

Discovery Report

Middle North Canadian Watershed, HUC 8 – 11100301

*Blaine, Canadian, Dewey, Ellis, Harper, Major, Oklahoma, and
Woodward Counties, Oklahoma*

October 2012



FEMA

Project Area Community List

Community Name	CID
Blaine County Communities	
Blaine County Unincorporated Areas	400011
Canton	400012
Geary	400381
Greenfield	400013
Longdale	400014
Watonga	400016
Canadian County Communities	
Canadian County Unincorporated Areas	400485
Calumet	400268
El Reno	405377
Mustang	400409
Union City	400334
Yukon	400028
Dewey County Communities	
Dewey County Unincorporated Areas	400626
Seiling	400058
Vici	400448
Ellis County Communities	
Ellis County Unincorporated Areas	N/A
Harper County Communities	
Harper County Unincorporated Areas	405449
Major County Communities	
Major County Unincorporated Areas	400110
Oklahoma County Communities	400466
Oklahoma County Unincorporated Areas	400466
Bethany	400254
Oklahoma City	405378
Warr Acres	400449
Woodlawn Park	400340
Tribes	
Cheyenne-Arapaho Tribes of Oklahoma	400590
Woodward County Communities	
Woodward County Unincorporated Areas	400500
Mooreland	400230
Mutual	405383
Sharon	400231
Woodward	400232

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Acronyms and Abbreviations

BFE	Base Flood Elevation
CAV	Community Assistance Visit
CEO	Chief Executive Officer
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFS	Cubic Feet per Second
CID	Community Identification number
CLOMR	Conditional Letter of Map Revision
CNMS	Coordinated Needs Management Strategy
CRS	Community Rating System
DEM	Digital Elevation Model
eLOMA	Electronic Letter of Map Amendment
EPA	Environmental Protection Agency
ESRI	Environmental Systems Research Institute
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FPA	Floodplain Administrator
FY	Fiscal Year
G&S	Guidelines and Standards for Flood Hazard Mapping Partners
GIS	Geographic Information System
HEC-1	Hydrologic Engineering Center – Hydrologic model program
HEC-2	Hydrologic Engineering Center – Hydraulic model program
HMP	Hazard Mitigation Plan
HUC	Hydrologic Unit Code
IDIQ	Indefinite Delivery Indefinite Quantity
LiDAR	Light Detection and Ranging System
LOMA	Letter of Map Amendment
LOMA-F	Letter of Map Amendment based on Fill
LOMC	Letter of Map Change
LOMR	Letter of Map Revision
MIP	Mapping Information Platform
MLI	Midterm Levee Inventory
MNC	Middle North Canadian Watershed
MXD	ArcMap map document extension
NAVD	North American Vertical Datum
NCDC	National Climatic Data Center
NFIP	National Flood Insurance Program
NHD	National Hydrologic Dataset
NRCS	Natural Resources Conservation Service
NVUE	New Validated or Updated Engineering
OKC	Oklahoma City
OWRB	Oklahoma Water Resources Board
PDF	Portable Document Format file

PMR	Physical Map Revision
RCRA	Resource Conservation and Recovery Act
RSC	Regional Service Center
Risk MAP	Risk Mapping, Assessment, and Planning Program
RL	Repetitive Loss
SFHA	Special Flood Hazard Area
SHMO	State Hazard Mitigation Officer
SHP	ESRI Shapefile
SQ MI	Square Mile
SRL	Severe Repetitive Loss
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

I. Discovery Overview

The Federal Emergency Management Agency (FEMA) is currently implementing the Risk Mapping, Assessment, and Planning (Risk MAP) Program across the Nation. The purpose of Risk MAP is the continued improvement of flood hazard information for the National Flood Insurance Program (NFIP); the promotion of increased national awareness and understanding of flood risk; and the support of Federal, State, and local mitigation actions necessary to reduce risk.

The vision and intent of the Risk MAP Program is to, through collaboration with State and local entities, deliver quality data that increases public awareness and leads to mitigation actions that reduce risk to life and property. To achieve this vision, FEMA has transformed its traditional flood identification and mapping efforts into an integrated process of more accurately identifying, assessing, communicating, planning, and mitigating flood risks. Risk MAP will address gaps in flood hazard data to form a solid foundation for risk assessment and floodplain management and will provide State and local entities with information needed to mitigate flood related risks.

The beginning step of the Risk MAP process is defined as Discovery and encompasses deployment of engagement activities in a watershed of interest. Watersheds are selected for Discovery based on risk, need, available topographic data, and other factors. The goal of the Discovery process is to gather local information and readily available data to determine project viability and the need for Risk MAP products to assist in the movement of communities towards resilience.

Through Discovery, FEMA can determine which areas of the 8-digit Hydrologic Unit (HUC-8) Discovery watersheds to examine for further flood risk identification and assessment in a collaborative manner, taking into consideration the information collected from local communities. Discovery opens lines of communication and relies on local involvement for productive discussions about flood risk. The process provides a forum for a watershed-wide discussion of how each included community's individual flood risks are related to the flood risks present throughout the watershed.

In October 2011, FEMA approved Discovery activities for the Middle North Canadian (MNC) Watershed to be performed by the Oklahoma Water Resources Board (OWRB) under the Cooperative Technical Partner Agreement Number EMT-2011-CA-0007. On March 1, 2012, the OWRB, assisted by FEMA Region VI and its contractor Meshek & Associates, PLC (Meshek), held the Discovery Meeting in the City of El Reno, Oklahoma.

During this meeting, the OWRB and FEMA reached out to the local communities to:

- Gather information about local flood risk and flood hazards;
- Review current and historic mitigation plans to understand local mitigation capabilities, hazard risk assessments, and current or future mitigation activities; and
- Include multi-disciplinary staff from within their community to participate and assist in the development of a watershed vision.

The results of the Discovery process are presented in a Discovery Report, a watershed-scale Discovery Map, and the digital data that was gathered or developed during this process. The digital data submitted during this process contain correspondence, exhibits used at the Discovery Meetings, Geographic Information System (GIS) data, mapping documents (PDF, shapefiles, personal geo-databases, and ESRI ArcGIS 9.3.1 MXDs), and other supplemental digital information. Any graphics shown in this report are available as larger format graphics files for printing and as GIS data that may be printed and used at any map scale.

i. Watershed Selection

The Middle North Canadian Watershed (MNC), Hydrologic Unit Code (HUC) 11100301, is located in Central Oklahoma and covers 1,858.3 square miles. The watershed stretches across eight counties, twenty incorporated communities (cities and towns), and seven other census-designated places. One Native American Tribe, Cheyenne-Arapaho Tribes of Oklahoma, also has lands in the watershed. A map of the watershed is shown in Figure 1.

Based on the 2010 U.S. Census Bureau, the watershed population is approximately 156,254 and includes a portion of Oklahoma City, the largest city in the state (population: 579,179). Oklahoma City is classified by the Census Bureau as one of the top 50 most populous places in the United States.

This watershed straddles two distinct state “regions” which the State of Oklahoma has separated from the rest of the state due to their decidedly diverse landscapes. The southeastern part of the watershed is designated as “Frontier Country” and ranges from wooded hill country to short-grass prairie land. The northwestern part of the watershed is situated in “Red Carpet Country” and rises out of the prairie to become a land of contrasts with majestic vistas and expansive high plains.

The primary river in the watershed is the North Canadian River which is a tributary to the Canadian River. The river enters the watershed approximately 0.3 miles south of the southern boundary of Harper County and continues through the watershed in a southeasterly direction toward State Highway 58A which crosses Canton Lake Dam. From there, the river exits at the southwestern point of the lake and travels toward the Town of Canton and then onto the City of Yukon in Canadian County until arriving at Lake Overholser in Oklahoma City. For a seven mile stretch inside Oklahoma City, the river is called the Oklahoma River. It finally exits Oklahoma City and Oklahoma County at the confluence with Campbell Creek. Other significant flood sources in the watershed include Indian Creek, Persimmon Creek, Bent Creek, Fourmile Creek, Sixmile Creek, Shell Creek, Turtle Creek, Mustang Creek, and Campbell Creek.

Canton Lake is located just two miles north of Canton, Oklahoma, and is operated by the U.S. Army Corps of Engineers (USACE). It has 45 miles of shoreline and 7,910 surface acres. According to a February 2011 report by USACE, Canton Dam is considered to be a “very high risk” dam due to potential consequences from significant seepage through the foundation, possible weakening of the foundation during a maximum credible earthquake, and the potential overtopping of the dam during a probable maximum flood event.

Figure 1: Watershed Locator Map

Middle North Canadian Watershed

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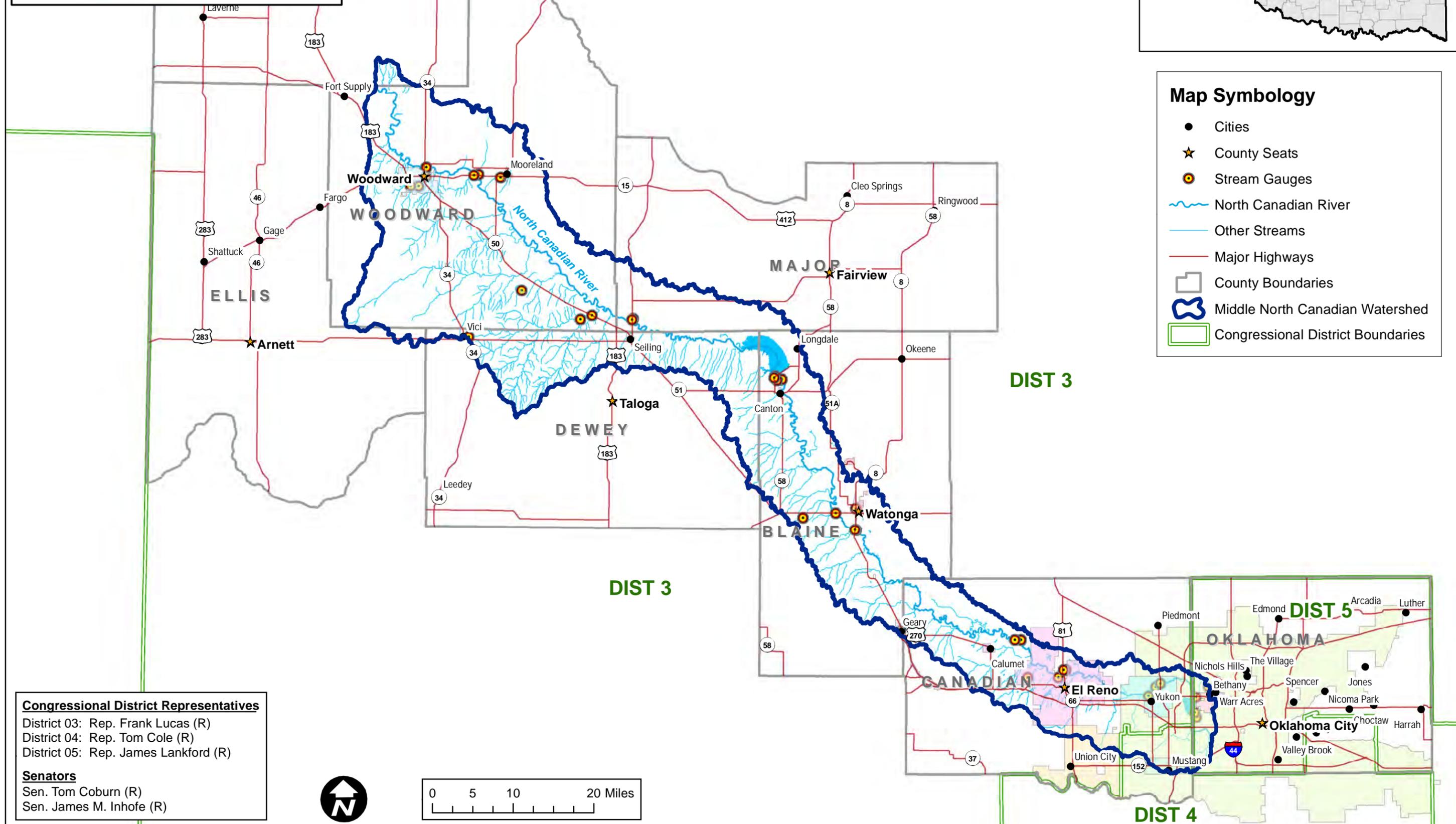


WATERSHED LOCATOR - STATE OF OKLAHOMA



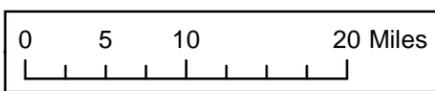
Map Symbology

- Cities
- ★ County Seats
- Stream Gauges
- ~ North Canadian River
- Other Streams
- Major Highways
- County Boundaries
- ⬭ Middle North Canadian Watershed
- ⬭ Congressional District Boundaries



Congressional District Representatives
 District 03: Rep. Frank Lucas (R)
 District 04: Rep. Tom Cole (R)
 District 05: Rep. James Lankford (R)

Senators
 Sen. Tom Coburn (R)
 Sen. James M. Inhofe (R)



A Dam Safety Modification is underway to address foundation seepage at Canton Dam and its potential overtopping. This project is scheduled to be completed in 2014. In the interim, risk reduction measures undertaken include limiting the reservoir to an elevation of 1,626 feet; updating emergency preparedness plans and exercises; stockpiling materials to use in the event of an emergency; and adding instruments for monitoring foundation seepage.

Lake Overholser is Oklahoma City’s oldest reservoir and impounds water from the North Canadian River west of Oklahoma City. It was constructed to provide water to a treatment plant still operating at NW 6th and Pennsylvania Avenue and its dam was added to the National Register of Historic Places in 2007. Today, the lake is used as a “backup” reservoir during the summer to meet increased seasonal demand. It covers 1,500 surface acres with an average depth of 6 feet and 13 feet at its deepest.

No certified levees were found in the watershed. Community comments received during the Discovery process noted the existence of levee(s) in the Yukon area. A thorough review of the Mid-Term Levee Inventory (MLI), DFIRM database and Flood Map DesktopTM revealed no record of certified levees within this HUC-8.

The watershed contains populated areas as well as parks scattered throughout the watershed, one regional park near El Reno, Boiling Springs State Park, and a wildlife refuge near Lake Overholser. There are no national forests, parks, or military facilities, in the watershed. Areas that may be excluded from flood risk consideration, if they have significant acreages, include large cemeteries, U.S. Environmental Protection Agency (EPA) remediation sites (i.e., Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) sites), prison areas, and water quality or flowage easement areas. These areas contribute to the overall square mileage of the watershed, but are not places where communities plan for population growth and development. There are no identified Superfund Sites in this watershed. Table 1 shows the land use in the watershed.

Table 1: Land Use within the Watershed

Land Use	Approximate Square Miles Within the Watershed
Incorporated Communities	235.1
Unincorporated Counties	1623.2
Undevelopable Areas Within Watershed (Sum of Below)	33.8
Lakes/Reservoirs/Detention Ponds	24.2
Parks/Preserves	5.3
Military Areas	0.0
Miscellaneous Non- Developable Areas	4.3

Of the total 1,858.3 square miles in the MNC Watershed, it is estimated that all but 33.8 square miles are available to be developed or have development and population currently in place.

The bulk (79%) of MNC Watershed has been mapped for flood hazards. The remaining unmapped areas include the portions of Harper, Ellis, Major and Dewey County located in the watershed.

Major County has been partially mapped; however, none of the mapped area is located in the MNC Watershed. Blaine County is mapped in paper Flood Insurance Rate Maps (FIRMs) only and was not included in FEMA’s Map Modernization Program. This county covers 19.2% of the watershed.

Currently, all communities but Greenfield, Mutual and Longdale participate in the NFIP. The Cheyenne-Arapaho Tribes of Oklahoma do not participate in the NFIP. The effective dates for the current county-wide Flood Insurance Rate Maps (FIRMs) are shown in Table 2.

Table 2: Effective Flood Insurance Rate Map Dates

County	Status	Effective Date
Blaine County	Effective	8/2/1995
Canadian County	Effective	9/26/2008
Dewey County	N/A	N/A
Ellis County	N/A	N/A
Harper County	N/A	N/A
Major County*	N/A	N/A
Oklahoma County	Effective	12/18/2009
Woodward County	Effective	1/18/2012

* Major County has been partially mapped – City of Fairview (1988) and Town of Cleo (1985). Neither community is located in the MNC Watershed.

As for streams within the watershed, the U.S. Geological Survey (USGS) provides the National Hydrologic Dataset (NHD), consisting of hydrologic spatial files that can be used to identify stream locations. The NHD stream mileage was used to approximate the total potential stream miles for the watershed. Artificial flow paths were removed from the count, and only natural flow paths were counted. A total of 2,504 miles of streams were calculated using the NHD.

Additionally, the Coordinated Needs Management Strategy (CNMS) database maintained by FEMA also provides mileage information for streams in FEMA’s floodplain inventory. In general, the stream mileage shown in CNMS reflects streams that have effective Special Flood Hazard Areas (SFHAs) designated for them. Table 3 compares the NHD data to the CNMS data in the MNC Watershed. It summarizes the status and attributes of studies in FEMA’s floodplain inventory.

Table 3: Stream Miles in the Watershed

Source	Stream Miles
NHD streams	2504.1
CNMS streams (streams with effective SFHA's)	637.7
NHD stream miles not accounted for in CNMS	1764.9

NHD = National Hydrologic Dataset
CNMS = Coordinated Needs Management Strategy
SFHA = Special Flood Hazard Area

The CNMS database assists in evaluating the validity of data contained in FEMA's floodplain inventory – and its goal is to determine whether or not there is an adequate level of flood hazard risk recognized on that particular community's FIRM. This process evaluates the existing study alongside seventeen potential indicators that may have occurred since the date of the effective analysis. These indicators include changes in land use, new or removed bridges or culverts, changes in discharge or gage record, and significant channel fill or scour.

In addition to listing the number of miles of studied stream within a watershed, CNMS documents contain physiological, climatological, or engineering methodological factors that may have changed since the date of the effective flood studies. The stream miles shown in CNMS are attributed with a Validation Status and Status Type that allows an evaluation of the condition of a given study or group of studies. Studies considered Valid in CNMS are the only ones that contribute to the New Validated or Updated Engineering (NVUE) metric.

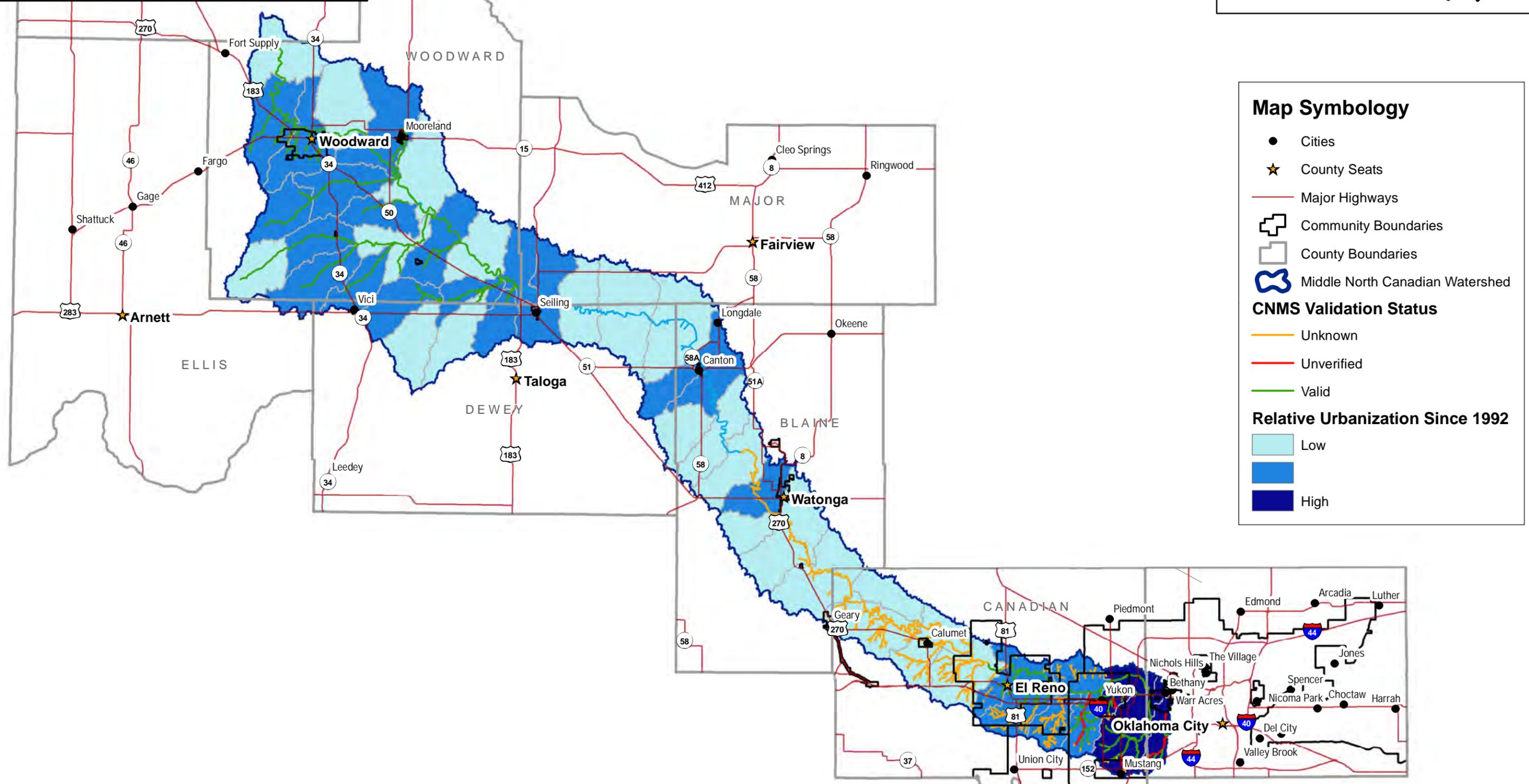
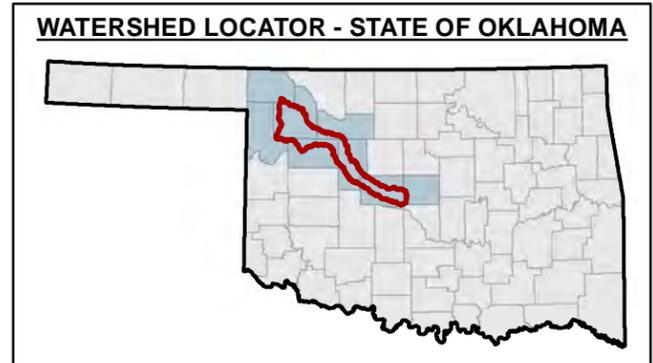
Figure 2 shows areas of relatively higher urban change within the watershed. As previously mentioned, this is one factor that can be used to help determine if streams are Valid. Streams are Valid if they meet NVUE Criteria. See Section III.iv, "Post-Discovery CNMS Analysis", for more information. The NVUE metric is an indicator of the status of studies for the FEMA mapped SFHA inventory. The categorization of these studies as Unverified typically means that there has been some factor of change since the SFHA became effective, or the effective SFHA may have a deficiency, such as areas with more than five new or removed hydraulic structures (bridge/culvert) in the SFHA or hot spots of Repetitive Loss/Severe Repetitive Loss (RL/SRL) properties, warranting restudy. CNMS stream mileage categorized as "Requires Assessment" requires more input to determine their validity, often because they represent paper inventory or non-modernized studies.

CNMS aids in identifying areas to be considered for study during the Discovery process by highlighting needs on a map, quantifying them (by mileage), and providing further categorization of these needs. Table 4 summarizes the NVUE stream mileage from CNMS for the MNC Watershed.

Figure 2: 10 Year View of Urban Change within the Watershed

Middle North Canadian Watershed

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Map Symbology

- Cities
- ★ County Seats
- Major Highways
- ⊕ Community Boundaries
- County Boundaries
- ⊖ Middle North Canadian Watershed

CNMS Validation Status

- Unknown
- Unverified
- Valid

Relative Urbanization Since 1992

- Low
- Medium
- High

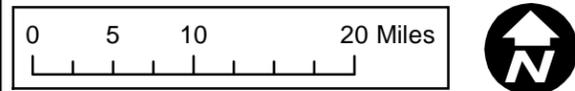


Table 4: NVUE Approximate Stream Mileage in the Watershed

NVUE Validation Status	Stream Miles
CNMS Valid Zone AE/AH/AO	114.0
CNMS Valid Zone A	224.9
CNMS Unverified Zone AE/AH	25.1
CNMS Unverified Zone A	0.0
CNMS Zone AE/AH Requiring Further Assessment or in the process of being studied	10.0
CNMS Zone A Requiring Further Assessment	263.2
All Stream Miles not accounted for in CNMS as there are no effective SFHAs (sum of the below)	1764.9
Stream Miles not accounted for in CNMS that would fall in land that could be developed	1649.3
Stream Miles not accounted for in CNMS that would fall in land that could not be developed	115.6

NVUE= New Validated or Updated Engineering
 CNMS= Coordinated Needs Management Strategy

An aggregated parcel summarization data set has been created for counties intersecting the LNC Watershed. Coverage for this data set includes polygons approximately one river mile in length and derived from the extent of existing SFHAs and surrounding areas where FIRMs exist. The data set coverage uses a set width buffer around stream reaches where SFHAs do not currently exist.

Table 5 includes recent disaster declarations in the MNC Watershed. Since 2007, five disaster declarations have involved flooding, averaging to about one major flood-related disaster per year. A review of declared disasters over the past 25 years reveals an average of one flood-related disaster every two years.

Table 5: Recent Disaster Declarations in the Watershed

Date	County	Disaster
8/24/2007	Blaine, Canadian, Oklahoma, Major	Severe Storms, Tornadoes, and Flooding
7/9/2008	Blaine, Dewey, Ellis, Harper, Major	Severe Storms and Flooding
10/8/2008	Dewey, Ellis, Harper, Major, Woodward	Severe Storms, Tornadoes, and Flooding
2/15/2009	Oklahoma	Severe Storms and Tornadoes
6/19/2009	Oklahoma	Wildfires
3/5/2010	Blaine, Canadian, Dewey, Ellis, Major	Severe Winter Storm
7/26/2010	Major, Oklahoma	Severe Storms, Tornadoes, Straight-line Winds and Flooding
6/6/2011	Blaine, Canadian, Major	Severe Storms, Tornadoes, Straight-line Winds, Flooding

Table 6 shows the status of all the mitigation plans within the watershed. The Discovery process is a good opportunity for FEMA and State officials to touch base with local officials on the status of their mitigation plans. More information about mitigation plans for communities within the watershed is found in the Discovery Engagement Plan.

Table 6: Mitigation Plan Status

Organization and Plan	Date Approved by FEMA	Expires	Comments
State of Oklahoma Hazard Mitigation Plan	2/17/2011	2/16/2014	Adopted - 1/27/2011
Blaine County Hazard Mitigation Plan	3/21/2011	3/20/2016	
Canton, Town of	7/02/2007	7/1/2012	In County Plan
Geary, City of	3/21/2011	3/20/2016	In County Plan
Greenfield, Town of	3/21/2011	3/20/2016	In County Plan
Watonga, City of	3/21/2011	3/20/2016	In County Plan
Canadian County Hazard Mitigation Plan	4/23/2004	4/22/2009	Being Written
Calumet, Town of	7/16/2004	7/15/2009	To be added to County Plan
El Reno, City of	3/31/2004	3/30/2009	To be added to County Plan
Mustang, City of	7/26/2004	7/25/2009	To be added to County Plan
Union City, Town of	7/07/2004	7/06/2009	To be added to County Plan
Yukon, City of	5/25/2011	5/24/2016	
Dewey County Hazard Mitigation Plan	12/11/2009	12/10/2014	
Seiling, Town of	12/11/2009	12/10/2014	In County Plan
Vici, Town of	12/11/2009	12/10/2014	In County Plan
Ellis County Hazard Mitigation Plan	7/29/2008	7/28/2013	
Harper County Hazard Mitigation Plan	8/02/2011	8/01/2016	
Major County Hazard Mitigation Plan	9/16/2004	9/15/2009	Plan undergoing update
Oklahoma County Hazard Mitigation Plan	9/10/2007	9/09/2012	Plan Being Written
Bethany, City of	9/10/2007	9/09/2012	In County Plan
Oklahoma City, City of	11/27/2006	11/26/2011	Plan Being Written (separate plan from County)
Warr Acres, Town of	9/10/2007	9/09/2012	In County Plan
Woodward County Hazard Mitigation Plan	7/29/2008	7/28/2013	
Mooreland, Town of	7/29/2008	7/28/2013	In County Plan
Mutual, Town of	7/29/2008	7/28/2013	In County Plan
Sharon, Town of	7/29/2008	7/28/2013	In County Plan

Organization and Plan	Date Approved by FEMA	Expires	Comments
Woodward, City of	7/29/2008	7/28/2013	In County Plan

Table 7 shows NFIP insurance claims by communities and counties in the watershed. Claims for each community are for the whole community, including areas outside of the watershed. Over 92% of the flood insurance claims are from four communities - Oklahoma City, El Reno, Yukon, and Woodward.

Table 7: NFIP Insurance Claims by County and Community in the Watershed*

Community	Claims
Blaine County, Unincorporated Areas	3
Canton, Town of	0
Greenfield, Town of	0
Longdale, Town of	0
Watonga, City of	5
Canadian County, Unincorporated Areas	24
Calumet, Town of	0
El Reno, City of	46
Mustang, City of	7
Union City, Town of	0
Yukon, City of	48
Geary, City of	0
Dewey County, Unincorporated Areas	0
Seiling, Town of	0
Vici, Town of	0
Ellis County, Unincorporated Areas	0
Harper County, Unincorporated Areas	0
Major County, Unincorporated Areas	0
Oklahoma County, Unincorporated Areas	47
Bethany, City of	9
Oklahoma City, City of	1102**
Warr Acres, City of	6
Woodlawn Park, Town of	0
Woodward County, Unincorporated Areas	1
Mooreland, Town of	0
Mutual, Town of	0
Sharon, Town of	0
Woodward, City of	42

Community	Claims
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* Claims for each community are for the whole community, including areas outside of the watershed.

**85 percent of Oklahoma City area is located outside of this watershed.

In addition to NFIP claims, there are several RL/SRL properties in the MNC Watershed. As expected, most of the RL/SRL properties are in and around Oklahoma City. Table 8 summarizes these claims by county and community within the watershed. Communities not shown in Table 8 do not have identified RL/SRL properties. The total number of RL/SRL is 46 claims for the paid amount of \$1,018,065.44. The average paid per claim is \$22,131.86.

Table 8: Non-Mitigated Repetitive and Severe Repetitive Losses (RL/SRL) in Watershed*

By County (Unincorporated)			
County	Number of Properties	Total Claims	Average Number of Claims per Property
Canadian County	3	13	4.3
By Community			
Community	Number of Properties	Total Claims	Average Number of Claims per Property
City of Bethany	1	2	2
City of Mustang	1	3	3
City of Oklahoma City	6	12	2
City of Woodward	2	4	2
City of Yukon	4	12	3

*Communities not shown do not have any identified RL/SRL properties.

During the Discovery process, watersheds are selected and analyzed at the HUC-8 level and evaluated using three major factors: population, topographic data availability, and risk decile. Risk decile is ranked 1 to 10, with 1 being the highest and 10 being the lowest. Risk decile is calculated using the following nine parameters:

- Population density
- Historical population growth
- Predicted population growth
- Number of housing units
- Number of flood policies
- Number of single claims
- Number of repetitive losses
- Number of repetitive loss properties
- Number of declared disasters

Recent acquisition of topographic data has been or will soon be completed for Canadian County and portions of Oklahoma County and Blaine County¹. Light Detection and Ranging (LiDAR) data was obtained for El Reno, Oklahoma, in 2011. Also, the City of Bethany has recently updated its topographic dataset.

Areas that are noted to be lacking updated topographic information include the northern portion of Blaine County, and all of Dewey, Major and Woodward County that fall within the HUC8. Only USGS 10-meter Digital Elevation Model (DEM) data is available for these missing areas.

Figure 3 shows risk factors and topographic data availability for the watershed. This information, along with the rankings of smaller HUC-12 sub-watersheds, helps identify stream segments and locations where risk evaluation can be targeted. Additionally, to assist risk assessment, available parcel, population and NFIP claim information was correlated with stream miles derived from existing SFHA and NHD for mapped and unmapped streams, respectively. Taking this information into account may assist in the process of identifying additional areas of risk which may derive from unmapped streams adjacent to areas having a high level of risk exposure, or mapped streams with high levels of risk exposure just beyond existing SFHA bounds.

Table 9 shows the overall rankings of the MNC Watershed compared to other HUC-8 watersheds nationally and regionally. The combination of these factors was important in the selection of this watershed for a Discovery project.

Table 9: Watershed Risk Factor Rankings

Middle North Canadian Watershed Selection Rankings
National Risk Factor Rank: 490 National Risk Decile: 2 Average Annualized Loss: \$ 19.6 million National Average Annualized Loss Rank: 421 National Overall Rank: 486
Region 6 Risk Factor Rank: 181 Region 6 Risk Decile: 2 Average Annualized Loss: \$ 19.6 million Region 6 Average Annualized Loss Rank: 209 Region 6 Overall Rank: 125

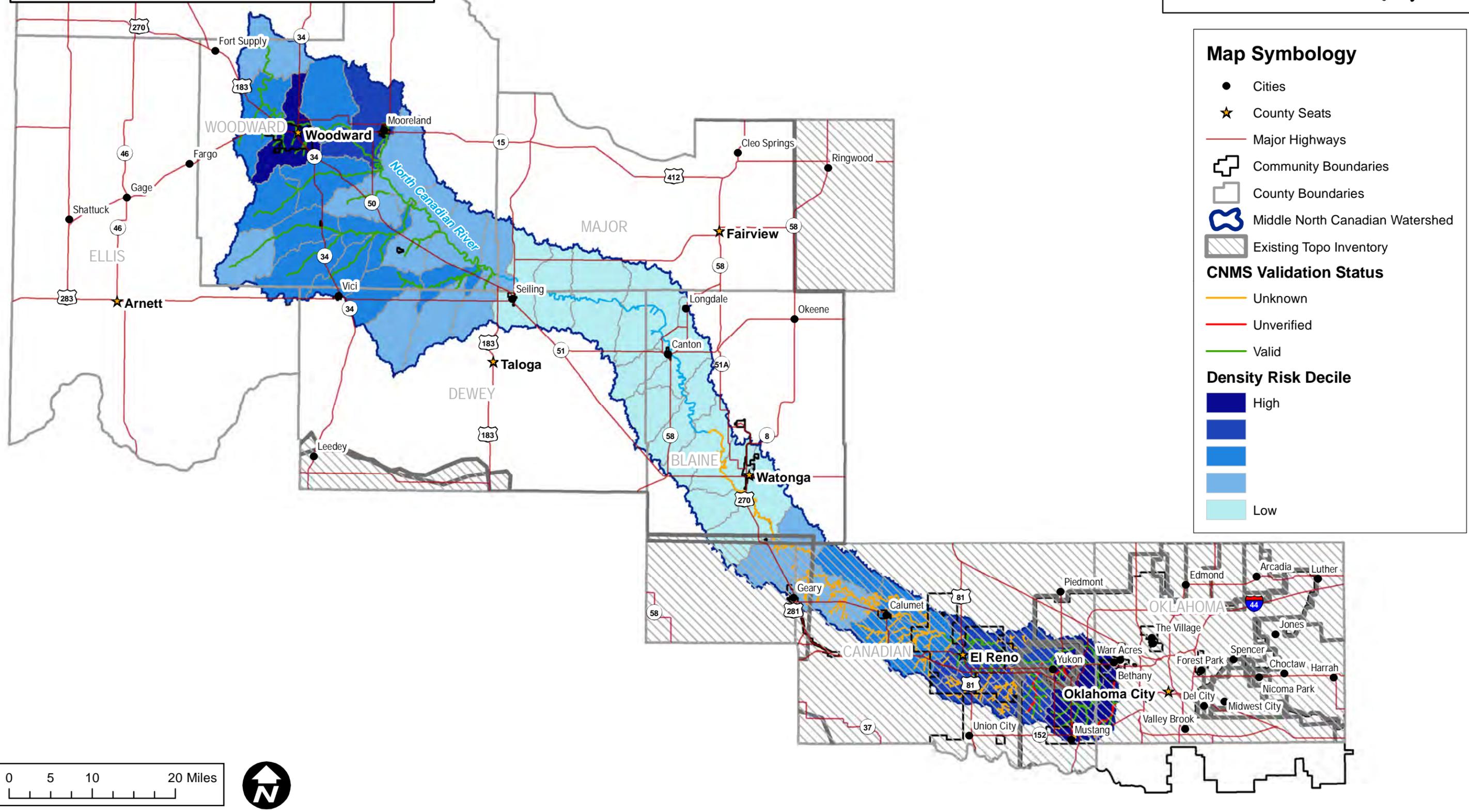
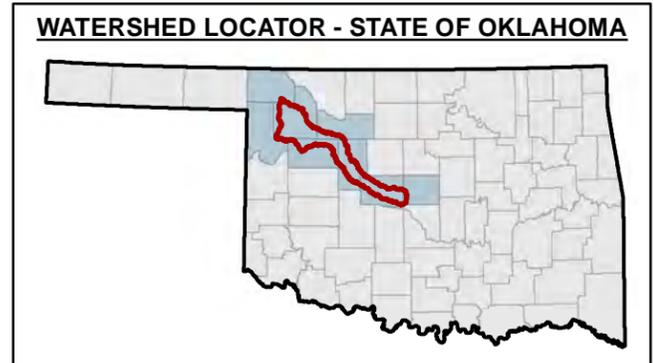
All background information in this report for population data, historical flooding, and community information was obtained from the Coordinated Needs Management Strategy (CNMS), effective Flood Insurance Study (FIS) reports, State and local hazard mitigation plans and data filed at FEMA Region VI.

¹ Source: Oklahoma NRCS LiDAR Coverage, United States Department of Agriculture (NRCS 2-meter Priority Project Area for 2012).

Figure 3: Risk Factors and Topographic Data Availability for the Watershed

Middle North Canadian Watershed

Jul 26 2012



Map Symbology

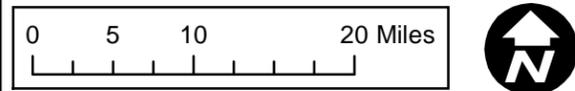
- Cities
- ★ County Seats
- Major Highways
- ⊕ Community Boundaries
- County Boundaries
- ⊕ Middle North Canadian Watershed
- ▨ Existing Topo Inventory

CNMS Validation Status

- Unknown
- Unverified
- Valid

Density Risk Decile

- High
-
-
-
- Low



II. Discovery Efforts

i. Engagement Plan

The MNC Watershed Engagement Plan was prepared during Pre-Discovery by the Project Team. The Project Team was made up of the staff shown in Table 10 below.

Table 10: Project Team

Name	Organization	Project Role
Ron Wanhanen	FEMA Region VI	Project Monitor – Engineering and Mapping Lead
Shanene Thomas	FEMA Region VI	Mitigation Planning Oversight
Don Davis	FEMA Region VI	Grants Specialist
Diane Howe	FEMA Region VI	Outreach Specialist
Roberto Ramirez	FEMA Region VI	Insurance Oversight
Joe Remondini	USACE	Flood Risk Engineer
Brittnee Preston	Congressman Lankford	Field Representative
Lynne Hill	Congressman Lucas	Field Representative
Stratton Edwards	Congressman Cole	Field Representative
Sara Drozdowski	Senator Inhofe	Field Representative – FEMA Contact
Cale Walker	Senator Inhofe	Field Representative – Northwest Region
Brian Hackler	Senator Inhofe	Field Representative – Central Region
Matt Ball	Senator Coburn	Field Representative
Kent Wilkins	OWRB	CTP Project Manager
Gavin Brady	OWRB	State NFIP Coordinator/Compliance
Matthew Rollins	OWRB	GIS Specialist
Robert Fabian	OWRB	State Dam Safety Officer
Carl Watts	FEMA – Contractor	Insurance Specialist
Bill Penka	OEM	State Hazard Mitigation Officer
Janet Meshek	Meshek & Associates	Discovery Project Manager
Ana Stagg	Meshek & Associates	CTP Project Manager
Brandon Claborn	Meshek & Associates	Project Engineer
Chris Duncan	Meshek & Associates	Project Engineer
Michael Couch	Meshek & Associates	GIS Specialist
Rita Henze	Meshek & Associates	Hazard Mitigation Plan Specialist
Lacie Jones	Meshek & Associates	Discovery Coordinator

FEMA = Federal Emergency Management Agency

USACE = U.S. Army Corps of Engineers

OWRB = Oklahoma Water Resources Board

OEM = Oklahoma Emergency Management

The Engagement Plan is a tool that allows Project Team members to understand the history of the watershed and highlights recent engagements performed by FEMA Region VI Mitigation Division and OWRB. In addition to contact information for key stakeholders and organizations in the watershed, the Engagement Plan captures media outlet information, the location and summary of recent articles or news releases, a strategy for keeping Congressional liaisons involved in the Discovery process, and a history of communications. The various team members can use the Engagement Plan to strategize communications to the various groups within the watershed, to deliver the Discovery Meeting messages and vision, and to track hot topics or points of interest.

The Engagement Plan served as the initial repository for summary information about the watershed. Data for the MNC Watershed were discussed in the Pre-Discovery Data Gathering section of the Engagement Plan to provide background for the selection process to proceed through the Discovery process. This plan served as a clearinghouse for information about mitigation planning, active and closed grants, insurance policy information, socioeconomic overviews of the communities, and a review of the recent mapping initiatives in the watershed. From this collective review of the watershed, the project team (1) identifies how communities – within a project area – ought to be engaged, and (2) selects from a high, medium, or low engagement strategy based on the risk, need, and political will of the communities.

ii. Pre-Discovery Efforts

FEMA and the project team contacted watershed stakeholders via letters, telephone calls, emails, and an interactive web-media before the Discovery Meeting to request local participation and identify key people to include in the Discovery process. Stakeholders were also asked to provide any data that could assist in risk identification in the watershed.

In preparation for the Discovery Meeting, the Project Team:

- Gathered information about local flood risk and flood hazards.
- Reviewed mitigation plans to understand local mitigation capabilities, hazard risk assessments, and current or future mitigation activities.
- Encouraged communities in the watershed to develop a vision for the watershed's future.
- Used all information gathered to determine which areas of the watershed might require further study through a Risk MAP project.

The Project Team then began outreach efforts to the local governments in the watershed, along with Federal and State Congressional representatives, public officials (including floodplain managers, emergency managers, and planners), the USACE, State departments, and the Cheyenne-Arapaho Tribes of Oklahoma to inform them of the Discovery process and invite them to participate and contribute relevant information. The following key steps were taken before the Discovery Meeting was held:

- OWRB's contractor, Meshek & Associates, PLC, organized the meeting dates, locations, and facilities.
- OWRB invited USACE and FEMA to participate as active members of the Project Team.

- Identified stakeholders included community policymakers and decision makers; floodplain administrators; federal, state, and local officials; the Cheyenne- Arapaho Tribes, interest groups and others.
- A website was established to allow electronic interaction between the Project Team and the stakeholders. Stakeholders were notified of the website and provided access to enter important data regarding known flood risk areas.
- The Project Team contacted stakeholders via telephone to inform them of the meetings and to request data. Phone calls to stakeholders were followed with a combination of emails, faxes, newsletters, U.S. mail, and the interactive website to maintained stakeholders engaged in the process. Stakeholders were requested and encouraged to identify and notify other stakeholders.
- Invitation letters, a watershed map, and a Data Questionnaire were emailed to stakeholders and the media.
- An invitation with meeting details was emailed to the membership of the Oklahoma Floodplain Managers Association (OFMA).
- The Project Team followed the initial contacts with regular emails to remind stakeholders of the meeting details and to further encourage attendance to the meeting.
- The website was updated routinely with meeting specifics and updated watershed information to maintained stakeholders informed of data collection progress.

Copies of key correspondence associated with Discovery are included with the supplemental digital data that accompanies this report.

iii. Discovery Meeting

One Discovery Meeting was held for the MNC Watershed. The meeting time and location are shown below in Table 11.

Table 11: Project Discovery Meeting Time and Location

Date and Time	Location
March 1, 2012 9:00AM-12:00PM	City Council Chambers 101 N. Choctaw Avenue El Reno, OK

The format for the Discovery Meeting was an informal “Come and Go” style with two brief presentations interspersed during the first and last hour of the three hour time period. Presentations consisted of one formal presentation and a second less formal presentation to provide attendees an overview of Risk MAP, its purpose and process, including the purpose behind the Discovery Meeting, and introduce the attendees to the different Discovery stations and Project Team. Large scale watershed maps, using aerial photography of the watershed overlaid with the local County and community boundaries and road names, were located along one wall and included the following information:

- Flood risk, need, and topographic data
- Population density
- Urbanization
- Stream miles mapped
- Current Letters of Map Change (LOMCs)
- RL/SRL claims
- Hazard mitigation grant activity
- Hazard Mitigation Plans

Every attendee received a packet of information including the following information:

- Understanding Risk in Watersheds – Discovery in Middle North Canadian Watershed
- Watershed Talking Points: Key Messages for Middle North Canadian Watershed
- FEMA Hazard Mitigation Assistance
- FEMA Unified Hazard Mitigation Assistance Grant Programs
- FEMA Mitigation Planning
- HUC-8 Middle North Canadian Watershed Locator Map
- FEMA New Levee Analysis and Mapping Approaches Being Mapped Fact Sheet
- Middle North Canadian Watershed Pre-Discovery Newsletter
- The Voice Newsletter
- FEMA What Is Risk MAP?
- Risk MAP Discovery Brochure
- FEMA Risk MAP Process Path
- FEMA Do You Have a Hazard Mitigation Plan?
- FEMA Tribal Mitigation Planning
- Middle North Canadian Watershed Engagement Plan Executive Summary
- The Middle North Canadian Watershed List of Communities
- List of FEMA Acronyms and Abbreviations

Four Discovery stations, focusing on Grants, Planning, Compliance and Mitigation, and Mapping, were available for attendees to interact with knowledgeable staff. Each station was equipped with a copy of the NFIP “Answers to Questions About the NFIP”, March 2011, as well as comment sheets to document flood issues, areas of concerns, and any other information provided by individual attendees.

At each station, attendees were asked to contribute watershed information and issues on a comment form. Members of the Project Team were available at each station to answer questions and collect watershed and community-specific flood-related information and concerns. Attendees were also able to point out on the watershed maps any flood hazard concerns or issues and then mark them on the maps. After visiting a station, attendees rotated to the next station, and each attendee was encouraged to stop at all four stations. Attendees were encouraged to provide any relevant information (not brought with them to the Discovery Meeting) to the Project Team afterward.

Information sheets were collected at each station and the Discovery watershed maps were collected for future reference. These information sheets are included in the supplemental digital data that accompanies this report.

The four stations also had the following:

- *Mapping Station:* The Mapping station was divided into three mini-stations, each one equipped with a computer which provided attendees immediate access to a GIS web-based viewer and allowed attendees to identify quickly and easily localized flood problems, known areas of risk, concerns related to effective FIRMs, and any recent flood mitigation projects. Locations and areas of hazards and risks identified by attendees were then flagged within the watershed with an identification number and the data were input into the computer as well as logged on individual comment sheets also using the same identification number. OWRB staff assisted at the Mapping station.
- *Grants Station:* Community Benefits and Grant Opportunities – This station was manned by the Oklahoma State Hazard Mitigation Officer (SHMO) who informed attendees of grant opportunities and availability as well as provided handouts on various FEMA grant programs.
- *Planning Station:* Mitigation Planning and Mitigation Activities – Experienced GIS staff and hazard mitigation planners were available at this station to answer attendee questions and collect information regarding the availability and status of hazard mitigation plans and/or emergency action plans, any GIS-based community data, land use data, hazard mitigation projects underway or constructed since the update of the hazard mitigation plans, any environmental issues, and tribal data.
- *Compliance and Mitigation Station:* NFIP Community Actions – The Oklahoma NFIP Coordinator and an NFIP representative were present at this station to explain available NFIP opportunities and insurance availability as well as collect current data from attendees and establish follow up visits with the counties, communities and tribe(s) within the watershed.

iv. **Data Gathering Overview**

The Discovery Meeting was attended by local participants. A full list of attendees is provided in the sign-in sheets in the digital data that accompanies this report. The meetings were well attended with most local communities represented. Attendees included:

- Federal and State agencies
- Congressional representatives
- County Commissioners
- Conservation District staff
- City Managers
- Local Tribes
- Local Floodplain Managers
- Emergency Management staff
- Community Planners
- Community Public Works staff

The meeting afforded personal, interactive communication with attendees at each station. The Project Team interviewed attendees and listed areas of positive mitigation and ongoing concerns for the watershed.

Feedback from the attendees indicated that they felt this was an opportunity to express their concerns about the watershed and that they preferred the interactive stations rather than a lengthy presentation. Many attendees were appreciative of the chance to speak with the Project Team members from both FEMA and the State of Oklahoma. Some information that was collected included:

- Areas with local drainage or surface water flooding issues
- Places where bridges or roads are regularly closed due to flooding or flooded
- Places where structures flood and there is no current SFHA defined
- Places where the effective FIRM and FIS products were believed not to reflect actual conditions
- Areas that have been mitigated through buy-out or elevation of structures
- Areas of high urban change and planned growth
- Studies being conducted by others that could be of use in future mapping and mitigation activities

The information from the comment forms and the locations of the concerns were compiled into a spatial data set after the meeting. This spatial set is included in the digital data accompanying this report.

Data collected – from websites, outreach contacts and email solicitations prior to the Discovery Meeting – are summarized in Table 12.

Table 12: Data Collection Summary - Pre-Discovery Meeting

Data Location	Data Custodian	Data Set Description
Watershed-wide	FEMA	Effective FIRM and FIS and back-up
Watershed-wide	FEMA	Letter of Map Change (LOMC) locations
Watershed-wide	OWRB	Locations of Repetitive Loss/Severe Repetitive Loss (RL/SRL)
Watershed-wide	FEMA	Location of funded grants
Watershed-wide	U.S. Census	Populated area and population characteristics
Watershed-wide	FEMA	Location of available or planned areas of updated Light Detection and Ranging (LiDAR) or other topographic data
Watershed-wide	USGS	Watershed HUC boundaries, NHD streams, stream gage information
Watershed-wide	FEMA	Participation in the NFIP, Community Rating System (CRS) ratings
Watershed-wide	Community Representatives	Currently accepted HMPs
Watershed-wide	FEMA	Disaster Declarations
Watershed-wide	FEMA	CNMS information

Availability of topographic data is a critical factor considered in the selection and/or analysis of watersheds. Preliminary research indicates that much of the MNC Watershed has available, updated topographic data. Prior to the meeting, the City of Bethany noted communicated that it has recently updated its topographic data. Additionally, Light Detection and Ranging (LiDAR) data appears available for some areas in Caddo County, southern Blaine County and portions of western Canadian County. FEMA Region VI data also records that photogrammetric data was collected in Oklahoma City during 2010-2011.

Table 13 summarizes the comments and issues collected at the four stations during the Discovery Meeting. Scans of comment forms are included in the digital deliverables. Locations of concerns and other comments have been recorded in an ESRI spatial file and included in the digital deliverables. Some areas of concern identified at the meetings were determined to be outside the watershed and have been noted in the table.

Table 13: Summary of Data Collected During the Discovery Meeting and Post-Meeting

Issues and Concerns Collected During the Discovery Meeting and Post-Meeting			
Item	Flooding Source	Information Provided by	Discovery Meeting Comment Summary
C1	City of Woodward	City of Woodward	<ul style="list-style-type: none"> The City of Woodward has a repetitive loss structure (could not recall the address of the structure). The City requested information on Hazard Mitigation Grants to remove the structure from the floodplain.
M1	North Persimmon Creek	Oklahoma Department of Transportation	<ul style="list-style-type: none"> Woodward County, east of Sharon, bridges have washed out. Two structures east of Sharon on Sharon Shattuck Road were lost.
M2	North Canadian River	Oklahoma Department of Transportation	<ul style="list-style-type: none"> The north side of Woodward County floods (refer to dot 34c near state highway).
M3	North Canadian River	Oklahoma Department of Transportation	<ul style="list-style-type: none"> Major County has flooding along US 60.
M4	Indian Creek and Woodward Creek	Oklahoma Department of Transportation	<ul style="list-style-type: none"> Indian Creek and Woodward Creek floods are severe enough to affect school bus routes and commuters.
M5	North Canadian River	Oklahoma Department of Transportation	<ul style="list-style-type: none"> Western Avenue in Woodward County has washed out several times. Contact Woodward County Commissioners for more information on the subject.
M6	Persimmon Creek	Oklahoma Department of Transportation	<ul style="list-style-type: none"> The structure on US Highway 183 near E 0530 Road has siltation.
M7	Persimmon Creek	Oklahoma Department of Transportation	<ul style="list-style-type: none"> The structure on US Highway 183 south of E 0530 Road has scouring. This highway floods.
M8	Indian Creek	Oklahoma Department of Transportation	<ul style="list-style-type: none"> In Woodward County, a new structure has been constructed at N/S 210 and E/W 45.1 after the old structure failed.
M9	North Canadian River	Oklahoma Department of Transportation	<ul style="list-style-type: none"> Roadway flooding occurs at SH 34C and along the county road upstream (to the west).
M10	North Canadian River	Oklahoma Department of Transportation	<ul style="list-style-type: none"> A new culvert has been constructed at County E/W 39 (Western Avenue) in Woodward County after the old culvert blew out.

Issues and Concerns Collected During the Discovery Meeting and Post-Meeting			
Item	Flooding Source	Information Provided by	Discovery Meeting Comment Summary
M11	Twin Lakes	City of Warr Acres	<ul style="list-style-type: none"> In Bluff Creek in Warr Acres, several LOMAs exist, but flood maps do not reflect current conditions. Approximately 30 LOMAs have been completed along the Twin Lakes chain of lakes.
M12	North Canadian River	Dewey County	<ul style="list-style-type: none"> Flooding occurs along US 60 and the downstream county roads.
M13	Twin Lakes	City of Warr Acres	<ul style="list-style-type: none"> A localized intersection near the intersection of 34th and Hammond floods.
M14	City of Woodward	City of Woodward	<ul style="list-style-type: none"> The City would like to have its Zone AO floodplain studied and become a Zone AE to determine base flood elevations for regulation.
M15	City of Woodward	City of Woodward	<ul style="list-style-type: none"> Since the early 1980s a new detention pond has existed near the intersection southwest of 13th and Cedar.
M16	City of Woodward	City of Woodward	<ul style="list-style-type: none"> A second smaller detention structure exists immediately southwest of 13th and Cedar in series with the larger pond.
M17	City of Yukon	City of Yukon	<ul style="list-style-type: none"> There is a potential LOMR at Main and Piedmont in the City of Yukon.
M18	Turtle Creek	City of Yukon	<ul style="list-style-type: none"> A new study for Turtle Creek has been done.
M19	North Canadian River	City of Yukon	<ul style="list-style-type: none"> The North Canadian River was straightened in the past and levees were constructed. The levees located downstream of Canton near El Reno within Yukon's city limits are in disrepair and failing.
M20	City of Yukon	City of Yukon	<ul style="list-style-type: none"> The City will provide additional information on structures that have been replaced.
M21	City of Yukon	City of Yukon	<ul style="list-style-type: none"> There is a City limit boundary error northeast of Richard Road and 2nd Street near Shell Creek.
M22	City of Yukon	City of Yukon	<ul style="list-style-type: none"> North Mustang Road has been renamed North and South Yukon Parkway within Yukon's city limits.

Issues and Concerns Collected During the Discovery Meeting and Post-Meeting			
Item	Flooding Source	Information Provided by	Discovery Meeting Comment Summary
M23	City of Yukon	City of Yukon	<ul style="list-style-type: none"> • A flooding problem exists along State Highway 4 (Piedmont Road) north of Yukon. • Currently, this highway is in the design phase of replacement.
M24	North Canadian River	City of Yukon	<ul style="list-style-type: none"> • A new bridge on 11th Street over the North Canadian River has been constructed.
M25	Purcell Creek	Canadian County	<ul style="list-style-type: none"> • New structures have been added along Purcell Creek. • A detailed study is needed due to added impervious area and anticipated growth. • Detailed topographic data is available for a detailed study.
M26	Canadian County	Canadian County	<ul style="list-style-type: none"> • There is a new bridge on Reno Road. • 15th Street needs a new bridge.
M27	Canadian County	Canadian County	<ul style="list-style-type: none"> • Several bridges are ready to be constructed along North Banner Road at 10th Street (right of way acquisition is in progress), South Banner Road at 10th Street (right of way acquisition is in progress), and Manning Road at 10th Street.
M28	Purcell Creek	Canadian County	<ul style="list-style-type: none"> • Highway 66 at Banner Road over Purcell Creek was replaced in 2009.
M29	Purcell Creek	Canadian County	<ul style="list-style-type: none"> • Purcell Creek has a debris problem.
M30	Sixmile Creek	Canadian County	<ul style="list-style-type: none"> • Sixmile Creek Tributary at Highway 81 and Reno needs the AE zone extended through the Zone A.
M31	Canadian County	Canadian County	<ul style="list-style-type: none"> • Chesapeake Oil and Gas has developed in the area. • A new residential development exists in the area near Highway 81 and Reuter Road.
M32	Sixmile Creek	Canadian County	<ul style="list-style-type: none"> • Although the mainstem up to Sixmile Creek AE zone is “okay”, FEMA needs to extend the Zone AE through Zone A due to additional development being initiated from oil and gas development in the area near Reuter Road.
M33	Canadian County	Canadian County	<ul style="list-style-type: none"> • Canadian County is the fastest growing county in Oklahoma in terms of percent of population growth.

Issues and Concerns Collected During the Discovery Meeting and Post-Meeting			
Item	Flooding Source	Information Provided by	Discovery Meeting Comment Summary
M34	North Canadian River	Canadian County	<ul style="list-style-type: none"> North Canadian River is a Zone A between upstream and downstream Zone AE along Highway 81 (north and south).
M35	Skyview Tributary	Canadian County	<ul style="list-style-type: none"> Stream line of the Skyview Tributary does not follow the floodplain since the Map Mod addition was done.
M36	North Banner Road Tributary	Canadian County	<ul style="list-style-type: none"> New population growth has changed the hydrology in the North Banner Road Tributary. It is currently a Zone A and needs a detailed study.
M37	Cimarron Road Tributary	Canadian County	<ul style="list-style-type: none"> New population growth has changed the hydrology in the Cimarron Road Tributary. It is currently a Zone A and needs a detailed study.
M38	Richland Tributary	Canadian County	<ul style="list-style-type: none"> New population growth has occurred in the Richland Tributary area. It is a current Zone A and needs a detailed study.
M39	North Canadian River	Canadian County	<ul style="list-style-type: none"> In the North Canadian River DFIRM, the Zone AE and Zone A do not tie together and the channel is outside the floodplain area (Cimarron Road and Richland Road).
M40	Fourmile Creek Tributary	Canadian County	<ul style="list-style-type: none"> The floodplain for Fourmile Creek Tributary A-1 needs to be cleaned up.
M41	Fourmile Creek Tributary	Canadian County	<ul style="list-style-type: none"> Fourmile Creek Tributary floodplain has a disconnected Zone AE to a Zone X to nothing to Zone X to Zone AE through a residential area in El Reno.
M42	Seminole Creek	Canadian County	<ul style="list-style-type: none"> Roadway overtopping results in frequent road closures on State Highway 66 east of El Reno near N 2880 Road.
M42	Tributary 14	City of Oklahoma City	<ul style="list-style-type: none"> A LOMR was approved in 2011 for Tributary 14. A new hydrology model and a new HEC RAS model exist.

Issues and Concerns Collected During the Discovery Meeting and Post-Meeting			
Item	Flooding Source	Information Provided by	Discovery Meeting Comment Summary
M43	Purcell Creek	Canadian County	<ul style="list-style-type: none"> Canadian County has money for a potential study of Purcell Creek and a possible monetary match for LIDAR. Canadian County needs money for clearing and snag. USACE has made an initial study.
M44	Sixmile Creek Tributary	Canadian County	<ul style="list-style-type: none"> Chesapeake Oil and Gas is developing a piece of land with floodplain on it near the intersection of Jensen Road and South Radio Road in El Reno.
M45	City of El Reno	City of El Reno	<ul style="list-style-type: none"> There are ponding and flooding problems near Park Street and Sunset Drive.
N1	North Canadian River	Oklahoma Conservation Commission - WQ	<ul style="list-style-type: none"> Oil and gas exploration in the North Canadian River riparian areas is an area of concern. Another concern is the application of drilling muds on agricultural lands and the lack of low impact development ordinances in the urban communities of El Reno, Mustang, and Yukon.
N2	Oklahoma County	Oklahoma County	<ul style="list-style-type: none"> Outside watershed.
N3	City of Warr Acres	City of Warr Acres	<ul style="list-style-type: none"> Maps released for Oklahoma County in 2009 do not correctly reflect about 30 LOMAs. Maps show another subdivision to be in the floodplain instead of showing a LOMR.
N4	City of Warr Acres	City of Warr Acres	<ul style="list-style-type: none"> The City requested a copy of the Lower North Canadian Discovery Report.
N5	Citizen Potawatomi Nation	Citizen Potawatomi	<ul style="list-style-type: none"> Outside watershed. Citizen Potawatomi Nation requested to be invited to comment on Lower North Canadian Discovery Report and a copy of the Discovery Report when available.
N6	Town of Calumet	Town of Calumet	<ul style="list-style-type: none"> The town representative stated there were no issues.
N7	City of Yukon	City of Yukon	<ul style="list-style-type: none"> House Bill 2836 is an issue of concern for the City. The City would like to request repetitive loss information for its community. The City does not think it has any RLs.

Issues and Concerns Collected During the Discovery Meeting and Post-Meeting			
Item	Flooding Source	Information Provided by	Discovery Meeting Comment Summary
N8	City of El Reno	City of El Reno	<ul style="list-style-type: none"> The City of El Reno is interested in possible CRS participation and will check with OWRB.
N9	Central North Canadian River Conservation District	Central North Canadian River Conservation District	<ul style="list-style-type: none"> FEMA needs to contact the Greenfield area about participating in the NFIP program.
N10	East Canadian City Conservation District	East Canadian City Conservation District	<ul style="list-style-type: none"> Development is occurring in El Reno with oil companies moving in as well as development in Mustang and Yukon.
N11	East Canadian County Conservation District	East Canadian County Conservation District	<ul style="list-style-type: none"> Mitigation plans for East Canadian County are available in the District office.
N12	Dewey County	Dewey County	<ul style="list-style-type: none"> County Clerk Sandy Glenson (580-328-5361) needs to be contacted about possible enrollment in the NFIP program.
P1	City of Bethany	City of Bethany	<ul style="list-style-type: none"> The City is included in the County Hazard Mitigation Plan. The City does participate in the NFIP, but not in CRS. It updated its floodplain ordinance last year. The City is completely landlocked, and no new development is anticipated.
P2	City of Bethany	City of Bethany	<ul style="list-style-type: none"> The City recently had new contours flown and will send the CAD files.
P3	City of El Reno	City of El Reno	<ul style="list-style-type: none"> An EAP for Dam Number 1 was adopted in 2008. No other EAPs are known to exist.
P4	City of El Reno	City of El Reno	<ul style="list-style-type: none"> The City has land use data available and will provide its comprehensive land use map and zoning map.
P5	City of El Reno	City of El Reno	<ul style="list-style-type: none"> FEMA should talk to the Public Works Director.
P6	City of El Reno	City of El Reno	<ul style="list-style-type: none"> FEMA should check with County Floodplain Administrator regarding the Fourmile Creek flood map.
P7	City of El Reno	City of El Reno	<ul style="list-style-type: none"> City representative will check about existing High Water Marks.
P8	City of El Reno	City of El Reno	<ul style="list-style-type: none"> The City representative will check about photographs of High Water Marks.

Issues and Concerns Collected During the Discovery Meeting and Post-Meeting			
Item	Flooding Source	Information Provided by	Discovery Meeting Comment Summary
P9	City of Oklahoma City	City of Oklahoma City	<ul style="list-style-type: none"> City Hazard Mitigation Plan expired in November of 2011. The update is pending review at FEMA and has already been approved by OEM.
P10	City of Oklahoma City	City of Oklahoma City	<ul style="list-style-type: none"> Mitigation actions by Public Works.
P11	City of Oklahoma City	City of Oklahoma City	<ul style="list-style-type: none"> City of Oklahoma City is not a participant in CRS.
P12	City of Oklahoma City	City of Oklahoma City	<ul style="list-style-type: none"> The City has dam emergency plans (storm control and reservoirs).
P13	Dewey County Conservation District	Dewey County Conservation District	<ul style="list-style-type: none"> Representative was not aware of any Hazard Mitigation Plan in existence.
P14	Dewey County Conservation District	Dewey County Conservation District	<ul style="list-style-type: none"> Emergency Operations Plans (by facilities, such as nursing homes, safe rooms, etc.) exist.
P15	Dewey County Conservation District	Dewey County Conservation District	<ul style="list-style-type: none"> Dewey County does not participate in the NFIP.
P16	Dewey County Conservation District	Dewey County Conservation District	<ul style="list-style-type: none"> The Conservation District has some records of private dams and all conservation dams outside the Middle North Canadian watershed.
P17	Dewey County Conservation District	Dewey County Conservation District	<ul style="list-style-type: none"> The County is willing to authorize access to its county assessor records for the watershed.
P18	Dewey County Conservation District	Dewey County Conservation District	<ul style="list-style-type: none"> Dewey County has emergency operation plans. The County has no Hazard Mitigation Plan. Flooding in occurred in Seiling in 2002, and a bridge was taken out on the east side of the county (although unsure if located physically within the HUC-8 or not).
P19	Dewey County Conservation District	Dewey County Conservation District	<ul style="list-style-type: none"> Contact the county assessor for Dewey County for land use data.
P20	Dewey County Conservation District	Dewey County Conservation District	<ul style="list-style-type: none"> District will provide a hard copy of the approved Hazard Mitigation Plan which expires in 2014.

Issues and Concerns Collected During the Discovery Meeting and Post-Meeting			
Item	Flooding Source	Information Provided by	Discovery Meeting Comment Summary
P21	City of Oklahoma City	City of Oklahoma City	<ul style="list-style-type: none"> FIRM maps were updated December 2009. Some drainage projects have been completed since the last FIRM. LOMAs have been completed for any channel improvements.
P22	City of Oklahoma City	City of Oklahoma City	<ul style="list-style-type: none"> The City will provide any records of High Water Marks and drainage complaints.
P23	City of Oklahoma City	City of Oklahoma City	<ul style="list-style-type: none"> Currently, there are no Master Drainage Plans, but one is ready to start. There is inadequate staff to join the CRS.
P24	Canadian County	Canadian County	<ul style="list-style-type: none"> The County's Hazard Mitigation Plan expired in 2010. The update is pending revision and submission to OEM for review.
P25	Canadian County	Canadian County	<ul style="list-style-type: none"> There are local EAPs for dam breaches.
P26	Canadian County	Canadian County	<ul style="list-style-type: none"> The County will resend the parcel data.
P27	Canadian County	Canadian County	<ul style="list-style-type: none"> Canadian County is considering joining CRS.
P28	Canadian County	Canadian County	<ul style="list-style-type: none"> There is a High Water Mark in the unincorporated community of Banner on Banner Road.
P29	Canadian County	Canadian County	<ul style="list-style-type: none"> No mitigation projects have been completed since the last map update. No land use data are available.
P30	Canadian County	Canadian County	<ul style="list-style-type: none"> For more information, contact the County Emergency Manager at smithj@canadiancounty.org

Supporting information, data, and files collected for this report are included in the supplemental digital data submitted with this report. The following list is a directory of the available files and folders as well as the data found within each sub-folder. If a submittal was not applicable for the MNC Watershed, a Readme Text file was included in its place noting that it was not included.

11100301\Discovery

- Transmittal Letter

\1-Project_Discovery_Initiation

- Engagement Plan
- Community_Contact_List
- Project_Team_Information
- \GIS
 - HUC8_Middle_North_Canadian_Cities shapefile
 - HUC8_Middle_North_Canadian_Citywards shapefile
 - HUC8_Middle_North_Canadian_Cnty_Comm shapefile
 - HUC8_Middle_North_Canadian_COG_Boundaries shapefile
 - HUC8_Middle_North_Canadian_Counties shapefile
 - HUC8_Middle_North_Canadian_Precinct shapefile
 - HUC8_Middle_North_Canadian_School_Districts shapefile
 - HUC8_Middle_North_Canadian_School_Disctricts_Tax_2011 shapefile
 - HUC8_Middle_North_Canadian_ST_House shapefile
 - HUC8_Middle_North_Canadian_ST_Sentate shapefile
 - HUC8_Middle_North_Canadian_Tribal_Juris shapefile
 - HUC8_Middle_North_Canadian_US_Cong shapefile
 - HUC8_Middle_North_Canadian_Zipcodes shapefile
 - MNC_Basin_Boundaries_HUC8 shapefile
 - MNC_Roads_2008_Tiger shapefile

\2-Discovery_Meeting

- Attendance_Record
- Meeting_Agenda
- Meeting_Summary
- \Correspondence
 - Notification_and_Invitation_Letter
 - OK_Thank-You_Letter_DID_ATTEND
 - OK_Thank-You_Letter_DID_NOT_ATTEND

\3-Post_Discovery

- Mapping_Activity_Statement
- MNC_Discovery_Meeting_Surveys
- Middle_North_Canadian_Discovery_Report
- MNC_Potential_Projects
- \Discovery_Maps
 - Discovery Map Flood Risk
 - Discovery Map Flood Hazard
 - Geospatial Data Summary

\4-Supplemental_Data

- CTP_Discovery_Newsletter_MNC
- \Discovery_Meeting_Exhibits
 - Big_MNC_FloodRisk_36x36
 - Big_MNC_Grants_36x36
 - Big_MNC_HMP_Plans_36x36
 - Big_MNC_LOMX_36x36
 - Big_MNC_Mapping_Coverage_36x36
 - Big_MNC_Population_Density_36x36
 - Big_MNC_Rep_Losses_36x36
 - Big_MNC_Risk_Topo_36x36
 - Big_MNC_Urbanization_36x36
 - Big_MNC_Watershed_36x36
- \GIS
 - CNMS_Maps
 - Overview_Maps
 - Topic_Maps
- \Information_Collection_Sheets
 - Community_Benefits_and_Grant_Opportunities
 - Mapping_Station_1_Comments
 - Mapping_Station_2_Comments
 - Mitigation_Planning_And_Mitigation_Actions_Comments
 - NFIP_Community_Actions
- \Photos

III. Watershed Findings

Once the data was collected from the Discovery Meeting, an analysis was performed to identify critical areas highlighted as concerns for future projects in the watershed. The analysis focused on areas within the watershed that had been identified as having mitigation action plans for the future. The details in this section supplement the documentation supporting the need for further mitigation actions or studies in particular streams, reaches, or communities in the watershed.

This section describes the riverine floodplain analysis as either basic or enhanced. The basic analysis will produce a model-backed Zone A floodplain delineation. The enhanced analysis will produce a model-backed Zone AE floodplain delineation. These analysis types are discussed in more detail below as part of the evaluation of needs.

i. Engineering Review of Community Comments

All comments were filtered to determine which were engineering-related. Engineering-related comments provided by communities during the Discovery Meeting were then analyzed. These comments were reviewed in terms of hydrologic and hydraulic issues in the watershed and with any general floodplain or Base Flood Elevation (BFE) related comments. All comments were investigated to determine whether or not they would have any effect on the hydrology of the watershed.

One recurring issue identified by many communities was the occurrence of development and growth in terms of population in the areas along the floodplain. The communities in the watershed that have experienced such growth and development were near the following flood sources: Bluff Creek, Cimarron Road Tributary, North Banner Road Tributary, North Canadian River, Purcell Creek, Richland Tributary, Sixmile Creek, and Twin Lakes chain of lakes.

Many comments also addressed the locations and types of flooding within communities, including repetitive loss structures and structures that have been replaced after being washed out during storm events. These structures were identified during the Discovery Meeting.

Issues with FIRMS were also discussed. One of these was that the communities would like to have their floodplains studied to identify Zone AEs with Base Flood Elevations for regulation. Some communities stated that they have detailed topographic data that they would provide to FEMA to update their studies. Some communities expressed concern that their FIRMS Zone A and Zone AEs do not tie together and that the channels are outside the floodway. In addition, community representatives indicated that the floodplain delineation on the effective FIRMS may not show actual locations of flooding.

ii. Post-Discovery Hydrology

Reviews of the hydrologic information were performed in the MNC Watershed after the Discovery Meeting. These reviews focused on:

- Peak discharges in the watershed
- Limited gage analyses in the watershed

The 1-percent-annual-chance peak discharges were reviewed for all streams across community and county boundaries. Areas with Letters of Map Revision (LOMRs) were specifically checked because LOMRs may indicate that there are larger issues. Information obtained from USGS gages was checked against the effective FIS for consistency. This analysis could potentially flag anomalies that would indicate that the hydrology is out of date, too high, or too low for the watershed.

Peak discharges in the watershed were reviewed based on effective FIS reports, flow gages, and available LOMRs. Areas of special interest were county boundaries and locations of LOMRs and gages. Hydrologic models were not provided for areas studied by basic methods.

iii. Frequency Analysis

Frequency analyses were completed for all gages in the MNC Watershed having more than 10 peaks. Frequency analyses were performed using the USGS PeakFQWin 5.2 program. There are eight locations in the MNC Watershed with USGS gages. All eight of these gages have more than 10 years of record, making them suitable for analysis and all are located on the North Canadian River. A map of the gage sites is shown in Figure 4.

The USGS gages having 10 or more years of unbroken records were analyzed using the USGS PeakFQWin 5.2 program to determine the 1-percent-annual-chance discharges. Several of the gages had peak flows that were tagged as being impacted by urbanization or regulation. The input parameters were modified to include these values in the calculations. These computed discharges were compared to the flow rates from effective studies. The comparisons are shown below in Table 14.

Only two of the locations have a flow rate in an effective FIS because the other locations were studied by basic methods only and do not have reported flow rates. The effective flow rates are approximately 40 percent higher than the computed flows from the frequency analyses. The effective flow rates were also computed by performing a frequency analysis. A more detailed look at the previous study may be warranted to determine if the additional period of record has had an impact on the frequency analysis of the gage.

iv. Post-Discovery CNMS Analysis

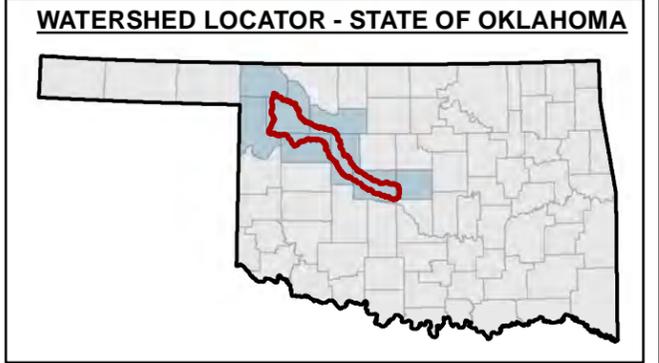
As part of the Discovery process, a review of the CNMS validation elements was performed in accordance with the methodology specified in the CNMS Database User's Guide, Version 4.3, dated June 2011. Canadian, Oklahoma, and Woodward County were part of a detailed CNMS Phase III process.

Table 15 lists the detailed studied streams in the MNC Watershed that have either failed one or more validation elements. It also notes studied streams which contain null² values for validation elements. Table 16 defines those elements as described in the CNMS Database User's Guide.

² The term null refers to CNMS elements which contained no information – or were empty.

Figure 4: Stream Gage Locations
Middle North Canadian Watershed

Jul 26 2012



Map Symbology

- Cities
- ★ County Seats
- Stream Gages
- ~ North Canadian River
- Other Streams
- Major Highways
- County Boundaries
- ⬭ Middle North Canadian Watershed
- ⬭ Congressional District Boundaries

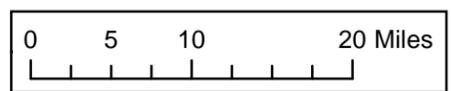
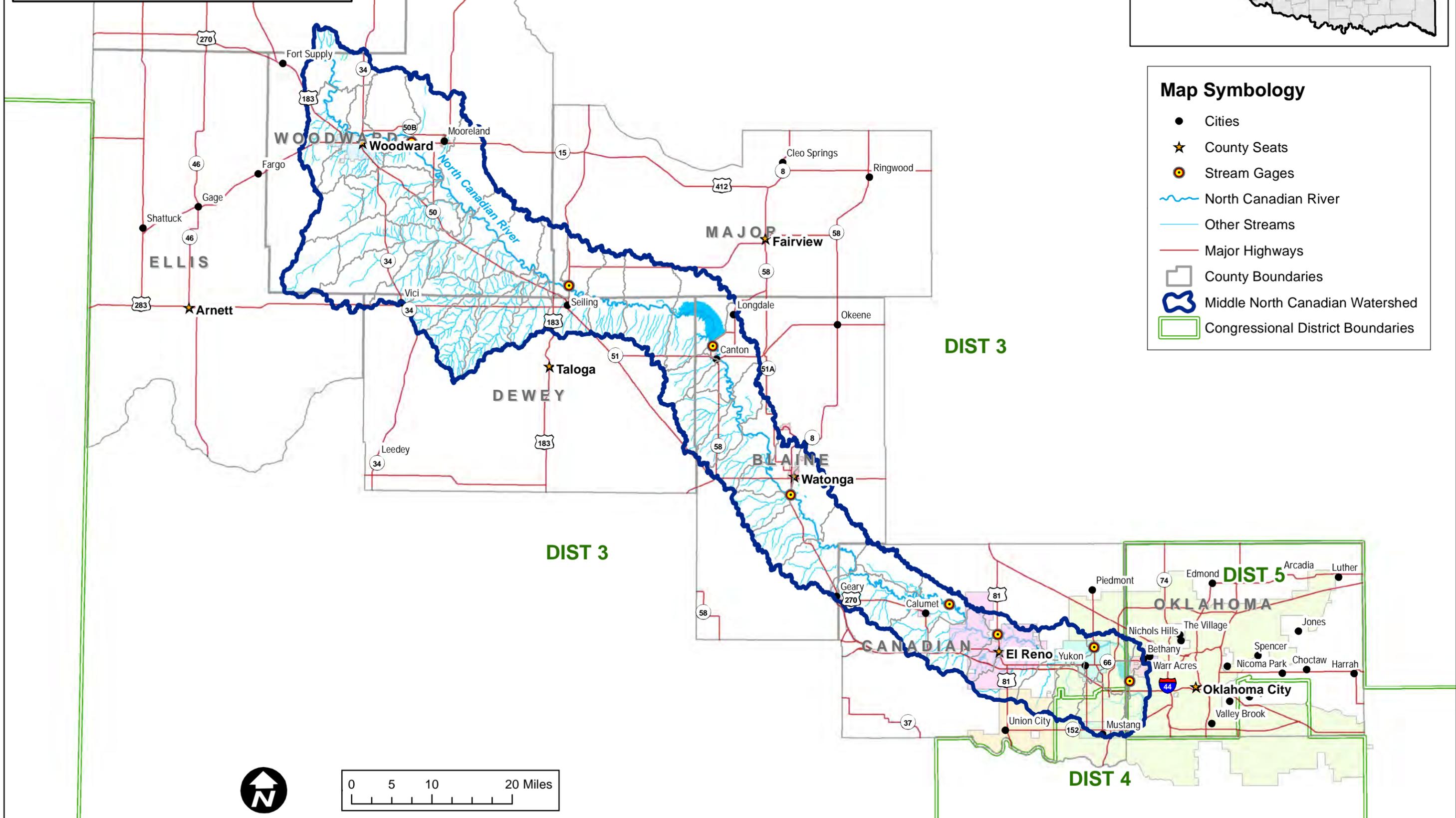


Table 14: Comparison of 1-Percent-Annual-Chance Peak Flows of Gage Frequency Analysis and Effective Discharges

Stream Name and Location	USGS Gage	Drainage Area from USGS Gage (square miles)	Effective Discharges Source	Effective 1% Annual-Chance Discharge (cfs)	95% Confidence Limits Lower (cfs) (Gage)	1% Annual-Chance Discharge from PeakFQWin (Gage)	95% Confidence Limits Upper (cfs) (Gage)	Number of Peaks on Record
North Canadian River at Woodward	07237500	6,777	N/A*	N/A*	30,870	48,930	87,730	74
North Canadian River near Seiling	07238000	7,414	N/A*	N/A*	17,620	24,540	37,520	66
North Canadian River at Canton	07239000	7,601	N/A*	N/A*	12,480	17,960	28,990	59
North Canadian River below Weavers Creek near Watonga	07239300	7,837	N/A*	N/A*	6,946	9,982	17,080	28
North Canadian River near Calumet	07239450	8,063	N/A*	N/A*	12,690	20,310	42,390	23
North Canadian River near El Reno	07239500	8,143	N/A*	N/A*	14,500	18,350	24,650	79
North Canadian River near Yukon	07239700	8,284	Canadian County FIS	42,600	15,420	30,690	113,100	12
North Canadian River below Lake Overholser near OKC	07241000	8,323	Canadian County FIS	45,000	18,260	27,120	45,190	59

*Approximate Study. No effective discharge is available.
 USGS = U.S. Geological Survey
 cfs = cubic feet per second

Table 15: Current CNMS Validation Status and Discovery Level CNMS Review for Detailed Streams (Zone AE)

Stream Name	County	Original CNMS Data					Discovery Level CNMS Review		
		Validation Status	Failed CNMS Elements	Unknown CNMS Elements	Null Elements	Date of Effective Study	Failed CNMS Elements	Unknown CNMS Elements	Recommended Validation Status Change
Cornwell Branch of East Branch Turtle Creek	Canadian	Valid		C7, S3, S6		8/1/1999			Unknown
East Branch Turtle Creek	Canadian	Unverified	S1, S2, S4, S6	C7		8/2/1999			
Fourmile Creek	Canadian	Valid		C3, C6, C7, S1, S3, S4, S7		8/12/1980			Unknown
Fourmile Creek Tributary	Canadian	Valid		C3, C6, C7, S1, S3, S4, S8		10/8/1976			Unknown
Fourmile Creek Tributary A1	Canadian	Valid		C3,C7, S1, S3, S7		10/8/1976			Unknown
Holly Branch of Middle Branch Turtle Creek	Canadian	Valid	S1, S4, S6	C7		8/1/1999			Unknown
Main Stem Turtle Creek	Canadian	Valid		S6, C7		8/1/1999			Unknown
Middle Branch Turtle Creek	Canadian	Valid		S1, S4, S6, C7		8/1/1999			Unknown
Mustang Creek New Channel	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	2/1/2003			Unknown
Mustang Creek Tributary 1	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Mustang Creek Tributary 1 East Branch	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Mustang Creek Tributary 1 West Branch	Canadian	Valid	S4, S6, S10	C3, C7,		7/1/1978			Unknown
Mustang Creek Tributary 2	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Mustang Creek Tributary 2 South Branch	Canadian	Unverified	C6, S6	C3, C7		7/1/1978			
Mustang Creek Tributary 3	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Mustang Creek Tributary 3 East Branch	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Mustang Creek Tributary 3 West Branch	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Mustang Creek Tributary 4	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
North Canadian River	Canadian	Valid	S2, S6	C7		12/1/1977		C3, C7	Unknown
North Canadian River Tributary A	Canadian	Valid	S2, S4, S6	C7		8/1/1999			Unknown
North Canadian River Tributary B	Canadian	Valid	S6	C7, 3, S7		8/1/1999			Unknown
North Canadian River Tributary B West Branch	Canadian	Valid	S6	C3, C7, S3, S7		12/1/1977	C3		Unverified
North Canadian River Tributary C	Canadian	Valid	S6	C7, S3, S7		8/1/1999			Unknown
North Canadian River Tributary C West Branch #1	Canadian	Valid	S4, S6	C3, C7		12/1/1977	C3		Unverified
North Canadian River Tributary C West Branch #2	Canadian	Valid	S6	C3, C7, S3, S7		12/1/1977	C3		Unverified
Shell Creek	Canadian	Unverified	C6, S6	C3,C7, S1, S3, S7		12/1/1977			
Shell Creek Tributary 1	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown

Stream Name	County	Original CNMS Data					Discovery Level CNMS Review		
		Validation Status	Failed CNMS Elements	Unknown CNMS Elements	Null Elements	Date of Effective Study	Failed CNMS Elements	Unknown CNMS Elements	Recommended Validation Status Change
Shell Creek Tributary 2	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Shell Creek Tributary 3	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Shell Creek Tributary 4	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Shell Creek Tributary 4 West Branch	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Shell Creek Tributary 5	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Shell Creek Tributary 5 East Branch	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Shell Creek Tributary 6	Canadian	Valid			C1, C2, C3, C4, C5, C6, C7, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10	6/1/2006			Unknown
Sixmile Creek	Canadian	Valid	S2	C3, C7, S1, S3, S7		10/8/1976			Unknown
Sixmile Creek Tributary	Canadian	Valid		C3, C7, S1, S3, S7		10/8/1976			Unknown
Sixmile Creek Tributary 1	Canadian	Valid		C3, C7, S1, S3, S7		10/8/1976			Unknown
Sixmile Creek Tributary 3	Canadian	Valid		C3, C7, S1, S3, S8		10/8/1976			Unknown
Unnamed Tributary to Sixmile Creek	Canadian	Valid		C3, C7, S1, S3, S7		10/8/1976			Unknown
Unnamed Tributary to Sixmile Creek Tributary	Canadian	Valid		C3, C7, S1, S3, S8		10/8/1976			Unknown
West Branch Turtle Creek	Canadian	Unverified	S1, S6, S7, S10	C7		12/1/1977			
Campbell Creek	Oklahoma	Unverified	S3, S4, S6, S10			5/1/1980			
Campbell Creek East Branch	Oklahoma	Valid		S3, S6, S10		5/1/1980			Unknown
Campbell Creek Middle Branch	Oklahoma	Valid		S3, S6, S10		5/1/1980			Unknown
Mustang Creek	Oklahoma	Valid		S6, S10		5/1/1980		C3	Unknown
North Canadian River Tributary 14	Oklahoma	Unverified	S2, S3, S6, S10			5/1/1980			
Unnamed Tributary to North Canadian River	Oklahoma	Valid	S3, S6, S10			6/1/1992			
Overflow from Unnamed Tributaries	Woodward	Valid		C3, S1, S10		7/1/1976		C3	
Spring Creek	Woodward	Valid	S10			7/1/1976			
Tributary to North Canadian River	Woodward	Valid	S10			7/1/1976			
Unnamed Tributary	Woodward	Valid		C3, S1, S10		7/1/1976		C3	Unknown
Woodward Creek	Woodward	Valid	S4, S10			7/1/1976			
Woodward Creek Tributary	Woodward	Valid	S10			7/1/1976			

Table 16: Failed Element for Streams

Element Name	Issue Being Identified by the Element	Element Description
C1	<i>Major change in gage record since effective analysis that includes major flood events</i>	Failure of this element happens when a major change in the gage record occurs after the date of the Effective Study.
C2	<i>Updated and effective peak discharges differ significantly based on confidence limits criteria</i>	Failure of this element indicates that the updated and effective peak discharges differ significantly from the current confidence limits criteria since the date of the Effective Study.
C3	<i>Model methodology no longer appropriate(one-dimensional vs. two-dimensional)</i>	This element fails when the model methodology used no longer meets current guidelines and specifications.
C4	<i>Major flood control structure added or removed</i>	Failure of this element indicates the addition or removal of a major flood control structure (i.e., certified levee or seawall, reservoir with more than 50 acre-feet storage per square mile).
C5	<i>Current channel reconfiguration outside effective SFHA</i>	Failure of this element indicates the streamline is seen on imagery as outside the SFHA and cannot be explained by a minor mapping error, which could be corrected through base fitting.
C6	<i>More than five new or removed hydraulic structures</i>	This element fails when more than five new or removed hydraulic structures that impact the BFEs have not been identified.
C7	<i>Significant channel fill or scour</i>	Failure of this element indicates a significant channel or scour has been identified.
S1	<i>Use of rural regression equations in urbanized areas</i>	This element attempts to flag studies in current urban areas where rural regression equations were used for the effective study hydrology.
S2	<i>Repetitive losses outside the SFHA</i>	This element fails when repetitive losses have been noted outside of the SFHA. Repetitive losses determined to be from an unmapped source, or due to local drainage issues are not considered.
S3	<i>Increase in impervious area in subbasin of more than 50 percent</i>	Failure of this element identifies a significant increase in impervious area (due to urban development since the study date) based on best available land use/land cover data sources.
S4	<i>More than one and less than five new or removed hydraulic structures (bridge/culvert) impacting BFEs</i>	This element identifies addition or removal of more than one, but less than five hydraulic structures along the studied streams since the date of the Effective Study.
S5	<i>Channel improvements / shoreline changes</i>	Failure of this element indicates the FIRM, Imagery, or other data input sources show channel improvements since the study date.

Element Name	Issue Being Identified by the Element	Element Description
S6	<i>Better topographic data available</i>	Failure of this element indicates better topographic data has been made available since the Effective Study date.
S7	<i>Changes to vegetation or land use</i>	Failure of this element indicates there have been significant changes in land use or vegetative cover since the date of the Effective Study.
S8	<i>Failure to identify primary frontal dune in coastal areas</i>	Failure of this element indicates that the primary frontal dune was not properly identified in coastal areas.
S9	<i>Significant storms with high water marks</i>	Failure of this element indicates that recent storm surge high waters marks were not identified.
S10	<i>New regression equations available</i>	Failure of this element indicates updates to regression equations since the date of study for studies that used a regression analysis for hydrology.

According to the CNMS validation process, the studied reach is considered unverified or is assigned an unverified status, if one of seven critical elements fails, or if four or more of the 10 secondary elements fail during stream reach level validation. The following is a detail of the CNMS review findings, including any Zone As, per County:

Blaine County, OK

Because none of the streams located in Blaine County are model-backed in the FEMA Library, the streams (Chicken Creek, Horse Creek, Minnehaha Creek, North Canadian River, Relay Creek, and Weavers Creek) are not CNMS valid. Their validation status is listed as Unknown in the CNMS database. Despite the streams being listed as Flood Zone A, they are not considered to be Basic Study because they are not model-backed.

Canadian County, OK

Out of the 347.3 miles of Canadian County streams located within the watershed, 120.1 miles are detailed (Zone AE) studies. Of the Zone AE stream miles, 105.4 stream miles are classified as Valid and 14.7 as Unverified. In addition, 78.2 miles of the Zone AE stream miles are digital conversions and 41.9 stream miles are updated detailed studies.

East Branch of Turtle Creek: The East Branch of Turtle Creek failed the Secondary Elements S1, S2, S4 and S6. This indicates the following:

- Rural regression equations were used in urbanized areas;
- Repetitive losses exist outside the SFHA;
- More than one and less than five new or removed hydraulic structures (bridge/culvert) impact the BFEs; and
- Better topographic data was available.

No change is recommended to the validation status of Unverified.

West Branch of Turtle Creek: The West Branch of Turtle Creek failed the Secondary Elements of S1, S6, S7 and S10 which indicates that:

- Rural regression equations were used in urbanized areas;
- Better topographic data was available;
- Changes to vegetation or land use have been noted; and
- New regression equations are available.

No change is recommended to the validation status of Unverified.

Shell Creek: Shell Creek failed Critical Element C6 indicating that there are more than five new or removed hydraulic structures. Shell Creek also failed Secondary Elements S1, S6, S7 and S10 which indicates:

- Rural regression equations were used in urbanized areas;
- Better topographic data is available;
- Changes have occurred to vegetation or land use; and
- New regression equations are available.

No change is recommended to the validation status of Unverified.

Mustang Creek Tributary 2 South Branch: Mustang Creek Tributary 2 South Branch failed Critical Element C6 which indicates more than five new or removed hydraulic structures. Mustang Creek Tributary 2 South Branch also failed Secondary Elements S6 and S10 which indicates:

- Better topographic data is available; and
- New regression equations are available.

No change is recommended to the validation status of Unverified.

Recommended CNMS Status modifications from Valid to Unknown:

Of the 105.4 stream miles of Valid Zone AE streams, the following streams had no critical or secondary factors evaluated:

Mustang Creek and Tributaries:

- Mustang Creek
- Mustang Creek New Channel
- Mustang Creek Tributary 1
- Mustang Creek Tributary 1 East Branch
- Mustang Creek Tributary 2
- Mustang Creek Tributary 3
- Mustang Creek Tributary 3 East Branch
- Mustang Creek Tributary 3 West Branch
- Mustang Creek Tributary 4

Shell Creek and Tributaries:

- Shell Creek Tributary 1
- Shell Creek Tributary 2
- Shell Creek Tributary 3
- Shell Creek Tributary 4

- Shell Creek Tributary 4 West Branch
- Shell Creek Tributary 5
- Shell Creek Tributary 5 East Branch
- Shell Creek Tributary 6

The reason in the CNMS data is listed as “Bulk Validated due to effective date during Map Mod”. The validations for the 41.94 streams miles should be corrected to Unknown, and each NVUE status shown as “To be Assessed”.

Fourmile Creek and Tributaries: Fourmile Creek, Fourmile Creek Tributary and Fourmile Creek Tributary A1 did not contain any failed validation elements.

All of the Fourmile Creek segments are detailed streams. However, all list C3 and C7 listed as Unknown indicating that the model methodology and the potential for significant channel scour are unknown. Secondary Elements S1, S3, and S7 are also listed as Unknown which indicates:

- Rural regression equations may have used in urbanized areas
- An increase in impervious area of more than 50 percent in the subbasin may have occurred; and
- Changes may have occurred to vegetation or land use.

Additionally, Fourmile Creek and Fourmile Creek Tributary have Critical Element C6 and Secondary Element S4 listed as Unknown indicating:

- There may be more than five new or removed hydraulic structures (bridge/culvert) impacting the BFEs; and
- There may be more than one and less than five new or removed hydraulic structures (bridge/culvert) impacting BFEs.

The CNMS comment addressing this is “City of El Reno FIS Unavailable”. The validations for these 5.4 stream miles should be corrected to Unknown, and each NVUE status shown as “To be Assessed”.

Sixmile Creek and Tributaries: In addition, the following did not fail the validation element: Sixmile Creek Tributary, Sixmile Creek Tributary 1, Sixmile Creek Tributary 3, and Unnamed Tributary to Sixmile Creek.

However, Sixmile Creek and its tributaries (Sixmile Creek Tributary, Sixmile Creek Tributary 1, Sixmile Creek Tributary 3, Unnamed Tributary to Sixmile Creek, and Unnamed Tributary to Sixmile Creek Tributary) have Critical Elements C3 and C7 listed as Unknown. This is an indication that the model methodology and the potential for significant channel scour are unknown. Secondary Elements S1, S3, and S7 are also listed as Unknown which indicates:

- Rural regression equations may have been used in urbanized areas;
- An increase in impervious area of more than 50 percent in the subbasin may have occurred; and
- Changes to vegetation or land use may have occurred.

There is also a portion of Sixmile Creek that fails Secondary Element S2 indicating that repetitive losses are located outside the SFHA. The CNMS comment addressing all these issues is the “City of El Reno FIS Unavailable”. The validations for the 16.9 stream miles should be corrected to Unknown and each NVUE status shown as “To be Assessed”.

North Canadian River Tributaries: The North Canadian River Tributary C and the North Canadian River Tributary B have Critical Element C7 listed as Unknown. This is an indicator that the potential for significant channel scour is unknown. The validations for the 5.4 stream miles should be corrected to Unknown, and each NVUE status shown as “To be Assessed”.

North Canadian River Tributary B and North Canadian River Tributary C failed Secondary Element S6 indicating that better topographic data are available. The validations for these streams should be corrected to Unknown, and each NVUE status shown as “To be Assessed”.

North Canadian River Tributary C West Branch #2 and the North Canadian River Tributary B West Branch both have Critical Elements C3 and C7 listed as Unknown which is an indication that the model methodology and the potential for significant channel scour are unknown.

The North Canadian River Tributary B West Branch and the North Canadian River Tributary C West Branch #2 also failed Secondary Element S6 indicating that there is better topographic data available.

Turtle Creek: The Cornwell Branch of East Branch Turtle Creek has Critical Element C7 listed as Unknown because the potential for significant channel scour is unknown. Secondary Elements, S3 and S6, also are listed as Unknown indicating the following:

- An increase in impervious area of more than 50 percent in the subbasin may have occurred; and
- Better topographic data might be available.

The validations for these streams should be corrected to Unknown, and each NVUE status shown as “To be Assessed”.

The Holly Branch of Middle Branch Turtle Creek and Middle Branch Turtle Creek has Critical Element C7 listed as Unknown. They also both failed Secondary Elements S1, S4, and S6 which indicates the following:

- Rural regression equations were incorrectly used;
- Changes occurred to structures; and
- Better topographic data are available.

The validations for these streams should be corrected to Unknown, and each NVUE status shown as “To be Assessed”.

Recommended CNMS Status modifications from Valid to Unverified:

North Canadian River Tributaries: The North Canadian River Tributary B West Branch, North Canadian River Tributary C West Branch #1, and North Canadian River Tributary C West Branch #2 incorrectly show C3 as Unknown. The hydrologic model is listed as “TR-55 (JUNE 1986)””; this is listed as one of the “Current Unacceptable Models” by FEMA. These validations should be corrected to Unverified and each NVUE status shown as “To Be Studied”.

Dewey County, OK

Dewey County was not included in CNMS Phase III. No streams were found in the CNMS data for Dewey County, because no data exist within the HUC 8 boundary.

Ellis County, OK

Ellis County was not included in CNMS Phase III. No streams were found in the CNMS data for Ellis County, because there is no data within the HUC 8 boundary.

Harper County, OK

Harper County was not included in CNMS Phase III. No current or historical flood maps were found for this area. No streams were found in the CNMS data for Harper County, because no data are available within the HUC 8 boundary.

Major County, OK

Major County was not included in the CNMS Phase III effort due to the non-existence of any current or historic flood maps for this area.

Oklahoma County, OK

Oklahoma County was included in the CNMS Phase III effort. The Oklahoma County streams that fall within the watershed include 2.4 miles of Valid model-backed and updated approximate studies, 60.4 miles of Valid detailed studies and 10.7 miles of Unverified detailed studies.

Campbell Creek: Among the Unverified detailed studies, Campbell Creek failed Secondary Elements S3, S4, S6 and S10 which indicates:

- A significant increase has occurred in impervious area;
- More than one and less than five new or removed hydraulic structures (bridge/culvert) impacting BFEs have occurred;
- Better topographic data are available; and
- New regression equations are available.

North Canadian River Tributary: The North Canadian River Tributary 14 fails Secondary Elements S2, S3, S6 and S10 which indicates;

- A significant increase in impervious area has occurred;
- More than one and less than five new or removed hydraulic structures (bridge/culvert) impacting BFEs have occurred;
- Better topographic data are available; and

- New regression equations are available.

No change is recommended to the validation status of Unverified.

Recommended CNMS Status modifications from Valid to Unknown:

Campbell Creek East, Campbell Creek Middle Branch and Unnamed Tributary (North Canadian River): All of these creeks failed Secondary Elements S3, S6, and S10 which indicates:

- A significant increase in impervious area exists;
- Better topographic data are available; and
- The study used regression methods.

Mustang Creek (Oklahoma County): Mustang Creek failed Secondary Elements S6 and S10 indicating:

- Better topographic data are available; and
- New regression equations are available.

This portion of Mustang Creek, 0.8 miles, is the downstream portion of the remaining 8.6 miles that lie within Canadian County. The hydraulic model used is noted as “other” for each segment. “Regression equations” was listed as the hydrologic model in Oklahoma County, prepared in 1980, but the Canadian County segment was listed as Unknown. This segment of Mustang Creek should be changed, at a minimum, to a validation of Unknown and the NVUE status shown as “To be Assessed”

North Canadian Creek (Oklahoma County): That portion of the North Canadian River located in Oklahoma County failed Secondary Elements S2, S6 and S10 which indicates:

- Repetitive losses are located outside the SFHA;
- Better topographic data are available;
- New regression equations are also available.

In addition, this 57.1 mile segment is incorrectly listed in the CNMS in HUC-8 11100302 (Lower North Canadian) rather than 11100301 (Middle North Canadian). The HUC8_KEY should be changed to 11100301. For the same reasons as noted in the previous paragraph, the 57.1 mile length of the North Canadian River should be changed, at the very least, to Unknown and each NVUE status shown as “To be Assessed”.

Woodward County, OK

Woodward County was included in the CNMS Study. Of the 232.3 total miles of mapped streams in Woodward County located within the MNC Watershed 226.5 stream miles are Valid model-backed and updated approximate studies, 1.4 stream miles are digitized Zone AO, 0.6 stream miles are digitized Zone AH and 3.8 stream miles are Zone AE redelineations.

Recommended CNMS Status modifications from Valid to Unknown:

There are no streams that fail the critical factors.

Unnamed Tributaries and Unnamed Stream: The 1.4 miles of Overflow from Unnamed Tributaries (Zone AO) and the 0.6 miles of Unnamed Stream (Zone AH) in Woodward have Unknown values for Critical Element C3 indicating that the model methodology may no longer be appropriate. Unknown values for Secondary Elements S1 and S10 indicate:

- Rural regression equations may have been used in urbanized areas; and
- New regression equations may be available.

Additionally, these segments were digitized instead of redelineated. The Unknown value for Critical Element C3 requires that these validations be corrected to Unknown and each NVUE status shown as “To be Assessed”.

The remaining Zone AE streams are based on studies that are 36 years old and based on 10 meter DEMs in addition to failing Secondary Element S10 (or an indicator that new regression equations are available). Woodward Creek also failed Secondary Element S4 indicating that more than one and less than five new or removed hydraulic structures (bridge/culvert) impacting BFEs have occurred. Based on the limited value of the original study and topography, the validations for Woodward Creek Tributary, Tributary to North Canadian River, Spring Creek and Woodward Creek should be changed, at the minimum, to Unknown and each NVUE status shown as “To be Assessed”.

Table 17 lists study methodologies for Zone AE (and Zone A) streams studied by enhanced methods and their validation status, as recorded in the CNMS. It should be noted that hydrologic model “TR-55 (JUNE 1986)” is listed as one of the “Current Unacceptable Models” by FEMA’s CNMS Database User’s Guide, Version 4.3, dated June 2011. Thus, validations status should be noted as Unverified, and each NVUE status shown as “To Be Studied”. Cases were TR-55 (JUNE 1986) has been used in the watershed have been highlight in red font below.

Table 17: Hydrologic and Hydraulic Information for Enhanced Streams

Stream Name	County	Validation Status	Date of Effective Analysis	Hydrology Model	Hydraulic Model
Bent Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Boggy Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Camp Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Campbell Creek East Branch	Oklahoma	Valid	5/1/2007	Regression Equations	HEC-RAS
Campbell Creek East Branch	Oklahoma	Valid	5/1/1980	Regression Equations	Other
Campbell Creek Middle Branch	Oklahoma	Valid	5/1/2007	Regression Equations	HEC-RAS
Campbell Creek Middle Branch	Oklahoma	Valid	5/1/1980	Regression Equations	Other
Cornwell Branch of East	Canadian	Valid	8/1/1999	Regression	HEC-RAS

Stream Name	County	Validation Status	Date of Effective Analysis	Hydrology Model	Hydraulic Model
Branch Turtle Creek				Equations	
Deep Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Fourmile Creek	Canadian	Valid	8/12/1980	Unknown	Unknown
Fourmile Creek Tributary	Canadian	Valid	10/8/1976	Unknown	Unknown
Fourmile Creek Tributary A1	Canadian	Valid	10/8/1976	Unknown	Other
Hackberry Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Holly Branch of Middle Branch Turtle Creek	Canadian	Valid	8/1/1999	Regression Equations	HEC-RAS
Indian Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Kizer Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Mainstem Turtle Creek	Canadian	Valid	8/1/1999	Regression Equations	HEC-RAS
Middle Branch Turtle Creek	Canadian	Valid	8/1/1999	Regression Equations	HEC-RAS
Mustang Creek	Oklahoma	Valid	6/1/2006	Unknown	Other
Mustang Creek	Oklahoma	Valid	5/1/1980	Regression Equations	Other
Mustang Creek New Channel	Oklahoma	Valid	2/1/2003	Unknown	Other
Mustang Creek Tributary 1	Canadian	Valid	6/1/2006	Regression Equations	HEC-2
Mustang Creek Tributary 1 East Branch	Canadian	Valid	6/1/2006	Regression Equations	HEC-2
Mustang Creek Tributary 1 West Branch	Canadian	Valid	7/1/1978	Regression Equations	Unknown
Mustang Creek Tributary 2	Oklahoma	Valid	6/1/2006	Unknown	Other
Mustang Creek Tributary 2 South Branch	Canadian	Unverified	7/1/1978	Regression Equations	Unknown
Mustang Creek Tributary 3	Oklahoma	Valid	6/1/2006	Unknown	Other
Mustang Creek Tributary 3 East Branch	Oklahoma	Valid	6/1/2006	Unknown	HEC-2
Mustang Creek Tributary 3 West Branch	Oklahoma	Valid	6/1/2006	Unknown	Other
Mustang Creek Tributary 4	Oklahoma	Valid	6/1/2006	Unknown	Other
North Canadian River	Woodward	Valid		Not in CNMS Data	HEC-RAS
North Canadian River	Oklahoma	Valid	12/1/1977	Other	Other
North Canadian River	Canadian	Valid	12/1/1977	Other	Other
North Canadian River Tributary A	Canadian	Valid	8/1/1999	Regression Equations	HEC-RAS
North Canadian River	Canadian	Valid	8/1/1999	Regression	HEC-RAS

Stream Name	County	Validation Status	Date of Effective Analysis	Hydrology Model	Hydraulic Model
Tributary B				Equations	
North Canadian River Tributary B West Branch	Canadian	Valid	12/1/1977	TR-55 (June 1986)	Unknown
North Canadian River Tributary C	Canadian	Valid	8/1/1999	Regression Equations	HEC-RAS
North Canadian River Tributary C West Branch #1	Canadian	Valid	12/1/1977	TR-55 (June 1986)	Unknown
North Canadian River Tributary C West Branch #2	Canadian	Valid	12/1/1977	TR-55 (June 1986)	Unknown
Overflow from Unnamed Tributaries	Woodward	Valid	7/1/1976	Other	Unknown
Persimmon Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Roundup Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Sand Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Shell Creek Tributary 1	Oklahoma	Valid	6/1/2006	Unknown	Other
Shell Creek Tributary 2	Oklahoma	Valid	6/1/2006	Unknown	Other
Shell Creek Tributary 3	Oklahoma	Valid	6/1/2006	Unknown	Other
Shell Creek Tributary 4	Oklahoma	Valid	6/1/2006	Unknown	Other
Shell Creek Tributary 4 West Branch	Oklahoma	Valid	6/1/2006	Unknown	Other
Shell Creek Tributary 5	Oklahoma	Valid	6/1/2006	Unknown	Other
Shell Creek Tributary 5 East Branch	Oklahoma	Valid	6/1/2006	Unknown	Other
Shell Creek Tributary 6	Oklahoma	Valid	6/1/2006	Unknown	Other
Sixmile Creek	Canadian	Valid	10/8/1976	Unknown	Unknown
Sixmile Creek Tributary	Canadian	Valid	10/8/1976	Unknown	Unknown
Sixmile Creek Tributary 1	Canadian	Valid	10/8/1976	Unknown	Unknown
Sixmile Creek Tributary 3	Canadian	Valid	10/8/1976	Unknown	Unknown
South Persimmon Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Spring Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Spring Creek	Woodward	Valid	7/1/1976	Regression Equations	HEC-2
Tributary to North Canadian River	Woodward	Valid		Not in CNMS Data	HEC-RAS
Tributary to North Canadian River	Woodward	Valid	7/1/1976	Regression Equations	HEC-2
Unknown	Woodward	Valid		Not in CNMS Data	HEC-RAS
Unnamed Stream	Oklahoma	Valid	5/1/2007	Regression Equations	HEC-RAS
Unnamed Tributary	Woodward	Valid		Not in CNMS Data	HEC-RAS

Stream Name	County	Validation Status	Date of Effective Analysis	Hydrology Model	Hydraulic Model
Unnamed Tributary	Woodward	Valid	7/1/1976	Unknown	Unknown
Unnamed Tributary to North Canadian River	Oklahoma	Valid	6/1/1992	Regression Equations	Other
Unnamed Tributary to Sixmile Creek	Canadian	Valid	10/8/1976	Unknown	Other
Unnamed Tributary to Sixmile Creek Tributary	Canadian	Valid	10/8/1976	Unknown	Other
Unnamed Tributary	Woodward	Valid		Not in CNMS Data	HEC-RAS
Unnamed Tributary	Woodward	Valid		Not in CNMS Data	HEC-RAS
Woodward Creek	Woodward	Valid		Not in CNMS Data	HEC-RAS
Woodward Creek	Woodward	Valid	7/1/1976	Regression Equations	HEC-2
Woodward Creek Tributary	Woodward	Valid		Not in CNMS Data	HEC-RAS
Woodward Creek Tributary	Woodward	Valid	7/1/1976	Regression Equations	HEC-2

Following review of the CNMS validation elements – and assuming that a studied reach is to be considered unverified if one of seven critical elements fails, or if four or more of the 10 secondary elements fail during stream reach level validation, it is recommended that approximate 1 stream mile of Valid stream segments be changed to Unverified.

Secondly, the CNMS does not contain Critical or Secondary Element information for approximately over 1/3 of inventoried streams (null elements). To facilitate accurate risk assessment, update of the CNMS database for these stream segments is beneficial. In the interim, it is recommended that the validation status be changed from Valid to Unknown for approximately 33 stream miles.

Lastly, one or more Critical Elements are inventoried as unknown for approximately 42 stream miles. It is recommended that the validation status for this additional 42 stream miles be also changed from Valid to Unknown.

v. Post- Discovery Hydraulics and Floodplain Analysis

Analyses of the hydraulic and floodplain data were performed by reviewing the FIS report and FIRMs. A search was performed for available models on FEMA’s MIP. Because of the limited scope of work, no request was made to the FEMA library to collect all hydraulic models available for this watershed. Instead, a limited search was performed for available models that were stored on FEMA’s MIP website.

The CNMS data notes that all Zone A streams in Oklahoma County and Woodward County for this watershed are model-backed. None of the Zone A streams in Blaine County are model-backed. The CNMS database does not indicate whether or not the Zone A streams in Canadian County are model-backed or non-model-backed.

Based on limited hydraulic analysis and engineering judgment, several disconnects were identified at the county boundaries. Table 18 lists these disconnects for the MNC Watershed.

Table 18: Hydraulic Issues with Floodplain Boundaries

Stream Name	Issue	Location
North Canadian River	Disconnected floodplain	There is a disconnected floodplain at the watershed boundary between the Lower Beaver watershed and Middle North Canadian Watershed.
North Canadian River	Disconnected floodplain	There is a disconnected floodplain boundary between Blaine County and Canadian County. The floodplain does not extend north of Canadian County.
North Canadian River	Disconnected floodplain	There is a disconnected floodplain at the watershed boundary between the Middle North Canadian Watershed and the Lower North Canadian Watershed.

Table 19 identifies any recent LOMRs in the MNC Watershed that have had impacts on the hydraulics and may be the source of disconnects that were located within the floodplains.

Table 19: LOMRs that Revise Hydraulics within the Watershed

Stream Name	Case Number	Basis of Request	Notes
North Canadian River	08-06-2954P	Hydraulic analysis with new topographic data	LOMR that revised a Zone AE based on new topographic information and hydraulic analysis. Project includes fill.

vi. Summary of Findings

The MNC Watershed has experienced recent significant changes in land use or land cover. One recurring issue identified by many communities was the occurrence of development and growth in terms of population in the areas along the floodplain. Updated and effective peak discharges were found to differ considerably, with effective flow rates approximately 40 percent higher than the computed flows from the frequency analyses.

In general, stream locations on aerial imagery were found to be within the mapped FIRM SFHAs. In total, 16 segments (totaling 1 mile) were found to be located outside the effective SFHA belonging to thirteen different stream reaches. Some communities, however, expressed concern that their FIRMs Zone A and Zone AEs do not tie together and that the channels are outside the floodway. In addition, community representatives indicated that the floodplain extents on the effective FIRMs may not show actual locations of flooding. Several disconnects were also identified in the Canadian River at the watershed boundaries and the county boundaries.

The majority of the flood insurance claims are from four communities (Oklahoma City, El Reno, Yukon and Woodward). Many comments also addressed the locations and types of flooding within communities, including repetitive loss structures, and structures that have been replaced after being washed out during storm events. These structures were identified during the Discovery Meeting.

Better topographic data is available or being acquired for Canadian County and portions of Oklahoma County and Blaine County. Updated regression equations from 1997 are available for the State of Oklahoma. Therefore, studies using regression analysis for hydrology were identified as potential needs for restudy due to the availability of new or updated regression equations since the study date.

Lastly, it is recommended that the CNMS database be updated as noted in Section III.iv. This would facilitate future evaluation of validity data contained in FEMA's floodplain inventory – and its goal is to determine whether or not there is an adequate level of flood hazard risk recognized on that particular community's FIRM. This process evaluates the existing study alongside seventeen potential indicators that may have occurred since the date of the effective analysis. These indicators include changes in land use, new or removed bridges or culverts, changes in discharge or gage record, and significant channel fill or scour.

IV. Watershed Options

In conjunction with the assessment of risk, need, and the availability of topographic data, as well as the input of community officials and stakeholders in the watershed, it is recommended that future projects be initiated in the MNC Watershed. Table 20 lists some potential needs in the watershed and actions that could be taken under each of the four areas discussed during the Discovery Meeting, which are:

- Risk identification and communication, including traditional flood studies and data updates
- NFIP community actions, including insurance-related mitigation or information
- Mitigation planning and mitigation actions, including items related to planning updates
- Community benefits and grant opportunities, which relate to outreach and disaster preparedness as well as non-flooding hazards like safe room information

Table 20: Potential Watershed Needs and Actions

Risk Identification and Communication
<ul style="list-style-type: none">• Modernize Blaine, Major and Dewey Counties. Perform FISs on all flooding sources with drainage areas greater than 1 square mile.• Complete CNMS validation for 50 miles of North Canadian River. Less than 30 percent of watershed stream miles are included in CNMS. Of those, nearly half are classified as unknown or unverified.• Update FISs and FIRMs for flooding sources identified by the communities as needing updates due to updated topographic information, infrastructure improvement projects not incorporated into the effective FIS and FIRMs, and inaccuracies in effective information.• Update FISs for segments of North Canadian in urbanized areas where changes in topographic information and infrastructure improvements are not included in effective FISs and FIRMs. City of Yukon noted existing levees in disrepair condition.• Perform FISs and FIRMs for unmapped segments of Fourmile and Sixmile Creeks, in areas where community noted rapid, recent urban growth.• Perform FISs on flooding sources where the effective FIRM needs to be updated (covert Zone AO to AE, City of Woodward) to better manage floodplain. Community noted severe damage to drainage structures and bridges due to flooding.• Perform and/or update FISs on stream reaches in areas identified as high potential for oil and gas development. Convert Zone A to Zone AE to facilitate floodplain management.• Updated detailed hydrologic and hydraulic analysis available for Turtle Creek, City of Yukon.

NFIP Community Action

- Deliver presentations on the benefits of joining the NFIP to non-participating, interested communities.
- Deliver presentations on the CRS program to interested communities.
- Train communities on the electronic Letter of Map Amendment (eLOMA) process to facilitate LOMC submissions.
- Work with Tribes to increase communication.

Mitigation Planning and Mitigation Actions

- Provide mitigation planning assistance for City of Bethany and Dewey County.
- Assist Oklahoma City and Canadian County in updating expired Mitigation Plans.
- Assist communities with preparation of Emergency Action Plan for small communities / private dam owners.
- Review availability of grants for small communities / private dam owners for repair and breach inundation mapping.
- Train communities on grants for repetitive loss properties.
- Support and leverage communities master drainage planning efforts.

Community Benefits and Grant Opportunities

- Additional communities in NFIP.
- Community outreach improved.
- Increased facilitation for HMP Grants applications.
- Expedite the Grant approval process.
- Local drainage and flooding issue addressed.
- Updated and current flood hazard information for communities.
- Increased credibility of NFIP information.
- Identification of local drainage issues and possible solutions.

To further detail the list of needs captured during the Discovery Meeting and in any follow-up correspondence, Table 21 provides a specific evaluation of streams or areas that could benefit from additional study. FEMA-based metrics are noted that would be met if the need or issue was addressed and if any current FEMA map actions would impact the activity. A comment or concern raised by a stakeholder during the Discovery process that could be correlated to one of

the needs or actions for the watershed is also noted. There are some needs and actions listed that were not noted by any particular community but were improvements that could be made in the MNC Watershed to meet general FEMA Regional goals.

Needs are identified as being on the critical path as high, medium or low priority or as something that a State or local community could be tasked with completing. These definitions are also included in Table 21.

- **High** – Local community would immediately benefit from the action, and FEMA’s metrics would also be met.
- **Medium** – Local community would benefit over the longer term from the action, and a portion of FEMA’s metrics may be met.
- **Low** – Local community activities can continue without this revision, and FEMA’s metrics are not impacted.
- **Community Action** – Activity would be more appropriate as a community-led action rather than a FEMA-led action.

Table 21: Metrics and Rankings of Needs

Item	Description of Need		Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation	Relates to Community Comment Number
	Location of Need/Project	Details				
	<p>Evaluation Guide Community Action – Activity would be more appropriate as a community-led action Low – Local community activities can continue without this revision, and FEMA’s metrics are not impacted Medium – Local community would benefit over the longer term from the action, and a portion of FEMA’s metrics may be met High – Local community would immediately benefit from the action, and FEMA’s metrics would also be met</p>					
A	Mitigation / Prepare New HMP	<ul style="list-style-type: none"> HMP completion recommended. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Facilitate the application for HMP Grants Expedite the Grant approval process 	Community Action	P1, P2, P13, P14, P17, P18, P19
B	Mitigation / Update Expired HMP	<ul style="list-style-type: none"> The Oklahoma City HMP expired in 2011 and Canadian County HMP expired in 2010. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Facilitate the application for HMP Grants Expedite the Grant approval process 	Community Action	P4, P9, P24, P29, P30
C	Mitigation / HMP Updates	<ul style="list-style-type: none"> Communities should update their HMP any time flood risks change. Communities should develop mitigation strategies in an on-going fashion. Update with mitigation successes to show work completed. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Impacts all communities Facilitate the application for HMP Grants Expedite the Grant approval process 	Community Action	No specific comment
D	Outreach / Coordination for Dam Emergency Action Plan	<ul style="list-style-type: none"> OWRB to coordinate with communities. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Community outreach improved 	Community Action	P12
E	Outreach / Coordination for Discovery	<ul style="list-style-type: none"> OWRB to provide Discovery Reports. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Community outreach improved 	Community Action	N4, N5
F	Outreach / Coordination for FPM	<ul style="list-style-type: none"> OWRB to extend outreach to support protection and beneficial use of floodplain areas. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Community outreach improved 	Community Action	N1
G	Outreach / Coordination for Grant Opportunities	<ul style="list-style-type: none"> OWRB to provide information on grants for small communities / private owners for dam repair and breach inundation mapping. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Community outreach improved 	Community Action	P3, P16, P25
H	Outreach / Coordination for Repetitive Loss Grant Opportunities	<ul style="list-style-type: none"> City of Woodward noted interest in grants opportunities for repetitive loss properties. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Community outreach improved 	High	C1, N7
I	Outreach / Coordination to enter CRS program	<ul style="list-style-type: none"> OWRB to extend outreach for CRS program. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Potential decrease in flood insurance premiums Community outreach improved 	Community Action	P11, P23, P27, N9
J	Outreach / Coordination to join NFIP program	<ul style="list-style-type: none"> Central North Canadian River Conservation District, Dewey County, and Dewey County Conservation District expressed interest in joining the NFIP. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Additional communities in NFIP Community outreach improved 	Medium	P15, N9, N12

Item	Description of Need		Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation	Relates to Community Comment Number
	Location of Need/Project	Details				
	<p>Evaluation Guide Community Action – Activity would be more appropriate as a community-led action Low – Local community activities can continue without this revision, and FEMA’s metrics are not impacted Medium – Local community would benefit over the longer term from the action, and a portion of FEMA’s metrics may be met High – Local community would immediately benefit from the action, and FEMA’s metrics would also be met</p>					
K	Outreach / Master Drainage Planning	<ul style="list-style-type: none"> City Oklahoma City, Del City and Yukon expressed interest in completing Master Drainage Plans. City of Yukon performed hydrology and hydraulics in support of a Hazard Mitigation project on Turkey Creek. City of Oklahoma City is ready to begin planning. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Identification of local drainage issues and possible solutions Grant application for assistance in mitigation Community outreach improved 	Community Action	P23
L	Updating the FIRM and FIS for Four Mile Creek, Canadian County. <ul style="list-style-type: none"> Community noted SFHAs mapping errors. Effective model for Fourmile Creek Tributary and Tributary A1 dates to 1976. Request for detailed study due to significant, recent urbanization changes. 	<ul style="list-style-type: none"> 8.3 miles of detailed hydrologic and hydraulic analysis for: <ul style="list-style-type: none"> 2.7 miles Fourmile Creek 2.1 miles Fourmile Creek Tributary 3.6 miles Fourmile Creek Tributary A1 8.3 miles of floodplain mapping. Updated topo (FY2012) exists for a portion of study reaches. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> No NVUE for 5.4 miles (study already valid in CNMS). 2.9 miles of new NVUE. Community outreach improved. FIRMs updated to reflect existing conditions. 	High	P6, P7, P8, M40, M41
M	Updating the FIRM and FIS for Purcell Creek, Canadian County. <ul style="list-style-type: none"> Community requested new study from confluence with Arkansas River to limited study location. Request for study due to significant, recent urbanization changes and replacement of structures. 	<ul style="list-style-type: none"> 31 miles of detail hydrologic and hydraulic study 31 miles of floodplain mapping. Updated topo (FY2011) and local matching available for a detail study. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> 31 miles of new NVUE Community outreach improved. FIRMs updated to reflect existing conditions. 	High	P28, M25, M26, M27, M28, M29, M39, M36, M42, M43
N	Updating the FIRM and FIS for Turtle Creek, Canadian County. <ul style="list-style-type: none"> Community noted SFHAs mapping changes. New studies requested to assess changes in flood risk. New drainage projects constructed since 2009 FIRM. Effective model dated 1977 for West Branch. New hydrology and hydraulics for 5.3 miles completed in 2011 	<ul style="list-style-type: none"> Upgrade 8.3 miles of detailed hydrologic and hydraulic study completed in 2011 to include floodways for: <ul style="list-style-type: none"> 2.9 miles Main Stem Turtle Creek 0.6 miles Cornwell Branch of East Branch Turtle Creek 1.4 miles East Branch Turtle Creek 0.4 Holly Branch of Middle Branch Turtle Creek 2.3 miles Middle Branch Turtle Creek 0.7 miles West Branch Turtle Creek 8.3 miles of floodplain mapping. 	<ul style="list-style-type: none"> None (Current study prepared for grant application to be updated to include floodways) 	<ul style="list-style-type: none"> No NVUE for 5.4 miles (study already valid in CNMS). 2.9 miles of new NVUE. Community outreach improved. FIRMs updated to reflect existing conditions. 	High	M20, M21, M22, N10

Item	Description of Need		Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation	Relates to Community Comment Number
	Location of Need/Project	Details				
O	<p>Updating the FIRM and FIS for North Canadian River Tributary 14, Oklahoma County.</p> <ul style="list-style-type: none"> Effective model dated 1980. Hydraulic model unspecified. 	<ul style="list-style-type: none"> 3.4 miles of detailed hydraulic study. 3.4 miles of floodplain mapping. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> 3.4 miles of new NVUE. FIRMs updated to reflect existing conditions. 	High	No specific comment
P	<p>Updating the FIRM and FIS for North Canadian River, Canadian, Oklahoma and Woodward County. Modernize unmapped segments of North Canadian River, Blain, Dewey and Major County.</p> <ul style="list-style-type: none"> Community noted <ul style="list-style-type: none"> SFHAs mapping changes. New levees, bridge, SH 4 and river channelization. Repetitive flooding of US 60, SH 34C, Western Avenue. Need for detailed study (Zone AE) From HWY 152(Mustang) to HWY 81 (El Reno). New mapping from Canton Lake to HUC-8 boundary needed. Approximately 115 miles of Zone A stream – of which 47 miles are classified unknown in CNMS. Effective models dated range from 1976 to 2000. 	<ul style="list-style-type: none"> Approximately 55 miles of detailed hydrologic and hydraulic study for: <ul style="list-style-type: none"> 42.9 miles North Canadian River 4.1 miles Tributary A 2.2 miles Tributary B and West Branch 3.4 miles Tributary C West Branch 1 and 2 2.7 miles North Canadian River Tributary and Unnamed Tributary 94 miles of approximate (model-backed) hydrologic and hydraulic study for North Canadian River, Blaine, Canadian and Woodward County – rural areas. 56 miles of approximate (model-backed) hydrologic and hydraulic study for unmapped North Canadian River, Blaine, Dewey and Major County. 205 miles of floodplain mapping. Updated topo (FY2011) available for segments of stream. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> 134 miles of new NVUE. No NVUE for 61.5 miles (study already valid in CNMS). Community outreach improved. FIRMs updated to reflect existing conditions. 	High	M2, M3, M5, M9, M10, M12, M19, M23, M24, M34, M42
Q	<p>Updating the FIRM and FIS for Campbell Creek, Canadian and Oklahoma Counties.</p> <ul style="list-style-type: none"> Community requested new study to assess changes in flood risk since 2009. New structures constructed since 2009 FIRM. Effective model dated 1980 for Oklahoma County. 	<ul style="list-style-type: none"> 13 miles of detail hydrologic and hydraulic study. 13 miles of floodplain mapping. Updated topo (FY2011) and (FY2011) available. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> 8.5 miles of new NVUE. No NVUE for 4.5 miles (study already valid in CNMS). Community outreach improved. FIRMs updated to reflect existing conditions. 	High	P21, P22

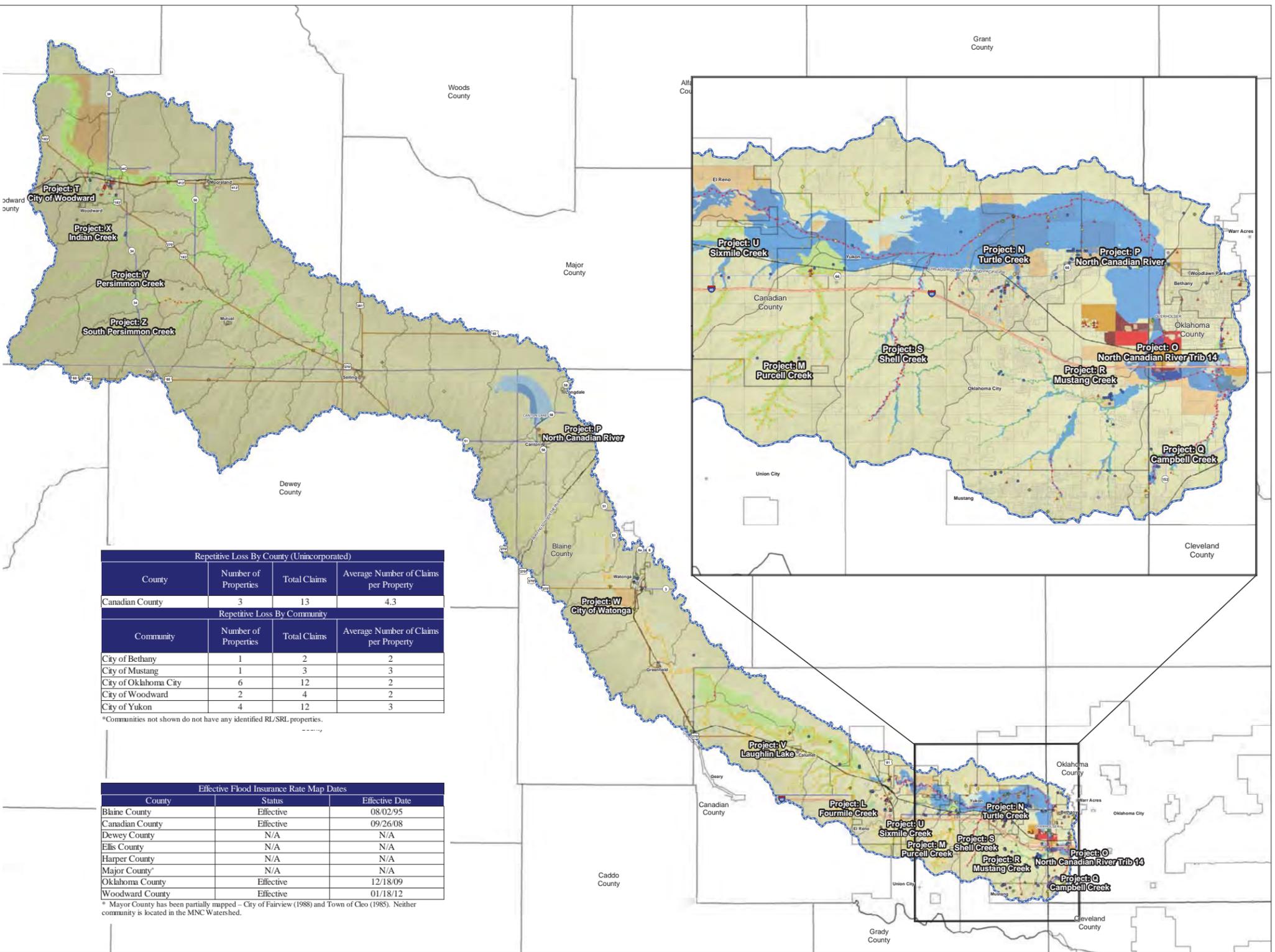
Item	Description of Need		Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation	Relates to Community Comment Number
	Location of Need/Project	Details				
R	<p>Updating the FIRM and FIS for Mustang Creek, City of Mustang and Canadian County.</p> <ul style="list-style-type: none"> • Effective model dated 1978 for Tributary 1 and 2. • Hydrologic and/or hydraulic model used unknown for 23.5 miles. • New studies necessary to assess changes in flood risk due to urbanization. 	<ul style="list-style-type: none"> • 33 miles of detail hydrologic and hydraulic study. <ul style="list-style-type: none"> ○ 10 miles Mustang Creek ○ 6.4 miles Mustang Creek Tributary 1 and Tributary 1 East Branch ○ 7.3 miles Mustang Creek Tributary 2 and Tributary 2 South Branch ○ 6.2 miles Mustang Creek Tributary 3 and Tributary 3 East Branch and West Branch ○ 1.3 miles Mustang Creek Tributary 4 ○ 1.3 miles Unnamed Stream • 33 miles of floodplain mapping. • Updated topo (FY2011) available. 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • 4.7 miles of new NVUE. • No NVUE for 27.9 miles (study already valid in CNMS). • FIRMs updated to reflect existing conditions. 	High	No specific comment
S	<p>Updating the FIRM and FIS for Shell Creek, Canadian County.</p> <ul style="list-style-type: none"> • Hydrology in Cimarron Creek tributary has changed due to increased urbanization. • Effective model dated 1977 for segment of Shell Creek. • New studies necessary to assess changes in flood risk due to urbanization. 	<ul style="list-style-type: none"> • 28.9 miles of detail hydrologic and hydraulic study. <ul style="list-style-type: none"> ○ 10.9 miles Shell Creek ○ 17.2 miles Shell Creek Tributary 1, Tributary 2, Tributary 3, Tributary 4 and 4 West Branch, Tributary 5 and 5 East Branch, and Tributary 6 ○ 0.8 miles Unnamed Stream • 28.9 miles of floodplain mapping. • Updated topo available for over 90% of the area 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • 12.8 miles of new NVUE. • No NVUE for 16 miles (study already valid in CNMS). • Community outreach improved. • FIRMs updated to reflect existing conditions. 	High	M37, M38
T	<p>Updating the FIRM and FIS for City of Woodward, Woodward County.</p> <ul style="list-style-type: none"> • Community requested detailed study for areas within the City of Woodward. • Requested study to facilitate enforcement in Zone AO. • Effective model dated 1976. 	<ul style="list-style-type: none"> • 17.2 miles of detail hydrologic and hydraulic study. • 5.1 miles of approximate (model-backed) hydrologic and hydraulic study. • 22.35 miles of floodplain mapping. • No topo data is currently available. 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • No NVUE for 22.35 miles (study already valid in CNMS). • Community outreach improved. • FIRMs updated to reflect existing conditions. 	Medium	M14, M15, M16

Item	Description of Need		Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation	Relates to Community Comment Number
	Location of Need/Project	Details				
U	<p>Updating the FIRM and FIS for Sixmile Creek and Tributary, El Reno and Canadian County.</p> <ul style="list-style-type: none"> Community requested study detailed study of Zone A (approximately 27 miles). Effective model dated 1976 for segments of Sixmile Creek and Tributaries (El Reno). New studies necessary to assess changes in flood risk due to urbanization. 	<ul style="list-style-type: none"> 45.95 miles of detailed hydrologic and hydraulic study. <ul style="list-style-type: none"> 14.0 miles Sixmile Creek 7.4 miles Sixmile Creek Tributary 4.1 miles Sixmile Creek Tributary 1 1.3 miles Sixmile Creek Tributary 3 9.6 miles Unnamed Tributary 6.7 miles (unmapped) Sixmile Creek Tributary 2.9 miles (erroneously named as Fourmile Creek tributary A1) Sixmile Creek tributary 45.95 miles of floodplain mapping. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> 30.1 miles of new NVUE. No NVUE for 15.8 miles (study already valid in CNMS). Community outreach improved. FIRMs updated to reflect existing conditions. 	High	M30, M31, M32, M44
V	<p>Updating the FIRM and FIS for Laughlin Lake, Canadian County.</p> <ul style="list-style-type: none"> New studies necessary to assess changes in flood risk due to urbanization. 	<ul style="list-style-type: none"> 1.2 miles of detailed hydrologic and hydraulic study. 1.2 miles of floodplain mapping. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> 1.2 miles of New NVUE. Community outreach improved. FIRMs updated to reflect existing conditions. 	Medium	M33
W	<p>Updating the FIRM and FIS for City of Watonga, Blain County.</p> <ul style="list-style-type: none"> Unmapped stream segment (extending from City limits to the North Canadian River) floods due to backwater from North Canadian River. Stream segment not included in CNMS and unmapped. 	<ul style="list-style-type: none"> 6.0 miles of detailed hydrologic and hydraulic study. 6.0 miles of floodplain mapping. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> 6.0 miles of New NVUE. Community outreach improved. FIRMs updated to reflect existing conditions. 	Medium	No specific comment
X	<p>Updating the FIRM and FIS for Indian Creek, Woodward County.</p> <ul style="list-style-type: none"> Community noted new structure at N/S 210 and E/W 45 and repetitive flooding of roadways. Neither date nor methodology recorded for effective model. 	<ul style="list-style-type: none"> 21.4 miles of approximate (model-backed) hydrologic and hydraulic study. <ul style="list-style-type: none"> 19.6 miles Indian Creek 1.8 miles Unknown 21.4 miles of flood mapping. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> No NVUE for 21.4 miles (study already valid in CNMS). Community outreach improved. FIRMs updated to reflect existing conditions. 	Medium	M4
Y	<p>Updating the FIRM and FIS for Persimmon Creek, Woodward County.</p> <ul style="list-style-type: none"> Neither date nor methodology for hydrologic study recorded for effective model. 	<ul style="list-style-type: none"> 45.1 miles of approximate (model-backed) hydrologic and hydraulic study. 45.1 miles of floodplain mapping. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> No NVUE for 45.1 miles (study already valid in CNMS). FIRMs updated to reflect existing conditions. 	Medium	M1, M6, M7

Item	Description of Need		Impacts from Any Current Map Actions	FEMA Metric or Community Benefit	Evaluation	Relates to Community Comment Number
	Location of Need/Project	Details				
	<p>Evaluation Guide Community Action – Activity would be more appropriate as a community-led action Low – Local community activities can continue without this revision, and FEMA’s metrics are not impacted Medium – Local community would benefit over the longer term from the action, and a portion of FEMA’s metrics may be met High – Local community would immediately benefit from the action, and FEMA’s metrics would also be met</p>					
Z	Updating the FIRM and FIS for South Persimmon Creek, Woodward County. <ul style="list-style-type: none"> Neither date nor methodology for hydrologic study recorded for effective model. 	<ul style="list-style-type: none"> 10.0 miles of approximate (model-backed) hydrologic and hydraulic study. 10.0 miles of floodplain mapping. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> No NVUE for 10 miles (study already valid in CNMS). FIRMs updated to reflect existing conditions. 	Medium	No specific comment
AA	HAZUS Outreach / Coordination	<ul style="list-style-type: none"> Provide information from the Average Annualized Loss Study. Introduction to HAZUS. 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Communities become more familiar with the HAZUS program and are prepared to use Risk MAP products when they are issued. HAZUS can be used for HMP updates. 	Medium	No specific comment

Mitigation Plan Status			
Organization and Plan	Date Approved by FEMA	Expires	Comments
State of Oklahoma Hazard Mitigation Plan	02/17/11	02/16/14	Adopted - 1/27/2011
Blaine County Hazard Mitigation Plan	03/21/11	03/20/16	
Canton, Town of	07/02/07	07/01/12	In County Plan
Geary, City of	03/21/11	03/20/16	In County Plan
Greenfield, Town of	03/21/11	03/20/16	In County Plan
Watonga, City of	03/21/11	03/20/16	In County Plan
Canadian County Hazard Mitigation Plan	04/23/04	04/22/09	Being Written
Calumet, Town of	07/16/04	07/15/09	To be added to County Plan
El Reno, City of	03/31/04	03/30/09	To be added to County Plan
Mustang, City of	07/26/04	07/25/09	To be added to County Plan
Union City, Town of	07/07/04	07/06/09	To be added to County Plan
Yukon, City of	05/25/11	05/24/16	
Dewey County Hazard Mitigation Plan	12/11/09	12/10/14	
Seiling, Town of	12/11/09	12/10/14	In County Plan
Vici, Town of	12/11/09	12/10/14	In County Plan
Ellis County Hazard Mitigation Plan	07/29/08	07/28/13	
Harper County Hazard Mitigation Plan	08/02/11	08/01/16	
Major County Hazard Mitigation Plan	09/16/04	09/15/09	Plan undergoing update
Oklahoma County Hazard Mitigation Plan	09/10/07	09/09/12	Plan Being Written
Oklahoma City, City of	11/27/06	11/26/11	Plan Being Written (separate plan from county)
Warr Acres, Town of	09/10/07	09/09/12	In County Plan
Woodward County Hazard Mitigation Plan	07/29/08	07/28/13	
Mooreland, Town of	07/29/08	07/28/13	In County Plan
Mutual, Town of	07/29/08	07/28/13	In County Plan
Sharon, Town of	07/29/08	07/28/13	In County Plan
Woodward, City of	07/29/08	07/28/13	In County Plan

Item	Location of Need/Project
A	Mitigation / Prepare New HMP
B	Mitigation / Update Expired HMP
C	Mitigation / HMP Updates
D	Outreach / Coordination for Dam Emergency Action Plan
E	Outreach / Coordination for Discovery
F	Outreach / Coordination for FPM
G	Outreach / Coordination for Grant Opportunities
H	Outreach / Coordination for Repetitive Loss Grant Opportunities
I	Outreach / Coordination to enter CRS program
J	Outreach / Coordination to join NFIP program
K	Outreach / Master Drainage Planning
L	Updating the FIRM and FIS for Four Mile Creek, Canadian County.
M	Updating the FIRM and FIS for Purcell Creek, Canadian County.
N	Updating the FIRM and FIS for Turtle Creek, Canadian County.
O	Updating the FIRM and FIS for North Canadian River Tributary 14, Oklahoma County.
P	Updating the FIRM and FIS for North Canadian River, Canadian, Oklahoma and Woodward County. Modernize untrapped segments of North Canadian River, Blain, Dewey and Major County.
Q	Updating the FIRM and FIS for Campbell Creek, Canadian and Oklahoma Counties.
R	Updating the FIRM and FIS for Mustang Creek, City of Mustang and Canadian County.
S	Updating the FIRM and FIS for Shell Creek, Canadian County.
T	Updating the FIRM and FIS for City of Woodward, Woodward County.
U	Updating the FIRM and FIS for Sixmile Creek and Tributary, El Reno and Canadian County.
V	Updating the FIRM and FIS for Laughlin Lake, Canadian County.
W	Updating the FIRM and FIS for City of Watonga, Blain County.
X	Updating the FIRM and FIS for Indian Creek, Woodward County.
Y	Updating the FIRM and FIS for Persimmon Creek, Woodward County.
Z	Updating the FIRM and FIS for South Persimmon Creek, Woodward County.
AA	HAZUS Outreach / Coordination



Repetitive Loss By County (Unincorporated)			
County	Number of Properties	Total Claims	Average Number of Claims per Property
Canadian County	3	13	4.3

Repetitive Loss By Community			
Community	Number of Properties	Total Claims	Average Number of Claims per Property
City of Bethany	1	2	2
City of Mustang	1	3	3
City of Oklahoma City	6	12	2
City of Woodward	2	4	2
City of Yukon	4	12	3

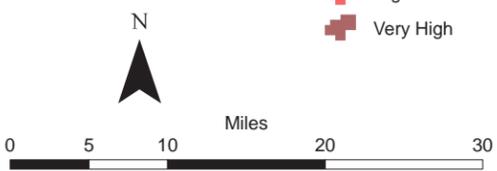
* Communities not shown do not have any identified RL/SRL properties.

Effective Flood Insurance Rate Map Dates		
County	Status	Effective Date
Blaine County	Effective	08/02/95
Canadian County	Effective	09/26/08
Dewey County	N/A	N/A
Ellis County	N/A	N/A
Harper County	N/A	N/A
Major County	N/A	N/A
Oklahoma County	Effective	12/18/09
Woodward County	Effective	01/18/12

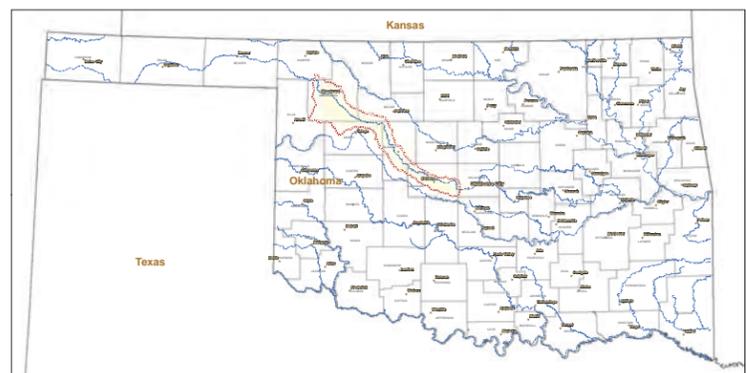
* Mayor County has been partially mapped - City of Fairview (1988) and Town of Cleo (1985). Neither community is located in the MNC Watershed.

MAP SYMBOLOLOGY

HUC8 Watershed	LOMC Locations	CNMS Data	Effective Flooding	Avg. Annualized Loss
HUC 12 Boundaries	Citizen Comment Locations	Validated	AE; AH; AO	Very Low
Transportation	Mitigation Grant	Unknown	A	Low
Interstate	Single Claims	Unverified	500Y	Medium
US Hwy	Repetitive Loss			High
State Hwy	Severe Repetitive Loss			Very High
RR	Community Participation			
Dams	Not Participating in NFIP			
USGS Gages	Participating in NFIP			



WATERSHED LOCATOR



**NATIONAL FLOOD INSURANCE PROGRAM
Discovery Map**

MIDDLE NORTH CANADIAN WATERSHED



Total Stream Miles:	2,504
Studied Stream Miles:	638
Detailed Study Miles:	149
Approximate Study Miles:	489
Population:	274,183

HUC-8 Code
11100301

Release Date: 7/31/2012

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