for disruptions.

Regionally smaller utility suppliers generally have limited resources for mitigation. Thus, the large number of small electric providers could mean greater vulnerability in the event of a major, widespread disaster, such as a major flood, severe winter storm or ice storm. In recent years, regional electric power grid system failures in the western and east-centralern United States have demonstrated that similar failures could happen in south Kansas. This vulnerability is most appropriately addressed on a multi-state regional or national basis.

Since utility/infrastructure failure is generally a secondary or cascading impact of other hazards, it is not possible to quantify estimated potential losses specific to this hazard due to the variables associated with affected population, duration of outages, etc..

Although the limitless variables make it difficult to estimate future losses on a statewide basis, FEMA has developed standard loss of use estimates in conjunction with their Benefit-Cost Analysis methodologies to estimate the cost of lost utilities on a per-person, per-use basis.

FEMA Benefit-Cost Analysis

Loss of Electric Power	Cost of Complete Loss of Service
Total Economic Impact	$126 per person per day
Loss of Potable Water Service	Cost of Complete Loss of Service
Total Economic Impact	$93 per person per day
Loss of Wastewater Service	Cost of Complete Loss of Service
Total Economic Impact	$41 per person per day
Loss of Road/Bridge Service	Cost of Complete Loss of Service
Vehicle Delay Detour Time	$38.15 per vehicle per hour
Vehicle Delay Mileage	$0.55 per mile (or current federal mileage rate)

Source: FEMA BCA Reference Guide, June 2009, Appendix C

	Magnitude/Severity
Utility / Infrastructure Failure	2.00

Future Development

Future development and increases in population would increase the risk of this hazard. In addition, lack of maintenance and system upgrades could also increase the risk of this hazard occurring on a more frequent basis. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Based on historical records, utility failures occur annually across the region. As such, the likelihood of a utility failure event occurring is likely within the next year.

	Probability
Utility / Infrastructure Failure	2.78

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Utility/Infrastructure Failure Consequence Analysis

Subject	Ranking	Impacts of Utility / Infrastructure Failure
Health and Safety of Persons in the Area of the Incident	Moderate to Severe	Localized impact will be moderate to severe for persons with functional and access needs, and the elderly, depending on length of failure and time of year.
Responders	Minimal	Impact to responders will be minimal if properly trained and equipped.
Continuity of Operations	Minimal	COOP plans are not expected to be activated If the recovery time is excessive then temporary relocation may become necessary.
Property, Facilities, and Infrastructure	Minimal	Impact is dependent on the nature of the incident, and electric, water, sewage, gas and communication disruptions.
Delivery of Services	Minimal	Delivery of services could be affected within and around the affected area.
Environment	Minimal	Impact should be minimal.
Economic Conditions	Minimal	Economic conditions could be adversely affected depending on extent of damage.
Public Confidence in Governance	Minimal	Impact will be dependent on whether response, recovery, and planning were timely and effective.

3.7.20 WILDFIRE

Hazard	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Wildfire	3.44	2.56	4.00	2.00	3.12

Description

Wildfires in south Kansas typically originate in pasture or prairie areas following the ignition of dry grasses (by natural or human sources). On occasion, ranchers and farmers intentionally ignite vegetation to restore soil nutrients or alter the existing vegetation growth. These fires have the potential to erupt into wildfires. Wildfires are also associated with lightning and drought conditions, as dry conditions make vegetation more flammable. Wildfires may also originate, or spread to forested areas, or other areas with concentrations of woody fuel that can cause wildfires to increase in intensity and spread. Since protecting people and structures takes priority, a wildfire's cost to natural resources, crops, and pastured livestock can be ecologically and economically devastating. In addition to the health and safety impacts to those directly affected by fires, the region is also concerned about the health effects of smoke emissions to surrounding areas.

The region experiences most of its wildfires in March and April when people are conducting controlled burns in grassland and fields. As the plant mass greens up later in the summer and the humidity is higher, the risk of wildfires is generally lower. This trend, however, does not continue in years of extreme drought when hot and dry weather prevail.

The wildland/urban interface is the area where human improvements such as homes, ranches and farms come in contact with the wildlands. Urban expansion has driven the increased building of homes in wildland areas. Wherever people are living in or adjacent to wildland areas, the threat of wildfire exists. As the rural population increases, so does the risk to life and property from wildfire.

	Warning Time
Wildfire	4.00

	Duration
Wildfire	2.00

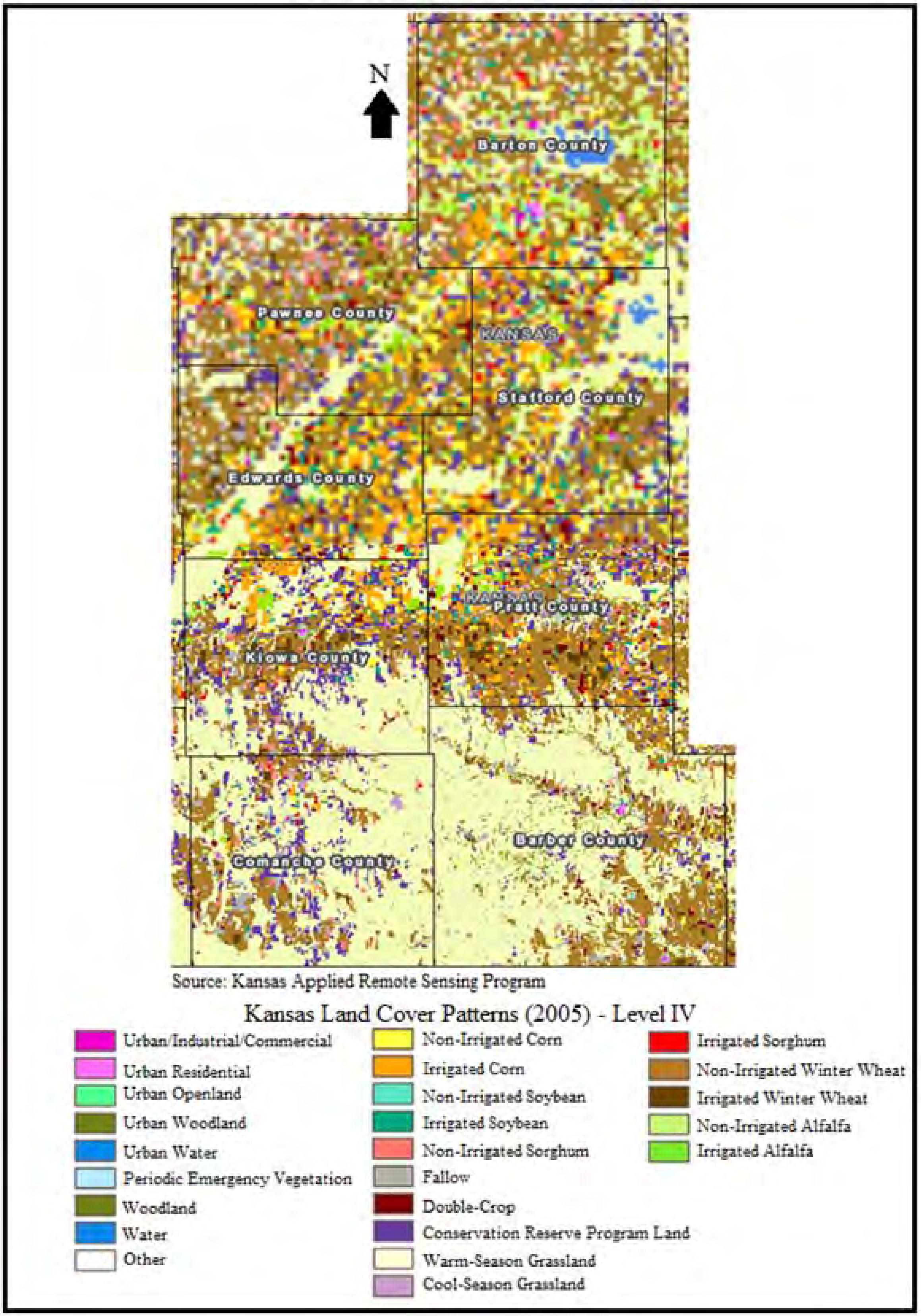
Hazard Location

Wildfires in south Kansas typically originate in pasture or prairie areas following the ignition of dry grasses (by natural or human sources). The Eastern Red Cedar is of concern in areas of south Kansas. This invasive evergreen species can take over fence rows and un-planted fields, adding to wildfire fuel and risk. Additionally, this type of fuel, as well as other tree plantings near structures can cause structures to be consumed by wildfires, putting inhabitants at risk.

Due to the primarily rural and agricultural characteristics of the region, as well as the existence of wild land and grassland areas, the entire region is susceptible to wildfires. However, due to lower population densities in large areas of the region the number of people potentially affected by a wildfire is often minimal. Additionally, due to the built up nature of the larger cities in the region, the risk of wildfires in these areas is also lower.

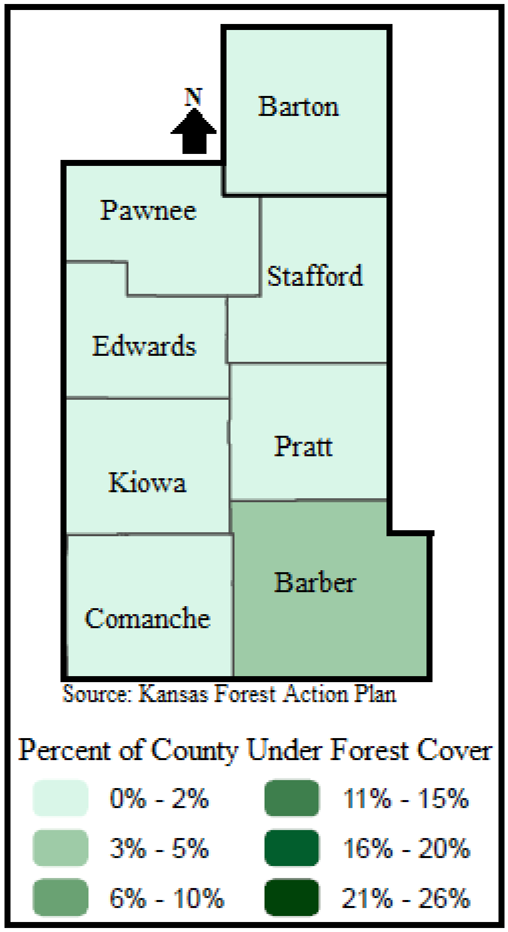
According to the 2011 *Kansas Forest Action Plan*, with the exception of Eastern Redcedar/hardwood, most forest types in Kansas do not pose significant fire management issues. However, grasslands which make up a majority of the open areas in south Kansas due pose fire management issues. These areas, and the wild land-urban interface where development has occurred, are the focus of wild land fire management issues in Kansas. The following figure shows the land cover in south Kansas.

South Kansas Land Cover Map

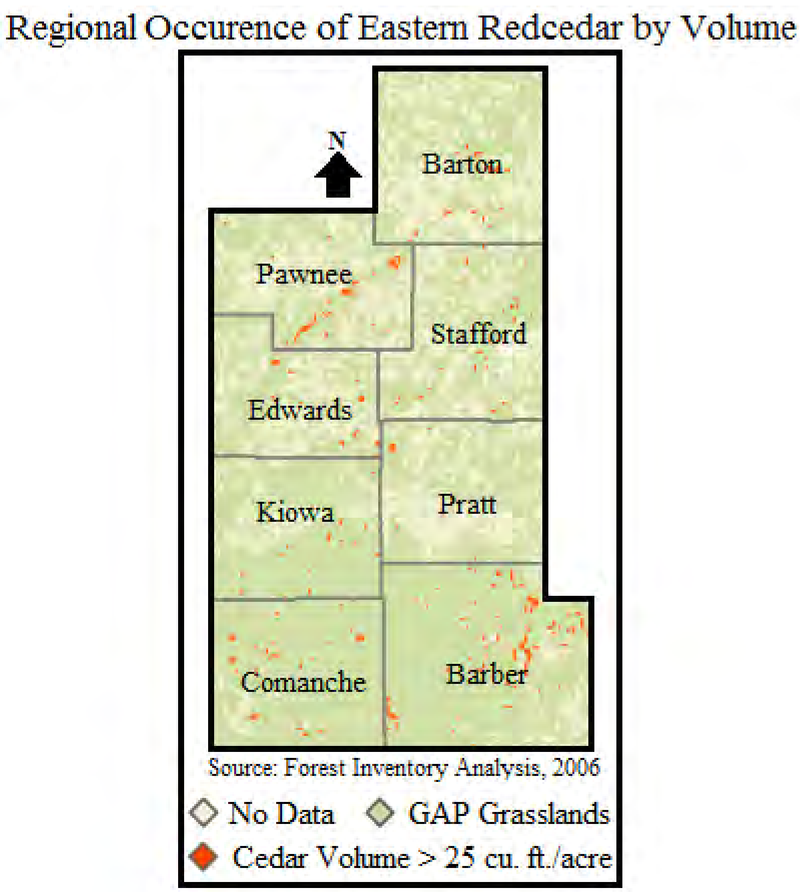


Forests have increased in volume by a billion cubic feet and in density by 106 percent since 1965 with an estimated 74 million dry tons of total biomass. Growing stock volume has been increasing steadily for the past 40 years. The average age of Kansas forests is getting younger with the majority of volume and trees occurring between 30 and 59 years of age. The following figure shows the percent forest cover in south Kansas counties.

Regional Percent Forest Cover



Although Eastern Redcedar makes up less than 4 percent of forest types, it has increased in volume by 23,000 percent since 1965 and is the primary specie of concern in grasslands. The following figure shows the occurrence of Eastern Redcedar by volume.



Previous Occurrences and Extent

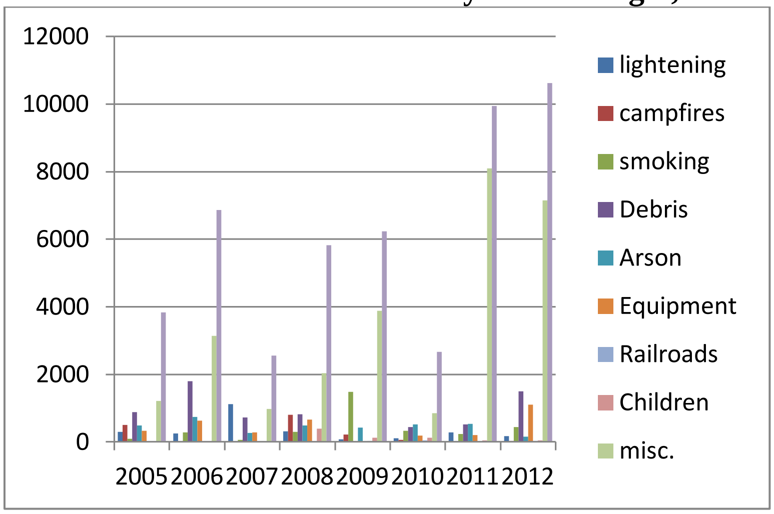
The following provide brief details on notable regional wildfire events.

> **2012**: More than 41,000 acres and 26 structures burned across the state from April through September due to extreme drought conditions. This places 2012 as one of the worst years for wildfires in Kansas on record.

Hazard Vulnerability and Impact

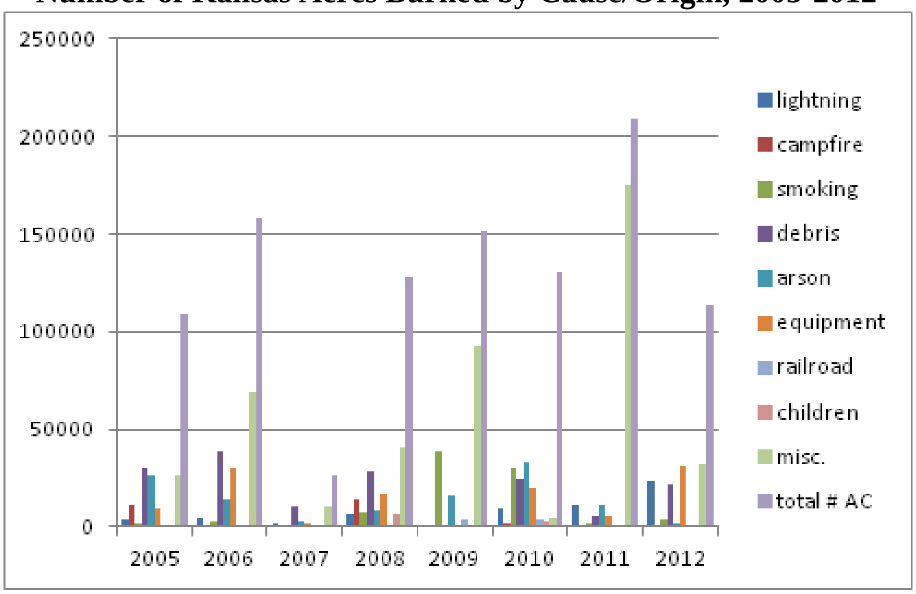
The Kansas Forest Service provided the following charts based on statistics from the National Fire Incident Reporting System regarding occurrence of wildfires in Kansas from 2005-2012. The first figure provides the total number of wild land fires in Kansas by cause/origin and the second figure provides the number of acres burned in Kansas each year by cause/origin.

Number of Kansas Wild Land Fires by Cause/Origin, 2005-2012



Source: Kansas Forest Service

Number of Kansas Acres Burned by Cause/Origin, 2005-2012



Source: Kansas Forest Service

USDA's Risk Management Agency on Crop insurance payments for loss of crops due to wildfire indicates that no payments were made as a result of wildfires to the south Kansas region.

Although some data is available from the National Fire Incident Reporting System (NFIRS) in terms of previous events, this data has limitations in providing useful statistical data for an overview regional vulnerability analysis. The most problematic issues are that not all fire departments report to NFIRS and of those that report, not all incidents are reported. This current lack of local level requirements and a past lack of enforcement of state statutes has led to a lack of fire occurrence data for both prescribed burns and wildfires being available in south Kansas. Changes in enforcement of wildfire reporting requirements at the state level, as well as prescribed fire reporting requirements that are part of the EPA-mandated Kansas Flint Hills Smoke Management Plan (approved in 2011) will give the Kansas Forest Service a much greater opportunity to begin using real-time fire occurrence data to assist in making the best fire management decisions.

In light of the data limitations associated with available statistics, and with the publication of the 2011 *Kansas Forest Action Plan*, it has been determined that the best available data for the regional vulnerability analysis is the weighted sum analysis that was completed and utilized to develop a wildfire risk composite layer as part of the Forest Action Plan. The weighted sum analysis combined six data layers produced from a combination of eight separate datasets. In close consultation with the Kansas Forest Service's Fire Management Coordinator and other Fire Management staff six data inputs were developed to represent Wildfire Risk in Kansas. These data inputs and their corresponding analysis weight are listed below:

Kansas Forest Action Plan Wildfire Data Sets and Weighted Sums

Data Set	Analysis Weight
Wildland Urban Interface	0.85
ISO Fire Station Coverage Gaps	0.75
Conservation Reserve Program Lands	0.60
Eastern Redcedar in Grasslands	0.75
Moderate Fire Potential risk	0.53
High Fire Potential risk	0.80

Source: *Kansas Forest Action Plan*,

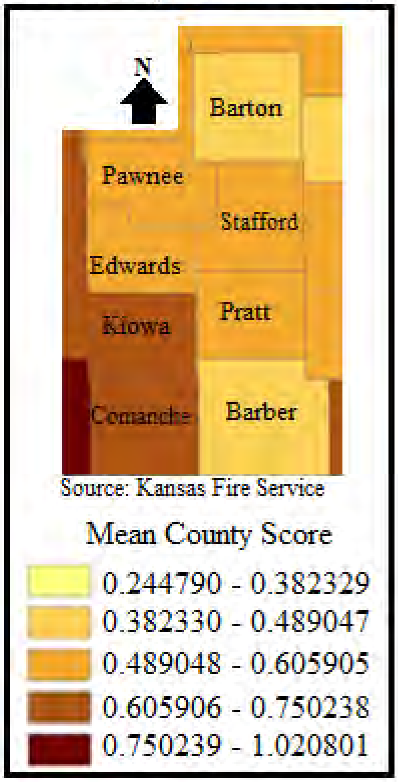
The resulting score contains values ranging from 0 to 3.48, with the higher the numbers indicating higher wildfire risk. The following table provides the mean score for each county within the south Kansas region.

Wildfire Risk Score

County	Mean Wildfire Risk Score
Barber	0.48301097751
Barton	0.48904693127
Comanche	0.71569627523
Edwards	0.54626333714
Kiowa	0.72480762005
Pawnee	0.57326853275
Pratt	0.50816005468
Stafford	0.56549882889
Regional Average	0.57571906969

The following figure provides a map indicating the mean score for each county.

Wildfire Risk by Mean County Score

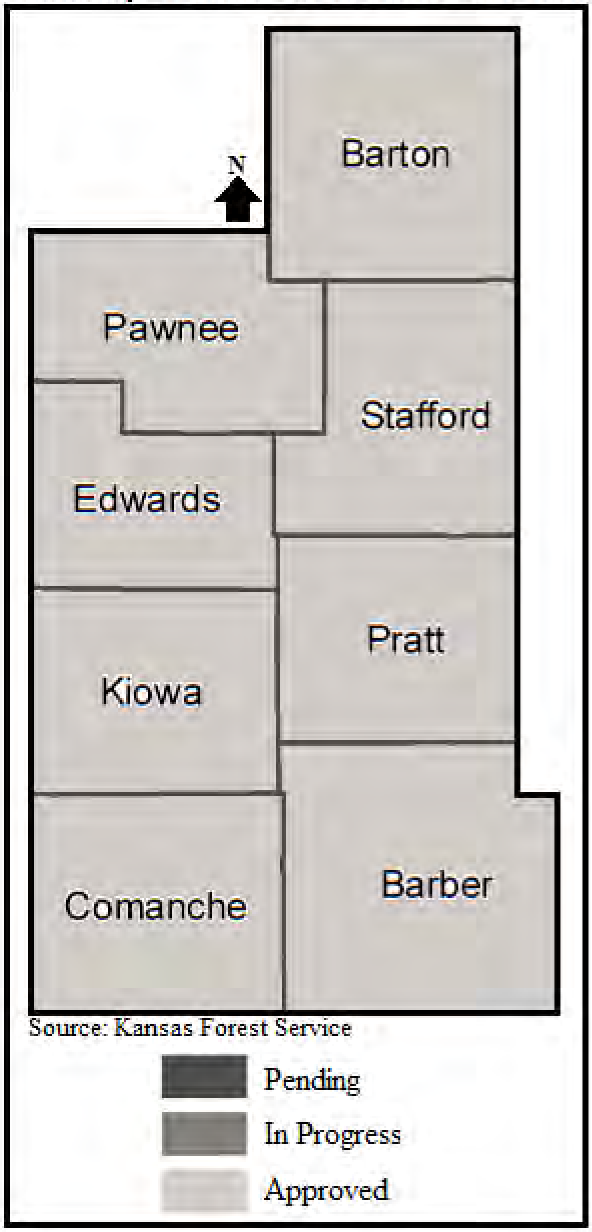


Community Wildfire Protection Plans

One way for communities at risk to wildfire to reduce their overall vulnerability is development of Community Wildfire Protection Plans (CWPP) to identify specific areas at risk and actions that can be taken to reduce risk. The Healthy Forests Restoration Act (HFRA) provided communities with an opportunity to influence where and how federal agencies implement fuel reduction projects on federal lands. A CWPP is the most effective way to take advantage of this opportunity. Additionally, communities with Community Wildfire Protection Plans in place are given priority for funding of HFRA hazardous fuels reduction projects.

The following figure shows the status of CWPPs in south Kansas counties.

Community Wildfire Protection Plan Status



	Magnitude/Severity
Wildfire	2.56

Future Development

Future development and increases in population would tend to increase the risk of this hazard. As cities continue to expand they often build in areas that are prone to wildfires and may not have adequate fire coverage. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Wildfires occur on an annual basis in the region. Although wildfires occur every year, the outlook through June for south Kansas from the National Interagency Fire Center Predictive Services for a wildfire event in Kansas that will require mobilization of additional resources from outside the area in which the fire situation originated is considered to be in the normal range.

	Probability
Wildfire	3.44

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Wildfire Consequence Analysis

Subject	Ranking	Impacts of Wildfire
Health and Safety of Persons in the Area of the Incident	Severe	Impact of the immediate area could be severe for affected areas.
Responders	Minimal to Severe	Impact to responders could be severe depending on the size and scope of the fire, especially for fire fighters. Impact will be low to moderate for support responders with the main threat as smoke inhalation.
Continuity of Operations	Minimal to Severe	Temporary relocation may be necessary if government facilities experience damage.
Property, Facilities, and Infrastructure	Severe	Localized impact could be severe to facilities and infrastructure in the incident area as all are vulnerable to destruction by wildfire.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	Impact will be severe for the immediate area with regards to trees, bushes, animals, and crops. Impact will lessen as distance increases.
Economic Conditions	Minimal to Moderate	Impacts to the economy could be moderate in the immediate area.
Public Confidence in Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Evacuation orders and shelter availability could be called in to question.

3.7.21 WINDSTORM

Hazard	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Windstorm	3.94	2.75	3.00	2.13	3.26

Description

Relatively frequent strong winds are a weather characteristic of south Kansas. High winds, often accompanying severe thunderstorms, can cause significant property and crop damage, threaten public safety, and have adverse economic impacts from business closures and power loss.

Straight-line winds are generally any thunderstorm wind that is not associated with rotation. It is these winds, which can exceed 100 mph that represent the most common type of severe weather and are responsible for most wind damage related to thunderstorms. Since thunderstorms do not have narrow tracks like tornados, the associated wind damage can be extensive and affect entire counties or regions. Objects like trees, barns, outbuildings, high-profile vehicles, and power lines/poles can be toppled or destroyed, and roofs, windows, and homes can be damaged as wind speeds increase. In 2005, hail and wind damage made up 45% of homeowners' insurance losses. One type of straight-line wind is the downburst, which can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation.

Thunderstorms over south Kansas typically happen between late April and early September, but, given the right conditions, they can develop as early as March. They are usually produced by super-cell thunderstorms or a line of thunderstorms that typically develop on hot and humid days.

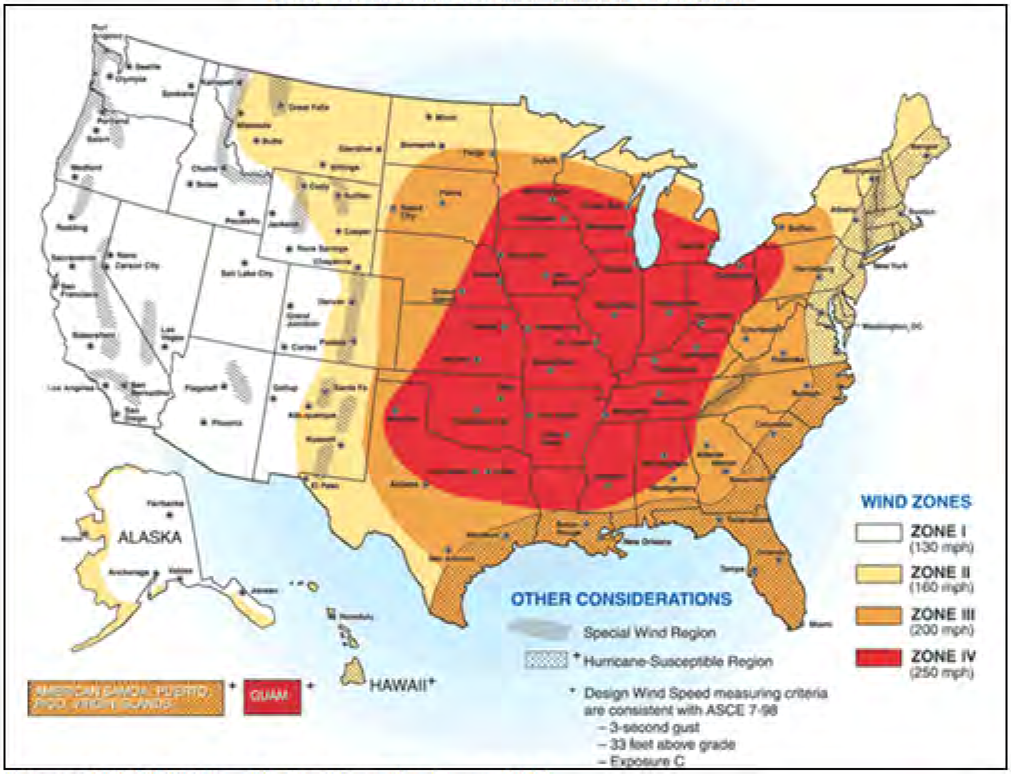
	Warning Time
Windstorm	3.00

	Duration
Windstorm	2.13

Hazard Location

The following figure shows the wind zones of the United States based on maximum wind speeds. South Kansas is located within wind zones IV, the highest inland category.

Wind Zones in the United States



Source: FEMA Taking Shelter From the Storm, 2008

Previous Occurrences and Extent

The following are notable high wind events that have occurred in the region.

February 28, 2012: A powerful storm system produced widespread severe weather across portions of central, south central and southeast Kansas during the evening hours.

August 9, 2011: Winds estimated at 70 to 80 mph moved across central and south central Kansas causing wide-spread damages to buildings in the area.

July 14, 2010: Damaging winds knocked down 23 power poles along Kansas Highway 4 in Barton County. This knocked out power to six small towns in the area and they remained without power for almost 12 hours. It also closed Kansas Highway 4 for a short time because of the damage.

August 19, 2005: The severe thunderstorms that brought a tornado to Great Bend were also packed with 75-80 mph winds, which caused an estimated $5 million in damage in and around the City. Many buildings sustained major roof and structural damage. Numerous vehicles sustained smashed or shattered windows. Twelve people were injured.

July 3, 2005: Severe thunderstorms struck central and south-central Kansas. Winds between 70 and 100 mph caused extensive damage.

According to the NCDC Storm Events database, there were 465 high wind, strong wind and thunderstorm wind events in south Kansas between 2004 and 2014, with 2014 being an incomplete data year. The average recorded high wind over that period was 73 mph, with the strongest wind measured at 78 mph. Total property damage for events between 2004 and 2014 is estimated at $9,181,500 with an estimated $40,000 in crop damages The data reported below is from the NCDC who receives storm data from the NWS, which receives information` from a variety of sources, which include but are not limited to county, state, and federal emergency management officials, local law enforcement officials, Skywarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry and the general public. The wind events represent wind reports, not necessarily individual storms, and thus likely over count the actual number of windstorms.

NCDC Wind Events, 2004- 2014

County	Number of Days with Wind Events	Strongest Measured Wind (Knots)	Total Property Damage	Total Crop Damage
Barber	52	78	$36,000	$0
Barton	75	87	$5,655,000	$0
Comanche	31	70	$5,000	$0
Edwards	66	78	$12,500	$0
Kiowa	34	83	$50,000	$0
Pawnee	41	87	$131,000	$0
Pratt	92	87	$555,500	$0
Stafford	70	78	$250,000	$0
Regional Total	461	81 (average)	$6,695,000	$0

Source: NCDC Storm Events Database

Local Events:

The following detail locally reported events:

May 7, 2013: In Barton County a severe downburst damaged utility poles and caused limited roof damages top residences.

Spring, 2013: Pratt County, USD #438 - Skyline Schools: A windstorm caused a damages to the roof and gutters resulting in $74,666 in insured losses.

August 12, 2011: Barber County, USD #254 - Barber County North: Strong winds blew a dumpster into a car causing $1,242 in insured losses.

May 24, 2011: In Barton County high winds damaged five structures and power lines in four locations.

2011: Pawnee County, Coats: High winds blew the roof off the fire station causing $84,000 in insured losses.

Hazard Vulnerability and Impact

All counties in south Kansas are vulnerable to windstorms. To refine and access the relative vulnerability of each of south Kansas' counties to wind events, the region assigned ratings to pertinent factors that were examined at the county level. These factors are: social vulnerability index, prior events, prior annualized property damage, building exposure valuation, population density, crop exposure and annualized crop loss. Then a rating value of 1-10 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for comparison and to determine the most vulnerable counties.

The following information was used for this analysis:

- Social Vulnerability Index for Kansas from the Hazards and Vulnerability Research Institute at the University of South Carolina
- National Climatic Data Center storm events 2004 – 2014
- U.S. Census Bureau (2012)
- USDA's Census of Agriculture (2012).

Vulnerability Factor Amounts for Wind

County	SoVI Rating (1-5)	Prior Events 2004-2014	Property Damages	Annualized Property Damages	Total Building Exposure ($000)	Population Density	Crop Exposure (2012 Census of Agriculture)	Crop Insurance Paid for Wind (2010-2013)	Annualized Crop Insurance Paid
Barber	4	52	$36,000	$3,600	$388,136	4	$45,420,000	$216,800	$54,200
Barton	3	75	$5,655,000	$565,500	$1,772,118	21	$96,206,000	$821,804	$205,451
Comanche	5	31	$5,000	$500	$135,138	2	$21,783,000	$541,940	$135,485
Edwards	4	66	$12,500	$1,250	$232,382	5	$126,933,000	$1,645,844	$411,461
Kiowa	4	34	$50,000	$5,000	$237,655	3	$63,956,000	$582,792	$145,698
Pawnee	5	41	$131,000	$13,100	$449,592	9	$92,111,000	$2,304,708	$576,177
Pratt	3	92	$555,500	$55,550	$689,239	13	$52,353,000	$1,412,812	$353,203
Stafford	4	70	$250,000	$25,000	$295,331	6	$74,549,000	$1,363,288	$340,822
Regional Total	-	461	$6,695,000	$669,500	$4,199,591	8	$573,311,000	$8,889,988	$2,222,497

Using the above information, a value of 1-10 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for comparison and to determine the greatest vulnerable counties. The Social Vulnerability Index is in a range of 1 - 5. To give Social Vulnerability Index the same weight as the other factors, the numbers were multiplied by two.

Wind Data Rating Determination

Ratings	Social Vulnerability	NCDC Prior Events	Annualized Property Damage	Building Exposure Valuation	Population Density	Crop Exposure	Annualized Crop Loss
1		9 - 34	$0 - $200,000	$117,421 - $4,492,825	1.6 - 116.3	0 - $18,548,500	19 - $40,800
2	1	35 - 56	$200,001 - $400,000	$4,492,826 - $8,868,229	116.4 - 231.1	$18,548,501 - $32,126,000	$40,801 - $81,576
3		57 - 78	$400,001 - $600,000	$8,868,230 - $13,243,634	231.2 - 345.9	$32,126,001 - $45,703,500	$81,577 - $122,352
4	2	79 - 100	$600,001 - $800,000	$13,243,635 - $17,619,039	346 - 460.7	$45,703,501 - $59,281,000	$122,353 - $163,128
5		101 - 122	$800,001 - $1,000,000	$17,619,040 - $21,994,444	460.8 - 575.5	$59,281,001 - $72,858,500	$163,129 - $203,904
6	3	123 - 144	$1,000,001 - $3,000,000	$21,994,445 - $26,369,848	575.6 - 690.3	$72,858,501 - $86,436,000	$203,905 - $244,680
7		145 - 165	$3,000,001 - $5,000,000	$26,369,849 - $30,745,253	690.4 - 805.1	$86,436,001 - $100,013,500	$244,681 - $285,456
8	4	166 - 187	$5,00,001 - $7,000,000	$30,745,254 - $35,120,658	805.2 - 919.9	$100,031,501 - $113,591,000	$285,457 - $326,232
9		188 - 209	$7,000,001 - $9,000,000	$35,120,659 - $39,496,062	920- 1,034.7	$113,591,001 - $127,168,500	$326,233 - $367,008
10	5	210 - 232	$9,000,001 - $25,460,428	$39,496,063 - $43,871,468	1,034.8 - 1,149.6	$127,168,501 - $140,746,000	$367,009 - $407,783

Based on the above ratings system, ranges were applied to each county to determine their potential vulnerability. The following related the scoring to a vulnerability assessment:

- **Low:** Score range of 9 -14
- **Medium-Low:** Score range of 15 - 19
- **Medium:** Score range of 20 - 24
- **Medium-High:** Score range of 25 - 29
- **High:** Score range of 30 - 35

The following table provides the factor's amount per county that are considered for wind vulnerability.

Vulnerability of South Kansas Counties to Wind

County	SoVi Rating	NCDC Prior Event Rating	Annualized Property Damage Rating	Bldg Exposure Valuation Rating	Population Density Rating	Crop Exposure Rating	Annualized Crop Loss Rating	Overall Vulnerability Rating	Wind Vulnerability
Barber	8	2	1	1	1	3	2	18	Medium-Low
Barton	6	3	3	1	1	7	6	27	Medium-High
Comanche	10	1	1	1	1	2	4	20	Medium
Edwards	8	3	1	1	1	9	10	33	High
Kiowa	8	1	1	1	1	5	4	21	Medium
Pawnee	10	2	1	1	1	7	10	32	High
Pratt	6	4	1	1	1	4	9	26	Medium-High
Stafford	8	3	2	1	1	6	9	30	High

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	Magnitude/Severity
Windstorm	2.75

Future Development

Future development projects should consider windstorm hazard at the planning, engineering and architectural design stage with the goal of reducing vulnerability. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

Available data suggests that south Kansas has experienced 461 high wind days over the 10 year period from 2004 to 2014, with 2014 being an incomplete data year, with a total damage amount of $6,695,000. This would equate to an average of 46 high wind days per year with an average loss of $669,500 per year. As such, the probability of this hazard occurring during future years is highly likely.

	Probability
Windstorm	3.94

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Windstorm Consequence Analysis

Subject	Ranking	Impacts of Windstorm
Health and Safety of Persons in the Area of the Incident	Minimal to Moderate	Impact of the immediate area could be minimal to moderate for affected areas.
Responders	Minimal	Impact to responders is expected to be minimal unless responders live within the affected area.
Continuity of Operations	Minimal	Temporary relocation may be necessary if government facilities experience damage.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact could be minimal to moderate in the incident area. Utility lines would likely be severely affected.
Delivery of Services	Minimal	Delivery of services could be affected if there is any disruption to the roads and/or utilities..
Environment	Minimal to Severe	Impact may be severe for the immediate impacted area with regards to trees, bushes, and crops. Impact will lessen as distance increases from the immediate incident area.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the trajectory of the windstorm. Revenue could be impacted if businesses are halted due to structural damages and infrastructure damage.
Public Confidence in Governance	Minimal	Response and recovery will be in question if not timely and effective. Warning systems in place and the timeliness of those warnings could be questioned.

3.7.22 WINTER STORM

Hazard	Probability	Magnitude/Severity	Warning Time	Duration	CPRI
Winter Storm	3.88	3.06	1.88	3.25	3.27

Description

Winter storms in south Kansas usually come in the form of heavy snow or freezing rain. Regardless of form, they can have significant impacts to the region and its residents for days, weeks or months. They can immobilize a region by blocking roads and railways and closing airports, which can disrupt emergency and medical services, hamper the flow of supplies and isolate homes and farms. Heavy snow can collapse roofs and knock down trees and power lines. Unprotected livestock may be lost. Economic impacts include cost of snow removal, damage repair, business and crop losses, and power failures.

A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. The NWS describes different types of winter storm events as follows:

- **Blizzard**—Winds of 35 mph or more with snow and blowing snow reducing visibility to less than 1/4 mile for at least three hours.
- **Blowing Snow**—Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.
- **Snow Squalls**—Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.
- **Snow Showers**—Snow falling at varying intensities for brief periods of time. Some accumulation is possible.
- **Freezing Rain**—Rain that falls onto a surface with a temperature below freezing. This causes it to freeze to surfaces forming a coating or glaze of ice. Most freezing-rain events are short lived and occur near sunrise between the months of December and March.
- **Sleet**—Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects.

Heavy accumulations of ice, often the result of freezing rain, can bring down trees, utility poles, and communications towers and disrupt communications and power for days. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians.

	Warning Time
Winter Storm	1.88

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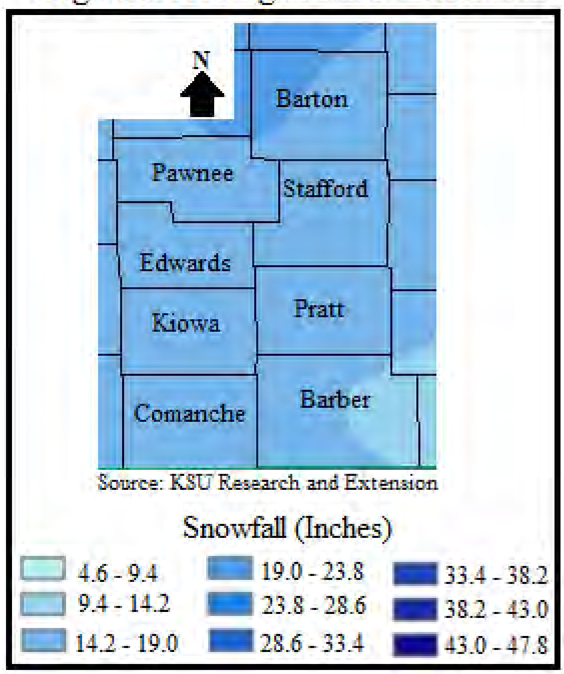
	Duration
Winter Storm	3.25

Hazard Location

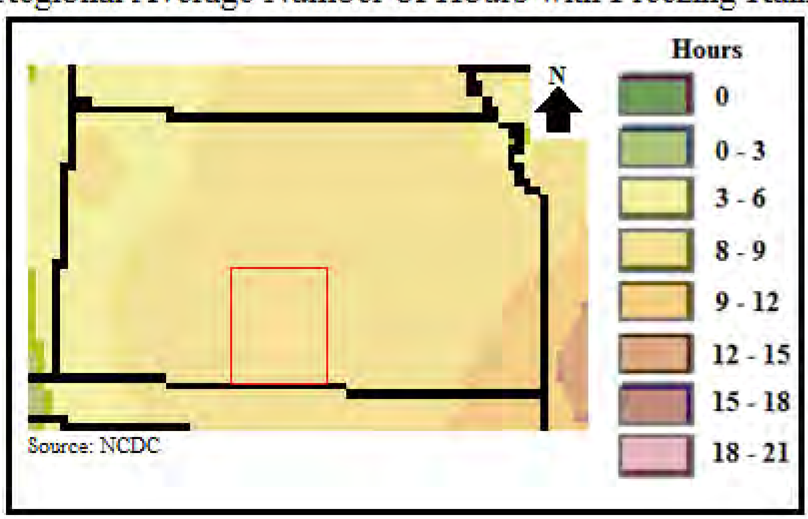
The entire planning region is vulnerable to heavy snow and freezing rain. The following map illustrates the average annual snowfall for the region.

Regional Average Annual Snowfall



Freezing rains occurs frequently in south Kansas. The following map indicates the average number of hours of freezing rain per year.

Regional Average Number of Hours with Freezing Rain



In recent years, except the winter of 2011-2012, the weather patterns have created significant snow accumulations and ice storms throughout the region. Also future development could potentially increase vulnerability to this hazard by increasing the demand on the utilities and increasing the exposure of aging infrastructure networks.

Previous Occurrences and Extent

The following table lists the five most recent presidential disaster declarations for south Kansas.

Presidential Disaster Declarations, Winter Storm

Declaration Number	Declaration Date*	Disaster Description	Regional Counties Involved	Disaster Cost**
4112	04/25/2013 (02/20/2013 - 02/23/2013)	Severe Winter Storm	Barton, Barber, Pawnee, Pratt, Stafford	$1,286,885
1848	06/24/2009 (3/26-29/2009)	Severe Winter Storm and Record and Near Record Snow	Butler	$20,174,657
1741	02/01/2008 (12/06-19/2007)	Severe Winter Storms	Barber, Barton, Comanche, Edwards, Kiowa, Pawnee, Pratt and Stafford	$359,557,345
1675	1/7/2007 (12/28-30/2006)	Severe Winter Storm	Comanche, Edwards, Kiowa, Pawnee and Stafford	$315,201,639
1626	1/26/2006 (11/27-28/2005)	Severe Winter Storm	Edwards and Pawnee	$50,281,517
1579	2/8/2005 (1/4-6/2005)	Severe Winter Storm, Heavy Rains, and Flooding	Barber, Comanche, Kiowa and Pratt	$106,873,672
1402	2/6/2002 (1/29-2/15/2002)	Ice Storm	Barber, Comanche, Kiowa and Pratt	$60,185,754

Sources: FEMA and KDEM

* Incident dates are in parentheses.

** Disaster costs include Public Assistance and Individual Assistance for all impacted counties, including those not shown

The following are brief discussions of the above noted events.

FEMA-4112-DR— April 26, 2013 (February 20-23, 2013): A severe storm produced record or near record snowfall across parts of the region. Several areas reported power outages due to the snow, ice and wind. Federal assistance funding for this disaster was $1,286,885.

FEMA-1848-DR— June 24, 2009 (March 26-29, 2009): A late March blizzard produced record or near record snowfall of one to two feet across parts of central, south central and southwest Kansas. The heavy snow and high wind resulted in blizzard conditions on Friday into Saturday. Several areas reported power outages due to the snow, ice and wind. FEMA Public Assistance funding for this disaster was $20,174,657.

FEMA-1741-DR: February, 2008 (December 6-19, 2007): Winter weather started across central and southeast Kansas with two different ice storms that moved across the area and produced significant accumulations. The ice caused numerous power outage and approximately 130,000 Kansas customers were without power. Then a major winter storm moved through Kansas during the evening hours of December 14th and the heaviest snow targeted areas still suffering from the ice storm that hit earlier in the week. FEMA Public Assistance funding for this disaster was $355,651,857.

FEMA-1675-DR: January 7, 2007 (December 28–30, 2006): This storm was one of Kansas' worst disasters on record. It began on December 28, 2006, and increased in intensity December 29 overnight into December 30. Snow depths ranged from four inches in Saline County to 30 inches in Wallace County. Several counties set snowfall records. Numerous highways were closed for days in western Kansas, and there were major power outages because of icing. The ice was 1/4 inch thick on guide wires that brought several communication towers down. During the peak of the storm there were 46,300 meters off-line and 10,500 power poles down. Approximately 60,000 people were without power. There were three storm-related fatalities. The storm also severely impacted ranchers, making it temporarily impossible for some to feed and water livestock. The Kansas National Guard used Black Hawk helicopters to feed stranded cattle. FEMA Public Assistance funding for this disaster was $315,201,639.

FEMA-1626-DR: January 26, 2006 (November 27-28, 2005): Much of the State was affected by this storm. Winds of 40 to 60 mph combined with two to seven inches of snow resulted in a blizzard, which raged across parts of north central Kansas. The wind whipped the snow into drifts 10 to 15 feet high in some places. Interstate 70 was closed west of Russell, and numerous other highways were impassable during the storm. There were several reports of auto accidents, including a 25-car pileup, and sporadic power outages. At least three auto-related deaths were attributed to the storm. FEMA Public Assistance funding for this disaster was $50,281,517.

FEMA-1579-DR—February 8, 2005 (January 4-6): This was one of the worst ice storms on record to hit central, south central, and southeast Kansas. Although freezing rain was the primary culprit, sleet also played a vital role in coating nearly the entire region with one-two inches of ice, which caused incredible damage to trees, power lines, and power poles. Roads and highways were blocked by tree debris and downed power poles and lines. Many areas were without power for more than a week. Three deaths were attributed to the storm. FEMA Public Assistance funding for this disaster was $106,873,672.

FEMA-1402-DR: Ice Storm—February 6, 2002 (January 29–February 15): Beginning on January 29, a three-day severe winter storm hit 35 Kansas counties in the southeast corner of the State with freezing rain, drizzle, sleet and snow. With one to two inches of ice accumulation, utility poles and power lines snapped, transportation was treacherous and fallen trees damaged many structures. The resulting power outages affected nearly the entire region and lasted nearly a week in some areas. Loss of power was particularly problematic for many nursing homes. There were seven fatalities. FEMA Public Assistance funding for this disaster was $45,020,240.

The following provide further descriptions and other notable winter storm events.

February 25, 2011: Periods of freezing drizzle and freezing fog affected much of south Kansas from the late evening on the 25th through the morning on the 26th. Area roads became very slick, producing numerous accidents and slide-offs.

December 23, 2010: Patchy light freezing rain and freezing drizzle during the evening hours on the 23rd produced a thin glaze of ice across south Kansas. The glaze of ice produced very slick roads through the early morning hours on the 24th. Several automobile accidents and slide-offs occurred as a result, producing numerous injuries.

December 7, 2009: A two pronged winter storm moved across south region of Kansas during the period of December 6th through December the 8th, 2009. The initial system on December 6th spread a thin layer of freezing drizzle which produced numerous automobile accidents. A more potent low pressure arrived on December 7th and 8th, 2009. This system led to a band of heavy snow with 6 to 12 inches along a line from Great Bend, Kansas to Salina, Kansas.

According to the NCDC there were 83 winter storms (ice storm and winter storm) in south Kansas between 2004 and 2014, with 2014 being an incomplete data year. Total property damage during that period was estimated by the NCDC at $0, whereas the total public assistance and individual assistance from the seven Presidential Declarations listed above totaled over $913,561,469 for all involved counties, including the counties from the south Kansas region. This suggests that although there are more winter storm events recorded in NCDC than there have been declarations, and that damages to NCDC are likely under-reported.

NCDC Winter Storm Events, 2003 -2013

County	Number of Winter Storm Events	Total Property Damage Winter Weather and Storms	Number of Ice Storm Events	Total Property Damage, Ice Storms
Barber	8	$0	0	$0
Barton	8	$0	2	$9,800,000
Comanche	8	$0	2	$0
Edwards	11	$0	0	$0
Kiowa	10	$0	1	$0
Pawnee	11	$0	1	$0
Pratt	8	$0	1	$0
Stafford	11	$0	1	$0
Regional Total	75	$0	8	$9,800,000

Source: NCDC Storm Events Database

Local Events

The following are locally reported events:

February, 2013: Barton County, Great Bend: A winter closed local businesses and schools.

February 2013: Barton County, Hoisington: A winter closed local businesses and schools. $5,254 in federal disaster funding was received.

December 2012: Stafford County, City of Stafford: A winter storm damaged electrical utilities and downed trees. In addition , there were business and school closures.

March, 2008: Kiowa County, Haviland: An ice storm caused significant damage yo the city, including utilities, power poles and trees. In addition, many local businesses closed for numerous days.

December 10, 2007: Pawnee County: An ice storm damaged trees an downed lines throughout the county.

December 6, 2007: Barton County, Claflin: An ice storm knocked out electricity for approximately one week.

Hazard Vulnerability and Impact

All counties in south Kansas are vulnerable to winter storms. To refine and access the relative vulnerability of each of south Kansas' counties to winter storm events, the region assigned ratings to pertinent factors that were examined at the county level. These factors are: social vulnerability index, prior events, prior annualized property damage, building exposure valuation, population density, crop exposure and annualized crop loss. Then a rating value of 1 -10 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for comparison and to determine the most vulnerable counties.

The following information was used for this analysis:

- Social Vulnerability Index for Kansas from the Hazards and Vulnerability Research Institute at the University of South Carolina
- National Climatic Data Center storm events 2004 – 2014
- U.S. Census Bureau (2012)
- USDA's Census of Agriculture (2012).

Vulnerability Factor Amounts for Winter Storm

County	SoVI Rating (1-5)	Prior Events 2004-2014	Property Damages	Annualized Property Damages	Total Building Exposure ($000)	Population Density	Crop Exposure (2012 Census of Agriculture)	Crop Insurance Paid (2010-2013)	Annualized Crop Insurance Paid
Barber	4	8	$0	$0	$388,136	4	$45,420,000	$255,784	$63,946
Barton	3	10	$0	$0	$1,772,118	21	$96,206,000	$414,880	$103,720
Comanche	5	10	$0	$0	$135,138	2	$21,783,000	$752,140	$188,035
Edwards	4	11	$0	$0	$232,382	5	$126,933,000	$1,457,816	$364,454
Kiowa	4	1	$0	$0	$237,655	3	$63,956,000	$1,300,196	$325,049
Pawnee	5	2	$0	$0	$449,592	9	$92,111,000	$1,586,804	$396,701
Pratt	3	9	$0	$0	$689,239	13	$52,353,000	$823,484	$205,871
Stafford	4	12	$0	$0	$295,331	6	$74,549,000	$832,848	$208,212
Regional Total	-	63	$0	$0	$4,199,591	8	$573,311,000	$7,423,952	$1,855,988

Using the above information, a value of 1-10 was assigned to the data obtained for each factor and then weighted equally and factored together to obtain overall vulnerability scores for comparison and to determine the greatest vulnerable counties. The Social Vulnerability Index is in a range of 1 - 5. To give Social Vulnerability Index the same weight as the other factors, the numbers were multiplied by two.

Winter Storm Data Rating Determination

Ratings	Social Vulnerability	NCDC Prior Events	Annualized Property Damage	Building Exposure Valuation	Population Density	Crop Exposure	Annualized Crop Loss
1		14 - 21	$2,000 - $50,000	$117,421 - $4,492,825	1.6 - 116.3	0 - $18,548,500	0 - $200,000
2	1	21 - 29	$50,001 - $100,000	$4,492,826 - $8,868,229	116.4 - 231.1	$18,548,501 - $32,126,000	$200,001 - $400,000
3		30 - 36	$100,001 - $300,000	$8,868,230 - $13,243,634	231.2 - 345.9	$32,126,001 - $45,703,500	$400,000 - $600,000
4	2	37 - 44	$300,001 - $500,000	$13,243,635 - $17,619,039	346 - 460.7	$45,703,501 - $59,281,000	$600,001 - $800,000
5		45 - 52	$500,001 - $700,000	$17,619,040 - $21,994,444	460.8 - 575.5	$59,281,001 - $72,858,500	$800,001 - $1,000,000
6	3	53 - 60	$700,001 - $900,000	$21,994,445 - $26,369,848	575.6 - 690.3	$72,858,501 - $86,436,000	$1,100,001 - $1,300,000
7		61 - 69	$900,001 - $1,100,000	$26,369,849 - $30,745,253	690.4 - 805.1	$86,436,001 - $100,013,500	$1,300,001 - $1,500,000
8	4	70 - 77	$1,100,001 - $1,700,000	$30,745,254 - $35,120,658	805.2 - 919.9	$100,031,501 - $113,591,000	$1,500,001 - $1,700,000
9		78 - 85	$1,700,001 - $2,200,000	$35,120,659 - $39,496,062	920- 1,034.7	$113,591,001 - $127,168,500	$1,700,001 - $2,700,000
10	5	86 - 93	$2,200,001 - $2,800,000	$39,496,063 - $43,871,468	1,034.8 - 1,149.6	$127,168,501 - $140,746,000	$2,700,001 - $3,700,000

Based o n t he ab ove r atings s ystem, r anges w ere ap plied t o each county t o d etermine their potential vulnerability. The following related the scoring to a vulnerability assessment:

- **Low:** Score range of 13 -17
- **Medium-Low:** Score range of 18 - 22
- **Medium:** Score range of 23 - 27
- **Medium-High:** Score range of 28 - 32
- **High:** Score range of 33 - 37

The following table provides the factor's amount per county that are considered for winter storm vulnerability.

Regional Vulnerability to Winter Storms

County	SoVI Converted Rating	Prior Event Rating	Annualized Property Damage Rating	Bldg Exposure Valuation Rating	Population Density Rating	Crop Exposure Rating	Annualized Crop Insurance Rating	Overall Vulnerability Rating	Winter Storm Vulnerability
Barber	8	0	0	1	1	3	1	14	Low
Barton	6	0	0	1	1	7	1	16	Low
Comanche	10	0	0	1	1	2	1	15	Low
Edwards	8	0	0	1	1	9	2	21	Medium-Low
Kiowa	8	0	0	1	1	5	2	17	Low
Pawnee	10	0	0	1	1	7	2	21	Medium-Low
Pratt	6	0	0	1	1	4	2	14	Low
Stafford	8	0	0	1	1	6	2	18	Medium-Low

In addition, the Kansas Department of Transportation (KDOT) incurs statewide annual costs for snow and ice removal. The average cost per year for snow and ice efforts for fiscal years 2008-2011 is $15,900,000 for labor, equipment and materials. However, the cost for snow and ice efforts in fiscal year 2012 was only $6,700,000 because it was a mild winter (source: Translines Express, KDOT, April 11, 2012).

	Magnitude/Severity
Winter Storm	3.06

Future Development

Future development projects should consider winter storm hazard at the planning, engineering and architectural design stage with the goal of reducing vulnerability. However, in general, the region is experiencing a population decline which could potentially lessen the potential of a future event.

Probability of Future Hazard Events

According to the NCDC there were 63 winter storm events in south Kansas between 2004 and 2014, with 2014 being an incomplete data year. Based on this information, it is highly likely that at least one winter storm will occur in south Kansas in any given year.

	Probability
Winter Storm	3.88

Consequence Analysis

The information in the following table provides the Consequence Analysis.

Winter Storm Consequence Analysis

Subject	Ranking	Impacts of Winter Storm
Health and Safety of Persons in the Area of the Incident	Severe	Impact of the immediate area could be severe for affected areas and moderate to light for other less affected areas.
Responders	Minimal	Impact to responders could be severe for unprotected personnel and moderate to light for prepared personnel.
Continuity of Operations	Minimal	Minimal expectation of execution of the COOP.
Property, Facilities, and Infrastructure	Minimal to Severe	Localized impact to facilities and infrastructure in the incident area. Utility lines most affected.
Delivery of Services	Minimal to Severe	Delivery of services could be affected if there is any disruption to the roads and/or utilities due to damages sustained.
Environment	Severe	Greatest impact will be to trees, bushes, foliage, crops, and wildlife, which could be severe.
Economic Conditions	Minimal to Severe	Impacts to the economy will greatly depend on the severity of the winter storm, longevity of the storm, and any damages sustained such as utilities and roads.
Public Confidence in Governance	Minimal to Severe	Response and recovery will be in question if not timely and effective. Utility failure could be called in to question if outages are persistent.

3.8 DATA SOURCES

The following table details the data sources used for this section.

Data on the past impacts and future probability of these hazards in the south Kansas planning area was collected from the following sources:

- Bureau of Alcohol, Tobacco, Firearms and Explosives Standards
- Electronic Mass Casualty Assessment and Planning Scenarios developed by Johns Hopkins University
- Emergency Management Accreditation Program
- Environmental Protection Agency
- Federal Bureau of Investigation
- Federal Emergency Management Agency
- Federal Emergency Management Agency Benefit-Cost Analysis Reengineering Tornado Safe Room Module Methodology Report, Version 4.5 Final, Dated May 2009
- Federal Emergency Management Agency Flood Insurance Administration
- Federal Emergency Management Agency Flood Insurance Rate Maps
- Federal Emergency Management Agency HAZUS-Multi Hazard-2.1
- Federal Emergency Management Agency Mid-Term Levee Inventory
- Federal Emergency Management Agency National Flood Insurance Program
- Federal Emergency Management Agency National Flood Insurance Program
- Federal Emergency Management Agency "Local Mitigation Planning Handbook, March 2013"
- Federal Emergency Management Agency, Taking Shelter From the Storm, 2008
- Federal Emergency Management Agency's "Policy and Loss Data by Community with County and State Data"
- Federal Emergency Management Agency's Policy and Claim Statistics for Flood Insurance
- Hazards and Vulnerability Research Institute at the University of South Carolina
- Homeland Security Act of 2002
- Kansas Corporation Commission
- Kansas Data Access & Support Center
- Kansas Department of Agriculture, Division of Animal Health
- Kansas Department of Agriculture, Division of Water Resources
- Kansas Department of Agriculture, Division of Water Resources, Water Structures Program
- Kansas Department of Agriculture, Plant Protection and Weed Control Division
- Kansas Department of Health & Environment, Bureau of Water, Livestock Waste Management
- Kansas Department of Health and Environment "Subsurface Void Space and Sinkhole/Subsidence Area Inventory for the State of Kansas", 2006

- Kansas Department of Health and Environment Bureau of Epidemiology and Public Health Informatics
- Kansas Department of Health and Environment Surface Mining Section
- Kansas Department of Health and Environment, Division of Environment
- Kansas Department of Health and Environment's Kansas Environmental Public Health Tracking Program
- Kansas Division of Emergency Management
- Kansas Division of Emergency Management 2012 Kansas Severe Weather Awareness Week
- Kansas Division of Emergency Management, Technological Hazards Section
- Kansas Fire Service
- Kansas Flint Hills Smoke Management Plan
- Kansas Forest Action Plan
- Kansas Forest Service
- Kansas Geological Survey
- Kansas Geological Survey, "Earthquakes in Kansas"
- Kansas Operations Plan
- Kansas Response Plan
- Kansas State University College of Engineering
- Kansas State University Research and Extension Climatic Map of Kansas
- Kansas Statutes Annotated
- Kansas Unified HazMat Response Program Statewide Contract # 35167
- Kansas Water Office
- Kansas Water Office Kansas Drought Stage Declarations
- Kansas Water Office, 2009 Kansas Water Plan
- Kansas Water Office, Kansas 2014 Drought Update
- Kansas University Geological Survey
- Kansas Commission on Emergency Planning and Response Annual Report, Managing the Risk: 2011
- Modified Mercalli Intensity Scale
- National Climatic Data Center
- National Dam Safety Act
- National Drought Mitigation Center Drought Impact Reporter
- National Fire Incident Reporting System
- National Fire Incident Reporting System
- National Interagency Fire Center Predictive Services
- National Oceanic and Atmospheric Administration Storm Prediction Center
- National Oceanic and Atmospheric Administration
- National Resources Conservation Service
- National Seismic Hazard Mapping Project
- National Weather Service
- National Weather Service Heat Index Program

- Oklahoma Climatological Survey
- Palmer Drought Severity Index
- Spatial Hazard Event and Loss Database
- Stanford University's National Performance of Dams Program
- "Surface Water in Kansas and its Interactions with Groundwater" 2000 M. A. Sophocleous, B. B. Wilson
- "The Annual Impact of Seasonal Influenza in the US: Measuring Disease Burden and Costs" by NA Molinari
- The Southern Poverty Law Center
- Tornado and Storm Research Organization
- Translines Express, Kansas Department of Transportation, April 11, 2012
- United States Army Corps of Engineers
- United States Army Corps of Engineers Levee Safety Program
- United States Army Corps of Engineers National Levee Database
- United States Bureau of Reclamation
- United States Census Bureau
- United States Census Bureau
- United States Census Bureau American Community Survey 2005 – 2009
- United States Centers for Disease Control and Prevention
- United States Department of Agriculture Kansas Crop Insurance Profile Report
- United States Department of Agriculture National Resources Inventory
- United States Department of Agriculture, Division of Water Resources
- United States Department of Agriculture, National Agricultural Statistics Service
- United States Department of Agriculture, Risk Management Agency
- United States Department of Agriculture's Census of Agriculture
- United States Department of Transportation Pipeline and Hazardous Materials Safety Administration
- United States Drought Monitor
- United States Fish and Wildlife Service
- United States Geological Survey Fact Sheet, "Water Use in Kansas 1990-2000"
- United States Geological Survey, Earthquake Hazards Program
- University of Kansas Institute for Policy and Social Research
- USA Patriot Act
- Vaisala's National Lightning Detection Network
- Other agencies and data collections as noted

4.0 CAPABILITY ASSESSMENT

4.1 INTRODUCTION

44 CFR 201.6 does not require a capability assessment to be completed for local hazard mitigation plans. However, 201.6(c)(3) states "A mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tool."

This section of the plan discusses the current capacity of the communities of south Kansas to mitigate the effects of identified hazards. A capability assessment is conducted to determine the ability of a jurisdiction to execute a comprehensive mitigation strategy, and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs or projects. This assessment includes a comprehensive examination of the following capabilities:

- Planning Capabilities
- Policies and Ordinances
- Programs
- Studies, Reports and Maps
- Departmental Staff
- Non-Governmental Organizations (NGOs)
- Financial Resources

A capability assessment helps to determine which mitigation actions are practical based on a jurisdictions fiscal, staffing and political resources. A capability assessment consists of:

- An inventory of relevant plans, ordinances, or programs already in place
- An analysis capacity to carry them out.

A thoughtful review of jurisdictional capabilities will assist in determining gaps that could limit current or proposed mitigation activities, or potentially aggravate a jurisdictions vulnerability to an identified hazard. Additionally, a capability assessment can detail current successful mitigation actions that should continue to receive support.

For the 2014 update each participating jurisdiction was given an opportunity to review and revise their capability assessment information presented from their previous plan.

4.2 METHODOLOGY

In order to facilitate this plan update and consolidation the following capability questions were asked of participating jurisdictions:

Planning Capabilities

Comprehensive Plan
Capital Improvement Plan
City Emergency Operations Plan
County Emergency Operations Plan
Local Recovery Plan
County Recovery Plan
Debris Management Plan
Economic Development Plan
Transportation Plan
Land-use Plan
Flood Mitigation Assistance Plan
Watershed Plan
Firewise or other fire mitigation plan
Critical Facilities Plan (Mitigation/Response/Recovery)

Policies/Ordinances

Zoning Ordinance
Building Code
Floodplain Ordinance
Subdivision Ordinance
Tree Trimming Ordinance
Nuisance Ordinance
Storm Water Ordinance
Drainage Ordinance
Site Plan Review Requirements
Historic Preservation Ordinance
Landscape Ordinance
Wetlands / Riparian Areas Conservation Plan

Programs

Zoning/Land Use Restrictions
Codes Building Site/Design
Hazard Awareness Program
National Flood Insurance Program
Community Rating System program under the National Flood Insurance Program
National Weather Service Storm Ready Certification
Firewise Community Certification
Building Code Effectiveness Grading
ISO Fire Rating
Economic Development Program
Land Use Program
Public Education/Awareness

Programs, Continued

Property Acquisition
Planning/Zoning Boards
Stream Maintenance Program
Tree Trimming Program
Engineering Studies for Streams (Local/County/Regional)
Mutual Aid Agreements

Studies/Reports/Maps

Hazard Analysis/Risk Assessment (City)
Hazard Analysis/Risk Assessment (County)
Evacuation Route Map
Critical Facilities Inventory
Vulnerable Population Inventory
Land Use Map

Staff/Department

Building Code Official
Building Inspector
Mapping Specialist (GIS)
Engineer
Development Planner
Public Works Official
Emergency Management Coordinator
NFIP Floodplain Administrator
Bomb and/or Arson Squad
Emergency Response Team
Hazardous Materials Expert
Local Emergency Planning Committee
County Emergency Management Commission
Sanitation Department
Transportation Department
Economic Development Department
Housing Department
Historic Preservation

NGOs

American Red Cross
Salvation Army
Veterans Groups
Local Environmental Organization
Homeowner Associations
Neighborhood Associations
Chamber of Commerce
Community Organizations (Lions, Kiwanis, etc.)

Financial Resources
Apply for Community Development Block Grants
Fund projects thru Capital Improvements funding
Authority to levy taxes for specific purposes
Fees for water, sewer, gas, or electric services
Impact fees for new development
Incur debt through general obligation bonds
Incur debt through special tax bonds
Incur debt through private activities
Withhold spending in hazard prone areas

Gathering this information from participating north-central jurisdictions assisted in assessing capabilities and served as a guide to potential future changes to create robust policies, procedures, plans and teams to strengthen hazard mitigation planning.

4.3 Regional Schools, Colleges and Universities

In order to facilitate this plan update and consolidation the following capability questions were asked of participating jurisdictions:

Schools, Colleges and Universities Capability Questions
Full-time building official (i.e. Principal)
Emergency Manager
Grant Writer
Public Information Officer
Capital improvements project funding
Local funds
General obligation bonds
Special tax bonds
Private activities/donations
State and federal funds

4.4 Governance

The planning area is comprised of eight counties in south Kansas, along with participating jurisdictions within those counties. All of the counties in the planning area operate under a county commissioner form of governance. In this form of government, the elected board of commissioners oversee county operations. The following table details each counties form of governance.

County Governance

Jurisdiction	Government Structure	Number of Commissioners
Barber County	Commission	3
Barton County	Commission	5
Comanche County	Commission	3
Edwards County	Commission	3
Kiowa County	Commission	3
Pawnee County	Commission	3
Pratt County	Commission	3
Stafford County	Commission	3

In general, the participating towns and cities operate either under a Mayoral form of governance or an elected city council form of governance.

4.5 JURISDICTIONAL CAPABILITIES

Information as to the current capacity of participating jurisdictions is summarized in the following sections and tables. All capability information was provided by jurisdictional officials through the above referenced questions and through outreach from the HMPC.

The ability of a local government to develop and implement mitigation projects, policies, and programs is directly tied to its ability to direct staff time and resources for that purpose. Administrative capability can be evaluated by determining how mitigation-related activities are assigned to local departments and if there are adequate personnel resources to complete these activities. The degree of intergovernmental coordination among departments will also affect administrative capability for the implementation and success of proposed mitigation activities.

Many smaller jurisdictions have very limited to no planning, management, response or mitigation capabilities. Often these jurisdiction rely on the county or nearby larger municipalities for assistance. This lack of capabilities is reflected in the following tables. Additionally, many very small or extremely limited participating small jurisdictions, largely townships, are not listed on the capability list. **This in no way diminishes the participation in the process of these jurisdictions.** Finally, special district capabilities are included in their overarching counties.

In implementing a mitigation plan or specific action, a local jurisdiction may utilize any or all of the four broad types of government authority granted by the State of Kansas. The four types are defined as:

- Regulation
- Acquisition
- Taxation
- Spending

Regulation

The scope of this local authority is subject to constraints, however, as all of Kansas' political subdivisions must not act without proper delegation from the State. Under a principle known as "Dillon's Rule," all power is vested in the State and can only be exercised by local governments to the extent it is delegated.

Acquisition

The power of acquisition can be a useful tool for pursuing local mitigation goals. Local governments may find the most effective method for completely "hazard-proofing" a particular piece of property or area is to acquire the property, thus removing the property from the private market and eliminating or reducing the possibility of inappropriate development occurring. Kansas legislation empowers cities, towns, counties to acquire property for public purpose by gift, grant, devise, bequest, exchange, purchase, lease or eminent domain (County Home Rule Powers, K.S.A. 19-101, 19-101a, 19-212).

Taxation

The power to levy taxes and special assessments is an important tool delegated to local governments by Kansas law. The power of taxation extends beyond merely the collection of revenue, and can have a profound impact on the pattern of development in the community. Communities have the power to set preferential tax rates for areas which are more suitable for development in order to discourage development in otherwise hazardous areas. Local units of government also have the authority to levy special assessments on property owners for all or part of the costs of acquiring, constructing, reconstructing, extending or otherwise building or improving flood control within a designated area. This can serve to increase the cost of building in such areas, thereby discouraging development. Because the usual methods of apportionment seem mechanical and arbitrary, and because the tax burden on a particular piece of property is often quite large, the major constraint in using special assessments is political. Special assessments seem to offer little in terms of control over land use in developing areas. They can, however, be used to finance the provision of necessary services within municipal or county boundaries. In addition, they are useful in distributing to the new property owners the costs of the infrastructure required by new development.

Spending

The Kansas General Assembly allocated the ability to local governments to make expenditures in the public interest. Hazard mitigation principles can be made a routine part of all spending decisions made by the local government, including the adoption of annual budgets and a Capital Improvement Plan. A Capital Improvement Plan is a schedule for the provision of municipal or county services over a specified period of time. Capital programming, by itself, can be used as a growth management technique, with a view to hazard mitigation. By tentatively committing itself to a timetable for the provision of capital to extend services, a community can control growth to some extent. In addition to formulating a timetable for the provision of services, a local community can regulate the extension of and access to services. A Capital Improvement

Plan that is coordinated with extension and access policies can provide a significant degree of control over the location and timing of growth. These tools can also influence the cost of growth. If the Capital Improvement Plan is effective in directing growth away from environmentally sensitive or high hazard areas.

4.5.1 PLANNING CAPABILITIES

The planning capability assessment is designed to provide a general overview of the key planning and regulatory tools or programs in place or under development. This information helps identify opportunities to address existing planning gaps and provides an opportunity to review areas that mitigation planning actions can be utilized with existing plans. Jurisdictions were asked if they had completed the following plans:

Comprehensive Plan

A comprehensive plan establishes the overall vision for a jurisdiction and serves as a guide to governmental decision making. A comprehensive plan generally contains information on demographics, land use, transportation, and facilities. As a comprehensive plan is broad in scope the integration of hazard mitigation measures can enhance the likelihood of achieving risk reduction goals.

Capital Improvement Plan

A capital improvement plan guides scheduling of, and spending on, public improvements. A capital improvement plan can guide future development away from identified hazard areas, an effective mitigation strategy.

Emergency Operations Plan

An emergency operations plan outlines responsibilities, means and methods by which resources are deployed during and following an emergency or disaster.

Recovery Plan

A disaster recovery plan guides the recovery and reconstruction process following a disaster. Hazard mitigation principles should be incorporated into disaster recovery plans to assist in breaking the cycle of disaster loss.

Debris Management Plan

A debris management plan covers the response and recovery from debris-causing incidents such as tornados or floods. Planning considerations include debris removal and disposal, disposal locations, equipment availability, and personnel training.

Economic Development Plan

An economic development plan assists in advancing a strong and sustainable economy over the long term. This plan provides strategies, programs, and policies that will foster the jurisdictions business climate.

Transportation Plan

A transportation plan aids with the evaluation, review, design and locating of transportation infrastructure, including streets, highways, public transport lines, and transportation centers.

Land Use Plan

Land-use planning is used to regulate land use in an efficient and equitable manner, and to assist jurisdictions in managing the development of land within their boundaries.

Flood Mitigation Assistance Plan

The purpose of the flood mitigation assistance plan is to reduce or eliminate the long-term risk of flood damage to buildings and other structures insured under the National Flood Insurance Program.

Watershed Management Plan

A watershed management plan is used to provide assessment and management information for a geographically defined watershed.

Fire Mitigation Plan

A fire mitigation plan is used to mitigate a jurisdictions wildfire risk and vulnerability. The plan documents areas with an elevated risk of wildfires, and identifies the actions taken to decrease the risk.

Critical Facilities Plan

A critical facilities plan is used to identify a jurisdictions critical facilities, including fire stations, police stations, hospitals, schools, day care centers, senior care facilities, major roads and bridges, critical utility sites, and hazardous material storage areas. Additionally, this plan is used to determine methods to mitigate damage to these facilities.

The table below summarizes relevant local planning capabilities.

Jurisdictional Planning Capabilities

Jurisdiction	Comprehensive Plan	Capital Improvement Plan	City Emergency Operations Plan	County Emergency Operations Plan	Local Recovery Plan	County Recovery Plan	Debris Management Plan	Economic Development Plan	Transportation Plan	Land-use Plan	Flood Mitigation Assistance Plan	Watershed Plan	Firewise or other Fire Mitigation Plan	Critical Facilities Plan (Mitigation/ Response/ Recovery)
Barber County				x				x					x	
City of Hardtner														
City of Hazelton														
City of Isabel														
City of Kiowa	x	x	x				x							
City of Medicine Lodge		x								x				
City of Sharon														
City of Sun City														
Barton County	x			x				x		x				
City of Albert		x								x		x		
City of Claflin		x	x	x							x	x	x	
City of Ellinwood	x	x	x					x		x				x
City of Galatia		x												
City of Great Bend	x	x	x	x				x		x	x			
City of Hoisington	x	x		x				x	x	x		x	x	x
City of Olmitz		x												
City of Pawnee Rock		x												
City of Susank		x												

Jurisdiction	Comprehensive Plan	Capital Improvement Plan	City Emergency Operations Plan	County Emergency Operations Plan	Local Recovery Plan	County Recovery Plan	Debris Management Plan	Economic Development Plan	Transportation Plan	Land-use Plan	Flood Mitigation Assistance Plan	Watershed Plan	Firewise or other Fire Mitigation Plan	Critical Facilities Plan (Mitigation/ Response/ Recovery)
Comanche County		x												
City of Coldwater										x				
City of Protection										x				
City of Wilmore										x				
Edwards County				x		x		x		x				
City of Belpre														
City of Kinsley	x	x	x					x						
City of Lewis														
City of Offerle														
Kiowa County				x			x	x		x				x
City of Greensburg	x			x		x	x			x				
City of Haviland														
City of Mullinville			x	x		x	x							

Jurisdiction	Comprehensive Plan	Capital Improvement Plan	City Emergency Operations Plan	County Emergency Operations Plan	Local Recovery Plan	County Recovery Plan	Debris Management Plan	Economic Development Plan	Transportation Plan	Land-use Plan	Flood Mitigation Assistance Plan	Watershed Plan	Firewise or other Fire Mitigation Plan	Critical Facilities Plan (Mitigation/ Response/ Recovery)
Pawnee County				x										
City of Burdett														
City of Garfield														
City of Larned	x									x				
City of Rozel														
Pratt County		x		x				x						
City of Byers														
City of Coats														
City of Cullison														
City of Iuka														
City of Pratt	x	x						x		x				
City of Preston														
City of Sawyer														
Stafford County		x		x						x				
City of Hudson														
City of Macksville														
City of Radium														
City of Seward														
City of St. John														
City of Stafford	x		x	x		x	x	x	x		x			

4.5.2 POLICIES AND ORDINANCES

Based on the types of state of Kansas government authority granted, participating jurisdictions were asked if the following ordinances and plans were enacted and enforced.

Zoning

Zoning is the traditional and most common tool available to local jurisdictions to control the use of land. State of Kansas statutes grant municipalities and counties authority to engage in zoning for land use. Counties may also regulate inside municipal jurisdiction at the request of a municipality. Zoning is used to promote health, safety, and the general welfare of the community. Zoning is used to dictate the type of land use and to set minimum specifications for use such as lot size, building height and setbacks, and density of population. Local governments are authorized to divide their jurisdiction into districts, and to regulate and restrict the erection, construction, reconstruction, alteration, repair or use of buildings, structures, or land within those districts. Districts may include general use districts, overlay districts, special use districts or conditional use districts. Zoning ordinances consist of maps and written text.

Building Code

Many structural mitigation measures involve constructing and retrofitting homes, businesses and other structures according to standards designed to make the buildings more resilient to the impacts of natural hazards. Many of these standards are imposed through the building code. Kansas does not have state mandatory building codes. However, municipalities and counties may adopt codes for their respective areas if approved by the state as providing "adequate minimum standards." Local governments in Kansas are also empowered to carry out building inspections, and may empower cities and counties to create an inspection department to enforce construction codes and ordinances.

Floodplain Ordinance

In 1992 the Kansas General Assembly approved legislation for floodplain management (Kansas Statutes Annotated 12-766, “Floodplain Management”) authorizing the Department of Agriculture, Division of Water Resources as the primary department to oversee and approve local zoning regulation. The regulation requires planning and approval to prevent inappropriate development in the one hundred-year floodplain and to reduce flood hazards. The purpose of the law is to:

- Minimize the extent of floods by preventing obstructions that inhibit water flow and increase flood height and damage.
- Prevent and minimize loss of life, injuries, and property damage in flood hazard areas.
- Promote the public health, safety and welfare of citizens of Kansas in flood hazard areas.

The statute affects local governments by directing them to:

- Manage planned growth
- Adopt local ordinances to regulate uses in flood hazard areas
- Enforce those ordinances
- Grant permits for use in flood hazard areas that are consistent with the ordinance

The act also makes certain that local ordinances meet the minimum requirements of participation in the NFIP. The incentive for local governments adopting such ordinances is that they will afford their residents the ability to purchase flood insurance through the NFIP. In addition, communities with such ordinances in place will be given priority in the consideration of applications for loans and grants from the Clean Water Revolving Loan and Grant Fund.

Subdivision Ordinance

Subdivision regulations control the division of land into parcels for the purpose of building development or sale. Flood-related subdivision controls typically require that sub-dividers install adequate drainage facilities and design water and sewer systems to minimize flood damage and contamination. They prohibit the subdivision of land subject to flooding unless flood hazards are overcome through filling or other measures, and they prohibit filling of floodway areas. Subdivision regulations require that subdivision plans be approved prior to the division and/or sale of land. Subdivision regulations are a more limited tool than zoning and only indirectly affect the type of use made of land and the specifications for structures on that land.

Broad subdivision control authority resides with the county for areas outside of municipalities and municipal extra-territorial planning jurisdictions. Subdivision is defined as all divisions of a tract or parcel of land divided into two or more lots and all divisions involving new streets.

Tree Trimming Ordinance

These ordinances may place requirements for the removal, pruning, planting, and other tree work depending upon whether the tree is in the public right-of-way or on a private lot as well as tree size or species, and property zoning.

Nuisance Ordinance

Kansas' local governments have been granted broad regulatory powers in their jurisdictions. Kansas General Statutes bestow the general police power on local governments, allowing them to enact and enforce ordinances which define, prohibit, regulate or abate acts, omissions, or conditions detrimental to the health, safety, and welfare of the people, and to define and abate nuisances. Since hazard mitigation can be included under the police power (as protection of public health, safety and welfare), towns, cities, and counties may include requirements for hazard mitigation in local ordinances. Local governments may also use their ordinance-making power to abate "nuisances," which could include, by local definition, any activity or condition making people or property more vulnerable to any hazard.

Stormwater Ordinance

The purpose of a stormwater ordinance is to protect the quality and quantity of local, regional and state waters from the potential harm of unmanaged stormwater. Stormwater ordinances include protection from activities that result in the degradation of properties, water quality, stream channels, and other natural resources.

Drainage Ordinance

The purpose of a drainage ordinance is to improve storm sewer systems for the management and control of storm water runoff to prevent polluted waters from entering the water supply and other receiving waters.

Site Plan Review Ordinance

The purpose of a site plan review ordinance is to ensure orderly growth, and to minimize the adverse effects growth that could be caused by the development of commercial, industrial, retail or institutional structures.

Historic Preservation Ordinance

The purpose of a preservation ordinance is created to protect buildings and neighborhoods from destruction or modifications. A preservation ordinance protects designated historic properties through review requirements for renovations and protects historic neighborhoods through design guidelines for new development.

Landscape Ordinance

A landscape ordinance generally provides rules and procedures for the protection and maintenance of vegetation and landscaping.

Wetlands/Riparian Areas Conservation Plan

The purpose of a Wetlands/Riparian Areas Conservation Plan is to preserve and protect wetlands, water resources, and adjacent upland areas.

The table below summarizes relevant local policies and ordinances.

Jurisdictional Policies and Ordinances

Jurisdiction	Zoning Ordinance	Building Code	Floodplain Ordinance	Subdivision Ordinance	Tree Trimming Ordinance	Nuisance Ordinance	Storm Water Ordinance	Drainage Ordinance	Site Plan Review Requirements	Historic Preservation Ordinance	Landscape Ordinance	Wetlands / Riparian Areas Conservation Plan
Barber County						x			x			x
City of Hardtner												
City of Hazelton												
City of Isabel												
City of Kiowa	x	x		x	x	x			x			
City of Medicine Lodge	x	x	x	x	x	x						
City of Sharon												
City of Sun City												
Barton County	x		x			x						
City of Albert	x		x			x						
City of Claflin	x	x			x	x						
City of Ellinwood	x	x	x	x	x	x						
City of Galatia						x						
City of Great Bend	x	x	x	x		x	x	x	x		x	
City of Hoisington	x	x	x	x	x	x	x	x	x			
City of Olmitz						x						
City of Pawnee Rock			x			x						
City of Susank						x						

Jurisdiction	Zoning Ordinance	Building Code	Floodplain Ordinance	Subdivision Ordinance	Tree Trimming Ordinance	Nuisance Ordinance	Storm Water Ordinance	Drainage Ordinance	Site Plan Review Requirements	Historic Preservation Ordinance	Landscape Ordinance	Wetlands / Riparian Areas Conservation Plan
Comanche County	x					x			x			
City of Coldwater	x	x								x		
City of Protection	x		x							x		
City of Wilmore												
Edwards County	x					x						
City of Belpre						x						
City of Kinsley	x	x	x		x	x						
City of Lewis						x						
City of Offerle						x						
Kiowa County												
City of Greensburg	x	x		x		x	x	x	x			
City of Haviland						x						
City of Mullinville						x						
Pawnee County	x		x									
City of Burdett	x		x			x						
City of Garfield	x		x			x						
City of Larned	x	x	x	x	x	x						
City of Rozel	x		x			x						

Jurisdiction	Zoning Ordinance	Building Code	Floodplain Ordinance	Subdivision Ordinance	Tree Trimming Ordinance	Nuisance Ordinance	Storm Water Ordinance	Drainage Ordinance	Site Plan Review Requirements	Historic Preservation Ordinance	Landscape Ordinance	Wetlands / Riparian Areas Conservation Plan
Pratt County	x		x						x			
City of Byers												
City of Coats						x						
City of Cullison						x						
City of Iuka						x					x	
City of Pratt	x	x	x	x		x	x	x	x	x		
City of Preston						x						
City of Sawyer						x						
Stafford County						x						
City of Hudson						x						
City of Macksville						x						
City of Radium						x						
City of Seward						x						
City of St. John	x	x			x	x			x			
City of Stafford		x	x		x	x		x				

4.5.3 PROGRAMS

This part of the capabilities assessment includes the identification and evaluation of existing programs. Many of the programs have been generally discussed in the previous sections.

Hazard Awareness Program

A program designed to inform citizens as to the nature and extent of local and regional natural and manmade hazards.

National Flood Insurance Program

In 1968, Congress created the NFIP to help provide a means for property owners to financially protect themselves. The NFIP offers flood insurance to homeowners, renters, and business owners if their community participates in the NFIP. Participating communities agree to adopt and enforce ordinances that meet or exceed FEMA requirements to reduce the risk of flooding.

Community Rating System program under the National Flood Insurance Program

The NFIP's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Participants are offered flood insurance premium rates at a discount to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS. These goals are the reduction of flood damage to insurable property, the strengthening and support of insurance aspects of the NFIP, and the encouragement of a comprehensive approach to floodplain management.

Firewise Community Certification

The Firewise Communities Program encourages local solutions for safety by involving homeowners in taking individual responsibility for preparing their homes from the risk of wildfire. Firewise is a key component of Fire Adapted Communities, a collaborative approach that connects all those who play a role in wildfire education, planning and action with comprehensive resources to help reduce risk. The program is co-sponsored by the USDA Forest Service, the US Department of the Interior, and the National Association of State Foresters.

Building Code Effectiveness Grading

The Building Code Effectiveness Grading Schedule assesses the building codes in effect and how the community enforces its building codes, with special emphasis on mitigation of losses from natural hazards.

ISO Fire Rating

ISO's Fire Rating gauges the fire protection capability of the local fire department to respond to fires.

Land Use Program

A Land Use Program is designed with the goal of balancing environmental protection with economic development. This program, coupled with various other planning efforts, provides resources to local leaders to establish policies to guide the development of the community, including annexation, expansion, and building.

Public Education/Awareness

Education programs for the public that provide education and awareness about hazards, hazard planning and mitigation efforts.

Stream Maintenance Program

Programs designed to keep streams free from debris and blockages to prevent or minimize flooding.

Engineering Studies for Streams (Local/County/Regional)

Studies that detail information concerning flow data, potential trouble spots, and improvement recommendations for streams.

Mutual Aid Agreements

Mutual Aid Agreements are an understanding among localities to lend assistance across jurisdictional boundaries. This may occur due to an emergency response that exceeds local resources, such as a disaster. Mutual aid may be requested only when such an emergency occurs. Or may be a formal standing agreement on a continuing basis.

The table below summarizes relevant local programs.

Jurisdictional Programs

Jurisdiction	Zoning/Land Use Restrictions	Codes Building Site/Design	Hazard Awareness Program	National Flood Insurance Program	Community Rating System program under the National Flood Insurance Program	National Weather Service Storm Ready Certification	Firewise Community Certification	Building Code Effectiveness Grading	ISO Fire Rating	Economic Development Program	Land Use Program	Public Education/ Awareness	Property Acquisition	Planning/Zoning Boards	Stream Maintenance Program	Tree Trimming Program	Engineering Studies for Streams	Mutual Aid Agreements
Barber County									x	x		x						x
City of Hardtner																		x
City of Hazelton																		x
City of Isabel																		x
City of Kiowa	x								6	x				x		x		x
City of Medicine Lodge	x	x		x	x				9	x		x		x	x	x	x	x
City of Sharon																		x
City of Sun City																		x
Barton County	x			x						x	x			x				x
City of Albert				x					5				x	x				x
City of Claflin									5									x
City of Ellinwood	x			x					3	x	x		x	x		x		x
City of Galatia									8									x
City of Great Bend	x	x		x					3	x	x	x		x	x			x
City of Hoisington	x	x	x	x				x	5	x	x	x	x	x		x		x
City of Olmitz									8				x					x
City of Pawnee Rock				x					8				x					x
City of Susank																		x

Jurisdiction	Zoning/Land Use Restrictions	Codes Building Site/Design	Hazard Awareness Program	National Flood Insurance Program	Community Rating System program under the National Flood Insurance Program	National Weather Service Storm Ready Certification	Firewise Community Certification	Building Code Effectiveness Grading	ISO Fire Rating	Economic Development Program	Land Use Program	Public Education/ Awareness	Property Acquisition	Planning/Zoning Boards	Stream Maintenance Program	Tree Trimming Program	Engineering Studies for Streams	Mutual Aid Agreements
Comanche County	x			x		x			x						x			x
City of Coldwater	x		x						x					x				x
City of Protection	x			x														x
City of Wilmore																		x
Edwards County	x		x			x				x	x	x		x				x
City of Belpre									x									x
City of Kinsley	x			x					x	x				x				x
City of Lewis									x									x
City of Offerle									x									x
Kiowa County									9	x								x
City of Greensburg	x	x							6	x				x		x		x
City of Haviland									7	x		x			x			x
City of Mullinville									7									x
Pawnee County				x														x
City of Burdett																		
City of Garfield																		x
City of Larned	x	x		x					4					x				
City of Rozel				x										x				

Jurisdiction	Zoning/Land Use Restrictions	Codes Building Site/Design	Hazard Awareness Program	National Flood Insurance Program	Community Rating System program under the National Flood Insurance Program	National Weather Service Storm Ready Certification	Firewise Community Certification	Building Code Effectiveness Grading	ISO Fire Rating	Economic Development Program	Land Use Program	Public Education/ Awareness	Property Acquisition	Planning/Zoning Boards	Stream Maintenance Program	Tree Trimming Program	Engineering Studies for Streams	Mutual Aid Agreements
Pratt County	x			x					8/9			x		x				x
City of Byers									10									x
City of Coats									8/10			x						x
City of Cullison									7/10									x
City of Iuka									5/9									x
City of Pratt	x	x	x	x					5	x	x			x		x		x
City of Preston			x						7			x						x
City of Sawyer			x						5/9			x						x
Stafford County			x							x	x			x				x
City of Hudson																		x
City of Macksville																		x
City of Radium																		x
City of Seward																		x
City of St. John	x	x							5		x			x		x		x
City of Stafford		x	x	x					x									x

4.5.4 AVAILABLE STUDIES, REPORTS AND MAPS

Mitigation planning can be informed by existing information for a jurisdiction, including studies, reports and maps. The following is a brief description of the types of usable studies, reports or maps that may be available to a jurisdiction.

Hazard Analysis/Risk Assessment

A hazard analysis is the identification of different type of hazards that may affect a jurisdiction. A risk assessment is the determination of quantitative or qualitative value of risk related to a situation and a recognized hazard.

Evacuation Route Map

A map detailing the evacuation routes for a jurisdiction, often incorporating road, services, and travel time information.

Critical Facilities Inventory

A list of all critical facilities within a jurisdiction, which may include fire stations, police stations, hospitals, schools, day care centers, senior care facilities, major roads and bridges, critical utility sites, and hazardous material storage areas.

Vulnerable Population Inventory

A vulnerable population inventory may include members of the jurisdictions population who are elderly, limited in functional capacity, homeless, or have limited financial means. These populations may be poorly equipped with the resources and capabilities necessary to prepare for, and respond to, disasters without additional assistance.

Land Use Map

A jurisdictional map detailing current land uses.

The table below summarizes relevant local studies, reports and maps.

Available Jurisdictional Studies, Reports and Maps

Jurisdiction	Hazard Analysis/Risk Assessment (City)	Hazard Analysis/Risk Assessment (County)	Evacuation Route Map	Critical Facilities Inventory	Vulnerable Population Inventory	Land Use Map
Barber County		x	x	x		
City of Hardtner						
City of Hazelton						
City of Isabel						
City of Kiowa						x
City of Medicine Lodge	x			x		x
City of Sharon						
City of Sun City						
Barton County		x		x		x
City of Albert						
City of Claflin						
City of Ellinwood				x		x
City of Galatia						
City of Great Bend	x	x		x		x
City of Hoisington	x	x		x	x	x
City of Olmitz						
City of Pawnee Rock						
City of Susank						
Comanche County		x			x	
City of Coldwater						
City of Protection						
City of Wilmore						
Edwards County		x	x			
City of Belpre						
City of Kinsley			x			
City of Lewis						
City of Offerle						

Jurisdiction	Hazard Analysis/Risk Assessment (City)	Hazard Analysis/Risk Assessment (County)	Evacuation Route Map	Critical Facilities Inventory	Vulnerable Population Inventory	Land Use Map
Kiowa County		x	x			
City of Greensburg						x
City of Haviland						
City of Mullinville						
Pawnee County		x	x	x		
City of Burdett						
City of Garfield						
City of Larned						x
City of Rozel						
Pratt County		x	x	x	x	x
City of Byers						
City of Coats						
City of Cullison						
City of Iuka						
City of Pratt						x
City of Preston						
City of Sawyer						x
Stafford County		x	x	x		x
City of Hudson						
City of Macksville						
City of Radium						
City of Seward						
City of St. John				x		x
City of Stafford	x				x	

4.5.5 STAFFING AND DEPARTMENTAL CAPABILITIES

A comprehensive mitigation program relies on many skilled professionals. These professionals include:

- Planners
- Engineers
- Inspectors
- Emergency managers
- Floodplain managers
- GIS personnel

While exact responsibilities differ from jurisdiction to jurisdiction, the general duties of applicable departments are described below.

Building Code Official

Building officials are generally the jurisdictional administrator of building and construction codes, engineering calculation supervision, permits, facilities management, and accepted construction procedures.

Building Inspector

A building inspector is an official who inspects structures to ensure compliance with the plans and to check workmanship as well as code compliance.

GIS Mapping Specialist

A geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data. A GIS mapping specialist uses this data to create county maps, including flood plain, fire hazard, drought and other mitigation maps.

Engineer

An engineer may be responsible for the oversight, management and development of jurisdictions' road and infrastructure network.

Development Planner

A development planner may be responsible for guiding a jurisdictions worth and development through the application of codes, ordinances, building regulations and public input.

Public Works Official

Public works officials usually provide management and oversight of infrastructure projects such as public buildings (municipal buildings, schools, hospitals), transport infrastructure (roads, railroads, bridges, pipelines, airports), public spaces (public squares, parks), public services (water supply, sewage, electrical grid, dams), and other physical assets and facilities.

Emergency Management Coordinator

The Emergency Management office is responsible for the mitigation, preparedness, response and recovery operations that deal with both natural and man-made disaster events. The formation of an emergency management department in each county is mandated under Kansas General Statutes.

NFIP Floodplain Administrator

The NFIP floodplain administrator ensures a jurisdiction is meeting the minimum requirements of participation in the NFIP, and often is tasked with applying for funding or grants.

Bomb or Arson Squad

A bomb or arson squad is used to respond to, and investigate the cause of, fire and bomb events.

Emergency Response Team

An emergency response team is used to respond to emergency events.

Hazardous Materials Expert

A hazardous materials expert provides response and recovery information for hazardous material events.

Local Emergency Planning Committee

Local Emergency Planning Committees are generally housed at the county or municipal level. They do not function in actual emergency situations, but attempt to identify and catalogue potential hazards, identify available resources, mitigate hazards when feasible, and write emergency plans. The role of the LEPC is to anticipate and plan the initial response for foreseeable disasters in their jurisdiction.

Sanitation Department

Sanitation Departments are generally the agency responsible for garbage collection and recycling collection. Sanitation departments may also be tasked with street cleaning and snow removal.

Transportation Department

In general, transportation departments are responsible for road and bridge maintenance and transportation planning. Transportation departments may also be tasked with snow removal.

Economic Development Department

The economic development department is generally responsible for guiding a jurisdictions economic policies, fostering business development, and nurturing existing businesses.

Housing Department

Duties of a housing department may include enforcing fair housing laws, assisting low income citizens with finding housing, and managing jurisdictional housing properties.

Historic Preservation

A historic preservation department or society may provide expertise on environmental impacts to cultural resources, administer historic preservation grants, encourage historic preservation through local governments, and provide technical assistance for historic rehabilitation.

The table below summarizes relevant local staffing and departmental capabilities.

Staffing and Departmental Capabilities

Jurisdiction	Building Code Official	Building Inspector	Mapping Specialist (GIS)	Engineer	Development Planner	Public Works Official	Emergency Management Coordinator	NFIP Floodplain Administrator	Bomb and/or Arson Squad	Emergency Response Team	Hazardous Materials Expert	Local Emergency Planning Committee	County Emergency Management Commission	Sanitation Department	Transportation Department	Economic Development Department	Housing Department	Historic Preservation
Barber County			x	x		x	x			x		x	x	x	x	x		
City of Hardtner														x				
City of Hazelton														x				
City of Isabel														x				
City of Kiowa	x	x				x	x							x	x			
City of Medicine Lodge	x		x	x	x	x		x				x		x	x		x	
City of Sharon														x				
City of Sun City														x				
Barton County			x	x		x	x	x	x			x	x		x	x		
City of Albert						x		x										
City of Claflin		x				x				x								
City of Ellinwood	x	x				x		x						x		x		
City of Galatia						x												
City of Great Bend	x	x	x	x		x		x						x				
City of Hoisington	x	x	x		x	x		x		x	x	x	x		x			
City of Olmitz						x												
City of Pawnee Rock						x		x										
City of Susank						x												

Jurisdiction	Building Code Official	Building Inspector	Mapping Specialist (GIS)	Engineer	Development Planner	Public Works Official	Emergency Management Coordinator	NFIP Floodplain Administrator	Bomb and/or Arson Squad	Emergency Response Team	Hazardous Materials Expert	Local Emergency Planning Committee	County Emergency Management Commission	Sanitation Department	Transportation Department	Economic Development Department	Housing Department	Historic Preservation
Comanche County							x			x		x		x				
City of Coldwater						x								x			x	x
City of Protection						x		x						x			x	x
City of Wilmore																		
Edwards County						x	x					x				x		
City of Belpre																		
City of Kinsley	x	x				x		x						x		x		
City of Lewis																		
City of Offerle																		
Kiowa County			x	x		x		x	x	x	x	x		x	x	x		
City of Greensburg	x	x		x		x												
City of Haviland						x	x											
City of Mullinville						x								x				
Pawnee County			x			x	x	x				x				x		
City of Burdett						x												
City of Garfield																		
City of Larned	x	x				x								x				
City of Rozel						x		x										

Jurisdiction	Building Code Official	Building Inspector	Mapping Specialist (GIS)	Engineer	Development Planner	Public Works Official	Emergency Management Coordinator	NFIP Floodplain Administrator	Bomb and/or Arson Squad	Emergency Response Team	Hazardous Materials Expert	Local Emergency Planning Committee	County Emergency Management Commission	Sanitation Department	Transportation Department	Economic Development Department	Housing Department	Historic Preservation
Pratt County			x	x		x	x	x		x		x			x			
City of Byers										x								
City of Coats										x								
City of Cullison										x								
City of Iuka										x								
City of Pratt	x	x			x	x	x	x		x		x		x	x	x		
City of Preston	x					x				x		x						
City of Sawyer						x				x								
Stafford County						x	x					x		x		x		
City of Hudson						x												
City of Macksville						x												
City of Radium						x												
City of Seward						x												
City of St. John						x												
City of Stafford	x	x				x		x		x			x	x				

4.5.6 NON-GOVERNMENTAL ORGANIZATIONS CAPABILITIES

NGOs are legally constituted corporations that operate independently from any form of government and are not conventional for-profit businesses. In the cases in which NGOs are funded totally or partially by a government agency, the NGO maintains its non-governmental status by excluding government representatives from membership in the organization.

There are many types of NGOs, including:

- **Charitable**: Generally directed toward meeting the needs of the poor or those impacted by disasters.
- **Service**: Generally directed toward providing health, family planning or education services.
- **Participatory**: Generally directed toward self-help and/or community development projects.

NGOs can further be divided into community, local or national organizations. The following is a brief discussion of NGOs operating within south Kansas.

American Red Cross

The American Red Cross is a humanitarian organization that provides emergency assistance, disaster relief and education. In addition to domestic disaster relief, the American Red Cross offers services in five other areas: community services that help the needy; communications services and comfort for military members and their family members; the collection, processing and distribution of blood and blood products; educational programs on preparedness, health, and safety; and international relief and development programs.

Salvation Army

The Salvation Army is a Christian denomination and international charitable organization with a worldwide membership of over 1.5 million. In addition to being among the first to arrive with help after natural or man-made disasters, the Salvation Army runs charity shops and operates shelters for the homeless.

Veterans Groups

Generally veteran groups are local chapters of national groups that provide aid to active and retired soldiers and provide charitable support to target communities.

Local Environmental Organizations

An environmental organization may seek to protect, analyze or monitor the environment against misuse or degradation.

Homeowners Associations

Homeowner associations are residents of a community who form a board to monitor, control and oversee many aspects of a building, area or development. An association may have elected leaders and often has mandatory dues.

Neighborhood Associations

Neighborhood associations are groups of residents or property owners who advocate for or organize activities within a neighborhood. An association may have elected leaders and voluntary dues.

Chamber of Commerce

A chamber of commerce is generally a group of local businesses whose goal is to further the interests of businesses. Business owners in towns and cities form these local societies to advocate on behalf of the business community. Local businesses are members, and they elect a board of directors or executive council to set policy for the chamber. The board or council then hires a President, CEO or Executive Director, plus staffing appropriate to size, to run the organization.

Community Organizations

Generally community organizations are local chapters of national groups, such as the Elks, Shriners, or Kiwanis, that provide charitable support to citizens in need.

The table below summarizes the presence of relevant local NGOs.

Jurisdictional NGOs

Jurisdiction	American Red Cross	Salvation Army	Veterans Groups	Local Environmental Organization	Homeowner Associations	Neighborhood Associations	Chamber of Commerce	Community Organizations (Lions, Kiwanis)
Barber County			x					x
City of Hardtner			x				x	x
City of Hazelton								x
City of Isabel								x
City of Kiowa			x				x	x
City of Medicine Lodge			x				x	x
City of Sharon			x				x	x
City of Sun City								
Barton County			x		x		x	x
City of Albert								x
City of Claflin								
City of Ellinwood			x				x	x
City of Galatia								
City of Great Bend	x	x	x				x	x
City of Hoisington			x				x	x
City of Olmitz								
City of Pawnee Rock								x
City of Susank								
Comanche County	x	x	x				x	x
City of Coldwater			x					
City of Protection								
City of Wilmore								
Edwards County								
City of Belpre								
City of Kinsley			x				x	X
City of Lewis								
City of Offerle								
Kiowa County	x	x	x	x			x	x
City of Greensburg			x				x	x
City of Haviland			x				x	
City of Mullinville	x							x

Jurisdiction	American Red Cross	Salvation Army	Veterans Groups	Local Environmental Organization	Homeowner Associations	Neighborhood Associations	Chamber of Commerce	Community Organizations (Lions, Kiwanis)
Pawnee County			x				x	x
City of Burdett								
City of Garfield			x					x
City of Larned							x	x
City of Rozel								
Pratt County	x		x				x	x
City of Byers								
City of Coats								
City of Cullison								
City of Iuka								
City of Pratt	x	x	x				x	x
City of Preston								
City of Sawyer								
Stafford County			x					x
City of Hudson								
City of Macksville			x					x
City of Radium								
City of Seward								
City of St. John								x
City of Stafford			x				x	x

4.5.7 FISCAL CAPABILITIES

In general, the jurisdictions of south Kansas receive the majority of their revenue through state and local sales tax and federal and state pass through dollars. Based on available revenue information, and given that both the state and counties are experiencing budget deficits, funding for mitigation programs and disaster response is at a premium. Adding to the budget crunch is the increased reliance on local accountability by the federal government.

The following provide brief definitions of applicable fiscal programs.

Community Development Block Grant

The Community Development Block Grant (CDBG) is a U.S. Department of Housing and Urban Development program that funds local community development activities such as affordable housing, anti-poverty programs, and infrastructure development. CDBG, like other block grant programs, differ from categorical grants, made for specific purposes, in that they are subject to less federal oversight and are largely used at the discretion of the state and local governments and their sub-grantees.

Capital Improvement Funding

A Capital Improvement Plan is generally a short-range plan, usually four to ten years, which identifies capital projects and equipment purchases, provides a planning schedule and identifies options for financing the plan. Essentially, the plan provides a link between a municipality, school district, parks and recreation department and/or other local government entity and a comprehensive and strategic plans and the entity's annual budget. Funding may be drawn from this plan, if funding has been set aside as part of the planning process, and if the action works with the overall planning objectives and goals.

Authority to Levy Taxes

The authority to levy taxes would allow the jurisdiction to tax its population base.

Impact Fees for New Developments

Impact fees for new developments allow a jurisdiction to charge fees to developers to mitigate against any impact that development may have.

Incur Debt through General Obligation Bonds

General obligation bonds are issued with the belief that a municipality will be able to repay its debt obligation through taxation or revenue from projects. No assets are used as collateral.

Incur Debt through Special Tax Bonds

A government bond where repayment is guaranteed by a tax that the issuer levies specifically for that purpose.

Incur Debt through General Private Activities

In general, these tend to be tax-exempt bonds issued by or on behalf of local or state government for the purpose of providing special financing benefits for qualified projects. The financing is most often for projects of a private user, and the government generally does not pledge its credit.

Withhold Spending in Hazard Prone Areas

The ability of a jurisdiction to not provide funding for activities or actions in an area that is known to be prone to specific hazards.

The following table highlights each jurisdiction's fiscal capabilities.

Jurisdictional Fiscal Capabilities

Jurisdiction	Apply for Community Development Block Grants	Fund projects thru Capital Improvements funding	Authority to levy taxes for specific purposes	Fees for water, sewer, gas, or electric services	Impact fees for new development	Incur debt through general obligation bonds	Incur debt through special tax bonds	Incur debt through private activities	Withhold spending in hazard prone areas
Barber County	x	x	x			x	x		
City of Hardtner	x	x	x	x		x	x		
City of Hazelton	x	x	x	x		x	x		
City of Isabel	x	x	x	x		x	x		
City of Kiowa	x	x	x	x		x	x		
City of Medicine Lodge	x	x	x	x		x	x	x	x
City of Sharon	x	x	x	x		x	x		
City of Sun City	x	x	x			x	x		
Barton County	x	x	x			x	x	x	
City of Albert	x	x	x	x		x	x	x	x
City of Claflin	x	x	x	x		x	x	x	x
City of Ellinwood	x	x	x	x		x	x	x	x
City of Galatia	x	x	x	x		x	x	x	x
City of Great Bend	x	x	x	x		x	x	x	x
City of Hoisington	x	x	x	x		x	x	x	x
City of Olmitz	x	x	x	x		x	x	x	x
City of Pawnee Rock	x	x	x	x		x	x	x	x
City of Susank	x	x	x	x		x	x	x	x
Comanche County	x	x	x	x		x	x		x
City of Coldwater	x	x	x	x		x	x	x	
City of Protection	x	x	x	x		x	x		x
City of Wilmore	x		x			x	x		
Edwards County	x	x	x			x	x		
City of Belpre	x	x	x	x		x	x		
City of Kinsley	x	x	x	x		x	x		
City of Lewis	x	x	x	x		x	x		
City of Offerle	x	x	x	x		x	x		

Jurisdiction	Apply for Community Development Block Grants	Fund projects thru Capital Improvements funding	Authority to levy taxes for specific purposes	Fees for water, sewer, gas, or electric services	Impact fees for new development	Incur debt through general obligation bonds	Incur debt through special tax bonds	Incur debt through private activities	Withhold spending in hazard prone areas
Kiowa County	x	x	x						
City of Greensburg	x		x	x	x	x	x		x
City of Haviland	x	x	x	x		x			
City of Mullinville	x	x	x	x		x	x		
Pawnee County	x	x	x			x	x		
City of Burdett	x	x	x	x		x	x		
City of Garfield	x		x	x		x	x		
City of Larned	x	x		x	x	x	x		
City of Rozel	x	x	x	x		x	x		
Pratt County	x	x	x			x	x	x	x
City of Byers	x	x	x			x	x	x	x
City of Coats	x	x	x	x		x	x	x	x
City of Cullison	x	x	x	x	x	x	x	x	x
City of Iuka	x	x	x	x	x	x	x	x	x
City of Pratt	x	x	x	x		x	x	x	
City of Preston	x		x	x		x	x	x	
City of Sawyer	x	x	x	x		x	x	x	x
Stafford County	x	x	x			x	x		x
City of Hudson	x	x	x	x		x	x		x
City of Macksville	x	x	x	x		x	x		x
City of Radium	x	x	x			x	x		x
City of Seward	x	x	x			x	x		x
City of St. John	x	x	x	x		x	x		x
City of Stafford	x	x	x	x		x	x	x	x

4.5.8 SCHOOL, COLLEGE OR UNIVERSITY CAPABILITY ASSESSMENT

Participating schools, colleges and universities were provided with a different set of questions that participating governmental jurisdictions. These questions were asked to ascertain the level of preparedness of the institution.

The following provides brief definitions of terms used in the capability assessment of schools, colleges and universities.

Grant Writer

A grant writer writes applications for grant funding from an institution such as a government department, corporation, foundation or trust.

Public Information Officer

Public Information Officers (PIOs) are the communications coordinators or spokespersons. The primary responsibility of a PIO is to provide information to the media and public as required by law and according to the standards of their profession.

General Obligation Bond

A general obligation bond is a common type of municipal bond that is secured by a state or local government's pledge to use legally available resources, including tax revenues, to repay bond holders.

Special Tax Bond

A type of bond that is repaid by revenues derived from taxation of a particular activity or asset. These bonds are repaid with either excise taxes or special assessment taxes.

Information as to the current capacity of participating schools, colleges and universities is summarized in the following table.

School, College or University	Master Plan	Capital Improvement Plan	School Emergency Plan, Shelter in Place Protocols, Evacuation Protocols	Weapons Policy	Full-time building official (i.e. Principal)	Emergency Manager	Grant Writer	Public Information Officer	Capital improvements project funding	Local funds	General obligation bonds	Special tax bonds	Private activities/donations	State and federal funds
Barber County														
USD #254 - Barber County North	x	x	x	x	x	x		x	x	x	x	x	x	x
USD #255 - South Barber County	x	x	x	x	x	x		x	x	x	x	x	x	x
Barton County														
Barton County Community College	x	x	x	x	x	x	x	x	x	x	x		x	x
USD #112 - Clafin		x	x	x	x					x				
USD #355 Ellinwood	x		x	x	x	x	x	x	x	x	x		x	x
USD #428 - Great Bend	x	x	x	x	x	x		x	x	x	x	x	x	x
USD #431 - Hoisington			x	x	x	x		x						
Comanche County														
USD #300- Comanche County	x	x	x	x	x		x	x	x	x	x	x	x	x
Edwards County														
USD #347 - Kinsley / Offerle	x	x	x	x	x			x	x	x			x	x
USD #502 - Lewis	x	x	x	x	x			x	x	x			x	X
Kiowa County														
USD #422 - Kiowa County	x	x	x	x	x	x			x	x			x	x
USD #474 - Haviland			x	x					x	x	x			x
Pawnee County														
USD #495 - Fort Larned		x	x	x	x				x	x			x	x
USD #496 - Pawnee Heights	x	x	x	x	x				x	x	x	x	x	x
Pratt County														
Pratt County Community College		x	x	x	x		x	x		x	x	x	x	x
USD #382 - Pratt		x	x	x					x	x			x	x
USD #438 - Skyline Schools	x	x	x	x	x			x						

School, College or University	Master Plan	Capital Improvement Plan	School Emergency Plan, Shelter in Place Protocols, Evacuation Protocols	Weapons Policy	Full-time building official (i.e. Principal)	Emergency Manager	Grant Writer	Public Information Officer	Capital improvements project funding	Local funds	General obligation bonds	Special tax bonds	Private activities/donations	State and federal funds
Stafford County														
USD #349 - Stafford	x	x	x	x	x		x	x	x	x	x	x	x	x
USD #350 - St. John / Hudson			x	x	x			x	x	x	x		x	x
USD #351 - Macksville	x	x	x	x	x		x	x	x	x	x	x	x	x