City of Jonesboro

Municipal Center
300 S. Church Street
Jonesboro, AR 72401

Meeting Agenda

Public Works Council Committee

Tuesday, March 3, 2020 | **5:00 PM** | **Municipal Center**

1. Call To Order

2. Roll Call by City Clerk Donna Jackson

3. Approval of minutes

MIN-20:015 Minutes forthe Public Works Committee meeting on February 4, 2020.

Attachments: Minutes

4. New Business

ORDINANCES TO BE INTRODUCED

ORD-20:012 AN ORDINANCE ADOPTING BY REFERENCE THE BASE LEVEL ENGINEERING (BLE) STUDIES FOR THE ST. FRANCIS, CACHE AND L'ANGUILLE WATERSHEDS

Sponsors: Engineering

Attachments: Cache_BLE_Report
Cache_Discovery_FRR
L'Anguille_BLE_Report
L'Anguille_Discovery_FRR
St. Francis_BLE_Report
St. Francis_Discovery_FRR

RESOLUTIONS TO BE INTRODUCED

RES-20:031 A RESOLUTION REQUESTING FREE UTILITY SERVICES FROM CITY WATER AND LIGHT FOR TRAFFIC SIGNALS

Sponsors: Engineering

5. Pending Items

6. Other Business

7. Public Comments

8. Adjournment

City of Jonesboro

300 S. Church Street
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Legislation Details (With Text)

File #:	MIN-20:015	**Version:**	1	**Name:**	Minutes forthe Public Works Committee meeting on February 4, 2020
Type:	Minutes			**Status:**	To Be Introduced
File created:	2/10/2020			**In control:**	Public Works Council Committee
On agenda:				**Final action:**	
Title:	Minutes forthe Public Works Committee meeting on February 4, 2020.				
Sponsors:					
Indexes:					
Code sections:					
Attachments:	Minutes				

Date	Ver.	Action By	Action	Result

Minutes forthe Public Works Committee meeting on February 4, 2020.

City of Jonesboro

Municipal Center
300 S. Church Street
Jonesboro, AR 72401

Meeting Minutes
Public Works Council Committee

Tuesday, February 4, 2020 | **5:00 PM** | **Municipal Center**

1. Call To Order

2. Roll Call by City Clerk Donna Jackson

Present 5 - Mitch Johnson;John Street;Chris Moore;Charles Coleman and LJ Bryant

Absent 2 - Gene Vance and Ann Williams

3. Approval of minutes

MIN-20:004 Minutes for the Public Works Committee meeting for January 7, 2020.

A motion was made by Councilperson Chris Moore, seconded by Councilperson Charles Coleman, that this matter be Passed . The motion PASSED with the following vote.

Aye: 5 - Mitch Johnson;John Street;Chris Moore;Charles Coleman and LJ Bryant

Absent: 2 - Gene Vance and Ann Williams

4. New Business

ORDINANCES TO BE INTRODUCED

ORD-20:002 AN ORDINANCE ADOPTING BY REFERENCE THE GUIDELINES FOR THE REQUIREMENT OF A TRAFFIC IMPACT ANALYSIS IN THE CITY OF JONESBORO

Attachments: Transportation Impact Study Guidelines

ORD-20:006
Councilperson Dr. Charles Coleman said, Mr. Chair I have a question? Didn't Councilperson Gene Vance ask for a study on this? Chair John Street asked City Planner, Derrel Smith to please come up and answer Dr. Coleman's question.

Chief of Staff, Mike Downing said, come on up Derrel. Mr. Downing continued with, if you all remember back a meeting or two ago, there was a similar ordinance that was proposed, and it basically limited the number of salvage yards and all of that. This is a replacement ordinance to satisfy Mr. Vance's concerns. We have made it as restrictive as we could because of the situation. Again, this is the replacement based on Councilperson Vance's instructions. Dr. Coleman said, okay.

Chair John Street, said did that answer your question Dr. Coleman? Councilperson Dr.

Coleman said yes, I just wanted to make sure we didn't just pass it by without addressing Councilperson's Vance's concerns. Chair Street said, and I think several of us had concerns, like banning that in the last ordinance, I think that would face a losing challenge in court. We couldn't ban it, but we could allocate it to a certain industrial classification. City Planner Derrel Smith said, we are going to limit it to a certain zone with a conditional use only, and that would require a public hearing before it could go into that area.

A motion was made by Councilperson Charles Coleman, seconded by Councilperson Mitch Johnson, that this matter be Recommended to Council . The motion PASSED with the following vote.

Aye: 5 - Mitch Johnson;John Street;Chris Moore;Charles Coleman and LJ Bryant

Absent: 2 - Gene Vance and Ann Williams

ORD-20:003 AN ORDINANCE ADOPTING BY REFERENCE THE GUIDELINES FOR THE ACCESS MANAGEMENT IN THE CITY OF JONESBORO

Attachments: Traffic Access Management Policy

A motion was made by Councilperson Charles Coleman, seconded by Councilperson Mitch Johnson, that this matter be Amended . The motion PASSED with the following vote.

Aye: 5 - Mitch Johnson;John Street;Chris Moore;Charles Coleman and LJ Bryant

Absent: 2 - Gene Vance and Ann Williams

ORD-20:004 AN ORDINANCE AMENDING THE JONESBORO CODE OF ORDINANCES, AND ADOPTING THE CITY OF JONESBORO MASTER STREET PLAN; PROVIDING FOR AMENDMENTS OF ARTICLE III, CHAPTER 101, AND ADOPTING SUCH AMENDMENTS TO THE MASTER STREET PLAN BY REFERENCE;

Attachments: Master Street Plan

A motion was made by Councilperson Charles Coleman, seconded by Councilperson Mitch Johnson, that this matter be Recommended to Council . The motion PASSED with the following vote.

Aye: 5 - Mitch Johnson;John Street;Chris Moore;Charles Coleman and LJ Bryant

Absent: 2 - Gene Vance and Ann Williams

ORD-20:006 An Ordinance to Amend Section 117-139(C) OF the City of Jonesboro Zoning Code

Sponsors: Mayor's Office

A motion was made by Councilperson Charles Coleman, seconded by Councilperson LJ Bryant, that this matter be Recommended to Council . The motion PASSED with the following vote.

Aye: 5 - Mitch Johnson;John Street;Chris Moore;Charles Coleman and LJ Bryant

Absent: 2 - Gene Vance and Ann Williams

5. Pending Items

6. Other Business

7. Public Comments

8. Adjournment

A motion was made by Councilperson Chris Moore, seconded by Councilperson Mitch Johnson, that this matter be Adjourned . The motion PASSED with the following vote.

Aye: 5 - Mitch Johnson;John Street;Chris Moore;Charles Coleman and LJ Bryant

Absent: 2 - Gene Vance and Ann Williams

City of Jonesboro

300 S. Church Street
Jonesboro, AR 72401

Legislation Details (With Text)

File #:	ORD-20:012	**Version:**	1	**Name:**	
Type:	Ordinance			**Status:**	To Be Introduced
File created:	2/26/2020			**In control:**	Public Works Council Committee
On agenda:				**Final action:**	
Title:	AN ORDINANCE ADOPTING BY REFERENCE THE BASE LEVEL ENGINEERING (BLE) STUDIES FOR THE ST. FRANCIS, CACHE AND L'ANGUILLE WATERSHEDS				
Sponsors:	Engineering				
Indexes:					
Code sections:					
Attachments:	Cache_BLE_Report Cache_Discovery_FRR L'Anguille_BLE_Report L'Anguille_Discovery_FRR St. Francis_BLE_Report St. Francis_Discovery_FRR				

Date	Ver.	Action By	Action	Result

AN ORDINANCE ADOPTING BY REFERENCE THE BASE LEVEL ENGINEERING (BLE) STUDIES FOR THE ST. FRANCIS, CACHE AND L'ANGUILLE WATERSHEDS

WHEREAS, the Legislature of the State of Arkansas has in Ark. Code Ann. § 14-268-101 et. seq., delegated the responsibility of local governmental units to adopt regulations to minimize flood losses; and,

WHEREAS, the Federal Emergency Management Agency (FEMA) has identified Special Flood Hazard Areas of City of Jonesboro in the current scientific and engineering report entitled "**The Flood Insurance Study (FIS) for Jonesboro, City of**," dated September 27, 1991, with an effective Flood Insurance Rate Map (FIRM) dated September 27, 1991; and,

WHEREAS, FEMA has also identified additional areas of flood risk within the City of Jonesboro in current scientific and engineering reports entitled "Lower St. Francis Watershed BLE Analysis", "Cache Watershed BLE Analysis" and "L'Anguille Watershed BLE Analysis"; and,

WHEREAS, the Stormwater Management Board recommends the adoption of aforementioned scientific and engineering reports for regulating development in FEMA Zone A areas and in Local Special Flood Hazard Areas within the jurisdiction of the City of Jonesboro where BLE data is available.

WHEREAS, pursuant to ACA 14-55-207, public notice was given of the City's intent to adopt said studies by reference, and advised that three (3) copies of the documents were on file and available for public review and examination in the Office of the CIty Clerk; and

NOW, BE IT ORDAINED, BY THE CITY COUNCIL OF THE CITY OF JONESBORO:

SECTION 1: The following scientific and engineering studies are adopted by reference: “Lower St. Francis Watershed BLE Analysis”, “Cache Watershed BLE Analysis” and “L’Anguille Watershed BLE Analysis”.

SECTION 2: These documents shall apply to all Special Flood Hazard Areas in FEMA Zone A and other areas within the jurisdiction of the City of Jonesboro where Base Level Engineering is available.

AR Highway 33 near Bisco, AR - Jocelyn Augustino/FEMA Photo by Jocelyn Augustino

Cache Watershed, AR
Base Level Engineering (BLE) Results

Cache Watershed, HUC - 08020302

Clay*, Craighead*, Cross*, Greene*, Jackson*, Lawrence*, Monroe*, Poinsett*, Prairie*, Randolph*, St. Francis*, Woodruff* Counties, Arkansas and Butler* County, Missouri

**Spans more than one watershed. This report covers only the area within the studied watershed.*

June 2017

tn Associates Ltd.

Project Area Community List

Community Name	CID
Clay County Communities	
Clay County[1]	050423
Knobel, City of	050032
McDougal, City of	050033
Peach Orchard, City of	050034
Piggott, City of[1]	050035
Pollard, City of	050036
Craighead County Communities	
Bono, City of	050046
Cash, Town of	050396
Craighead County[1]	050427
Egypt, Town of	050585
Jonesboro, City of[1]	050048
Cross County Communities	
Cross County[1]	050056
Greene County Communities	
Greene County[1]	050435
Lafe, Town of	N/A
Jackson County Communities	
Amagon, Town of	050097
Beedeville, Town of	050098B
Grubbs, City of	050101
Jackson County[1]	050096
Newport, City of[1]	050103
Tupelo, Town of	050106
Weldon, Town of	N/A
Lawrence County Communities	
Lawrence County[1]	050443
Sedgwick, Town of	050576
Walnut Ridge, City of[1]	050122
Monroe County Communities	
Brinkley, City of[1]	050155
Fargo, Town of	05X020
Monroe County[1]	050154
Poinsett County Communities	
Fisher, City of[1]	N/A
Poinsett County[1]	050172
Waldenburg, Town of[1]	050497
Weiner, City of[1]	050373

[1] Community is located within more than one HUC8 watershed.

Community Name	CID
Prairie County Communities	
Biscoe, City of[1]	N/A
Prairie County[1]	050459
Randolph County Communities	
O'Kean, Town of	N/A
Randolph County[1]	050460
St. Francis County Communities	
St. Francis County[1]	050184
Woodruff County Communities	
Cotton Plant, City of	050231
Hunter, Town of	
McCrory, City of	050232
Patterson, City of	050274
Woodruff County[1]	050468
Butler County Communities	
Quilin, City of	230048
Butler, County of	290044

[1] Community is located within more than one HUC8 watershed.

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Appendix A – WORKMAPS

1. Executive Summary

The U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) is currently implementing the Risk Mapping, Assessment, and Planning (Risk MAP) Program across the Nation. 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 a more integrated process of more accurately identifying, assessing, communicating, planning and mitigating flood risks. Risk MAP attempts to address gaps in flood hazard data and form a solid foundation for risk assessment, floodplain management, and provide State and Local entities with information needed to mitigate flood related risks.

The FEMA Region 6 office and the Arkansas Natural Resources Commission (ANRC) entered into a Cooperating Technical Partners (CTP) partnership agreement for implementation of Risk MAP in the State of Arkansas. As part of this partnership, the ANRC and its contractor, FTN Associates, Ltd. (FTN), began work on a Base Level Engineering (BLE) analysis in the Cache Watershed in October 2016 to support FEMA's Discovery process and validation of effective Zone A Special Flood Hazard Area (SFHA).

The BLE process involves using best available data and incorporating automated techniques with existing hydrologic and hydraulic (H&H) model development procedures to produce quality flood hazard boundaries and secondary products (Water Surface Elevation grids, Depth grids, etc.) for multiple recurrence intervals. The purpose and intent of the BLE process is to validate existing Zone A flood boundaries within the existing Coordinate Needs Management Strategy (CNMS) dataset and provide updated flood risk data in the early stages of a Flood Risk Project (Discovery). An important goal of the BLE process developed by FEMA is the scalability of the results. Scalability means that the results of an BLE cannot only be used for CNMS evaluations of Zone A studies but also leveraged throughout the Risk MAP program.

The source digital terrain data used for surface model development in support of H&H analysis, as well as mapping activities were leveraged from existing Light Detection and Ranging (LIDAR) data collected by the Federal Emergency Management Agency (2011 Cache and 2011 L'Anguille), U.S. Geological Survey (2011 Bayou Meto, 2012 Upper Black, 2012 Upper White Village, 2013 Lower St. Francis, and 2015 Lower Black), and the U.S. Army Corps of Engineers (2010 White River to Newport, 2010 Greers Ferry and Red River, 2014 AR-MO LIDAR Project). The LiDAR datasets were 1-meter gridded DEM data that were reprojected to a 15 ft cell size for hydrologic processing and a 5 ft cell size for hydraulic and mapping processing.

Flood discharges for this analysis were calculated using the National Oceanic and Atmospheric Administration's National Weather Service, Precipitation Frequency Data Server (PFDS) for Atlas 14, ESRI's ArcGIS software, the HEC-Hydrologic Modeling System (HEC-HMS) computer program, and the HEC - River Analysis System (HEC-RAS) program, version 5.0.3. Initial precipitation values were obtained, based on a watershed level, from NOAA's Precipitation Frequency Data Server (PFDS) for Atlas 14, which was then processed in ESRI's ArcGIS 10.x software into a usable format. The obtained preceipitation values and resulting GIS parameters for the watershed, were then input into HEC-HMS to determine the excess rainfall that would result based on the applied conditions. This excess rainfall was then applied to a 2-D HEC-RAS model in the form of a rain on grid scenario, which was then used compute the water surface elevations for the 10-, 4-, 2-, 1-, 0.2-percent-events and the 1-percent-minus and 1-percent plus flood events.

The modeled stream mile network for the Cache Watershed was compiled initially using FEMA's CNMS inventory. It was then expanded to include streams that extended upstream to a contributing drainage area of approximately 1 sq. mile.

2. Base Level Engineering (BLE) Methodology

This section provides guidance for the hydrologic, hydraulic and floodplain mapping steps required to create a BLE. The BLE process involves using best available data and incorporating automated techniques with existing H&H model development procedures to produce quality flood hazard boundaries and secondary products (Water Surface Elevation grids, Depth grids, etc.) for multiple recurrence intervals. The purpose and intent of the BLE process is to validate existing Zone A flood boundaries within the existing CNMS dataset and provide updated flood risk data in the early stages of a Flood Risk Project (Discovery).

The cost and effort for developing the data and estimates resulting from the BLE process are lower than standard flood production tasks. An important goal of the BLE process developed by FEMA is the scalability of the results. Scalability means that the results of an BLE cannot only be used for CNMS evaluations of Zone A studies but also leveraged throughout the Risk MAP program. The large volume of data resulting from an BLE can be used for the eventual production of regulatory and non-regulatory products, outreach and risk communication and MT-1 processing. Leveraging this data outside the Risk MAP program may also be valuable to external stakeholders.

Per the the Code of Federal Regulations, once every five years, FEMA must evaluate whether the information on Flood Insurance Rate Maps (FIRMs) reflects the current risks. This evaluation is done by examining the existing flood boundaries for changes in study attributes and physical characteristics, as specified in the CNMS Technical Reference. Additionally, this evaluation occurs using a series of critical and secondary checks to determine the validity of the existing flood hazard areas. In addition to the need for evaluating the accuracy of Zone A mapping, newer FEMA standards also require that flood risk data be provided in the early stages of a Flood Risk Project. Particularly, FEMA Program Standard SID #29 requires that during Discovery, data must be identified that illustrates potential changes in flood elevation and mapping that may result from the proposed project scope. If available data does not clearly illustrate the likely changes, an analysis is required that estimates the likely changes. This data and any associated analyses should be shared and results should be discussed with stakeholders.

Therefore, based on these requirements, the results of the BLE process are being provided to the local Floodplain Administrators (FPAs), which allows for users to have access to a model backed Zone A study that is suitable to replace the effective Zone A products. The following sections are being supplied to document the hydrologic, hydraulic, and floodplain mapping techniques used. Regardless of the individual techniques used to perform these steps, the goal of a scalable product should be adhered to throughout the entire BLE process.

2.1. Terrain

To determine the parameters for the hydrologic and hydraulic analyses, FTN obtained Digital Elevation Model (DEM) data developed from LIDAR information that was collected by the Federal Emergency Management Agency (2011 Cache and 2011 L'Anguille), U.S. Geological Survey (2011 Bayou Meto, 2012 Upper Black, 2012 Upper White Village, 2013 Lower St. Francis, and 2015 Lower Black), and the U.S. Army Corps of Engineers (2010 White River to Newport, 2010 Greers Ferry and Red River, 2014 AR-MO LIDAR Project). The bare earth DEM data was provided as 1-meter or 1/3

arc-second DEMs with varying horizontal and vertical coordinate systems. Prior to use, the DEM data was reprojected to a 15 ft cell size for hydrologic processing and a 5 ft cell size for hydraulic and mapping processing with a horizontal coordinate system of NAD 1983 State Plane Arkansas North (feet) and a vertical datum of NAVD 88 (feet). DEMs were then mosaicked into a single DEM that covered the entire watershed. The single DEM was then processed using Environmental Systems Research Institute's (ESRI) ArcMap Geographic Information System (GIS) 10.x software and the ArcHydro toolset to develop the hydrologic parameters needed for use in the hydrologic modeling.

A terrain and workmap index has been prepared and is attached to the end of this report and included in Appendix A – Workmaps.

2.2. Hydrology

Excess runoff for the 10-, 4-, 2-, 1-, 0.2-percent-events and the 1-percent-minus and 1-percent plus flood events were calculated using NOAA's Precipitation Frequency Data Server (PFDS) for Atlas 14. This task was completed by processing raster data for the study events based on a HUC-10 level.The excess rainfall values were spatially averaged from raster data using the zonal statistics toolset in ESRI's ArcGIS. The maximum rainfall values, based on a HUC 10 level were selected as input for the resulting HEC-HMS model.

In addition to the Atlas 14 precipitation values, ESRI's ArcGIS software and supporting toolsets were used to process the initial terrain data, delineate drainage basins, and develop basin parameters for the study area. For this analysis, the SCS curve number method was selected to estimate losses due to varying landuse. The weighted Curve Number for the watershed was developed using the 2011 National Land Cover Database, NRCS's SSURGO Soil Surveys and TR-55 runoff curve numbers, and ESRI's ArcGIS software. The watershed was assumed to be at Antecedent Moisture Condition II (average moisture condition). To apply the rainfall, an SCS Type II rainfall distribution was used based to distribute the rainfall across the basin. Table 1, shown below, lists the initial and excess rainfall used for the hydrologic analysis.

Table 1: List of rainfall and peak runoff volume at different recurrence interval

Recurrence Interval (% chance)	NOAA Atlas 14 Rainfall (in)	Excess Volume (in)
10	5.60	3.52
4	6.89	4.41
2	7.52	5.28
1	8.51	6.21
0.2	11.04	8.64
1-plus	10.76	8.36
1-minus	6.68	4.50

After determining the excess runoff in HEC-HMS for the watershed, it was applied to the 2-D hydraulic model as a rain on grid scenario.

2.3. Hydraulics

For all streams identified in the Cache Watershed, the BLE process uses ESRI ArcGIS software and toolsets to create the HEC-RAS layers used for geometric data development and extraction. Additionally, the hydraulic modeling and mapping for this BLE process was conducted using the USACE's HEC-RAS 5.0.3 software package.

Streams

The streamlines used for determining what areas needed to be modeled were taken from the CNMS dataset. They were then expanded to include streams that extended up to a contributing drainage area of approximately 1 sq. mile. These streams were then reviewed and updated to match aerial imagery and detailed topographic data, as needed.

Hydraulic mesh (2-D analysis)

Hydraulic modeling for the Cache Watershed BLE Analysis was computed using 2-D analyses to better reflect the large, flat, and interconnected floodplains. To perform this modeling, 2-D capabilities of the HEC-RAS 5.0.3 was utilized. With a 2-D model, the area is modeled using a topographic mesh rather than a series of cross sections down the longitudinal axis of the stream reach, as is done in a 1-D model. The HEC-RAS mesh consists of computational cells that are assigned elevations and roughness values along the cell faces that represent the topographic surface and frictional characteristics of the area and and volumetric relationships for the cell area, respectively. The use of the 2-D model allows for more detailed resolution in water surface elevations, velocities, and flows than is possible with a 1-D model that is only capable of computing the average water surface elevations, velocities, and flows for three general regions at a cross section. Based on engineering judgement, breaklines were defined along the levees, dams, roads, culverts and elevated berms as seen on the topography. It is necessary to draw breaklines as it makes sure that the flow across the cell faces is blocked by the elevation of the structure along the break line.

Parameter Estimation

The Manning's "n" values used were based on engineering judgment and using the 2011 National Land Cover Data (NLCD) dataset. Table 2 lists the landuse and roughness coefficients used in this analysis.

Table 2: Manning's "n" Coefficients

Material Type	Manning's "n"
Open Water	0.01
Developed, Open Space	0.04
Barren Land (Rock/Sand/Clay)	
Grassland/Herbaceous	0.05
Pasture/Hay	
Emergent Herbaceous Wetlands	
Developed, Low Intensity	0.06
Shrub/Scrub	
Cultivated Crops	
Developed, Medium Intensity	0.08
Developed High Intensity	0.10
Deciduous Forest	
Evergreen Forest	
Mixed Forest	
Woody Wetlands	

Boundary Conditions

For this BLE analysis, the downstream boundary conditions are set to be normal depth slope. The computed slope is based on topographic data from the downstream limits of the modeling.

Model Calibrations

No calibration was performed on these streams.

2.4. Quality Control

Throughout the BLE analysis, quality checks were performed. These checks included review of topographic data processing, hydrologic parameters being applied, checking for complete model coverage, adjusting the mesh cell sizes, adjusting mesh boundaries, adding breaklines along structures, as required, and review of the final mapping results.

Significant efforts were made to resolve errors found during these quality checks.

2.5. Mapping

Following the hydraulic analysis, the model results were then imported into the HEC-RAS RAS Mapper tool to map floodplain boundaries for the model extent. This tool uses a routine that develops water surface elevation grids based on the 5-foot cell size DEM from Section 2.1. For this BLE analysis, mapping results were developed for seven (7) events. These events were the 10-, 4-, 2-, 1-, 0.2-percent-events and the 1-percent-minus and 1-percent plus boundaries.

Once the floodplain boundaries were created, the resulting floodplain data were smoothed and small polygons (less than 0.25 acres) and small disconnected fragments were removed. After the initial boundary edits, the resulting floodplain boundaries were merged into a single watershed based map boundary. For this BLE process, only the 1-percent-annual-chance floodplain is reported on the workmaps. Workmaps were generated to provide a graphical comparison of the effective floodplain boundaries to that of the BLE processed streams. These workmaps are provided in Appendix A – Workmaps.

Once the map boundaries were cleaned, the resulting rasters (Water Surface Elevation, Depth, etc.) were developed with the raster set to correspond in extent to the cleaned polygon boundary. This ensures that the water surface raster and the floodplain boundary are consistent with each other. The depth raster product was created by performing a raster subtraction with the water surface elevation raster and the ground DEM. Once complete, the resultant depth grids were used to perform an updated Flood Loss Analysis for the watershed using the HAZUS program.

3. Submittal

All information, data, and files for the Cache Watershed BLE process are uploaded to the FEMA MIP and provided digitally in electronic format in a directory structure provided below.

08020302\Cache Watershed BLE

\General

- Project Narrative (PDF)

\Hydraulic_Models

\08020302\08020302_CacheRiver

- HEC-RAS model

\Spatial_Files

- Cache_Watershed (file geodatabase format)

\Supplemental_Data

\CNMS_Update

- CNMS database update (file geodatabase format)

\HAZUS

- Loss Analysis project

\Appendix A – Workmaps

- Terrain and Workmap Index (PDF)
- Workmaps (PDF)
- Workmap Index (SHP format)

4. References

1. USGS. Multi-Resolution Land Characteristics Consortium. *National Land Cover Database 2011*. (http://www.mrlc.gov/nlcd2011.php).

2. NOAA. Precipitation-Frequency Atlas of the United States, Atlas 14. (http://hdsc.nws.noaa.gov/hdsc/pfds/).

3. Chow, Ven T. *Open Channel Hydraulics*. Caldwell, NJ: Blackburn, 1959. Print.

4. U.S. Army Corps of Engineers, Hydrologic Engineering Center. (September 2016). HEC-RAS River Analysis System, Version 5.0.3. Davis, California.

5. FEMA, "Guidance for Automated Engineering", May 2016.(http://www.fema.gov/media-library-data/1469144112748-3c4ecd90cb927cd200b6a3e9da80d8a/Automated_Engineering_Guidance_May_2016.pdf).

Photo Courtesy: Arkansas Department of Parks and Tourism

Flood Risk Report

Cache Watershed, AR

HUC8 08020302

November 2017

Version Number	Version Date	Summary
1.0	11/28/2017	Initial Report Development

Preface

The Department of Homeland Security, Federal Emergency Management Agency's (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) program provides states, tribes, and local communities with flood risk information, datasets, risk assessments, and tools that they can use to increase their resilience to flooding and better protect their residents. By pairing accurate floodplain maps with risk assessment tools and planning and outreach support, Risk MAP transforms the traditional flood mapping efforts into an integrated process of identifying, assessing, communicating, planning for, and mitigating flood-related risks.

The Flood Risk Report (FRR) is one of the tools created though the Risk MAP program. An FRR provides non-regulatory information to help local or tribal officials, floodplain managers, planners, emergency managers, and others. Local, federal, and state officials can use the information in the FRR to establish a better understanding of their flood risk, take steps to mitigate those risks, and communicate those risks to their residents and local businesses.

The FRR serves as a guide when communities update local hazard mitigation plans, community comprehensive plans, and emergency operations and response plans. It is meant to communicate risk to officials and inform them of the modification of development standards, as well as assist in identifying necessary or potential mitigation projects. The report extends beyond community limits to provide flood risk data for the Cache Watershed.

Flood risk is always changing, and studies, reports, or other sources may be available that provide more comprehensive information. This report is not intended to be the regulatory nor the final authoritative source of all flood risk data in the watershed. Rather, it should be used in conjunction with other data sources to provide a comprehensive picture of flood risk within the project area.

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Executive Summary

The Flood Risk Report has two goals: (**1) inform communities of their risks** related to certain natural hazards and (**2) enable communities to act to reduce their risk**. The information within this Risk Report is intended to assist federal, state, and local officials with the following goals:

- **Communicate risk** – Local officials can use the information in this report to communicate with property owners, business owners, and other residents about risks and areas of mitigation interest.
- **Update local hazard mitigation plans and community comprehensive plans** – Planners can use risk information to develop and/or update hazard mitigation plans, comprehensive plans, future land use maps, and zoning regulations. For example, zoning codes can be changed to provide for more appropriate land uses in high-hazard areas.
- **Update emergency operations and response plans** – Emergency managers can identify high-risk areas for potential evacuation and low-risk areas for sheltering. Risk assessment information may show vulnerable areas, facilities, and infrastructure for which continuity of operations plans, continuity of government plans, and emergency operations plans would be essential.
- **Inform the modification of development standards** – Planners and public works officials can use information in this report to support the adjustment of development standards for certain locations.
- **Identify mitigation projects** – Planners and emergency managers can use this risk assessment to determine specific mitigation projects of interest. For example, a floodplain manager may identify critical facilities that need to be elevated or removed from the floodplain.

This Risk Report showcases risk assessments, which analyze how a hazard affects the built environment, population, and local economy, to identify mitigation actions and develop mitigation strategies.

The information in this Risk Report should be used to identify areas in need of mitigation projects and to support additional efforts to educate residents on the hazards that may affect them. The areas of greatest hazard impact are identified in the Areas of Mitigation Interest section of this report, which can serve as a starting point for identifying and prioritizing actions a community can take to reduce its risks.

About the FEMA Risk Mapping, Assessment, and Planning (Risk MAP) Program

Flood risk is continually changing over time due to factors such as new building and development and weather patterns. The goal of the Federal Emergency Management Agency's (FEMA) Risk MAP program is to work with federal, state, tribal, and local partners to identify and reduce flood risk across communities. These projects are conducted using watershed boundaries, bringing together multiple communities to identify broader mitigation actions and create consistency across the watershed. The program provides resources and support that are tailored to each community to help mitigate their risk and work towards a reduction in risk and future loss.

Through coordination and data sharing, the communities in the watershed work as partners in the mapping process. In addition to providing data, the communities can also provide insight into flooding issues and flood prevention within their areas. To prepare for a future study and assist in mitigation, FEMA provides a number of data sources that include information from the community, such as the following:

- Areas of repeated flooding and insurance claims
- Future development plans
- Areas of low water crossings
- High water marks from recent flooding events
- Areas of evacuation during high water
- Master drainage plans, flood risk reduction projects, and large areas of fill placement
- Local flood studies
- Other flood risk information

For more information about ways communities can take action or take advantage of available resources, please review the attached appendices.

Part of the data that FEMA is providing communities during the Risk MAP process is Base Level Engineering (BLE) for select watersheds. BLE is a form of hydrologic and hydraulic modeling which, when completed, can provide modeled flood hazard data in existing Zone As or where no effective flood hazard zone has been designated. Knowing the extent of flooding during the 1-percent-annual-chance flooding event supports risk reduction efforts and supports more resilient community planning. Completed BLE data is provided to watershed communities for planning, risk communication, floodplain management, and permitting activities, and to inform future flood study needs.

For information on BLE in the Cache Watershed, see the Phase Zero: Investment section of this report.

About the Cache Watershed

The Cache Watershed (HUC 08020302) encompasses an area of approximately 1,956 square miles and extends across 12 counties in Arkansas (Clay, Craighead, Cross, Greene, Jackson, Lawrence, Monroe, Poinsett, Prairie, Randolph, St. Francis, and Woodruff) and one county in Missouri (Butler). The majority of the watershed is located in the northeastern portion of Arkansas between Crowley's Ridge and the White River. The major communities in the watershed include portions of the cities of Bono, Brinkley, Jonesboro, Newport, Piggott, and Walnut Ridge. Smaller communities include Cotton Plant, McCrory, and Weiner. The communities in the Cache Watershed and their NFIP status are listed in Table 1. All of the communities listed in the table are in Arkansas, except for Butler County, MO. The watershed and its communities are shown on Figure 2.

The Cache Watershed lies within the White River Basin and is located in northeastern Arkansas. The Cache Watershed consists of flat, low-lying areas with numerous interconnected channels except for Crowley's Ridge, a geological ridge formation that makes up the northeastern border of the watershed. During past events, local communities have experienced flooding issues, some of which are due to localized development in and around the floodplain and while other issues are due to the nature of the watershed. Upstream of Grubbs, AR, the drainage has been significantly altered from natural conditions with many of the streams being channelized. Downstream of Grubbs, there has been less alteration and

some restoration of the natural drainage. In the lower Cache Watershed, there are large areas of protected bottomland hardwood wetlands, including the Cache River National Wildlife Refuge and a number of State Wildlife Management Areas. Because of the low elevation and relief of the watershed, flooding is common in those areas of the watershed not on Crowley's Ridge.

The Cache River is a tributary of the White River. Its largest tributary is Bayou DeView, which joins the Cache River just upstream of the White River. The Cache River originates in southern Missouri, entering Arkansas in Clay County. Bayou DeView originates on Crowley's Ridge in Greene County.

Table 1: NFIP Status of Project Area Communities.

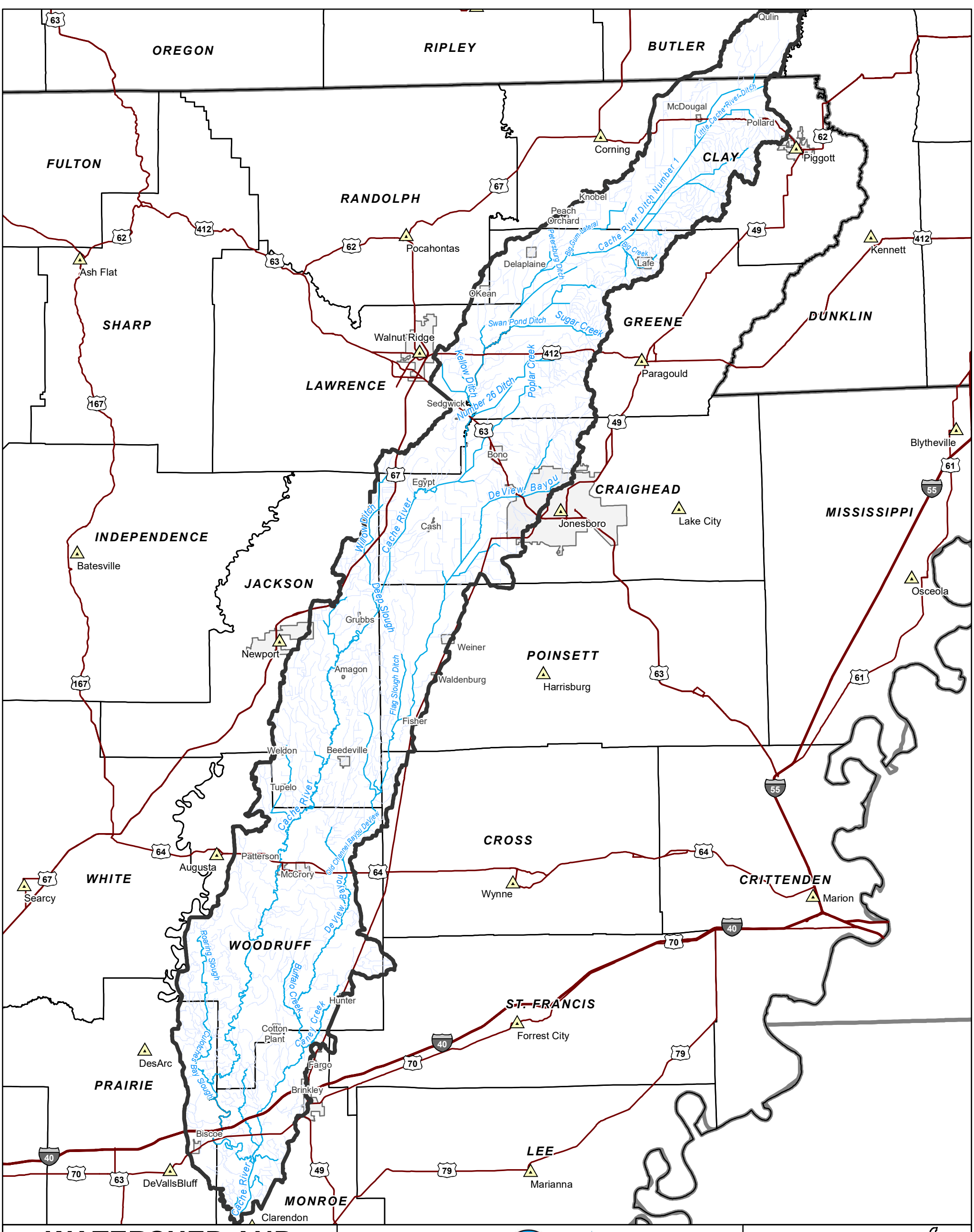
County	Community Name	Community Identification Number (CID)	Participating Community?	CRS Rating
Clay	Clay County Unincorporated Areas [1]	050423	Yes	N/A
Clay	Knobel, City of	050032	Yes	N/A
Clay	McDougal, City of	050033	Yes	N/A
Clay	Peach Orchard, City of	050034	Yes	N/A
Clay	Piggott, City of [1]	050035	Yes	N/A
Clay	Pollard, City of	050036	Yes	N/A
Craighead	Craighead County Unincorporated Areas [1]	050427	Yes	N/A
Craighead	Bono, City of	050046	Yes	9
Craighead	Cash, Town of	050396	Yes	N/A
Craighead	Egypt, Town of	050585	Yes	N/A
Craighead	Jonesboro, City of [1]	050048	Yes	8
Cross	Cross County Unincorporated Areas [1]	050056	Yes	N/A
Greene	Greene County Unincorporated Areas [1]	050435	Yes	N/A
Greene	Lafe, Town of	050569	No	N/A
Jackson	Jackson County Unincorporated Areas [1]	050096	Yes	N/A
Jackson	Amagon, Town of	050097	Yes	N/A
Jackson	Beedeville, Town of	050098	Yes	N/A
Jackson	Grubbs, City of	050101	Yes	N/A
Jackson	Newport, City of [1]	050103	Yes	N/A
Jackson	Tupelo, Town of	050106	Yes	N/A
Jackson	Weldon, Town of	050486	No	N/A
Lawrence	Lawrence County Unincorporated Areas [1]	050443	Yes	N/A
Lawrence	Sedgwick, Town of	050576	Yes	N/A
Lawrence	Walnut Ridge, City of [1]	050122	Yes	N/A
Monroe	Monroe County Unincorporated Areas [1]	050154	Yes	N/A
Monroe	Brinkley, City of [1]	050155	Yes	N/A
Monroe	Fargo, Town of	N/A	No	N/A
Poinsett	Poinsett County Unincorporated Areas [1]	050172	Yes	N/A
Poinsett	Fisher, City of [1]	050413	No	N/A
Poinsett	Waldenburg, Town of [1]	050497	Yes	N/A
Poinsett	Weiner, City of [1]	050373	Yes	N/A
Prairie	Prairie County Unincorporated Areas [1]	050459	Yes	N/A
Prairie	Biscoe, City of [1]	050415	Yes	N/A
Randolph	Randolph County Unincorporated Areas [1]	050460	Yes	N/A

County	Community Name	Community Identification Number (CID)	Participating Community?	CRS Rating
Randolph	O'Kean, Town of	050271	No	N/A
St. Francis	St. Francis County Unincorporated Areas [1]	050184	Yes	N/A
Woodruff	Woodruff County Unincorporated Areas [1]	050468	Yes	N/A
Woodruff	Cotton Plant, City of	050231	Yes	N/A
Woodruff	Hunter, Town of [1]	050599	No	N/A
Woodruff	McCrory, City of	050232	Yes	N/A
Woodruff	Patterson, City of	050274	Yes	N/A
Butler	Butler County, MO Unincorporated Areas [1]	290044	Yes	N/A

[1] Community is located within more than one HUC8 watershed.

WATERSHED AND COMMUNITIES MAP

CACHE
(HUC 08020302)



0 2.5 5 Miles

N
W E
S

County Seat
Interstate
U.S. Highway
City Limits
County Boundary
Major Reaches of Watershed
Other Waters
Large Waterbody
Watershed

Project Location

FIGURE 1

DATE: 6/27/2017

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Introduction

Flood Risk

Floods are naturally occurring phenomena that can and do happen almost anywhere. In its most basic form, a flood is an accumulation of water over normally dry area. Floods become hazardous to people and property when they inundate an area where development has occurred, causing losses. Mild flood losses may have little impact on people or property, such as damage to landscaping or the accumulation of unwanted debris. Severe flood losses can destroy buildings and crops and cause severe injuries or death.

Calculating Flood Risk

It is not enough to simply identify where flooding may occur. Even if people know where a flood might occur, they may not know the level of flood risk in that area. The most common method for determining flood risk, also referred to as vulnerability, is to identify both the probability and the consequences of flooding:

> **Flood Risk** (or Vulnerability) **= Probability x Consequences**; where
> **Probability** = the likelihood of occurrence
> **Consequences** = the **estimated** impacts associated with the occurrence on life, property, and infrastructure

The probability of a flood is the likelihood that it will occur. The probability of flooding can change based on physical, environmental, and/or engineering factors. These factors will also have an effect on the area that is impacted by the flood, increasing or decreasing the size of the affected area. The ability to assess the probability of a flood, and the level of accuracy for that assessment, are also influenced by modeling methodology advancements, better knowledge, and longer periods of record for the water body in question.

The consequences of a flood are the estimated effects associated with its occurrence. Consequences relate to human activities within an area and how a flood affects the natural and built environment. It is important that individuals and communities have an accurate and current understanding of their risk because anyone can be vulnerable to flooding. Individuals that are located outside of the Special Flood Hazard Area (SFHA) file more than 20 percent of insurance claims and receive 1/3 of disaster assistance for flooding. Having an awareness of risk can allow communities and their residents to address the potential consequences. Understanding risk can also allow for long-term development planning, opportunities for revitalization efforts, and modifications in how interaction occurs with the existing risk.

FEMA relies heavily on information and data provided at a local level for a holistic community approach to risk identification and mapping. Flood Risk Projects are focused on identifying (1) areas where current flood hazard inventory does not provide adequate detail to support local floodplain management activities, (2) mitigation interest areas that may require more detailed engineering information than currently available, and (3) determine community intent to reduce the risk throughout the watershed to assist FEMA's future investment in these project areas. Watersheds are selected for Discovery based on evaluations of flood risk, data need, availability of elevation data, regional knowledge of technical issues, identification of a community supported mitigation projects, and/or input from the federal, state, and local partners. The status of Discovery watersheds in Arkansas is shown in Figure 1.

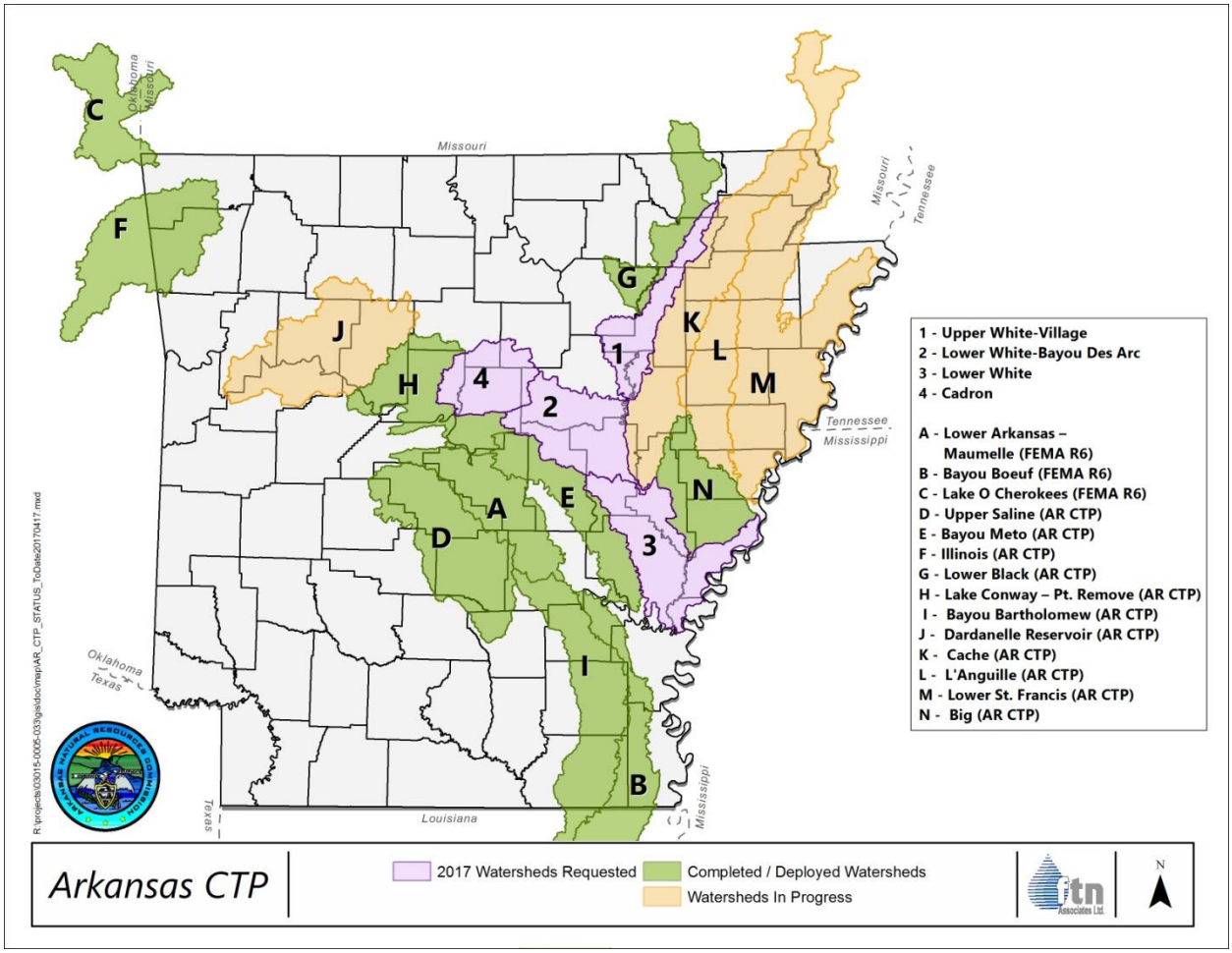


Figure 2. Arkansas CTP Discovery watershed status.

Watershed Basics

Background

The Cache Watershed (HUC8 08020302) spans from Butler County, Missouri to Monroe County, Arkansas where the Cache River flows into the downstream Lower White Watershed. A total of 42 communities are included in this Risk Mapping, Assessment, and Planning (Risk MAP) project, and over 1,950 square miles of study area make up the watershed. Figure 2 provides an overview of the Cache Watershed and its geographic location within the state.

Population

According to the 2010 Census, the total population of the watershed is estimated to be 56,296 people. Populations for the counties that intersect the Cache Watershed experienced an overall average population decrease of approximately 0.4 percent between the 2000 and 2010 censuses, although the largest population source, Craighead County, saw an average increase of approximate 1.6 percent. Since 2010, population growth has increased with the 2016 population estimate at 1.9 percent above the number reported in the 2010 census. Based on 2010 Census data, the major community in the watershed, Jonesboro, had a total population of 67,627 (22,447 in the watershed) in 2010 (see Table 2).

Watershed Land Use

The Cache Watershed lies within the White River Basin and is located in northeastern Arkansas. The Cache Watershed consists of flat, low-lying areas with numerous interconnected channels except for Crowley's Ridge, a geological ridge formation that makes up the northeastern border of the watershed. During past events, local communities have experienced flooding issues, some of which are due to localized development in and around the floodplain and while other issues are due to the nature of the watershed. Upstream of Grubbs, AR, the drainage has been significantly altered from natural conditions with many of the streams being channelized. Downstream of Grubbs, there has been less alteration and some restoration of the natural drainage. In the lower Cache Watershed, there are large areas of protected bottomland hardwood wetlands, including the Cache River National Wildlife Refuge and a number of State Wildlife Management Areas. Because of the low elevation and relief of the watershed, flooding is common in those areas of the watershed not on Crowley's Ridge (see Table 2).

Table 2: Population and Area Characteristics [3]

Risk MAP Project	Total Population in Deployed Area (2010)	Average % Population Growth/Yr. (2000-2010)	Predicted Population * (by 2021)	Land Area (mi^2)	Developed Area	Open Water
CACHE WATERSHED	56,296	-0.4%	370,644	1,956	2.1%	1.4%

[3] Data obtained from the U.S. Census Bureau; ESRI Demographic 5-year Projections; and National Land Cover Database

* Predicted Population by County, which may include areas outside of watershed.

National Flood Insurance Program Status and Regulation

In order to be a participant in the National Flood Insurance Program (NFIP), all interested communities must adopt and submit floodplain management ordinances that meet or exceed the minimum NFIP regulations. These regulations can be found in the Code of Federal Regulations and most of the community ordinance requirements are in Parts 59 and 60. The level of regulation depends on the level of information available and the flood hazards in the area. The levels are as follows:

- A: The Federal Emergency Management Agency (FEMA) has not provided any maps or data – 60.3(a)
- B: Community has maps with approximate A zones – 60.3(b)
- C: Community has a Flood Insurance Rate Map (FIRM) with Base Flood Elevations (BFE) – 60.3(c)
- D: Community has a FIRM with BFEs and floodways – 60.3(d)
- E: Community has a FIRM that shows coastal high hazard areas (V zones) – 60.3(e)

There are 35 communities in the watershed that participate in the NFIP. Of the 35 communities that participate, their level of regulations depend on the date of the effective mapping and if the community was modernized into a countywide format.

There are six incorporated communities, the Towns of Lafe, Weldon, Biscoe, O'Kean, and Hunter and the City of Fisher that are not participating in the NFIP. This means that they are not required to follow FEMA regulations; however, certain opportunities such as federal flood insurance and some forms of federal disaster assistance are not available to the residents of those areas.

Hazard Mitigation Plan

State and local governments must develop and adopt hazard mitigation plans in order to be eligible for certain types of funding. To remain eligible, communities need to update and resubmit their plans every 5 years for FEMA approval. Hazard mitigation plans are created to increase education and awareness, identify strategies for risk reduction, and identify other ways to develop long-term strategies to reduce risk and protect people and property. Eleven of the 12 counties in Arkansas in the ache Watershed have Hazard Mitigation Plans that are in progress. Only Clay County has an existing approved Hazard Mitigation Plan (expiring in August 2017).The plans effectively allow for FEMA to assess hazards identified through local, state, and federal partnerships and mitigation action items that communities have identified.

Community Rating System

The Community Rating System (CRS) is a voluntary incentive-based program that recognizes and encourages community floodplain management activities that communities undertake in addition to the minimum requirements they must meet when joining the NFIP. Individuals that carry flood insurance in a community that participates in the CRS program can receive a discount on their flood insurance premium. Discounts can range from 5 to 45 percent. Out of the 38 watershed communities participating in the NFIP, only two, the Cities of Bono and Jonesboro, are participating in the CRS program. The City of Bono currently is a class 9, which means that structures located both inside and outside of the SFHA are eligible for a 5-percent premium discount. The City of Jonesboro is currently rated a class 8 and therefore structures located both inside and outside of the SFHA are eligible for a 10-percent premium discount. Table 3 depicts NFIP and CRS participation status and provides an overview of the effective flood data availability.

Table 3: NFIP and CRS Participation [4]

Risk MAP Project	Participating NFIP Communities/ Total Communities	Number of CRS Communities	CRS Rating Class Range	Average Years since FIRM Update (Range 1982-2017)	Level of Regulations (44 CFR 60.3)
CACHE WATERSHED	36/42	2	8-9	15.7	CFR 60.3 (a), CFR 60.3 (b), CFR 60.3 (c), CFR 60.3 (d)

[4] Data obtained from the FEMA Community Information System

Dams and Levees

As recorded by the U.S. Army Corps of Engineers (USACE) in the National Inventory of Dams, 35 dams are within the portion of the counties that make up the Cache Watershed. The owners and operators of the 5 dams considered high hazard are required to develop and maintain Emergency Action Plans (EAPs) to reduce the risk of loss of life and property if the dam fails. Table 4 provides the characteristics of the dams identified in the project area. There are no levees identified within the watershed.

Table 4: Risk MAP Project Dam Characteristics[5]

Risk MAP Project	Total Number of Identified Dams	Number of Dams			Number of Dams Requiring EAP	Percentage of Dams without EAP (Total)	Average Years since Inspection	Average Storage (acre-feet)
		High Hazard	Significant Hazard	Low Hazard				
CACHE WATERSHED	35	5	9	21	5	85.7%	20+	1,065

[5] Data obtained from the ANRC State Database and USACE National Inventory of Dams

Flood Insurance Rate Maps

The average age of the effective FIRMs within the Cache Watershed is almost 16 years. The oldest effective maps are for the City of Cotton Plant, which are 35 years old and have an effective date of October 12, 1982. The newest FIRMs are dated June 7, 2017, for Jackson County. While most of the communities have effective FIRMs, six communities do not have effective FIRMs or have one 11X17 panel that does not show any SFHAs.

Project Phases and Map Maintenance

Background

FEMA manages several risk analysis programs, including Flood Hazard Mapping, National Dam Safety, the Earthquake Safety Program, Multi-Hazard Mitigation Planning, and the Risk Assessment Program, all of which assess the impact of natural hazards and lead to effective strategies for reducing risk. These programs support the Department of Homeland Security's objective to "strengthen nationwide preparedness and mitigation against natural disasters."

Flood-related damage between 1980 and 2013 totaled $260 billion, but the total impact to our Nation was far greater—more people lose their lives annually from flooding than any other natural hazard.

FEMA, "Federal Flood Risk Management Standard (FFRMS)" (2015)

FEMA manages the NFIP, which is the cornerstone of the national strategy for preparing American communities for flood hazards. In the nation's comprehensive emergency management framework, the analysis and awareness of natural hazard risk remains challenging. A consistent risk-based assessment approach and a robust communication system are critical tools to ensure a community's ability to make informed risk management decisions and take mitigation actions. Flood hazard mapping is a basic and vital component for a prepared and resilient nation.

In Fiscal Year 2009, FEMA's Risk MAP program began to synergize the efforts of federal, state, and local partners to create timely, viable, and credible information identifying natural hazard risks. The intent of the Risk MAP program is to share resources to identify the natural hazard risks a community faces and ascertain possible approaches to minimizing them. Risk MAP aims to provide technically sound flood hazard information to be used in the following ways:

- To update the regulatory flood hazard inventory depicted on FIRMs and the National Flood Hazard Layer

- To provide broad releases of data to expand the identification of flood risk (flood depth grids, water-surface elevation grids, etc.)
- To support sound local floodplain management decisions
- To identify opportunities to mitigate long-term risk across the nation's watersheds

How are FEMA's Flood Hazard Maps Maintained?

FEMA's flood hazard inventory is updated through several types of revisions.

Community-submitted Letters of Map Change. First and foremost, FEMA relies heavily on the local communities that participate in the NFIP to carry out the program's minimum requirements. These requirements include the obligation for communities to notify FEMA of changing flood hazard information and to submit the technical support data needed to update the FIRMs.

Under the current minimum NFIP regulations, a participating community commits to notifying FEMA if changes take place that will affect an effective FIRM no later than 6 months after project completion.

Section 65.3, Code of Federal Regulations

Although revisions may be requested at any time to change information on a FIRM, FEMA generally will not revise an effective map unless the changes involve modifications to SFHAs. Be aware that the best floodplain management practices and proper assessments of risk result when the flood hazard maps present information that accurately reflects current conditions.

Letters of Map Amendment (LOMAs). The scale of an effective FIRM does not always provide the information required for a site-specific analysis of a property's flood risk. FEMA's LOMA process provides homeowners with an official determination on the relation of their lot or structure to the SFHA. Requesting a LOMA may require a homeowner to work with a surveyor or engineering professional to collect site-specific information related to the structure's elevation; it may also require the determination of a site-specific BFE. Fees are associated with collecting the survey data and developing a site-specific BFE. Local surveying and engineering professionals usually provide an Elevation Certificate to the homeowner, who can use it to request a LOMA. A successful LOMA may remove the federal mandatory purchase requirement for flood insurance, but lending companies may still require flood insurance if they believe the structure is at risk.

FEMA-Initiated Flood Risk Project. Each year, FEMA initiates a number of Flood Risk Projects to create or revise flood hazard maps. Because of funding constraints, FEMA can study or restudy only a limited number of communities, counties, or watersheds each year. As a result, FEMA prioritizes study needs based on a cost-benefit approach whereby the highest priority is given to studies of areas where development has increased and the existing flood hazard data has been superseded by information based on newer technology or changes to the flooding extent. FEMA understands communities require products that reflect current flood hazard conditions to best communicate risk and implement effective floodplain management.

Flood Risk Projects may be delivered by FEMA or one of its Cooperating Technical Partners (CTPs). The CTP initiative is an innovative program created to foster partnerships between FEMA and participating NFIP communities, as well as regional and state agencies. Qualified partners collaborate in maintaining up-to-date flood maps. In FEMA Region 6, which includes the State of Arkansas, CTPs are generally statewide agencies that house the State Floodplain Administrator. However, some Region 6 CTPs are also large River Authorities or Flood Control Districts. They provide enhanced coordination with local,

state, and federal entities, engage community officials and technical staff, and provide updated technical information that informs the national flood hazard inventory.

Risk MAP has modified FEMA's project investment strategy from a single investment by fiscal year to a multi-year phased investment, which allows the Agency to be more flexible and responsive to the findings of the project as it moves through the project lifecycle. Flood Risk Projects are funded and completed in phases.

General Flood Risk Project Phases

Each phase of the Flood Risk Project provides both FEMA and its partner communities with an opportunity to discuss the data that has been collected and to determine a path forward. Local engagement throughout each phase enhances the opportunities for partnership, furthers the discussion on current and future risk, and helps identify local projects and activities to reduce long-term natural hazard risk.

Flood Risk Projects may be funded for one or more of the following phases:

- Phase Zero – Investment
- Phase One – Discovery
- Phase Two – Risk Identification and Assessment
- Phase Three – Regulatory Product Update

Local input is critical throughout each phase of a Flood Risk Project. More details about the tasks and objectives of each phase are included below.

Phase Zero: Investment

Phase Zero of a Flood Risk Project initiates FEMA's review and assessment of the inventories of flood hazards and other natural hazards within a watershed area. During the Investment Phase, FEMA reviews the availability of information to assess the current floodplain inventory. FEMA maintains several data systems to perform watershed assessments and selects watersheds for a deeper review of available data and potential investment tasks based on the following factors:

Availability of High-Quality Ground Elevation Data. FEMA reviews readily available and recently acquired ground elevation data. This information helps identify development and earth-moving activities near streams and rivers. Where necessary, FEMA may partner with local, state, and other federal entities to collect necessary ground elevation information within a watershed.

If high-quality ground elevation data is both available for a watershed area and compliant with FEMA's quality requirements, FEMA and its mapping partners may prepare engineering data to assess, revise, replace, or add to the current flood hazard inventory.

Mile Validation Status within Coordinated Needs Management Strategy (CNMS). FEMA uses the CNMS database to track the validity of the flood hazard information prepared for the NFIP. The CNMS database reviews 17 criteria to determine whether the flood hazard information shown on the current FIRM is still valid.

Communities may also inform and request a review or update of the inventory through the CNMS website at https://msc.fema.gov/cnms/. The CNMS Tool Tutorial provides an overview of the online tool and explains how to submit requests.

Local Hazard Mitigation Plans. Reviewing current and historic hazard mitigation plans provides an understanding of a community's comprehension of its flood risk and other natural hazard risks. The mitigation strategies within a local hazard mitigation plan provide a lens to local opportunities and underscore a potential for local adoption of higher standards related to development or other actions to reduce long-term risk.

Cooperating Technical Partner State Business Plans. In some states, a CTP generates an annual state business plan that identifies future Flood Risk Project areas that are of interest to the state. The Arkansas Natural Resources Commission works to develop user-friendly data. In this project area, FEMA has worked closely with ANRC to develop the project scope and determine the necessary project tasks.

Communities that have identified local issues are encouraged to indicate their data needs and revision requests to the State CTP so that they can be prioritized and included in theState Business Plans.

Possible Investment Tasks. After a review of the data available within a watershed, FEMA may choose to (1) purchase ground elevation data and/or (2) create some initial engineering modeling against which to compare the current inventory, also known as Base Level Engineering (BLE) modeling.

Phase One: Discovery

Phase One, the Discovery Phase, provides opportunities both internally (between the state and FEMA) and externally (with communities and other partners interested in flood potential) to discuss local issues with flooding and examine possibilities for mitigation action. This effort is made to determine where communities currently are with their examination of natural hazard risk throughout their community and to identify how state and federal support can assist communities in achieving their goals.

The Discovery process includes an opportunity for local communities to provide information about their concerns related to natural hazard risks. Communities may continue to inform the project identification effort by providing previously prepared survey data, as-built stream crossing information, and engineering information.

For a holistic community approach to risk identification and mapping, FEMA relies heavily on the information and data provided at the local level. Flood Risk Projects are focused on identifying (1) areas where the current flood hazard inventory does not provide adequate detail to support local floodplain management activities, (2) areas of mitigation interest that may require more detailed engineering information than is currently available, and (3) community intent to reduce the risk throughout the watershed to assist FEMA's future investment in these project areas. Watersheds are selected for Discovery based on these evaluations of flood risk, data needs, availability of elevation data, Regional knowledge of technical issues, identification of a community-supported mitigation project, and input from federal, state, and local partners.

Possible Discovery Tasks. Discovery may include a mix of interactive webinar sessions, conference calls, informational tutorials, and in-person meetings to reach out to and engage with communities for input. Data collection, interviews, and interaction with community staff and data-mining activities provide the basis for watershed-, community-, and stream-level reviews to determine potential projects that may benefit the communities. A range of analysis approaches are available to determine the extent of flood risk along streams of concern. FEMA and its mapping partners will work closely with communities to determine the appropriate analysis approach, based on the data needs throughout the community.

These potential projects may include local training sessions, data development activities, outreach support to local communities wanting to step up their efforts, or the development of flood risk datasets within areas of concern to allow a more in-depth discussion of risk.

Phase Two: Risk Identification and Assessment

Phase Two (Risk Identification and Assessment) continues the risk awareness discussion with communities through watershed analysis and assessment. Analyses are prepared to review the effects of physical and meteorological changes within the project watershed. The new or updated analysis provides an opportunity to identify how development has affected the amount of stormwater generated during a range of storm probabilities and shows how effectively stormwater is transported through communities in the watershed.

Coordination with a community's technical staff during engineering and model development allows FEMA and its mapping partners to include local knowledge, based on actual on-the-ground experience, when selecting modeling parameters.

The information prepared and released during Phase Two is intended to promote better local understanding of the existing flood risk by allowing community officials to review the variability of the risk throughout their community. As FEMA strives to support community-identified mitigation actions, it also looks to increase the effectiveness of community floodplain management and planning practices, including local hazard mitigation planning, participation in the NFIP, use of actions identified in the CRS Manual, risk reduction strategies for repetitive loss and severe repetitive loss properties, and the adoption of stricter standards and building codes.

FEMA is eager to work closely with communities and technical staff to determine the current flood risk in the watershed. During the Risk Identification and Assessment phase, FEMA would like to be alerted to any community concerns related to the floodplain mapping and analysis approaches being taken. During this phase, FEMA can engage with communities and review the analysis and results in depth.

Possible Risk Identification and Assessment Tasks. Phase Two may include a mixture of interactive webinars, conference calls, informational tutorials, and in-person meetings to reach out to and engage with communities for input. Flood Risk Project tasks may include hydrologic or hydraulic engineering analysis and modeling, floodplain mapping, risk assessments using Hazus-Multi Hazard software, and preparation of flood risk datasets (water-surface elevation, flood depth, or other analysis grids). Additionally, projects may include local training sessions, data development activities, outreach support to local communities that want to step up their efforts, or the development of flood risk datasets within areas of concern to allow a more in-depth discussion of risk.

Phase Three: Regulatory Products Update

If the analysis prepared in the previous Flood Risk Project phases indicates that physical or meteorological changes in the watershed have significantly changed the flood risk since the last FIRM was printed, FEMA will initiate the update of the regulatory products that communities use for local floodplain management and NFIP activities.

Delivery of the preliminary FIRM and Flood Insurance Study (FIS) report begins another period of coordination between community officials and FEMA to discuss the required statutory and regulatory steps both parties will perform before the preliminary FIRM and FIS report can become effective. As in

the previous phases, FEMA and its mapping partners will engage with communities through a variety of conference calls, webinars, and in-person meetings.

Once the preliminary FIRMs are prepared and released to communities, FEMA will initiate the statutory portions of the regulatory product update. FEMA will coordinate a Consultation Coordination Officer meeting and initiate a 90-day comment and appeal period. During this appeal period, local developers and residents may coordinate the submittal of their comments and appeals through their community officials to FEMA for review and consideration.

FEMA welcomes this information because additional proven scientific and technical information increases the accuracy of the mapping products and better reflects the community's flood hazards identified on the FIRMs.

Communities may host or hold Open House meetings for the public. The Open House layout allows attendees to move at their own pace through several stations, collecting information in their own time. This format allows residents to receive one-on-one assistance and ask questions pertinent to their situations or their interests in risk or flood insurance information.

All appeals and comments received during the statutory 90-day Appeal Period, including the community's written opinion, will be reviewed by FEMA to determine the validity of the appeal. Once FEMA issues the appeal resolution, the associated community and all appellants will receive an appeal resolution letter and FEMA will revise the preliminary FIRM if warranted. A 30-day period is provided for review and comment on successful appeals. Once all appeals and comments are resolved, the flood map is ready to be finalized.

After the Appeal Period, FEMA will send community leaders a Letter of Final Determination stating that the preliminary FIRM will become effective in 6 months. The letter also discusses the actions each affected community participating in the NFIP must take to remain in good standing in the NFIP.

After the preceding steps are complete and the 6-month compliance period ends, the FIRMs are considered effective maps and new building and flood insurance requirements become effective.

That is a brief general overview of a Flood Risk Project. Next, the Flood Risk Report will provide details on the efforts in the Cache Watershed.

Phase Zero: Investment

The Cache Watershed (HUC 08020302) encompasses an area of approximately 1,956 square miles and extends across 12 counties in Arkansas (Clay, Craighead, Cross, Greene, Jackson, Lawrence, Monroe, Poinsett, Prairie, Randolph, St. Francis, and Woodruff) and one county in Missouri (Butler). The majority of the watershed is located in the northeastern portion of Arkansas between Crowley's Ridge and the White River. The major communities in the watershed include portions of the cities of Bono, Brinkley, Jonesboro, Newport, Piggott, and Walnut Ridge. Smaller communities include Cotton Plant, McCrory, and Weiner. The communities in the Cache Watershed and their NFIP status are listed in Table 1. All of the communities listed in the table are in Arkansas, except for Butler County, MO. The watershed and its communities are shown on Figure 2.

The Cache Watershed lies within the White River Basin and is located in northeastern Arkansas. The Cache Watershed consists of flat, low-lying areas with numerous interconnected channels except for Crowley's Ridge, a geological ridge formation that makes up the northeastern border of the watershed. During past events, local communities have experienced flooding issues, some of which are due to localized development in and around the floodplain and while other issues are due to the nature of the watershed. Upstream of Grubbs, AR, the drainage has been significantly altered from natural conditions with many of the streams being channelized. Downstream of Grubbs, there has been less alteration and some restoration of the natural drainage. In the lower Cache Watershed, there are large areas of protected bottomland hardwood wetlands, including the Cache River National Wildlife Refuge and a number of State Wildlife Management Areas. Because of the low elevation and relief of the watershed, flooding is common in those areas of the watershed not on Crowley's Ridge.

The Cache River is a tributary of the White River. Its largest tributary is Bayou DeView, which joins the Cache River just upstream of the White River. The Cache River originates in southern Missouri, entering Arkansas in Clay County. Bayou DeView originates on Crowley's Ridge in Greene County.

Area of Interest Selection Factors

A number of factors and criteria are reviewed for watershed selection: flood risk, age of current flood hazard data, population growth trends and potential for growth, recent flood claims, and disaster declaration history. Local data and high quality ground elevation data availability are reviewed for use in flood hazard data preparation. The Coordinated Needs Management Strategy (CNMS) database is reviewed to identify areas of large unknown and unverified mileage. The Arkansas CTP, State NFIP Coordinator, and State Hazard Mitigation Officer coordinate to identify watersheds for study by FEMA.

The Cache Watershed was selected by the Arkansas CTP in coordination with FEMA Region 6, for the reasons summarized below.

- Topographic data developed from a Light Detection and Ranging System (LiDAR) is available throughout the watershed aiding in providing quality data.
- Within the State of Arkansas, losses in the watershed have exceeded $17.5 million from 1978 through 2017, and there are approximately 2,066 policies. These reported values include entire counties which may or may not be wholly located in the watershed.
- Clay, Greene, Jackson, Lawrence, Poinsett, and Randolph Counties are the only counties considered modernized. St. Francis County has a countywide study; however it is older (effective date 2005). These studies were completed without quality topographic data.

- Since 2001, the Cache Watershed has had declared federal disasters in every year except 2007 and 2012. The watershed includes the City of Brinkley, which experienced severe flooding in June 2014. This flooding event was a state-declared disaster.
- The communities of Bono, Jonesboro, Cross County, Jackson County, Poinsett County, and Randolph County have claims listed as BCX Claims, which are claims that occur outside the mapped floodplain. This indicates the need for additional review to determine if the effective maps are in need of update.
- Eleven of the 12 counties in Arkansas have Hazard Mitigation Plans that are in progress. Only Clay County has an existing approved Hazard Mitigation Plan (expiring in August 2017).

Flood Risk: The Cache River and its tributaries are not strangers to flood events, with a historical record of numerous flooding events. The Cache Watershed has historically flooded and has experienced major flooding as recently as August 2016 on its tributaries as well as the Cache River. The recent major floods in every year since 2001, except 2007 and 2012, have illustrated the ongoing flood threat for the Cache Watershed.

Growth Potential: Although the Cache Watershed is largely rural in nature, it is undergoing urbanization along the US Highway 67, 63, and 412, as well as the Interstate 40 corridors. These locations include the areas around the cities of Jonesboro, Walnut Ridge, Paragould, and Brinkley.

Age of Current Flood Information: Seven of the counties in the Cache Watershed have modernized maps, whereas five of the counties have not been modernized and have maps dating back to the 1980's.

Local Data Availability. The City of Jonesboro has undertaken large studies to improve drainage throughout the City. The first phase of this study was completed in 2015 with another expected to start in 2016. These studies are to provide drainage improvement concepts and plans to help alleviate future flooding events.

Additionally, Craighead County and its communities are undergoing a Phase 2 Risk Identification and Assessment project, which is currently being performed by the Arkansas CTP.

Availability of High Quality Ground Elevation Data. As a result of FEMA's efforts in teaming with other federal and state agencies, high quality ground elevation data was available for the Cache Watershed. This data provides a great basis for hydrologic and hydraulic modeling preparation. The source and date of LiDAR coverage is included in Table 5.

Table 5. Summary of Topographic Data

Watershed/ Flooding Source	Beginning and End Points of Topo Data Collection	New/Existing OR Leveraged	Accuracy & Year Acquired	Source/ Data Vendor	Contact Information	Use Restrictions
2014 AR-MO LIDAR Project	2013 - 2015	Existing	QL2 (Vert. Acc. 9.25 cm)	Public domain	USACE – St. Louis District	None
2012 FEMA/USGS Lower St. Francis River	04/2012 – 05/2012	Existing	QL3 (Vert. Acc. 11.8 cm)	Public domain	The National Map	None
2011 L'Anguille & Cache Watershed Area	03/2011 – 04/2011	Existing	QL2 (Vert. Acc. 9.25 cm)	Public domain	http://gis.arkansas.gov	None

Coordinated Needs Management Strategy Database Review: Coordinated Needs Management Strategy (CNMS) Database Review. The CNMS database indicates the validity of FEMA's flood hazard inventory. Streams that are indicated as ***Unverified*** or ***Unknown*** in the database indicate that the information that developed the floodplain currently shown on the FIRMs is inaccessible or that a complete evaluation of the Critical and Secondary CNMS elements could not be performed. The Cache Watershed stream coverage is not homogenous across the counties that intersect the basin. The H&H analysis behind majority of the basin flood hazard information is dated and in need of an update. The current inventory within the watershed is approximately 1,305 miles. Of this mileage approximately 52 miles is considered valid, having passed the seven critical element and ten secondary element criteria reviews that had been completed. The remaining mileage is listed as unverified mileage indicating that more than 96% of the existing inventory may require further review (Figure 3).

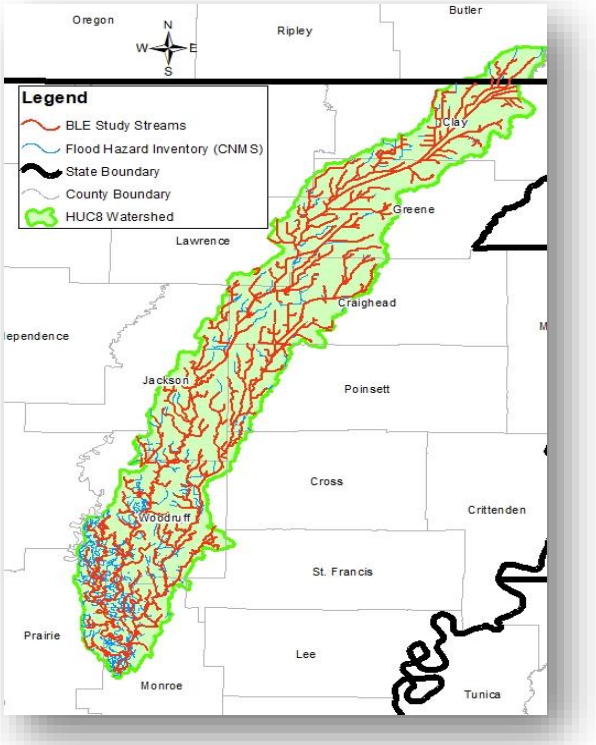


Figure 3. Flood Hazard Inventory

Unmapped Stream Coverage: FEMA and the Arkansas CTP also review the current stream coverage and compare the coverage against detailed terrain streams contributing up to 1 square mile drainage area or National Hydrography Dataset (NHD). The detailed terrain streams and NHD high resolution data inventoried by the US Geological Survey (USGS) Maps created at a 1:24,000 scale is used to review the water courses within the HUC8s of concern. The watershed as a whole is reviewed for additional mileage to be inventoried. The intent of this review is to identify streams and water courses where additional study may be required or to create a complete stream network for Base Level Engineering data preparation.

Base Level Engineering

The Arkansas CTP is coordinating with FEMA on Base Level Engineering (BLE). This approach prepares multi-profile hydrologic (how much water) and hydraulic (how is water conveyed in existing drainage) data for a large stream network or river basin to generate floodplain and other flood risk information for the basin area.

Base Level Engineering provides an opportunity for FEMA to produce and provide non-regulatory flood risk information for a large watershed area in a much shorter period of time. The data prepared in the Base Level Engineering approach provides planning level data which is prepared to meet FEMA's Standards for Floodplain Mapping.

FEMA Investment (2016). In Fiscal Year 2016, FEMA and the Arkansas CTP initiated Base Level Engineering on the Cache HUC8 sub basin. Figure 4 shows the network of streams that is being analyzed using the Base Level Engineering approach. The Base Level Engineering approach will provide the following items for use in the Cache Watershed:

- Hydrologic rain on grid modeling for 10%, 4%, 2%, 1%, 1-%, 1+%, and 0.2% storm events
- Hydraulic (HEC-RAS 5.0.3) modeling for all study streams using 2-Dimensional (2D) modeling techniques.
- Floodplain boundaries, Water Surface Elevation grids, and Flood Depth Grids for all modeled storm events.
- Approximate Mapping Change layer to distinguish areas of changes between BLE and effective mapping for 1% storm event.
- Hazus flood analysis for watershed.

The Base Level Engineering approach will prepare flood hazard information for approximately 1,635 miles adding over 300 stream miles of supplementary flood hazard information for communities throughout the basin. Once completed the Base Level Engineering information will be provided to the communities throughout the basin for planning, risk communication, floodplain management, and permitting activities.

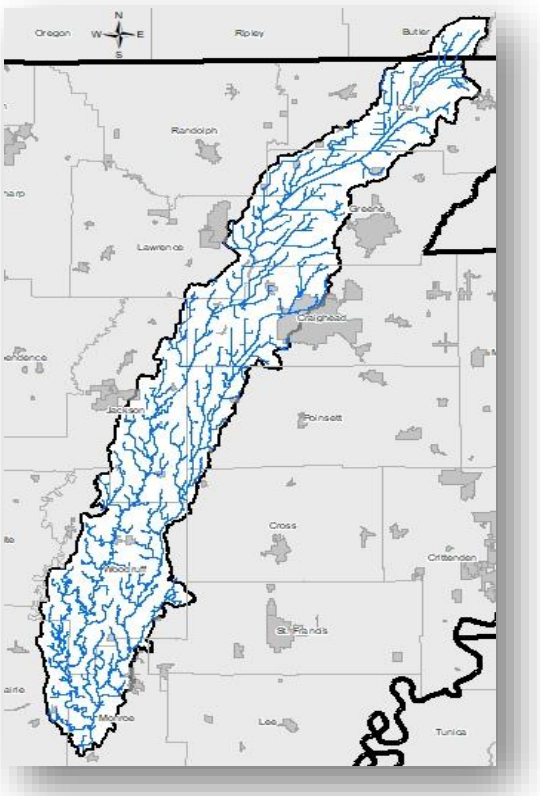


Figure 4. Base Level Engineering Study Streams

Creating BLE data is a cost effective way to provide communities with updated information on their flood risk. BLE provides an opportunity for FEMA to produce and provide non-regulatory flood risk information for a large watershed area in a much shorter period of time. The data prepared through BLE provides planning-level data that meets FEMA's Standards for Floodplain Mapping. This approach prepares multi-profile hydrologic (how much water) and hydraulic (how is water conveyed in existing drainage) data for a large stream network or river basin to generate floodplain and other flood risk information for the basin area. To create the BLE data, the

best available information was utilized. This information included terrain data, flood discharges, and hydrologic and hydraulic analysis.

CNMS Validation and Assessment. FEMA has compared the BLE results to the current flood hazard inventory identified in the CNMS database. This assessment allows FEMA to compare the updated flood hazard information to the current effective floodplain mapping of the watershed communities. BLE results for Zone A Validation denoted no miles to be New, Validated, or Updated Engineering (NVUE) compliant.

Community Coordination. FEMA will share the BLE results with communities throughout the project area. Access to workshops and training to support the use of BLE for planning, floodplain management, permitting, and risk communication activities will be made publicly available to communities and other interested parties. FEMA will work with communities to review, interpret, and incorporate the BLE information into their daily and future community management and planning activities.

Follow-On Phase Project Decisions. The BLE results and the current inventory have been compared to identify any areas of significant change. If the results show large areas of change (expansions and contractions of the floodplain, increases and decreases of the computed BFEs, and increases in expected flow values), FEMA will continue to coordinate with the communities to identify the streams that should be considered if the FIRMs are updated.

To identify other streams for future refinement, community growth patterns and potential growth corridors should be discussed with FEMA. These areas of expected community growth and development may benefit from updated flood hazard information. BLE can be further refined to provide detailed study information for a FIRM update.

Areas of communities that were developed prior to 1970 (pre-FIRM areas) may include repetitive and severe repetitive loss properties. They may also be areas where redevelopment is likely to occur. Having updated flood hazard information before redevelopment and reconstruction activities take place may benefit communities by providing guidance to mitigate future risk.

FEMA and the Arkansas CTP will work with communities following the delivery of Base Level Engineering to identify a sub set of streams for update and inclusion on the Flood Insurance Rate Maps, if required. Communities may wish to review the possible areas and provide feedback once the BLE data has been received. Base Level Engineering information may be refined by local communities and submitted through the Letter of Map Revision process to refine existing flood hazard information and maintain the Flood Insurance Rate Maps throughout their community.

Phase One: Discovery

Pre-Discovery

As part of the CTP partnership, the ANRC and its contractor, FTN Associates, Ltd. (FTN), began the Discovery process in the Cache Watershed (08020302) in October 2016 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. The watershed location can be seen on Figure 2.

Through the Discovery process, FEMA and the Arkansas CTP can determine which areas of the Hydrologic Unit Code (HUC) 8 (HUC-8) watersheds may be examined for further flood risk identification and assessment in a collaborative manner, taking into consideration the information collected from local communities during this process. Discovery initiates open lines of communication and relies on local involvement for productive discussions about flood risk. The process provides a forum for a watershed-wide effort to understand how the included watershed community's flood risks are related to flood risk throughout the watershed. In Risk MAP, projects are analyzed on a watershed basis, so Discovery Meetings target numerous stakeholders from throughout the watershed on local, regional, State, and Federal levels.

Discovery Meeting

In July 12 and July 13, 2017, the Arkansas CTP held Discovery Meetings in this watershed to discuss the Discovery process and where the communities can go from there with future studies. The Discovery meeting provided an opportunity to present the BLE results to the communities and how they could be used for future planning, risk communication, floodplain management, and permitting activities. At the meeting the communities were provided with digital copies of this Flood Risk Report, the modeling files for all of the BLE studied streams, including the floodplain boundaries, Water Surface Elevation Grids, and Flood Depth Grids, and a short tutorial on the use of the BLE products.

The results of the Discovery process is presented as part of this Flood Risk Report, a watershed scale Discovery Map and the digital data that was gathered or developed under the fiscal year 2016 CTP Agreement, EMW-2015-CA-00143, Mapping Activity Statement (MAS) 14, between FEMA and the Arkansas CTP. During Discovery, the Arkansas CTP and FEMA reached out to local communities to:

- Gather information about local flood risk and flood hazards;
- Obtain and ultimately 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 each community to participate and assist in the development of a watershed vision.

This document includes the portion of the Flood Risk Report that describes the Discovery process and provides the results to the watershed communities. The digital data submitted with this report contains correspondence, exhibits to be used at the Discovery meetings, GIS data, mapping documents (PDF, shapefiles, personal geodatabases and ESRI ArcGIS 10.x Map Exchange Documents [MXDs]), or other supplemental information. Graphics in this Pre-Discovery report are available as larger format graphics files for printing and as GIS data that may be printed and used at any map scale.

Watershed Findings

Engineering review of community comments:

At the Discovery meeting, Risk MAP Action Surveys were provided to each community in attendance so that general information and concerns about each community could be provided back to the Arkansas CTP. For those that did not attend the Discovery Meeting, Risk MAP Action Surveys were distributed via mail to the leaders of each community, with additional notices being distributed to secondary points of contact. Out of the 43 communities located in the watershed, only 6 were returned for engineering review. From the information provided, most communities are very proactive with purchasing equipment and improving structures to address localized drainage needs. A brief summary of the findings are summarized below:

As part of a larger project, the City of Bono, through the NRCS, completed construction on the Lake Bono Dam, which has helped with flooding in Bono. This dam is being studied as part of the ongoing Craighead County, AR Phase 2 Study.

The City of McCrory is currently working on a Mitigation Action to update the structure at 5th Street and has received mitigation grant funding in the past years to help improve the drainage of water throughout the City. The 5th Street project includes increasing capacity of the current structure. Additionally, the City has purchased equipment and is partnering with Woodruff County and the ArDOT to better maintain and improve local drainage.

Poinsett County has performed localized maintenance (improve structures, clean ditches, remove debris) to improve local drainage. Additionally, they have identified two (2) specific areas of concern. The East side of Poinsett County receives flood water from the West side of Jonesboro, while it is a flash flood type event, some homes in the low area of Trumann experience damage, and around Weiner, Waldenburg, Fisher, and Payneway, the County mentions if the Cache River had some levees in these areas, the issue of flooding would be significantly reduced. A levee analysis could be a future course of action.

The City of Jonesboro is working to perform an updated drainage study for the City, as its maps are outdated and do not appear to reflect the accurate risk. This project started from past Map Modernization efforts in Craighead County.

Hydrology: The review of hydrologic data was limited to Base Level Engineering hydrologic processing which includes Peak Discharges and partial gage analysis in the watershed. The 1-percent–annual-chance peak discharge data for Base Level Engineering analysis for the entire watershed was reviewed for any anomalies. Development, sinks, and flood control structures were noted to determine if they had an impact on the hydrology flows. Available gage information for the entire watershed was also reviewed and compared to the Base Level Engineering hydrology, when possible to identify discrepancies and possible anomalies stemming from outdated, overestimated, or underestimated sub-basin analyses.

Hydraulics and floodplain analysis: Base Level Engineering was conducted for this watershed. As a result, CNMS evaluations were conducted to compare the effective mapping to new mapping. The effective mapping was assembled from current National Flood Hazard Layer (modernized counties) and Q3 floodplain mapping data (non-modernized areas). Some noteworthy obstacles observed include the fact

that the Zone A floodplains do not match between most of the community and county boundaries, and there are discrepancies on the mapping for the 0.2% annual-chance-events throughout the watershed.

CNMS Concerns within the Watershed: It is important to note that for the watershed as a whole, most of the CNMS streams are considered unverified. Comparisons of the effective mapping to the draft Base Level Engineering results showed that the effective mapping should be revised based on better source data and processes. The three main concerns found in the area were non-digital FIRMs, vast areas of Unknown approximate studies which were not backed by technical data, and some communities that contained zero miles of detailed studies.

Non-digital FIRMs: Cross County, Craighead County, Monroe County, Prairie County, St. Francis County, and Woodruff County.

Unknown Approximate Studies: Clay County, Craighead County, Cross County, Greene County, Jackson County, Lawrence County, Monroe County, Poinsett County, Prairie County, Randolph County, St. Francis County, and Woodruff County in Arkansas and Butler County in Missouri.

Zero Miles of Detailed Study: Cross County and Prairie County (complete area). There are other parts of individual communities that do not have detail study streams within their jurisdictions.

Discovery Wrap-Up Meeting

At present, the Arkansas CTP plans to hold the Wrap-Up Meeting in association with additional advanced Base Level Engineering training throughout the area. A summary of the findings will be presented at those meeting opportunities.

Future Investments for Refinement

Watershed-wide Recommendations:

Based on comments from Poinsett County representatives, performing a more detailed analysis along the Cache River to examine if structural measures (levee, channel improvements, etc.) may be beneficial and feasible should be considered as a future possibility.

County-specific Recommendations:

Cross County, Monroe County, Prairie County, St. Francis County, and Woodruff County have non-modernized FIRMs. One goal of the Arkansas CTP is to update all non-modernized FIRMs. Once a county has been covered by Discovery and Base Level Engineering projects, it is recommended to move to Phase 2 or 3 to produce a modernized and digital FIRM with Flood Risk Products.

Currently, Craighead County is going through a Phase 2 countywide study to address existing mapping issues. This includes the City of Bono and should include, as it is completed and updated to FEMA standards, the City of Jonesboro Drainage Study.

City/Town-specific Recommendations:

There are multiple communities and /or unincorporated areas that have no detailed studies within the boundaries. It is recommended that for areas of need (population sources, possible development areas, etc) detailed studies be evaluated based on the community need and desire.

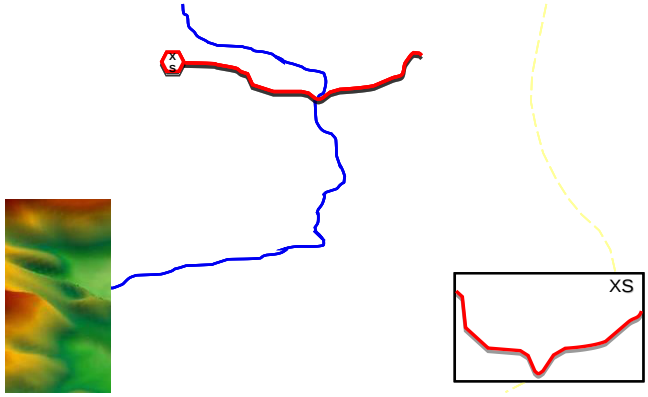
Phase Two: Risk Identification and Assessment

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Two project in this watershed.

During the Risk Identification and Assessment Phase of a project, engineering modeling and analysis is refined to further enhance the identification of flood risk. Existing modeling has been updated using a more detailed methodology for calculating the amount of water (hydrology) expected during a storm event, plus additional detail and gage analysis.

Hydraulic models include additional refinement to the cross sections and stream crossings (Figure 5) that may restrict flow in larger events, and the channel and structure information in existing models could be improved based on field surveys.

Figure 5. Hydraulic Cross-Section



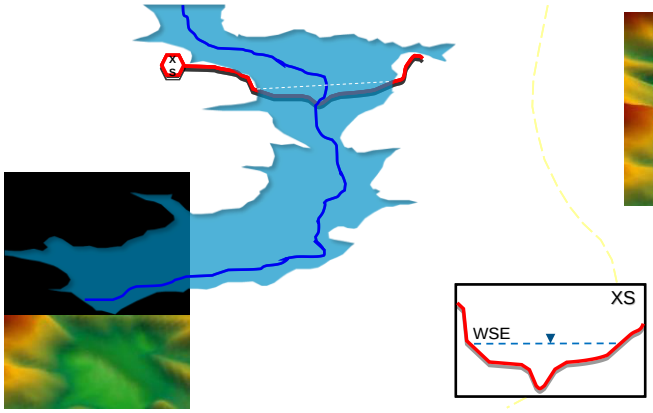


Figure 6. Floodplain Mapping of Peak Water Surface Elevation

Engineering modeling applies the flow volume calculated for a certain storm interval and places that water into the natural channel described in the hydraulic software. As tributaries and other drainage features are added to the main stream, the flow volume increases downstream. The modeling calculates the peak water-surface elevation (Figure 6) determined at each cross section, and these peak values are graphically described in a profile. The peak values are then mapped on ground elevation information to produce a floodplain delineation that identifies the expected flood extent during the analyzed storm event.

These models have been used to produce a range of flood risk datasets that describe the variability of flooding within the delineated floodplain. These flood risk datasets include:

- **Water-Surface Elevation Grid –** This two-dimensional grid describes the water-surface elevation and profile for the length of the study area. Interpolated values are produced between each analyzed cross section.
- **Flood Depth Grid –** This grid provides an estimated flood depth at any location within the floodplain, allowing the variability of flood depth to be better represented for the stream channel and the floodplain areas.
- **Annual Percent Chance Grid –** This grid is produced using statistical analysis to describe multiple percentages of the chance of flooding within the determined floodplain.

- **30-Year Percent Chance Grid –** Further statistical methodology is used to determine the percent chance of flooding within a 30-year window. The 30-year window was chosen because a 30-year period is common for home mortgages.
- **Changes Since Last FIRM –** This polygon file identifies each location where modifications are identified by the revised and updated hydrologic and hydraulic analysis. Areas where floodplain widths increase/decrease, areas where floodway widths increase/decrease, and areas where flood zones have been modified are identifiable within this layer.

This phase of the project benefits greatly from community interaction and coordination with local technical and operations staff, providing an opportunity for FEMA and its mapping partners to engage local knowledge as the modeling is prepared. FEMA and the Arkansas CTP would like to work closely with communities to identify areas where the modeling and floodplain mapping may not agree with on the ground accounts of flooding equivalent to the 1% annual chance storm event. FEMA and the Arkansas CTP would like to use this phase to review community comments and include any available technical information prior to proceeding to the update of the Regulatory products (FIRM, FIS and DFIRM database).

The following information will be added during any Phase 2 project that may be completed in the future.

Flood Risk Review Meeting

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Two project in this watershed.

Flood Risk Review Meetings are scheduled for XXXX, 20XX. The first formal sharing of the modeling and mapping updates occurs at the Flood Risk Review Meeting. At this meeting, FEMA intends to continue community coordination efforts and discussions with a variety of watershed partners to review the effects of physical and meteorological changes within the project area.

The FEMA team remains focused on reviewing the identification of flood and other natural hazard risks, areas where modifications in the flood delineations have been identified, and changes in risk assessment, working with community and technical staff throughout the analysis/assessment processes.

The team will deliver the Phase Two (Data and Engineering) data:

- Hydrological Analysis
- Hydraulic Analysis
- Resultant BLE data

The objectives of the Flood Risk Review meeting include:

- Promote local buy-in of analysis/study results
- Review Risk Identification (engineering) results with local communities
- Review the hazard mitigation plan, compared to the study findings
- Identify risk communication needs and options
- Support identified community-driven mitigation actions
- Identify and/or resolve community comments and appeals before the regulatory products are issued
- Solicit community input on results and promote buy-in of analyses prior to moving forward
- Continue developing relationships with communities

The new analysis and products will be delivered to communities in advance of this meeting, so communities will have the chance to review and assess the modeling and mapping results prior to the in-person meeting.

FEMA would like to work with communities at each project milestone to identify and address any technical concerns with the modeling results. Because this phase of the timeline is less rigid than the statutory and regulatory timelines in Phase Three, FEMA can work more closely and intimately with the communities to review and address their concerns.

Next Steps

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Two project in this watershed.

Once the analysis is completed, FEMA will review the areas of change before determining if a project will move forward to update the regulatory products (FIS report, FIRM, and DFIRM database). A cursory review of the modeling results indicates that this study area has significant changes in floodplain width and depth.

FEMA will work with communities after delivering the hydrologic and hydraulic analysis and floodplain work maps to collect any outstanding technical inquiries within the study area. After coordinating with communities, FEMA will likely initiate the Phase Three effort to update the regulatory products.

Potential Community Activities

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Two project in this watershed.

The availability of updated flood risk information provides the community a chance to review a range of possible actions that may be taken. Some possible community activities are identified below for consideration:

Stream Specific Recommendations: This section may be expanded at a later date.

Local Hazard Mitigation Plan (Hazard Profile): The updated flood risk information provides an opportunity to review local hazard mitigation plans. The flood risk profile, hazard extent, and vulnerability assessment may be refined based on the Changes Since Last FIRM, water-surface elevation grids, flood depth grids, and percent annual chance grids. Communities should reconvene their Mitigation Plan Steering Committee to identify how these narrative sections should be refined with the additional information.

Local Hazard Mitigation Plans help to:

- Protect public safety
- Prevent damage to community assets
- Reduce costs of disaster response and recovery
- Improve community capabilities
- Create safer, more sustainable development

Local Hazard Mitigation Plan (Mitigation Strategies): Communities may review community assets, critical facilities, and other vulnerable areas within a community to identify or refine the mitigation strategies and locate future mitigation projects to reduce long-term natural hazard risk throughout the community. FEMA's publication Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards may provide some strategies and projects for the local Mitigation Plan Steering Committee to review.

Mitigation Project Scope Preparation: Each year, communities may apply for various FEMA Hazard Mitigation Assistance (HMA) grants available for implementing mitigation actions. Communities may review their critical mitigation needs and opt to prepare project submittals for one of the grant opportunities FEMA offers.

PDM

The PDM grant program provides funding for hazard mitigation planning and projects on an annual basis. These funds are locally and nationally competitive. The amount of funding available annually depends on appropriations by Congress.

FMA

The FMA grant program provides funds for projects to reduce or eliminate the risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP). These funds are awarded on an annual basis through State allocations that are based on the number of NFIP policies in force.

HMGP

The HMGP assists in implementing long-term hazard mitigation measures following a Presidential disaster declaration. HMGP funding is generally 15% of the total amount of Federal assistance provided to a State, Territory, or federally recognized tribe following a major disaster declaration. If a State, Territory, or federally recognized tribe has an enhanced mitigation plan, the percentage rises to 20%. These grant funds are competitive within the State receiving the allocation.

These HMA Grant Programs are managed by the State of Arkansas (grantee), which has the primary responsibility for selecting and administering the mitigation activities throughout the state. Individuals are not eligible to apply directly for HMA funds; however, communities may act as an eligible applicant or sub-applicant to apply for funding on behalf of individuals.

For specific information on available HMA grant funding and current project priorities in Arkansas, please contact the appropriate state agency.

FMA, HMGP, and PDM Grant Programs
Arkansas Department of Emergency Management

Lacye Blake
Lacye.Blake@adem.arkansas.gov
(501) 683-6700

Arkansas Natural Resources Commission Management

Veronica Villalobos-Pogue
Veronica.Villalobos-Pogue@arkansas.gov
(501) 683-6700

Community Rating System (CRS): The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Communities interested in the CRS program may contact their FEMA Region 6 CRS Coordinator or the State of Arkansas CRS Coordinator.

FEMA CRS Programs
FEMA Region 6
Mark Lujan
mark.lujan@fema.dhs.gov
(940) 383-7327

Arkansas CRS Programs
Arkansas Natural Resources Commission
Whitney Montague
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Adoption of Higher Standards: Community participation in the NFIP is voluntary. When a community joins the NFIP, it must ensure its adopted floodplain management ordinance and enforcement procedures meet NFIP requirements. NFIP minimum requirements include requiring permits for all development in the SFHA and ensuring that the construction materials and methods used will minimize future flood damage. Higher standards, such as freeboard, land use and zoning practices, and other approaches allow communities to minimize future damages within the community by using more restrictive building codes and requirements.

Risk Reduction Activities: The NFIP's CRS Coordinator's Manual identifies a number of activities that communities can undertake to reduce their long-term risk. Higher standards, land use planning, future conditions modeling, and other approaches are available for consideration.

Severe Repetitive Loss (SRL) Strategy: The primary objective of the SRL properties strategy is to eliminate or reduce the damage to residential property and the disruption to life caused by repeated flooding. The SRL Grant Program makes funding available for a variety of flood mitigation activities. Under this program, FEMA provides funds to state and local governments to assist NFIP-insured SRL residential property owners with mitigation projects that reduce future flood losses. Projects could include acquisition or relocation of at-risk structures and conversion of the property to open space, elevation of existing structures, or dry floodproofing for historic properties.

Public Risk Awareness and Outreach Campaigns: Communities may use the new and existing flood hazard information to develop a public information and outreach campaign for their community. Since 2010, FEMA has conducted an annual nationwide study of flood risk awareness among U.S. households. Participants overwhelmingly responded that they expect and trust flood risk information when it comes from local community officials and staff.

FEMA Region 6 has also developed the Risk Communication Guidebook for Local Officials (http://www.riskmap6.com/guidebook.aspx), which identifies a number of local communication activities. The Guidebook provides tools, templates, and resources for communities interested in developing a local outreach campaign; it is presented by Risk MAP project phases, similar to this report.

The CRS Coordinators Manual and the CRS Resources website (for Activity 300, available at http://crsresources.org/300-3) can provide additional information for communities interested in local flood hazard and risk awareness outreach campaigns.

High Water Mark (HWM) Initiative: As part of the NFIP, the HWM Initiative is a community-based program that increases residents' awareness of flood risk and encourages action to mitigate that risk.

As part of the project, communities post HWM signs in prominent places, hold a high-profile launch event to unveil the signs, conduct ongoing education to build local awareness of flood risk, and complete mitigation actions to build community resilience against future flooding.

Phase Three: Regulatory Product Update

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

During the Regulatory Product Update Phase of a Flood Risk Project, the results produced in the previous phase are used to prepare and produce three regulatory products that are produced in a county-wide manner. This phase of the project is more regimented than previous phases, there are some statutory and regulatory timelines that must be adhered to by FEMA and the communities involved in the update areas. FEMA will remain in contact with communities throughout the process.

Flood Insurance Study (FIS) Text

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

The engineering analysis results will be used to update the existing countywide FIS texts produced for communities during the Map Modernization effort. The narratives within the FIS text are updated to include specifics about the latest analysis and study effort within each county. Additionally, the Floodway Data Tables and Water Surface Elevations that provide look up information to community staff in their administration of the program are also updated to provide the most up to date information to the public and communities alike.

Flood Insurance Rate Map (FIRM) Panels

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

The revised FIRM data is based on a combination of new and existing engineering analyses of floodplain boundaries. The new engineering analysis for your county/parish is based on detailed analysis.

Detailed studies are mapped with a flood zone designation of "Zone AE". All mileage studied by detailed methods produces a FIRM that included Base Flood Elevations (BFEs) published on the Preliminary DFIRMs. As previously described in Phase Two, studies of this nature include field surveys, hydraulic structures, modeling calibration and multiple flood frequency profiles published in the Flood Insurance Study (FIS) report delivered at Preliminary DFIRM issuance.

Some detailed mileage also includes a regulatory floodway. Floodway models are prepared to review the effect that fill or encroachment may have along a stream. Floodplain and floodway evaluations are the basis for community floodplain management programs. More information on floodway modeling is available in the Phase Two section of this report.

DFIRM Database

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

Communities receive an updated and standardized DFIRM Database which is a digital version of the FEMA flood insurance rate map designed for use with Geographic Information Systems (GIS) software.

The DFIRM Database is designed to provide the user the ability to determine the flood zone, base flood elevation and the floodway status for a particular location using its own internal GIS staff. The DFIRM database also includes data related to the NFIP community, FIRM panels, analysis cross sections and hydraulic structure information, as well as base map information like road, and stream data for reference and local use.

Letters of Map Change (LOMCs)

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

As part of the DFIRM update, the project team will review all LOMAs and LOMRs and make a determination of each case to: incorporate, revalidate/reissue or supersede the LOMAs and LOMRs, based on technical data.

The following Letters of Map Revision have been reviewed and categorized:

Case Number	Stream Name(s) & Community(ies)	Effective Date	Category
	To be completed at a later date.		

LOMAs for each county will also be reviewed in preparation for the preliminary issuance. Communities should be advised that ALL LOMAs will be included in the Preliminary Summary of Map Actions (Prelim SOMA) provided on the Preliminary release date.

Communities should review their map repositories for any Letters of Map Amendment (LOMA) or Letter of Map Revision (LOMR) within the stream areas being studied. These community files may provide additional information for historic map revisions that will assist in the review of the cases for incorporation.

Next Step: Preliminary Issuance

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

Once FEMA has received, reviewed and responded to all comments and technical data received as a result of the Flood Risk Review meeting, FEMA will prepare the preliminary FIRMs, FIS and DFIRM database for release. Preliminaries will be sent to the community Chief Executive Officer, or "CEO," and floodplain administrator, or "FPA," for an initial review.

Steps Post Preliminary Issuance

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

The post-preliminary process is initiated with the preliminary issuance of the FIRM, FIS and DFIRM Database. A number of activities will occur as highlighted in Figure 7 below.

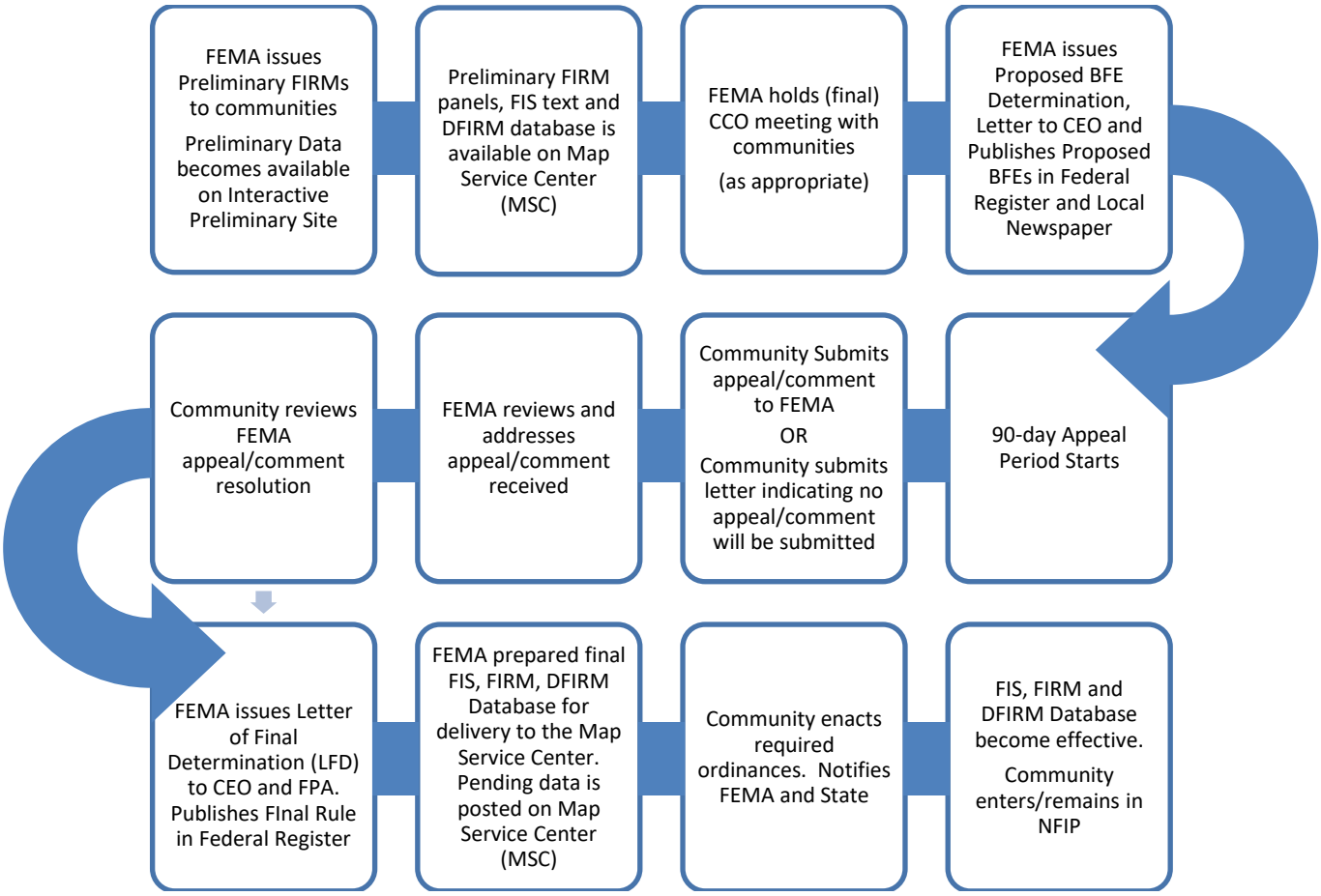


Figure 7. Post Preliminary Process

Additional information is provided for the immediate steps following preliminary issuance to provide some overview to communities prior to these activities being initiated.

Preliminary Data Available through Interactive Website. For FIRMs that are based on FEMA-contracted studies/mapping projects, Preliminary Map Viewer will be available describing information available on the site.

30-Day Community Review Period. For FIRMs that are based on FEMA-contracted studies/mapping projects, the initial community review is provided to communities. This informal review period generally lasts 30 days.

Consultation Coordination Officer (CCO) Meeting. Following the informal review of the preliminary information, FEMA holds a more formal community coordination meeting during which community officials meet with FEMA representatives.

90-Day Appeal and Comment Period Initiated: Following the CCO meeting, FEMA will issue a letter to the Community Elected Official and Local Floodplain Administrator to inform them that FEMA is moving towards the initiation of the appeal period. FEMA will work internally to publish the Proposed BFE Determination in the Federal Register and then will publish a notice in the local newspaper two times. The letter will indicate the publication date for the notice in the Federal Register and two publication dates for a local newspaper. The appeal and comment period is initiated after the second local print date and extends 90 calendar days.

During this period, community officials or citizens may appeal the proposed BFEs and/or base flood depths based on scientific or technical data. Community officials or citizens also may submit requests for changes to other information shown on the DFIRM - flood zone boundaries, regulatory floodway boundaries, road names and configurations - during the appeal period. **Communities are responsible for the collection, review and approval of appeals that are submitted during the 90-day appeal period.**

An **appeal** is a formal objection to proposed or proposed modified BFEs or base flood depths, submitted by a community official or an owner or lessee of real property within the community through the community officials during the statutory 90-day appeal period. An appeal must be based on data that show the proposed or proposed modified BFEs are scientifically or technically incorrect.

A **comment** is an objection to or comment on any information, other than proposed BFEs or base flood depths, shown on an NFIP map that is submitted by community officials or interested citizens through the community officials during the 90-day appeal period. Comments usually involve changes to items such as road locations and road names, corporate limits updates, or other base map features.

Future Physical Map Revisions

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

The release of the maps in these areas does not identify the end of coordination between the local community and FEMA. Local communities should continue their local floodplain management activities and submit Letters of Map Revision when local development alters the flood hazard in the community.

Appendix I: Community-Specific Reports

The following list depicts the county- and community-specific reports contained within this appendix.

Communities
CLAY COUNTY
Clay County Unincorporated Areas [1]
Knobel, City of
McDougal, City of
Peach Orchard, City of
Piggott, City of [1]
Pollard, City of
CRAIGHEAD COUNTY
Craighead County Unincorporated Areas [1]
Bono, City of
Cash, Town of
Egypt, Town of
Jonesboro, City of [1]
CROSS COUNTY
Cross County Unincorporated Areas [1]
GREENE COUNTY
Greene County Unincorporated Areas [1]
Lafe, Town of
JACKSON COUNTY
Jackson County Unincorporated Areas [1]
Amagon, Town of
Beedeville, Town of
Grubbs, City of
Newport, City of [1]
Tupelo, Town of
Weldon, Town of
LAWRENCE COUNTY
Lawrence County Unincorporated Areas [1]
Sedgwick, Town of
Walnut Ridge, City of [1]
MONROE COUNTY
Monroe County Unincorporated Areas [1]
Brinkley, City of [1]
Fargo, Town of

Communities
POINSETT COUNTY
Poinsett County Unincorporated Areas [1]
Fisher, City of [1]
Waldenburg, Town of [1]
Weiner, City of [1]
PRAIRIE COUNTY
Prairie County Unincorporated Areas [1]
Biscoe, City of [1]
RANDOLPH COUNTY
Randolph County Unincorporated Areas [1]
O'Kean, Town of
ST.FRANCIS COUNTY
St. Francis County Unincorporated Areas [1]
WOODRUFF COUNTY
Woodruff County Unincorporated Areas [1]
Cotton Plant, City of
Hunter, Town of [1]
McCrory, City of
Patterson, City of
BUTLER COUNTY, MO
Butler County, MO Unincorporated Areas [1]

[1] Community is located within more than one HUC8 watershed.

Appendix II: Points of Contact

Watershed

Subject/Topic of Interest	Name	Contact Information
FEMA Region 6 Risk MAP Team Lead *Project Outreach*	Diane Howe Risk Analysis Branch	Phone: (940) 898-5171 Email: diane.howe@fema.dhs.gov
FEMA Project Monitor (Arkansas)	John Bourdeau Risk Analysis Branch	Phone: (940) 383-7350 Email: John.BourdeauJr@fema.dhs.gov
• Floodplain Management • Floodplain Ordinance • Community Assistance Visits • Higher Standards • Flood Insurance	Pedro Perez Floodplain Management & Insurance Branch	Phone: (940) 383-7365 Email: Pedro.Perez@fema.dhs.gov
• Community Rating System • Flood Insurance	Mark Lujan	Phone: (940) 383-7327 Email: mark.lujan@fema.dhs.gov
• How to find and read FIRMs • Letters of Map Change and Elevation Certificates • Mandatory insurance purchase guidelines/ Flood zone disputes • Map Service Center (MSC) & National Food Hazard Layer	FEMA Map Information eXchange (FMIX)	Phone: 1-877-FEMA-MAP (336-2627) Email: FEMAMapSpecialist@riskmapcds.com Live Chat: https://www.floodmaps.fema.gov/fhm/fmx_main.html

State Partners

Organization/Title	Name	Partner Location	Contact Information
Arkansas Natural Resources Commission (ANRC) State NFIP Coordinator	Michael Borengasser, CFM	101 East Capitol Ave, Suite 350 Little Rock, AR 72201	Phone: (501) 682-3969 Email: michael.borengasser@arkansas.gov Web Page: http://www.anrc.arkansas.gov/
Arkansas Department of Emergency Management State Hazard Mitigation Officer	Lacye Blake	Building 9501 Camp Joseph T. Robinson North Little Rock, AR 72199	Phone: (512) 424-5489 Email: Lacye.Blake@adem.arkansas.gov Web Page: http://www.adem.arkansas.gov/

Appendix III: Resources

Arkansas Natural Resources Commission

The Arkansas Natural Resources Commission's (ANRC) mission is to manage and protect our water and land resources for the health, safety and economic benefit of the State of Arkansas.

The ANRC has been designated by state law as the State NFIP Coordinating Agency for Arkansas. Within ANRC- Water Resources Management Division, you will find Floodplain Management, where most of the flood-related information and flood planning and mitigation grant resources reside.

Organization	Contact Information	Website
Arkansas Natural Resources Commission (ANRC)	Phone: (501) 682-1611	http://www.anrc.arkansas.gov/

Arkansas Floodplain Management Association (AFMA)

The AFMA is an organization of professionals involved in floodplain management, flood hazard mitigation, the NFIP, flood preparedness, warning, and disaster recovery. The Association includes flood hazard specialists from local, state, and federal governments, the mortgage, insurance, and research communities, and the associated fields of flood zone determination, engineering, hydraulic forecasting, emergency response, water resources, Geographic Information Systems, and others.

Organization	Website
Arkansas Floodplain Management Association (AFMA)	https://www.arkansasfloods.org/

Certified Floodplain Manager (CFM) Certification

The Association of State Floodplain Managers (ASFPM) established a national program for certifying floodplain managers. This program recognizes continuing education and professional development that enhances the knowledge and performance of local, state, federal, and private-sector floodplain management professionals.

The role of the nation's floodplain managers is expanding due to increases in disaster losses, the emphasis on mitigation to alleviate the cycle of damage-rebuild-damage, and a recognized need for professionals to adequately address these issues. This certification program will lay the foundation for ensuring that highly qualified individuals are available to meet the challenge of breaking the damage cycle and stopping its negative drain on the nation's human, financial, and natural resources.

CFM® is a registered trademark and available only to individuals certified and in good standing under the ASFPM Certified Floodplain Manager Program.

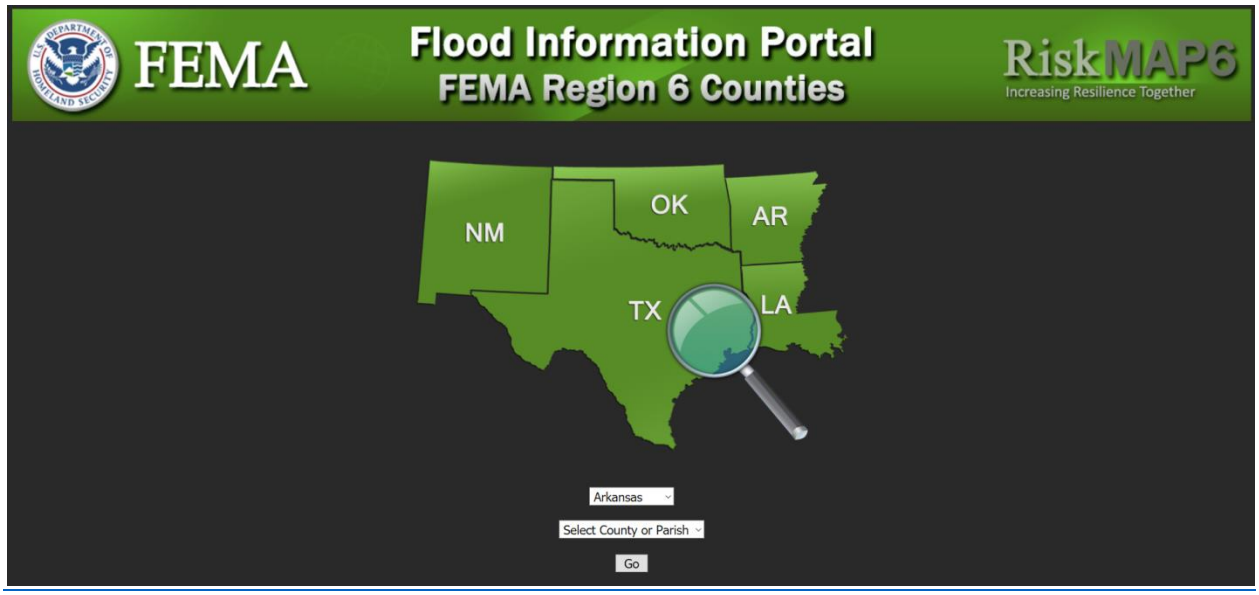
For more information, you may want to review these available CFM Awareness Videos:

- What is the CFM Program?
- Who can be a CFM?
- What are the Benefits of a CFM?

Study Materials for those interested in applying for the CFM certification can be found on the ASFPM Website at: http://www.floods.org/index.asp?menuID=215.

For information on becoming a member and the exam application process in the State of Arkansas visit https://www.arkansasfloods.org/cfm/.

Interactive Preliminary Data Viewer



To support community review of the study information and promote risk communication efforts, FEMA launched an interactive web tool accessible on-line at http://maps.RiskMAP6.com for the project areas.

Should a study be released for review, the study data may be viewed at this website.

For more information on the Interactive Preliminary Data Viewer, refer to the Region 6 Fact sheet: What is your Flood Risk?

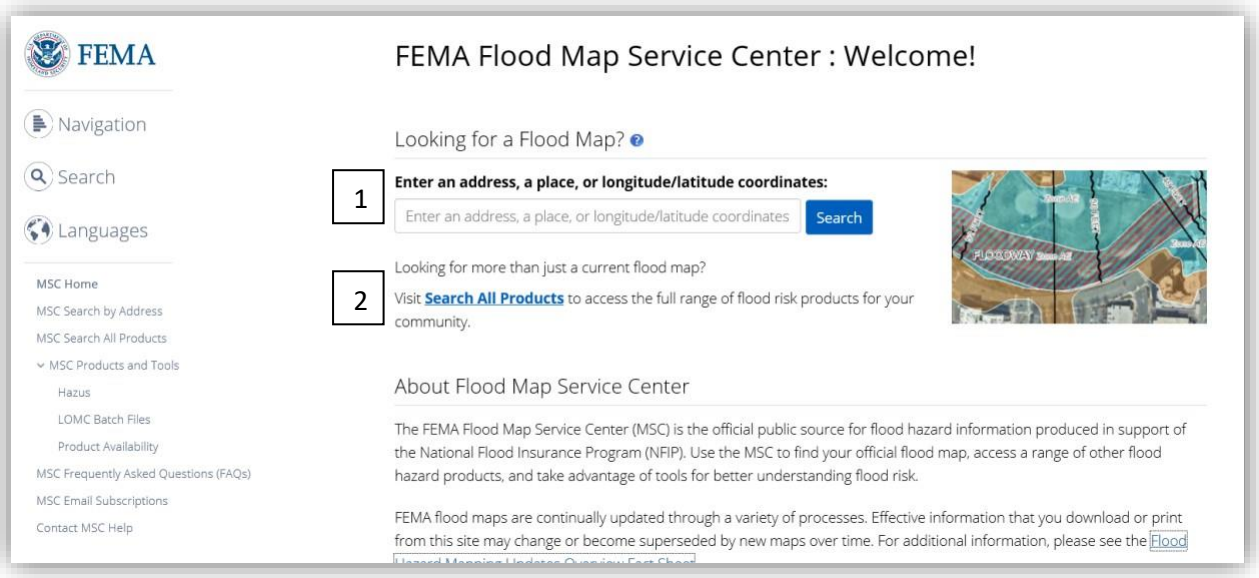
Map Service Center – Available Map Data

The FEMA Flood Map Service Center (MSC) is the official public source for flood hazard information produced in support of the NFIP. Use the MSC to find your official effective flood map, preliminary flood maps, and access a range of other flood hazard products.

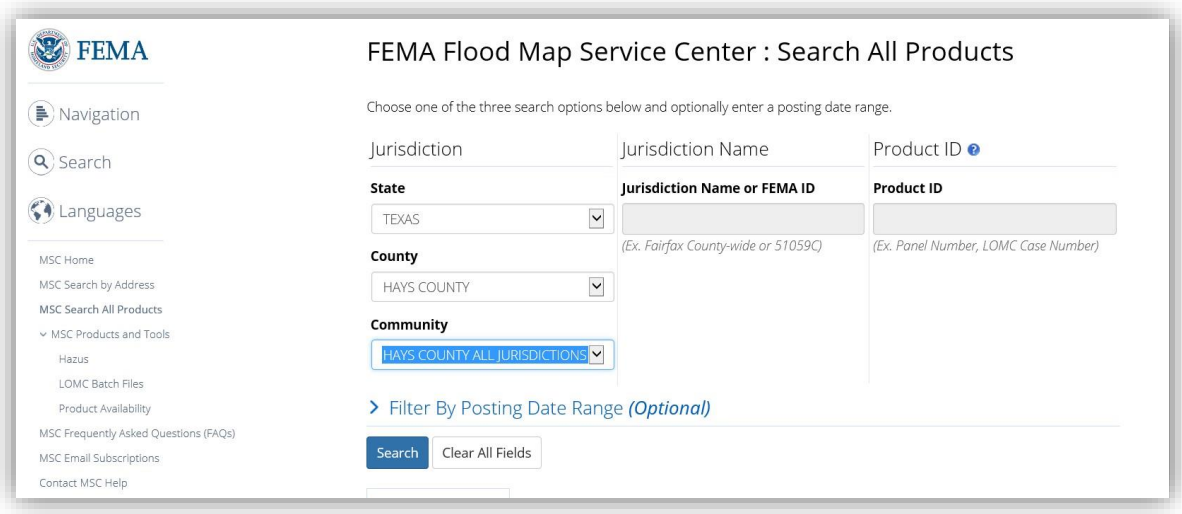
FEMA flood maps are continually updated through a variety of processes. Effective information that you download or print from this site may change or become superseded by new maps over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet.

At the MSC, there are two ways to locate flood maps in your vicinity.

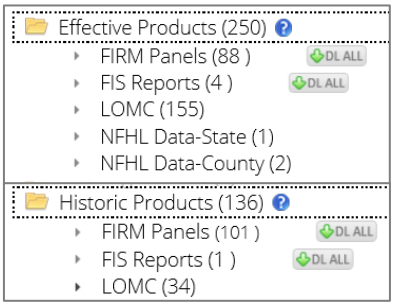
1. Enter an address, place name, or latitude/longitude coordinates and click search. This will provide the current effective FIRM panel where the location is shown.
2. Or Search All Products, which will provide access to the full range of flood risk information available.



By using the more advanced search option, “Search All Products,” users may access current, preliminary, pending, and historic flood maps. Additionally, GIS data and flood risk products may be accessed through the site with these few steps.



Using the pull down menus, select your state, county, and community of interest. For this example, we selected Hays County - All Jurisdictions. After the search button is selected, the MSC will return all items in the area. There are five types of data available.



Effective Products. The current effective FIS, FIRM, and DFIRM database (if available) is available through the MSC. If users click on the available effective products, they are presented a breakdown of the available products. FIRM panels, FIS reports, LOMRs, statewide National Flood Hazard Layer (NFHL) data, and countywide NFHL data may be available, as indicated in the breakdown on the right of the page.

Historic Products. A range of historic flood hazard maps, FIS texts, and Letters of Map Change are available through the MSC.

Flood Risk Products. The Flood Risk Report, Flood Risk Map, and

Flood Risk Database will be made available through the MSC once they have been compiled and completed. These products are made available after the flood study analysis and mapping have been reviewed and community comments incorporated.

Additional Web Resources

FLOOD MITIGATION PLANNING	http://www.adem.arkansas.gov/
NATIONAL FLOOD INSURANCE PROGRAM RESOURCES – HOW TO JOIN, SAMPLE ORDINANCES, ETC.	http://www.floodplain.ar.gov/
FLOOD GRANT PROGRAMS	http://www.adem.arkansas.gov/hazard-mitigation-grant-program http://www.floodplain.ar.gov/
FLOOD WORKSHOPS AND TRAINING SCHEDULES	http://www.floodplain.ar.gov/Conferences.html https://www.arkansasfloods.org/

AR Highway 33 near Bisco, AR - Jocelyn Augustino/FEMA Photo by Jocelyn Augustino

L'Anguille Watershed, AR Base Level Engineering (BLE) Results

L'Anguille Watershed, HUC - 08020205

Craighead*, Cross*, Lee*, Poinsett*, St. Francis* and Woodruff* Counties, Arkansas

**Spans more than one watershed. This report covers only the area within the studied watershed.*

June 2017

ftn Associates Ltd.

Project Area Community List

Community Name	CID
Craighead County Communities	
Craighead County	050427
Jonesboro, City of	050048
Cross County Communities	
Cherry Valley, City of	050057
Cross County	050056
Hickory Ridge, City of	050058
Wynne, City of	050060
Lee County Communities	
Haynes, Town of	
Lee County	050444
Marianna, City of	050124
Poinsett County Communities	
Fisher, City of	
Harrisburg, City of	050173
Poinsett County	050172
Weiner, City of	050373
St. Francis County Communities	
Caldwell, Town of	050185
Colt, City of	050186
Forrest City, City of	050187
Palestine, City of	050359
St. Francis County	050184
Woodruff County Communities	
Woodruff County	050468

[1] Community is located within more than one HUC8 watershed.

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Appendix A – WORKMAPS

1. Executive Summary

The U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) is currently implementing the Risk Mapping, Assessment, and Planning (Risk MAP) Program across the Nation. 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 a more integrated process of more accurately identifying, assessing, communicating, planning and mitigating flood risks. Risk MAP attempts to address gaps in flood hazard data and form a solid foundation for risk assessment, floodplain management, and provide State and Local entities with information needed to mitigate flood related risks.

The FEMA Region 6 office and the Arkansas Natural Resources Commission (ANRC) entered into a Cooperating Technical Partners (CTP) partnership agreement for implementation of Risk MAP in the State of Arkansas. As part of this partnership, the ANRC and its contractor, FTN Associates, Ltd. (FTN), began work on a Base Level Engineering (BLE) analysis in the L'Anguille Watershed in October 2016 to support FEMA's Discovery process and validation of effective Zone A Special Flood Hazard Area (SFHA).

The BLE process involves using best available data and incorporating automated techniques with existing hydrologic and hydraulic (H&H) model development procedures to produce quality flood hazard boundaries and secondary products (Water Surface Elevation grids, Depth grids, etc.) for multiple recurrence intervals. The purpose and intent of the BLE process is to validate existing Zone A flood boundaries within the existing Coordinated Needs Management Strategy (CNMS) dataset and provide updated flood risk data in the early stages of a Flood Risk Project (Discovery). An important goal of the BLE process developed by FEMA is the scalability of the results. Scalability means that the results of an BLE cannot only be used for CNMS evaluations of Zone A studies but also leveraged throughout the Risk MAP program.

The source digital terrain data used for surface model development in support of H&H analysis, as well as mapping activities were leveraged from existing Light Detection and Ranging (LIDAR) data collected by the Federal Emergency Management Agency (2011 Cache and 2011 L'Anguille), U.S. Geological Survey (2011 Bayou Meto, 2012 Upper Black, 2012 Upper White Village, 2013 Lower St. Francis, and 2015 Lower Black), and the U.S. Army Corps of Engineers (2010 White River to Newport, 2010 Greers Ferry and Red River, 2014 AR-MO LIDAR Project). The LiDAR datasets were 1-meter gridded DEM data that were reprojected to a 15 ft cell size for hydrologic processing and a 5 ft cell size for hydraulic and mapping processing.

Flood discharges for this analysis were calculated using the National Oceanic and Atmospheric Administration's National Weather Service, Precipitation Frequency Data Server (PFDS) for Atlas 14, ESRI's ArcGIS software, the HEC-Hydrologic Modeling System (HEC-HMS) computer program, and the HEC - River Analysis System (HEC-RAS) program, version 5.0.3. Initial precipitation values were obtained, based on a watershed level, from NOAA's Precipitation Frequency Data Server (PFDS) for Atlas 14, which was then processed in ESRI's ArcGIS 10.x software into a usable format. The obtained preceipitation values and resulting GIS parameters for the watershed, were then input into HEC-HMS to determine the excess rainfall that would result based on the applied conditions. This excess rainfall was then applied to a 2-D HEC-RAS model in the form of a rain on grid scenario, which was then used compute the water surface elevations for the 10-, 4-, 2-, 1-, 0.2-percent-events and the 1-percent-minus and 1-percent plus flood events.

The modeled stream mile network for the L'Anguille Watershed was compiled initially using FEMA's CNMS inventory. It was then expanded to include streams that extended upstream to a contributing drainage area of approximately 1 sq. mile.

2. Base Level Engineering (BLE) Methodology

This section provides guidance for the hydrologic, hydraulic and floodplain mapping steps required to create a BLE. The BLE process involves using best available data and incorporating automated techniques with existing H&H model development procedures to produce quality flood hazard boundaries and secondary products (Water Surface Elevation grids, Depth grids, etc.) for multiple recurrence intervals. The purpose and intent of the BLE process is to validate existing Zone A flood boundaries within the existing CNMS dataset and provide updated flood risk data in the early stages of a Flood Risk Project (Discovery).

The cost and effort for developing the data and estimates resulting from the BLE process are lower than standard flood production tasks. An important goal of the BLE process developed by FEMA is the scalability of the results. Scalability means that the results of an BLE cannot only be used for CNMS evaluations of Zone A studies but also leveraged throughout the Risk MAP program. The large volume of data resulting from an BLE can be used for the eventual production of regulatory and non-regulatory products, outreach and risk communication and MT-1 processing. Leveraging this data outside the Risk MAP program may also be valuable to external stakeholders.

Per the the Code of Federal Regulations, once every five years, FEMA must evaluate whether the information on Flood Insurance Rate Maps (FIRMs) reflects the current risks. This evaluation is done by examining the existing flood boundaries for changes in study attributes and physical characteristics, as specified in the CNMS Technical Reference. Additionally, this evaluation occurs using a series of critical and secondary checks to determine the validity of the existing flood hazard areas. In addition to the need for evaluating the accuracy of Zone A mapping, newer FEMA standards also require that flood risk data be provided in the early stages of a Flood Risk Project. Particularly, FEMA Program Standard SID #29 requires that during Discovery, data must be identified that illustrates potential changes in flood elevation and mapping that may result from the proposed project scope. If available data does not clearly illustrate the likely changes, an analysis is required that estimates the likely changes. This data and any associated analyses should be shared and results should be discussed with stakeholders.

Therefore, based on these requirements, the results of the BLE process are being provided to the local Floodplain Administrators (FPAs), which allows for users to have access to a model backed Zone A study that is suitable to replace the effective Zone A products. The following sections are being supplied to document the hydrologic, hydraulic, and floodplain mapping techniques used. Regardless of the individual techniques used to perform these steps, the goal of a scalable product should be adhered to throughout the entire BLE process.

2.1. Terrain

To determine the parameters for the hydrologic and hydraulic analyses, FTN obtained Digital Elevation Model (DEM) data developed from LIDAR information that was collected by the Federal Emergency Management Agency (2011 Cache and 2011 L'Anguille), U.S. Geological Survey (2011 Bayou Meto, 2012 Upper Black, 2012 Upper White Village, 2013 Lower St. Francis, and 2015 Lower Black), and the U.S. Army Corps of Engineers (2010 White River to Newport, 2010 Greers Ferry and Red River, 2014 AR-MO LIDAR Project). The bare earth DEM data was provided as 1-meter or 1/3

arc-second DEMs with varying horizontal and vertical coordinate systems. Prior to use, the DEM data was reprojected to a 15 ft cell size for hydrologic processing and a 5 ft cell size for hydraulic and mapping processing with a horizontal coordinate system of NAD 1983 State Plane Arkansas North (feet) and a vertical datum of NAVD 88 (feet). DEMs were then mosaicked into a single DEM that covered the entire watershed. The single DEM was then processed using Environmental Systems Research Institute's (ESRI) ArcMap Geographic Information System (GIS) 10.x software and the ArcHydro toolset to develop the hydrologic parameters needed for use in the hydrologic modeling.

A terrain and workmap index has been prepared and is attached to the end of this report and included in Appendix A – Workmaps.

2.2. Hydrology

Excess runoff for the 10-, 4-, 2-, 1-, 0.2-percent-events and the 1-percent-minus and 1-percent plus flood events were calculated using NOAA's Precipitation Frequency Data Server (PFDS) for Atlas 14. This task was completed by processing raster data for the study events based on a HUC-10 level. The excess rainfall values were spatially averaged from raster data using the zonal statistics toolset in ESRI's ArcGIS. The maximum rainfall values, based on a HUC 10 levelwere selected as input for the resulting HEC-HMS model.

In additional the the Atlas 14 precipitation values, ESRI's ArcGIS software and supporting toolsets were used to process the initial terrain data, delineate drainage basins, and develop basin parameters for the study area. For this analysis, the SCS curve number method was selected to estimate losses due to varying landuse. The weighted Curve Number for the watershed was developed using the 2011 National Land Cover Database, NRCS's SSURGO Soil Surveys and TR-55 runoff curve numbers, and ESRI's ArcGIS software. The watershed was assumed to be at Antecedent Moisture Condition II (average moisture condition). To apply the rainfall, an SCS Type II rainfall distribution was used based to distribute the rainfall across the basin. Table 1, shown below, lists the initial and excess rainfall used for the hydrologic analysis.

Table 1: List of rainfall and peak runoff volume at different recurrence interval

Recurrence Interval (% chance)	NOAA ATLAS 14 Rainfall (in)	Excess Volume (in)
10	5.55	3.68
4	6.50	4.56
2	7.24	5.26
1	7.99	5.97
2	9.84	7.74
1-plus	9.62	7.53
1-minus	6.58	4.64

After determining the excess runoff in HEC-HMS for the watershed, it was applied to the 2-D hydraulic model as a rain on grid scenario.

2.3. Hydraulics

For all streams identified in the L'Anguille Watershed, the BLE process uses ESRI ArcGIS software and toolsets to create the HEC-RAS layers used for geometric data development and extraction. Additionally, the hydraulic modeling and mapping for this BLE process was conducted using the USACE's HEC-RAS 5.0.3 software package.

Streams

The streamlines used for determining what areas needed to be modeled were taken from the CNMS dataset. They were then expanded to include streams that extended up to a contributing drainage area of approximately 1 sq. mile. These streams were then reviewed and updated to match aerial imagery and detailed topographic data, as needed.

Hydraulic mesh (2-D analysis)

Hydraulic modeling for the L'Anguille Watershed BLE Analysis was computed using 2-D analyses to better reflect the large, flat, and interconnected floodplains. To perform this modeling, 2-D capabilities of the HEC-RAS 5.0.3 was utilized. With a 2-D model, the area is modeled using a topographic mesh rather than a series of cross sections down the longitudinal axis of the stream reach, as is done in a 1-D model. The HEC-RAS mesh consists of computational cells that are assigned elevations and roughness values along the cell faces that represent the topographic surface and frictional characteristics of the area and and volumetric relationships for the cell area, respectively. The use of the 2-D model allows for more detailed resolution in water surface elevations, velocities, and flows than is possible with a 1-D model that is only capable of computing the average water surface elevations, velocities, and flows for three general regions at a cross section. Based on engineering judgement, breaklines were defined along the levees, dams, roads, culverts and elevated berms as seen on the topography. It is necessary to draw breaklines as it makes sure that the flow across the cell faces is blocked by the elevation of the structure along the break line.

Parameter Estimation

The Manning's "n" values used were based on engineering judgment and using the 2011 National Land Cover Data (NLCD) dataset. Table 2 lists the landuse and roughness coefficients used in this analysis.

Table 2: Manning's "n" Coefficients

Material Type	Manning's "n"
Open Water	0.01
Developed, Open Space	0.04
Barren Land (Rock/Sand/Clay)	
Grassland/Herbaceous	0.05
Pasture/Hay	
Emergent Herbaceous Wetlands	
Developed, Low Intensity	0.06
Shrub/Scrub	
Cultivated Crops	
Developed, Medium Intensity	0.08
Developed High Intensity	0.10
Deciduous Forest	
Evergreen Forest	
Mixed Forest	
Woody Wetlands	

Boundary Conditions

For this BLE analysis, the downstream boundary conditions are set to be normal depth slope. The computed slope is based on topographic data from the downstream limits of the modeling.

Model Calibrations

No calibration was performed on these streams.

2.4. Quality Control

Throughout the BLE analysis, quality checks were performed. These checks included review of topographic data processing, hydrologic parameters being applied, checking for complete model coverage, adjusting the mesh cell sizes, adjusting mesh boundaries, adding breaklines along structures, as required, and review of the final mapping results.

Significant efforts were made to resolve errors found during these quality checks.

2.5. Mapping

Following the hydraulic analysis, the model results were then imported into the HEC-RAS RAS Mapper tool to map floodplain boundaries for the model extent. This tool uses a routine that develops water surface elevation grids based on the 5-foot cell size DEM from Section 2.1. For this BLE analysis, mapping results were developed for seven (7) events. These events were the 10-, 4-, 2-, 1-, 0.2-percent-events and the 1-percent-minus and 1-percent plus boundaries.

Once the floodplain boundaries were created, the resulting floodplain data were smoothed and small polygons (less than 0.25 acres) and small disconnected fragments were removed. After the initial boundary edits, the resulting floodplain boundaries were merged into a single watershed based map boundary. For this BLE process, only the 1-percent-annual-chance floodplain is reported on the workmaps. Workmaps were generated to provide a graphical comparison of the effective floodplain boundaries to that of the BLE processed streams. These workmaps are provided in Appendix A – Workmaps.

Once the map boundaries were cleaned, the resulting rasters (Water Surface Elevation, Depth, etc.) were developed with the raster set to correspond in extent to the cleaned polygon boundary. This ensures that the water surface raster and the floodplain boundary are consistent with each other. The depth raster product was created by performing a raster subtraction with the water surface elevation raster and the ground DEM. Once complete, the resultant depth grids were used to perform an updated Flood Loss Analysis for the watershed using the HAZUS program.

3. Submittal

All information, data, and files for the L'Anguille Watershed BLE process are uploaded to the FEMA MIP and provided digitally on CD/DVD in a directory structure comparable to the example provided below.

08040205\L'Anguille Watershed BLE

\General

- Project Narrative (PDF)

\Hydraulic_Models

\08020205\08020205_L'AnguilleRiver

- HEC-RAS models

\Spatial_Files

- L'Anguille_Watershed (file geodatabase format)

\Supplemental_Data

\CNMS_Update

- CNMS database update (file geodatabase format)

\HAZUS

- Loss Analysis project

\Appendix A – Workmaps

- Terrain and Workmap Index (PDF)
- Workmaps (PDF)
- Workmap Index (SHP format)

4. References

1. USGS. Multi-Resolution Land Characteristics Consortium. *National Land Cover Database 2011*. (http://www.mrlc.gov/nlcd2011.php).

2. NOAA. Precipitation-Frequency Atlas of the United States, Atlas 14. (http://hdsc.nws.noaa.gov/hdsc/pfds/).

3. Chow, Ven T. *Open Channel Hydraulics*. Caldwell, NJ: Blackburn, 1959. Print.

4. U.S. Army Corps of Engineers, Hydrologic Engineering Center. (September 2016). HEC-RAS River Analysis System, Version 5.0.3. Davis, California.

5. FEMA, "Guidance for Automated Engineering", May 2016.(http://www.fema.gov/media-library-data/1469144112748-3c4ecd90cb927cd200b6a3e9da80d8a/Automated_Engineering_Guidance_May_2016.pdf).

L’Anguille River Railroad Bridge Photo Courtesy: J. Randall Houp April 2010

Flood Risk Report

L’Anguille Watershed, AR

HUC8 08020205

July 2017

Version Number	Version Date	Summary
1.0	07/10/2017	Initial Report Development

Preface

The Department of Homeland Security, Federal Emergency Management Agency's (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) program provides states, tribes, and local communities with flood risk information, datasets, risk assessments, and tools that they can use to increase their resilience to flooding and better protect their residents. By pairing accurate floodplain maps with risk assessment tools and planning and outreach support, Risk MAP transforms the traditional flood mapping efforts into an integrated process of identifying, assessing, communicating, planning for, and mitigating flood-related risks.

The Flood Risk Report (FRR) is one of the tools created though the Risk MAP program. An FRR provides non-regulatory information to help local or tribal officials, floodplain managers, planners, emergency managers, and others. Local, federal, and state officials can use the information in the FRR to establish a better understanding of their flood risk, take steps to mitigate those risks, and communicate those risks to their residents and local businesses.

The FRR serves as a guide when communities update local hazard mitigation plans, community comprehensive plans, and emergency operations and response plans. It is meant to communicate risk to officials and inform them of the modification of development standards, as well as assist in identifying necessary or potential mitigation projects. The report extends beyond community limits to provide flood risk data for the L'Anguille Watershed.

Flood risk is always changing, and studies, reports, or other sources may be available that provide more comprehensive information. This report is not intended to be the regulatory nor the final authoritative source of all flood risk data in the watershed. Rather, it should be used in conjunction with other data sources to provide a comprehensive picture of flood risk within the project area.

Table of Contents

Executive Summary

The Flood Risk Report has two goals: (**1) inform communities of their risks** related to certain natural hazards and (**2) enable communities to act to reduce their risk**. The information within this Risk Report is intended to assist federal, state, and local officials with the following goals:

- **Communicate risk** – Local officials can use the information in this report to communicate with property owners, business owners, and other residents about risks and areas of mitigation interest.
- **Update local hazard mitigation plans and community comprehensive plans** – Planners can use risk information to develop and/or update hazard mitigation plans, comprehensive plans, future land use maps, and zoning regulations. For example, zoning codes can be changed to provide for more appropriate land uses in high-hazard areas.
- **Update emergency operations and response plans** – Emergency managers can identify high-risk areas for potential evacuation and low-risk areas for sheltering. Risk assessment information may show vulnerable areas, facilities, and infrastructure for which continuity of operations plans, continuity of government plans, and emergency operations plans would be essential.
- **Inform the modification of development standards** – Planners and public works officials can use information in this report to support the adjustment of development standards for certain locations.
- **Identify mitigation projects** – Planners and emergency managers can use this risk assessment to determine specific mitigation projects of interest. For example, a floodplain manager may identify critical facilities that need to be elevated or removed from the floodplain.

This Risk Report showcases risk assessments, which analyze how a hazard affects the built environment, population, and local economy, to identify mitigation actions and develop mitigation strategies.

The information in this Risk Report should be used to identify areas in need of mitigation projects and to support additional efforts to educate residents on the hazards that may affect them. The areas of greatest hazard impact are identified in the Areas of Mitigation Interest section of this report, which can serve as a starting point for identifying and prioritizing actions a community can take to reduce its risks.

About the FEMA Risk Mapping, Assessment, and Planning (Risk MAP) Program

Flood risk is continually changing over time due to factors such as new building and development and weather patterns. The goal of the Federal Emergency Management Agency's (FEMA) Risk MAP program is to work with federal, state, tribal, and local partners to identify and reduce flood risk across communities. These projects are conducted using watershed boundaries, bringing together multiple communities to identify broader mitigation actions and create consistency across the

watershed. The program provides resources and support that are tailored to each community to help mitigate their risk and work towards a reduction in risk and future loss.

Through coordination and data sharing, the communities in the watershed work as partners in the mapping process. In addition to providing data, the communities can also provide insight into flooding issues and flood prevention within their areas. To prepare for a future study and assist in mitigation, FEMA provides a number of data sources that include information from the community, such as the following:

- Areas of repeated flooding and insurance claims
- Future development plans
- Areas of low water crossings
- High water marks from recent flooding events
- Areas of evacuation during high water
- Master drainage plans, flood risk reduction projects, and large areas of fill placement
- Local flood studies
- Other flood risk information

For more information about ways communities can take action or take advantage of available resources, please review the attached appendices.

Part of the data that FEMA is providing communities during the Risk MAP process is Base Level Engineering (BLE) for select watersheds. BLE is a form of hydrologic and hydraulic modeling which, when completed, can provide modeled flood hazard data in existing Zone As or where no effective flood hazard zone has been designated. Knowing the extent of flooding during the 1-percent-annual-chance flooding event supports risk reduction efforts and supports more resilient community planning. Completed BLE data is provided to watershed communities for planning, risk communication, floodplain management, and permitting activities, and to inform future flood study needs.

For information on BLE in the L'Anguille Watershed, see the Phase Zero: Investment section of this report.

About the L'Anguille Watershed

The L'Anguille Watershed (HUC 08020205) encompasses an area of approximately 955 square miles and extends across six counties in Arkansas (Craighead, Cross, Lee, Poinsett, St. Francis, and Woodruff) in the northeastern portion of Arkansas between the Cache and St. Francis Rivers. The major communities in the watershed include portions of the cities of Forrest City, Jonesboro, Marianna, and Wynne. Smaller communities include Harrisburg, Palestine, and Weiner. The communities in the L'Anguille Watershed and their NFIP status are listed in Table 1. The watershed and its communities are shown on Figure 2.

The L'Anguille Watershed lies within the St. Francis River Basin and is located in northeastern Arkansas bounded on the east by Crowley's Ridge and on the west by the Cache Watershed and Bayou DeView. The L'Anguille Watershed consists of flat, low-lying areas with numerous interconnected channels except for Crowley's Ridge, a geological ridge formation that makes up the

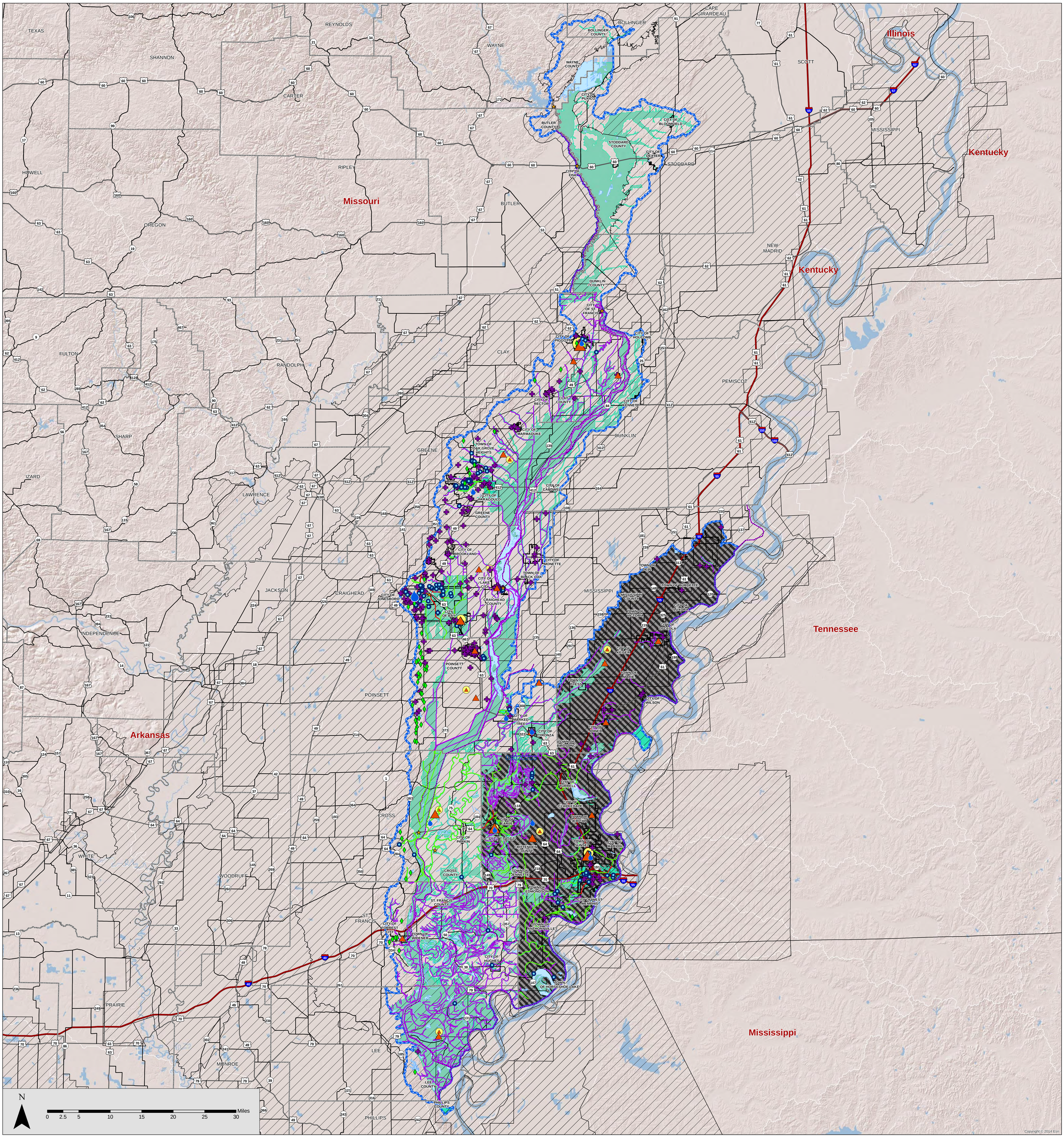
eastern border of the watershed. During past events, local communities have experienced flooding issues, some of which are due to localized development in and around the floodplain and while other issues are due to the nature of the watershed.

The L'Anguille River is a tributary of the St. Francis River. Its largest tributary is First Creek, which joins the L'Anguille River just upstream of the City of Palestine. The L'Anguille River originates in northeast Arkansas in Craighead County south of Jonesboro.

Table 1: NFIP Status of Project Area Communities.

County	Community Name	Community Identification Number (CID)	Participating Community?	CRS Rating
Craighead	Craighead County Unincorporated Areas [1]	050427	Yes	N/A
Craighead	Jonesboro, City of [1]	050048	Yes	8
Cross	Cross County Unincorporated Areas [1]	050056	Yes	N/A
Cross	Cherry Valley, City of	050057	Yes	N/A
Cross	Hickory Ridge, City of	050058	Yes	N/A
Cross	Wynne, City of [1]	050060	Yes	N/A
Lee	Lee County Unincorporated Areas [1]	050444	Yes	N/A
Lee	Haynes, Town of	N/A	No	N/A
Lee	Marianna, City of [1]	050124	Yes	N/A
Poinsett	Poinsett County Unincorporated Areas [1]	050172	Yes	N/A
Poinsett	Fisher, City of [1]	050413	No	N/A
Poinsett	Harrisburg, City of	050173	Yes	N/A
Poinsett	Weiner, City of [1]	050373	Yes	N/A
St. Francis	St. Francis County Unincorporated Areas [1]	050184	Yes	N/A
St. Francis	Caldwell, Town of	050185	Yes	N/A
St. Francis	Colt, City of	050186	Yes	N/A
St. Francis	Forrest City, City of [1]	050187	Yes	N/A
St. Francis	Palestine, City of	050359	Yes	N/A
St. Francis	Wheatley, City of	050374	Yes	N/A
Woodruff	Woodruff County Unincorporated Areas [1]	050468	Yes	N/A

[1] Community is located within more than one HUC8 watershed.



MAP SYMBOLOGY

- Mitigation Grant *
- Dams *
- USGS Gages *
- LOMC Locations *
- HMGP (Safe Rooms) *
- Levee *
- Local Highway
- Interstate
- State Highway
- US Highway
- Watershed
- Political Areas
- Lakes *
- Counties
- State / Federal Lands *
- States
- Available Topographic

Effective Flooding *

- Zone X (Shaded)
- Zone
- Zone

CNMS Data *

- Valid
- Assessed
- Unverified

Claims

- < 5
- 6 - 10
- 11 - 25
- > 25

BCX Claims

- < 5
- 6 - 10
- 11 - 25
- > 25

Avg. Annualized Loss

Total Loss

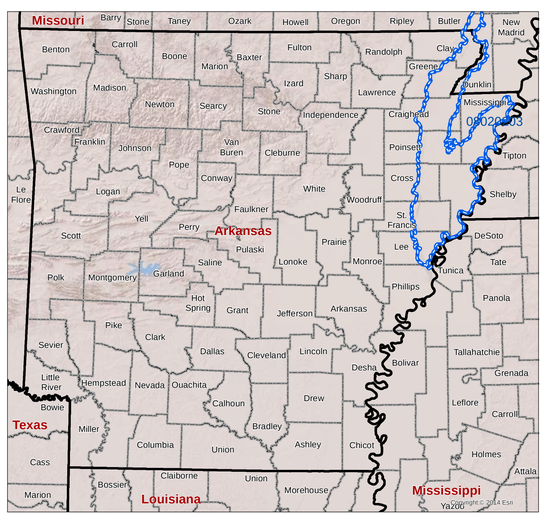
- Very Low
- Low
- Medium
- High
- Very High

Repetitive/Sever Repetitive Loss Claims

- < 5
- 6 - 10
- 11 - 15
- 16 - 20
- > 25

* Information limited to watershed extents

WATERSHED LOCATOR



NATIONAL FLOOD INSURANCE PROGRAM

Discovery Map

LOWER ST. FRANCIS WATERSHED

HUC-8 Code
08020203
Date
7/7/2017

FEMA

tn Associates Ltd.

Introduction

Flood Risk

Floods are naturally occurring phenomena that can and do happen almost anywhere. In its most basic form, a flood is an accumulation of water over normally dry area. Floods become hazardous to people and property when they inundate an area where development has occurred, causing losses. Mild flood losses may have little impact on people or property, such as damage to landscaping or the accumulation of unwanted debris. Severe flood losses can destroy buildings and crops and cause severe injuries or death.

Calculating Flood Risk

It is not enough to simply identify where flooding may occur. Even if people know where a flood might occur, they may not know the level of flood risk in that area. The most common method for determining flood risk, also referred to as vulnerability, is to identify both the probability and the consequences of flooding:

> **Flood Risk** (or Vulnerability) **= Probability x Consequences**; where
> **Probability** = the likelihood of occurrence
> **Consequences** = the **estimated** impacts associated with the occurrence on life, property, and infrastructure

The probability of a flood is the likelihood that it will occur. The probability of flooding can change based on physical, environmental, and/or engineering factors. These factors will also have an effect on the area that is impacted by the flood, increasing or decreasing the size of the affected area. The ability to assess the probability of a flood, and the level of accuracy for that assessment, are also influenced by modeling methodology advancements, better knowledge, and longer periods of record for the water body in question.

The consequences of a flood are the estimated effects associated with its occurrence. Consequences relate to human activities within an area and how a flood affects the natural and built environment. It is important that individuals and communities have an accurate and current understanding of their risk because anyone can be vulnerable to flooding. Individuals that are located outside of the Special Flood Hazard Area (SFHA) file more than 20 percent of insurance claims and receive 1/3 of disaster assistance for flooding. Having an awareness of risk can allow communities and their residents to address the potential consequences. Understanding risk can also allow for long-term development planning, opportunities for revitalization efforts, and modifications in how interaction occurs with the existing risk.

FEMA relies heavily on information and data provided at a local level for a holistic community approach to risk identification and mapping. Flood Risk Projects are focused on identifying (1) areas where current flood hazard inventory does not provide adequate detail to support local floodplain management activities, (2) mitigation interest areas that may require more detailed engineering information than currently available, and (3) determine community intent to reduce the risk throughout the watershed to assist FEMA's future investment in these project areas. Watersheds are selected for Discovery based on evaluations of flood risk, data need, availability of elevation data, regional knowledge of technical issues, identification of a community supported mitigation projects,

and/or input from the federal, state, and local partners. The status of Discovery watersheds in Arkansas is shown in Figure 1.

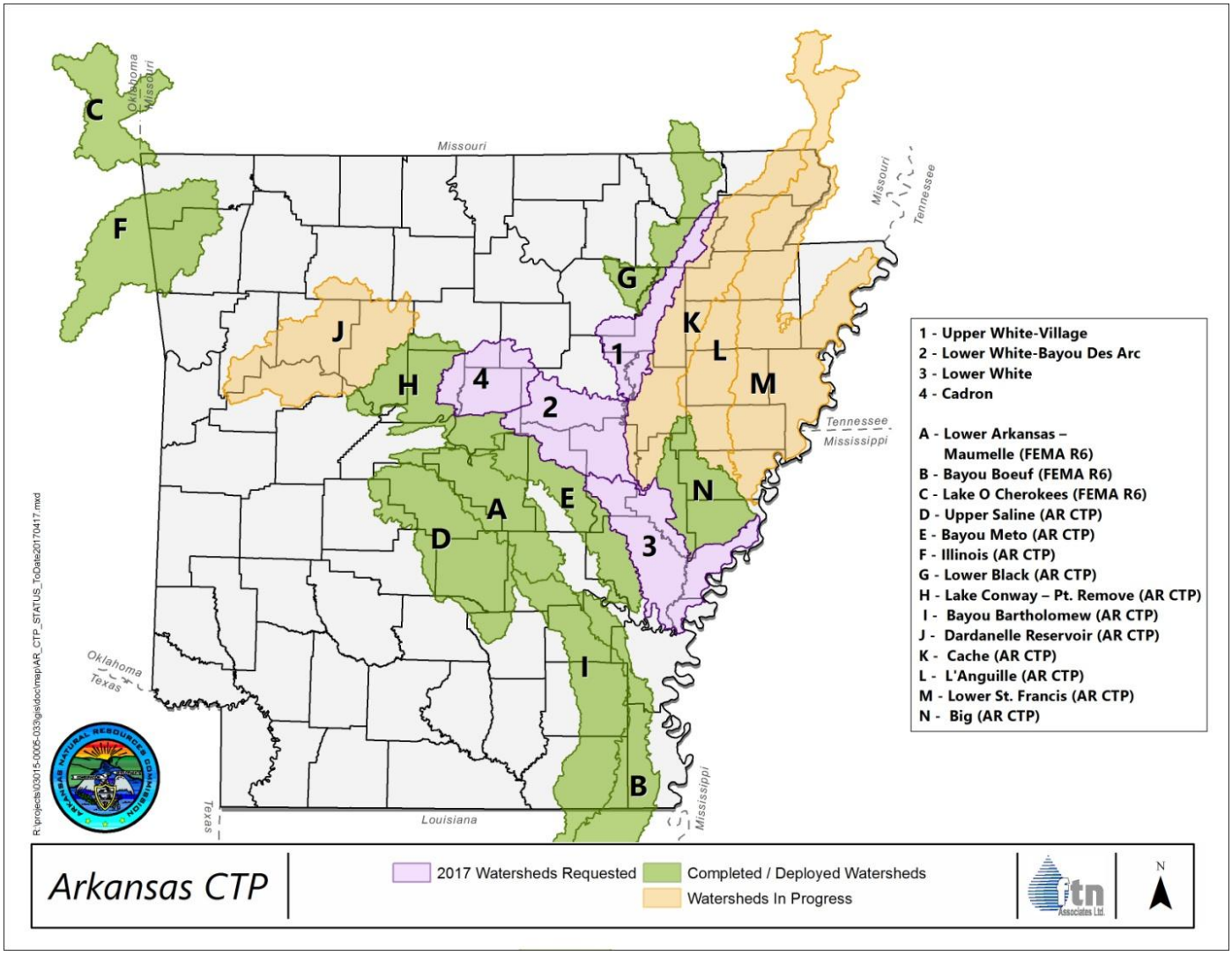


Figure 2. Arkansas CTP Discovery watershed status.

Watershed Basics

Background

The L'Anguille Watershed (HUC 08020205) encompasses an area of approximately 955 square miles and extends across six counties in Arkansas (Craighead, Cross, Lee, Poinsett, St. Francis, and Woodruff) in the northeastern portion of Arkansas between the Cache and St. Francis Rivers. The major communities in the watershed include portions of the cities of Forrest City, Jonesboro, Marianna, and Wynne. Smaller communities include Harrisburg, Palestine, and Weiner. The communities in the L'Anguille Watershed and their NFIP status are listed in Table 1. The watershed and its communities are shown on Figure 2.

Population

According to the 2010 Census, the total population of the watershed is estimated to be 46,226 people. Populations for the counties that intersect the L'Anguille Watershed experienced an overall average population decrease of approximately 0.6 percent between the 2000 and 2010 censuses, although the largest population source, Craighead County, saw an average increase of approximate 1.6 percent. Since 2010, population growth has increased with the 2016 population estimate at 5.7 percent above the number reported in the 2010 census. Based on 2010 Census data, the major communities in the watershed, Jonesboro and Forrest City, had total populations of 67,627 (22,447 in the watershed) and 15,328 (13,336 in the watershed), respectively in 2010 (see Table 2).

Watershed Land Use

The L'Anguille Watershed lies within the St. Francis River Basin and is located in northeastern Arkansas bounded on the east by Crowley's Ridge and on the west by the Cache Watershed and Bayou DeView. The L'Anguille Watershed consists of flat, low-lying areas with numerous interconnected channels except for Crowley's Ridge, a geological ridge formation that makes up the eastern border of the watershed. During past events, local communities have experienced flooding issues, some of which are due to localized development in and around the floodplain and while other issues are due to the nature of the watershed (see Table 2).

Table 2: Population and Area Characteristics [3]

Risk MAP Project	Total Population in Deployed Area (2010)	Average % Population Growth/Yr. (2000-2010)	Predicted Population * (by 2021)	Land Area (mi^2)	Developed Area	Open Water
L'ANGUILLE WATERSHED	46,226	-0.6%	203,817	955	2.1%	1.0%

[3] Data obtained from the U.S. Census Bureau; ESRI Demographic 5-year Projections; and National Land Cover Database

* Predicted Population by County, which may include areas outside of watershed.

National Flood Insurance Program Status and Regulation

In order to be a participant in the National Flood Insurance Program (NFIP), all interested communities must adopt and submit floodplain management ordinances that meet or exceed the minimum NFIP regulations. These regulations can be found in the Code of Federal Regulations and most of the community ordinance requirements are in Parts 59 and 60. The level of regulation

depends on the level of information available and the flood hazards in the area. The levels are as follows:

- A: The Federal Emergency Management Agency (FEMA) has not provided any maps or data – 60.3(a)
- B: Community has maps with approximate A zones – 60.3(b)
- C: Community has a Flood Insurance Rate Map (FIRM) with Base Flood Elevations (BFE) – 60.3(c)
- D: Community has a FIRM with BFEs and floodways – 60.3(d)
- E: Community has a FIRM that shows coastal high hazard areas (V zones) – 60.3(e)

There are 19 communities in the watershed that participate in the NFIP. Of the 19 communities that participate, their level of regulations depend on the date of the effective mapping and if the community was modernized into a countywide format.

There are two incorporated communities, the Town of Haynes and the City of Fisher that are not participating in the NFIP. This means that they are not required to follow FEMA regulations; however, certain opportunities such as federal flood insurance and some forms of federal disaster assistance are not available to the residents of those areas.

Hazard Mitigation Plan

State and local governments must develop and adopt hazard mitigation plans in order to be eligible for certain types of funding. To remain eligible, communities need to update and resubmit their plans every 5 years for FEMA approval. Hazard mitigation plans are created to increase education and awareness, identify strategies for risk reduction, and identify other ways to develop long-term strategies to reduce risk and protect people and property. Five of the six counties in Arkansas in the L'Anguille Watershed have Hazard Mitigation Plans that are in progress. Lee County does not have a Hazard Mitigation Plan. The plans effectively allow for FEMA to assess hazards identified through local, state, and federal partnerships and mitigation action items that communities have identified.

Community Rating System

The Community Rating System (CRS) is a voluntary incentive-based program that recognizes and encourages community floodplain management activities that communities undertake in addition to the minimum requirements they must meet when joining the NFIP. Individuals that carry flood insurance in a community that participates in the CRS program can receive a discount on their flood insurance premium. Discounts can range from 5 to 45 percent. Out of the 17 watershed communities participating in the NFIP, only the City of Jonesboro is participating in the CRS program. The City of Jonesboro is currently rated a class 8 and therefore structures located both inside and outside of the SFHA are eligible for a 10-percent premium discount. Table 3 depicts NFIP and CRS participation status and provides an overview of the effective flood data availability.

Table 3: NFIP and CRS Participation [4]

Risk MAP Project	Participating NFIP Communities/ Total Communities	Number of CRS Communities	CRS Rating Class Range	Average Years since FIRM Update (Range 1980-2011)	Level of Regulations (44 CFR 60.3)
L'ANGUILLE WATERSHED	17/19	1	8	20.1	CFR 60.3 (a), CFR 60.3 (b), CFR 60.3 (c), CFR 60.3 (d)

[4] Data obtained from the FEMA Community Information System

Dams and Levees

As recorded by the U.S. Army Corps of Engineers (USACE) in the National Inventory of Dams, 17 dams are within the portion of the counties that make up the L'Anguille Watershed. The owners and operators of the 5 dams considered high hazard are required to develop and maintain Emergency Action Plans (EAPs) to reduce the risk of loss of life and property if the dam fails. Table 4 provides the characteristics of the dams identified in the project area. There are no levees identified within the watershed.

Table 4: Risk MAP Project Dam Characteristics[5]

Risk MAP Project	Total Number of Identified Dams	Number of Dams			Number of Dams Requiring EAP	Percentage of Dams without EAP (Total)	Average Years since Inspection	Average Storage (acre-feet)
		High Hazard	Significant Hazard	Low Hazard				
L'ANGUILLE WATERSHED	17	5	5	7	5	82.4%	20+	620

[5] Data obtained from the ANRC State Database and USACE National Inventory of Dams

Flood Insurance Rate Maps

The average age of the effective FIRMs within the L'Anguille Watershed is over 20 years. The oldest effective maps are for the City of Marianna, which are 38 years old and have an effective date of September 28, 1979. The newest FIRMs are dated February 4, 2011, for Poinsett County. Only the Town of Haynes has no map.

Project Phases and Map Maintenance

Background

FEMA manages several risk analysis programs, including Flood Hazard Mapping, National Dam Safety, the Earthquake Safety Program, Multi-Hazard Mitigation Planning, and the Risk Assessment Program, all of which assess the impact of natural hazards and lead to effective strategies for reducing risk. These programs support the Department of Homeland Security's objective to "strengthen nationwide preparedness and mitigation against natural disasters."

Flood-related damage between 1980 and 2013 totaled $260 billion, but the total impact to our Nation was far greater—more people lose their lives annually from flooding than any other natural hazard.

FEMA, "Federal Flood Risk Management Standard (FFRMS)" (2015)

FEMA manages the NFIP, which is the cornerstone of the national strategy for preparing American communities for flood hazards. In the nation's comprehensive emergency management framework, the analysis and awareness of natural hazard risk remains challenging. A consistent risk-based assessment approach and a robust communication system are critical tools to ensure a community's ability to make informed risk management decisions and take mitigation actions. Flood hazard mapping is a basic and vital component for a prepared and resilient nation.

In Fiscal Year 2009, FEMA's Risk MAP program began to synergize the efforts of federal, state, and local partners to create timely, viable, and credible information identifying natural hazard risks. The intent of the Risk MAP program is to share resources to identify the natural hazard risks a community faces and ascertain possible approaches to minimizing them. Risk MAP aims to provide technically sound flood hazard information to be used in the following ways:

- To update the regulatory flood hazard inventory depicted on FIRMs and the National Flood Hazard Layer
- To provide broad releases of data to expand the identification of flood risk (flood depth grids, water-surface elevation grids, etc.)
- To support sound local floodplain management decisions
- To identify opportunities to mitigate long-term risk across the nation's watersheds

How are FEMA's Flood Hazard Maps Maintained?

FEMA's flood hazard inventory is updated through several types of revisions.

Community-submitted Letters of Map Change. First and foremost, FEMA relies heavily on the local communities that participate in the NFIP to carry out the program's minimum requirements. These requirements include the obligation for communities to notify FEMA of changing flood hazard information and to submit the technical support data needed to update the FIRMs.

Under the current minimum NFIP regulations, a participating community commits to notifying FEMA if changes take place that will affect an effective FIRM no later than 6 months after project completion.

Section 65.3, Code of Federal Regulations

Although revisions may be requested at any time to change information on a FIRM, FEMA generally will not revise an effective map unless the changes involve modifications to SFHAs. Be aware that the best floodplain management practices and proper assessments of risk result when the flood hazard maps present information that accurately reflects current conditions.

Letters of Map Amendment (LOMAs). The scale of an effective FIRM does not always provide the information required for a site-specific analysis of a property's flood risk. FEMA's LOMA process provides homeowners with an official determination on the relation of their lot or structure to the SFHA. Requesting a LOMA may require a homeowner to work with a surveyor or engineering professional to collect site-specific information related to the structure's elevation; it may also require the determination of a site-specific BFE. Fees are associated with collecting the survey data and developing a site-specific BFE. Local surveying and engineering professionals usually provide an Elevation Certificate to the homeowner, who can use it to request a LOMA. A successful LOMA may remove the federal mandatory purchase requirement for flood insurance, but lending companies may still require flood insurance if they believe the structure is at risk.

FEMA-Initiated Flood Risk Project. Each year, FEMA initiates a number of Flood Risk Projects to create or revise flood hazard maps. Because of funding constraints, FEMA can study or restudy only a limited number of communities, counties, or watersheds each year. As a result, FEMA prioritizes study needs based on a cost-benefit approach whereby the highest priority is given to studies of areas where development has increased and the existing flood hazard data has been superseded by information based on newer technology or changes to the flooding extent. FEMA understands communities require products that reflect current flood hazard conditions to best communicate risk and implement effective floodplain management.

Flood Risk Projects may be delivered by FEMA or one of its Cooperating Technical Partners (CTPs). The CTP initiative is an innovative program created to foster partnerships between FEMA and participating NFIP communities, as well as regional and state agencies. Qualified partners collaborate in maintaining up-to-date flood maps. In FEMA Region 6, which includes the State of Arkansas, CTPs are generally statewide agencies that house the State Floodplain Administrator. However, some Region 6 CTPs are also large River Authorities or Flood Control Districts. They provide enhanced coordination with local, state, and federal entities, engage community officials and technical staff, and provide updated technical information that informs the national flood hazard inventory.

Risk MAP has modified FEMA's project investment strategy from a single investment by fiscal year to a multi-year phased investment, which allows the Agency to be more flexible and responsive to the findings of the project as it moves through the project lifecycle. Flood Risk Projects are funded and completed in phases.

General Flood Risk Project Phases

Each phase of the Flood Risk Project provides both FEMA and its partner communities with an opportunity to discuss the data that has been collected and to determine a path forward. Local engagement throughout each phase enhances the opportunities for partnership, furthers the discussion on current and future risk, and helps identify local projects and activities to reduce long-term natural hazard risk.

Flood Risk Projects may be funded for one or more of the following phases:

- Phase Zero – Investment
- Phase One – Discovery
- Phase Two – Risk Identification and Assessment
- Phase Three – Regulatory Product Update

Local input is critical throughout each phase of a Flood Risk Project. More details about the tasks and objectives of each phase are included below.

Phase Zero: Investment

Phase Zero of a Flood Risk Project initiates FEMA's review and assessment of the inventories of flood hazards and other natural hazards within a watershed area. During the Investment Phase, FEMA reviews the availability of information to assess the current floodplain inventory. FEMA maintains several data systems to perform watershed assessments and selects watersheds for a deeper review of available data and potential investment tasks based on the following factors:

Availability of High-Quality Ground Elevation Data. FEMA reviews readily available and recently acquired ground elevation data. This information helps identify development and earth-moving activities near streams and rivers. Where necessary, FEMA may partner with local, state, and other federal entities to collect necessary ground elevation information within a watershed.

If high-quality ground elevation data is both available for a watershed area and compliant with FEMA's quality requirements, FEMA and its mapping partners may prepare engineering data to assess, revise, replace, or add to the current flood hazard inventory.

Mile Validation Status within Coordinated Needs Management Strategy (CNMS). FEMA uses the CNMS database to track the validity of the flood hazard information prepared for the NFIP. The CNMS database reviews 17 criteria to determine whether the flood hazard information shown on the current FIRM is still valid.

Communities may also inform and request a review or update of the inventory through the CNMS website at https://msc.fema.gov/cnms/. The CNMS Tool Tutorial provides an overview of the online tool and explains how to submit requests.

Local Hazard Mitigation Plans. Reviewing current and historic hazard mitigation plans provides an understanding of a community's comprehension of its flood risk and other natural hazard risks. The mitigation strategies within a local hazard mitigation plan provide a lens to local opportunities and underscore a potential for local adoption of higher standards related to development or other actions to reduce long-term risk.

Cooperating Technical Partner State Business Plans. In some states, a CTP generates an annual state business plan that identifies future Flood Risk Project areas that are of interest to the state. The Arkansas Natural Resources Commission works to develop user-friendly data. In this project area, FEMA has worked closely with ANRC to develop the project scope and determine the necessary project tasks.

Communities that have identified local issues are encouraged to indicate their data needs and revision requests to the State CTP so that they can be prioritized and included in the State Business Plans.

Possible Investment Tasks. After a review of the data available within a watershed, FEMA may choose to (1) purchase ground elevation data and/or (2) create some initial engineering modeling against which to compare the current inventory, also known as Base Level Engineering (BLE) modeling.

Phase One: Discovery

Phase One, the Discovery Phase, provides opportunities both internally (between the state and FEMA) and externally (with communities and other partners interested in flood potential) to discuss local issues with flooding and examine possibilities for mitigation action. This effort is made to determine where communities currently are with their examination of natural hazard risk throughout their community and to identify how state and federal support can assist communities in achieving their goals.

The Discovery process includes an opportunity for local communities to provide information about their concerns related to natural hazard risks. Communities may continue to inform the project identification effort by providing previously prepared survey data, as-built stream crossing information, and engineering information.

For a holistic community approach to risk identification and mapping, FEMA relies heavily on the information and data provided at the local level. Flood Risk Projects are focused on identifying (1) areas where the current flood hazard inventory does not provide adequate detail to support local floodplain management activities, (2) areas of mitigation interest that may require more detailed engineering information than is currently available, and (3) community intent to reduce the risk throughout the watershed to assist FEMA's future investment in these project areas. Watersheds are selected for Discovery based on these evaluations of flood risk, data needs, availability of elevation data, Regional knowledge of technical issues, identification of a community-supported mitigation project, and input from federal, state, and local partners.

Possible Discovery Tasks. Discovery may include a mix of interactive webinar sessions, conference calls, informational tutorials, and in-person meetings to reach out to and engage with communities for input. Data collection, interviews, and interaction with community staff and data-mining activities provide the basis for watershed-, community-, and stream-level reviews to determine potential projects that may benefit the communities. A range of analysis approaches are available to determine the extent of flood risk along streams of concern. FEMA and its mapping partners will work closely with communities to determine the appropriate analysis approach, based on the data needs throughout the community. These potential projects may include local training sessions, data development activities, outreach support to local communities wanting to step up their efforts, or the development of flood risk datasets within areas of concern to allow a more in-depth discussion of risk.

Phase Two: Risk Identification and Assessment

Phase Two (Risk Identification and Assessment) continues the risk awareness discussion with communities through watershed analysis and assessment. Analyses are prepared to review the effects of physical and meteorological changes within the project watershed. The new or updated analysis provides an opportunity to identify how development has affected the amount of stormwater generated during a range of storm probabilities and shows how effectively stormwater is transported through communities in the watershed.

Coordination with a community's technical staff during engineering and model development allows FEMA and its mapping partners to include local knowledge, based on actual on-the- ground experience, when selecting modeling parameters.

The information prepared and released during Phase Two is intended to promote better local understanding of the existing flood risk by allowing community officials to review the variability of the risk throughout their community. As FEMA strives to support community-identified mitigation actions, it also looks to increase the effectiveness of community floodplain management and planning practices, including local hazard mitigation planning, participation in the NFIP, use of actions identified in the CRS Manual, risk reduction strategies for repetitive loss and severe repetitive loss properties, and the adoption of stricter standards and building codes.

FEMA is eager to work closely with communities and technical staff to determine the current flood risk in the watershed. During the Risk Identification and Assessment phase, FEMA would like to be alerted to any community concerns related to the floodplain mapping and analysis approaches being taken. During this phase, FEMA can engage with communities and review the analysis and results in depth.

Possible Risk Identification and Assessment Tasks. Phase Two may include a mixture of interactive webinars, conference calls, informational tutorials, and in-person meetings to reach out to and engage with communities for input. Flood Risk Project tasks may include hydrologic or hydraulic engineering analysis and modeling, floodplain mapping, risk assessments using Hazus-Multi Hazard software, and preparation of flood risk datasets (water-surface elevation, flood depth, or other analysis grids). Additionally, projects may include local training sessions, data development activities, outreach support to local communities that want to step up their efforts, or the development of flood risk datasets within areas of concern to allow a more in-depth discussion of risk.

Phase Three: Regulatory Products Update

If the analysis prepared in the previous Flood Risk Project phases indicates that physical or meteorological changes in the watershed have significantly changed the flood risk since the last FIRM was printed, FEMA will initiate the update of the regulatory products that communities use for local floodplain management and NFIP activities.

Delivery of the preliminary FIRM and Flood Insurance Study (FIS) report begins another period of coordination between community officials and FEMA to discuss the required statutory and regulatory steps both parties will perform before the preliminary FIRM and FIS report can become effective. As in the previous phases, FEMA and its mapping partners will engage with communities through a variety of conference calls, webinars, and in-person meetings.

Once the preliminary FIRMs are prepared and released to communities, FEMA will initiate the statutory portions of the regulatory product update. FEMA will coordinate a Consultation Coordination Officer meeting and initiate a 90-day comment and appeal period. During this appeal period, local developers and residents may coordinate the submittal of their comments and appeals through their community officials to FEMA for review and consideration.

FEMA welcomes this information because additional proven scientific and technical information increases the accuracy of the mapping products and better reflects the community's flood hazards identified on the FIRMs.

Communities may host or hold Open House meetings for the public. The Open House layout allows attendees to move at their own pace through several stations, collecting information in their own time. This format allows residents to receive one-on-one assistance and ask questions pertinent to their situations or their interests in risk or flood insurance information.

All appeals and comments received during the statutory 90-day Appeal Period, including the community's written opinion, will be reviewed by FEMA to determine the validity of the appeal. Once FEMA issues the appeal resolution, the associated community and all appellants will receive an appeal resolution letter and FEMA will revise the preliminary FIRM if warranted. A 30-day period is provided for review and comment on successful appeals. Once all appeals and comments are resolved, the flood map is ready to be finalized.

After the Appeal Period, FEMA will send community leaders a Letter of Final Determination stating that the preliminary FIRM will become effective in 6 months. The letter also discusses the actions each affected community participating in the NFIP must take to remain in good standing in the NFIP.

After the preceding steps are complete and the 6-month compliance period ends, the FIRMs are considered effective maps and new building and flood insurance requirements become effective.

That is a brief general overview of a Flood Risk Project. Next, the Flood Risk Report will provide details on the efforts in the L'Anguille Watershed.

Phase Zero: Investment

The L'Anguille Watershed (HUC 08020205) encompasses an area of approximately 955 square miles and extends across six counties in Arkansas (Craighead, Cross, Lee, Poinsett, St. Francis, and Woodruff) in the northeastern portion of Arkansas between the Cache and St. Francis Rivers. The major communities in the watershed include portions of the cities of Forrest City, Jonesboro, Marianna, and Wynne. Smaller communities include Harrisburg, Palestine, and Weiner. The communities in the L'Anguille Watershed and their NFIP status are listed in Table 1. The watershed and its communities are shown on Figure 2.

The L'Anguille Watershed lies within the St. Francis River Basin and is located in northeastern Arkansas bounded on the east by Crowley's Ridge and on the west by the Cache Watershed and Bayou DeView. The L'Anguille Watershed consists of flat, low-lying areas with numerous interconnected channels except for Crowley's Ridge, a geological ridge formation that makes up the eastern border of the watershed. During past events, local communities have experienced flooding issues, some of which are due to localized development in and around the floodplain and while other issues are due to the nature of the watershed.

The L'Anguille River is a tributary of the St. Francis River. Its largest tributary is First Creek, which joins the L'Anguille River just upstream of the City of Palestine. The L'Anguille River originates in northeast Arkansas in Craighead County south of Jonesboro.

Area of Interest Selection Factors

A number of factors and criteria are reviewed for watershed selection: flood risk, age of current flood hazard data, population growth trends and potential for growth, recent flood claims, and disaster declaration history. Local data and high quality ground elevation data availability are reviewed for use in flood hazard data preparation. The Coordinated Needs Management Strategy (CNMS) database is reviewed to identify areas of large unknown and unverified mileage. The Arkansas CTP, State NFIP Coordinator, and State Hazard Mitigation Officer coordinate to identify watersheds for study by FEMA.

The L'Anguille Watershed was selected by the Arkansas CTP in coordination with FEMA Region 6, for the reasons summarized below.

- Topographic data developed from a Light Detection and Ranging System (LiDAR) is available throughout the watershed aiding in providing quality data.
- Within the State of Arkansas, losses in the watershed have exceeded $11.2 million from 1978 through 2017, and there are approximately 1,970 policies. These reported values include entire counties which may or may not be wholly located in the watershed.
- Poinsett County is the only county considered modernized. St. Francis County has a countywide study; however it is older. Craighead County has Preliminary FIRM maps dated 01/29/2010. All of these studies were completed without quality topographic data.
- Since 2001, the L'Anguille Watershed has had declared federal disasters in every year except 2007, 2012, and 2014.

- The communities of Jonesboro, Wynne, Cross County, and Poinsett County have claims listed as BCX Claims, which are claims that occur outside the mapped floodplain. This indicates the need for additional review to determine if the effective maps are in need of update.
- Five of the six counties in the watershed have Hazard Mitigation Plans that are in progress. Lee County does not have a Hazard Mitigation Plan.

Flood Risk: The L'Anguille River and its tributaries are not strangers to flood events, with a historical record of numerous flooding events. The L'Anguille Watershed has historically flooded and has experienced major flooding as recently as January 2016 on its tributaries as well as the L'Anguille River. The recent major floods in every year since 2001, except 2007, 2012, and 2014, have illustrated the ongoing flood threat for the L'Anguille Watershed.

Growth Potential: Although the L'Anguille Watershed is largely rural in nature; it is undergoing urbanization along the Interstate 40 and US Highway 79 and 64 corridors. These locations include the areas around the cities of Forrest City, Jonesboro, Marianna, and Wynne.

Age of Current Flood Information: Poinsett County is the only county considered modernized. St. Francis County has a countywide study; however it is older (effective date 2005). Craighead County has Preliminary FIRM maps dated January 2010. All of these studies were completed without quality topographic data.

Local Data Availability. The City of Jonesboro has undertaken large studies to improve drainage throughout the City. The first phase of this study was completed in 2015 with another expected to start in 2016. These studies are to provide drainage improvement concepts and plans to help alleviate future flooding events.

Additionally, Craighead County and its communities are undergoing a Phase 2 Risk Identification and Assessment project, which is currently being performed by the Arkansas CTP.

Availability of High Quality Ground Elevation Data. As a result of FEMA's efforts in teaming with other federal and state agencies, high quality ground elevation data was available for the L'Anguille Watershed. This data provides a great basis for hydrologic and hydraulic modeling preparation. The source and date of LiDAR coverage is included in Table 5.

Table 5. Summary of Topographic Data

Watershed/ Flooding Source	Beginning and End Points of Topo Data Collection	New/Existing OR Leveraged	Accuracy & Year Acquired	Source/ Data Vendor	Contact Information	Use Restrictions
2014 AR-MO LIDAR Project	2013 - 2015	Existing	QL2 (Vert. Acc. 9.25 cm)	Public domain	USACE – St. Louis District	None
2012 FEMA/USGS Lower St. Francis River	04/2012 – 05/2012	Existing	QL3 (Vert. Acc. 11.8 cm)	Public domain	The National Map	None
2011 L'Anguille & Cache Watershed Area	03/2011 – 04/2011	Existing	QL2 (Vert. Acc. 9.25 cm)	Public domain	http://gis.arkansas.gov	None

Coordinated Needs Management Strategy Database Review: Coordinated Needs Management Strategy (CNMS) Database Review The CNMS database indicates the validity of FEMA's flood hazard inventory. Streams that are indicated as ***Unverified*** or ***Unknown*** in the database indicate that the information that developed the floodplain currently shown on the FIRMs is inaccessible or that a complete evaluation of the Critical and Secondary CNMS elements could not be performed. The L'Anguille Watershed stream coverage is not homogenous across the counties that intersect the basin. The H&H analysis behind majority of the basin flood hazard information is dated and in need of an update. The current inventory within the watershed is approximately 615 miles. Of this mileage 142 miles is currently considered valid, mainly due to modernized inventory. The remaining mileage is a mixture of unverified and unknown mileage indicating that more than 75% of the existing inventory may require further review.

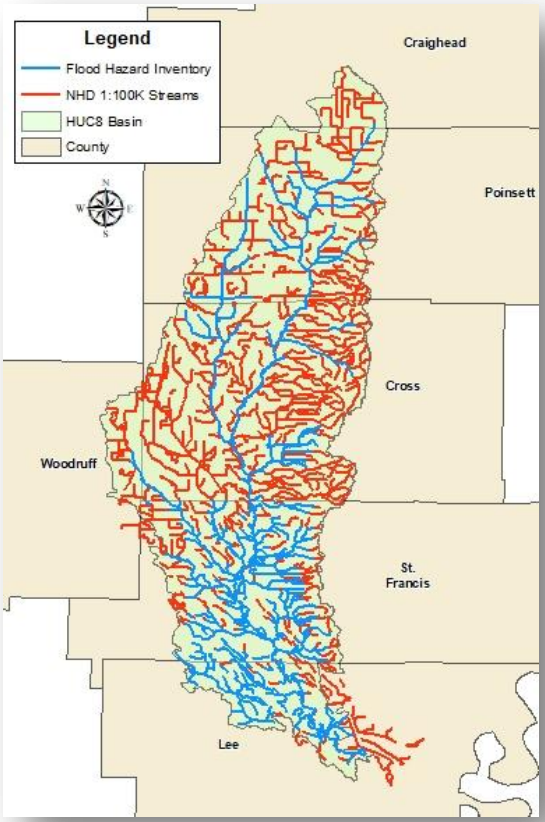


Figure 3. Flood Hazard Inventory

Unmapped Stream Coverage: FEMA and the Arkansas CTP also review the current stream coverage and compare the coverage against detailed terrain streams contributing up to 1 square mile drainage area or National Hydrography Dataset (NHD). The detailed terrain streams and NHD high resolution data inventoried by the US Geological Survey (USGS) Maps created at a 1:24,000 scale is used to review the water courses within the HUC8s of concern. The

watershed as a whole is reviewed for additional mileage to be inventoried. The intent of this review is to identify streams and water courses where additional study may be required or to create a complete stream network for Base Level Engineering data preparation.

Base Level Engineering

The Arkansas CTP is coordinating with FEMA on Base Level Engineering (BLE). This approach prepares multi-profile hydrologic (how much water) and hydraulic (how is water conveyed in existing drainage) data for a large stream network or river basin to generate floodplain and other flood risk information for the basin area.

Base Level Engineering provides an opportunity for FEMA to produce and provide non-regulatory flood risk information for a large watershed area in a much shorter period of time. The data prepared in the Base Level Engineering approach provides planning level data which is prepared to meet FEMA's Standards for Floodplain Mapping.

FEMA Investment (2016). In Fiscal Year 2016, FEMA and the Arkansas CTP initiated Base Level Engineering on the L'Anguille HUC8 sub basin. Figure 4 shows the network of streams that is being analyzed using the Base Level Engineering approach. The Base Level Engineering approach will provide the following items for use in the L'Anguille Watershed:

- Hydrologic rain on grid modeling for 10%, 4%, 2%, 1%, 1-%, 1+%, and 0.2% storm events
- Hydraulic (HEC-RAS 5.0.3) modeling for all study streams using 2-Dimensional (2D) modeling techniques.
- Floodplain boundaries, Water Surface Elevation grids, and Flood Depth Grids for all modeled storm events.
- Approximate Mapping Change layer to distinguish areas of changes between BLE and effective mapping for 1% storm event.
- Hazus flood analysis for watershed.

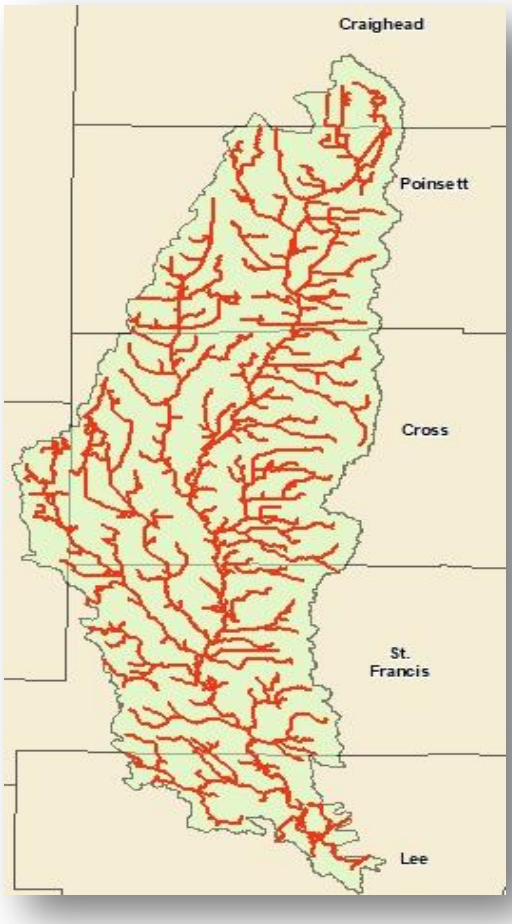


Figure 4. Base Level Engineering Study Streams

The Base Level Engineering approach will prepare flood hazard information for approximately 1,060 miles adding over 445 stream miles of supplementary flood hazard information for communities throughout the basin. Once completed the Base Level Engineering information will be provided to the communities throughout the basin for planning, risk communication, floodplain management and permitting activities.

Creating BLE data is a cost effective way to provide communities with updated information on their flood risk. BLE provides an opportunity for FEMA to produce and provide non-regulatory flood risk information for a large watershed area in a much shorter period of time. The data prepared through BLE provides planning-level data that meets FEMA's Standards for Floodplain Mapping. This approach prepares multi-profile hydrologic (how much water) and hydraulic (how is water conveyed in existing drainage) data for a large stream network or river basin to generate floodplain and other flood risk information for the basin area. To create the BLE data, the best available information was utilized. This information included terrain data, flood discharges, and hydrologic and hydraulic analysis.

CNMS Validation and Assessment. FEMA has compared the BLE results to the current flood hazard inventory identified in the CNMS database. This assessment allows FEMA to compare the updated flood hazard information to the current effective floodplain mapping of the watershed communities. BLE results for Zone A Validation denoted no miles to be New, Validated, or Updated Engineering (NVUE) compliant.

Community Coordination. FEMA will share the BLE results with communities throughout the project area. Access to workshops and training to support the use of BLE for planning, floodplain management, permitting, and risk communication activities will be made publicly available to communities and other interested parties. FEMA will work with communities to review, interpret, and incorporate the BLE information into their daily and future community management and planning activities.

Follow-On Phase Project Decisions. The BLE results and the current inventory have been compared to identify any areas of significant change. If the results show large areas of change (expansions and contractions of the floodplain, increases and decreases of the computed BFEs, and increases in expected flow values), FEMA will continue to coordinate with the communities to identify the streams that should be considered if the FIRMs are updated.

To identify other streams for future refinement, community growth patterns and potential growth corridors should be discussed with FEMA. These areas of expected community growth and development may benefit from updated flood hazard information. BLE can be further refined to provide detailed study information for a FIRM update.

Areas of communities that were developed prior to 1970 (pre-FIRM areas) may include repetitive and severe repetitive loss properties. They may also be areas where redevelopment is likely to occur. Having updated flood hazard information before redevelopment and reconstruction activities take place may benefit communities by providing guidance to mitigate future risk.

FEMA and the Arkansas CTP will work with communities following the delivery of Base Level Engineering to identify a sub set of streams for update and inclusion on the Flood Insurance Rate Maps, if required. Communities may wish to review the possible areas and provide feedback once the BLE data has been received. Base Level Engineering information may be refined by local communities and submitted through the Letter of Map Revision process to refine existing flood hazard information and maintain the Flood Insurance Rate Maps throughout their community.

Phase One: Discovery

Pre-Discovery

As part of the CTP partnership, the ANRC and its contractor, FTN Associates, Ltd. (FTN), began the Discovery process in the L'Anguille Watershed (08020205) in October 2016 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. The watershed location can be seen on Figure 2.

Through the Discovery process, FEMA and the Arkansas CTP can determine which areas of the Hydrologic Unit Code (HUC) 8 (HUC-8) watersheds may be examined for further flood risk identification and assessment in a collaborative manner, taking into consideration the information collected from local communities during this process. Discovery initiates open lines of communication and relies on local involvement for productive discussions about flood risk. The process provides a forum for a watershed-wide effort to understand how the included watershed community's flood risks are related to flood risk throughout the watershed. In Risk MAP, projects are analyzed on a watershed basis, so Discovery Meetings target numerous stakeholders from throughout the watershed on local, regional, State, and Federal levels.

Discovery Meeting

In July 2017, the Arkansas CTP will hold Discovery Meetings in this watershed to discuss the Discovery process and where the communities can go from there with future studies. The Discovery meeting will also provide an opportunity to present the BLE results to the communities and how they can be used for future planning, risk communication, floodplain management, and permitting activities. At the meeting the communities will be provided with digital copies of this Flood Risk Report, the modeling files for all of the BLE studied streams, including the floodplain boundaries, Water Surface Elevation Grids, and Flood Depth Grids, and a short tutorial on the use of the BLE products.

The results of the Discovery process will be presented as part of this Flood Risk Report, a watershed scale Discovery Map and the digital data that will be gathered or developed under the fiscal year 2016 CTP Agreement, EMW-2015-CA-00143, Mapping Activity Statement (MAS) 15, between FEMA and the Arkansas CTP. During Discovery, the Arkansas CTP and FEMA will reach out to local communities to:

- Gather information about local flood risk and flood hazards;
- Obtain and ultimately 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 each community to participate and assist in the development of a watershed vision.

This document includes the portion of the Flood Risk Report that describes the Discovery process and provides the results to the watershed communities. The digital data submitted with this report contains correspondence, exhibits to be used at the Discovery meetings, GIS data, mapping documents (PDF, shapefiles, personal geodatabases and ESRI ArcGIS 10.x Map Exchange Documents

[MXDs]), or other supplemental information. Graphics in this Pre-Discovery report are available as larger format graphics files for printing and as GIS data that may be printed and used at any map scale.

Watershed Findings

This section of the report will be completed in more detail at the conclusion of the Discovery project.

Engineering review of community comments:

Hydrology: The review of hydrologic data was limited to Base Level Engineering hydrologic processing which includes Peak Discharges and partial gage analysis in the watershed. The 1-percent–annual-chance peak discharge data for Base Level Engineering analysis for the entire watershed was reviewed for any anomalies. Development, sinks, and flood control structures were noted to determine if they had an impact on the hydrology flows. Available gage information for the entire watershed was also reviewed and compared to the Base Level Engineering hydrology, when possible to identify discrepancies and possible anomalies stemming from outdated, overestimated, or underestimated sub-basin analyses.

Hydraulics and floodplain analysis: Base Level Engineering was conducted for this watershed. As a result, CNMS evaluations were conducted to compare the effective mapping to new mapping. The effective mapping was assembled from current National Flood Hazard Layer (modernized counties) and Q3 floodplain mapping data (non-modernized areas). Some noteworthy obstacles observed include the fact that the Zone A floodplains do not match between most of the community and county boundaries, and there are discrepancies on the mapping for the 0.2% annual-chance-events throughout the watershed.

CNMS Concerns within the Watershed: It is important to note that for the watershed as a whole, most of the CNMS streams are considered unverified. Comparisons of the effective mapping to the draft Base Level Engineering results showed that the effective mapping should be revised based on better source data and processes. The three main concerns found in the area were non-digital FIRMs, vast areas of Unknown approximate studies which were not backed by technical data, and some communities that contained zero miles of detailed studies.

Non-digital FIRMs: Craighead County, Cross County, Lee County, St. Francis County, and Woodruff County.

Unknown Approximate Studies: Craighead County, Cross County, Lee County, Poinsett County, Prairie County, St. Francis County, and Woodruff County in Arkansas.

Zero Miles of Detailed Study: Cross County (complete area). There are other parts of individual communities that do not have detail study streams within their jurisdictions.

Discovery Wrap-Up Meeting

This section of the report will be completed at the conclusion of the Discovery project.

Future Investments for Refinement

This section of the report will be completed at the conclusion of the Discovery project.

- Watershed-wide Recommendations:
- County-specific Recommendations:
- City/Town-specific Recommendations:

Phase Two: Risk Identification and Assessment

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Two project in this watershed.

During the Risk Identification and Assessment Phase of a project, engineering modeling and analysis is refined to further enhance the identification of flood risk. Existing modeling has been updated using a more detailed methodology for calculating the amount of water (hydrology) expected during a storm event, plus additional detail and gage analysis.

Hydraulic models include additional refinement to the cross sections and stream crossings (Figure 5) that may restrict flow in larger events, and the channel and structure information in existing models could be improved based on field surveys.

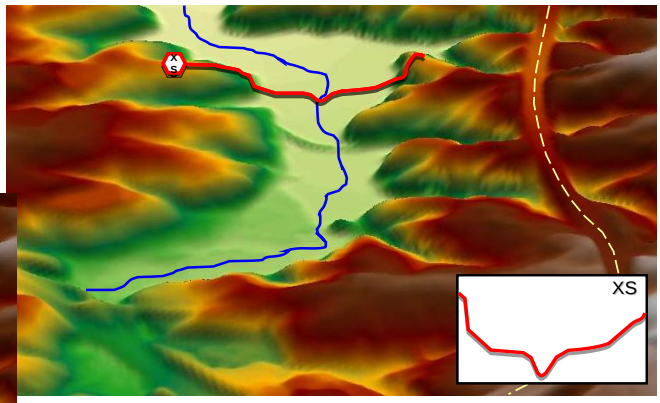


Figure 5. Hydraulic Cross-Section

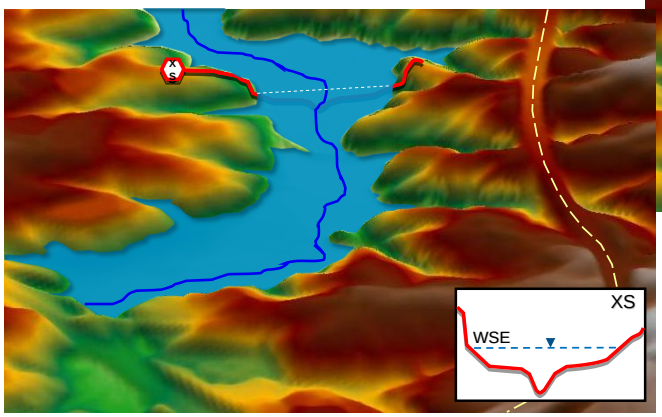


Figure 6. Floodplain Mapping of Peak Water Surface Elevation

Engineering modeling applies the flow volume calculated for a certain storm interval and places that water into the natural channel described in the hydraulic software. As tributaries and other drainage features are added to the main stream, the flow volume increases downstream. The modeling calculates the peak water-surface elevation (Figure 6) determined at each cross section, and these peak values are graphically described in a profile. The peak values are then mapped on ground elevation information to produce a floodplain delineation that identifies the expected flood extent during the analyzed storm event.

These models have been used to produce a range of flood risk datasets that describe the variability of flooding within the delineated floodplain. These flood risk datasets include:

- **Water-Surface Elevation Grid –** This two-dimensional grid describes the water-surface elevation and profile for the length of the study area. Interpolated values are produced between each analyzed cross section.
- **Flood Depth Grid –** This grid provides an estimated flood depth at any location within the floodplain, allowing the variability of flood depth to be better represented for the stream channel and the floodplain areas.
- **Annual Percent Chance Grid –** This grid is produced using statistical analysis to describe multiple percentages of the chance of flooding within the determined floodplain.
- **30-Year Percent Chance Grid –** Further statistical methodology is used to determine the percent chance of flooding within a 30-year window. The 30-year window was chosen because a 30-year period is common for home mortgages.
- **Changes Since Last FIRM –** This polygon file identifies each location where modifications are identified by the revised and updated hydrologic and hydraulic analysis. Areas where floodplain widths increase/decrease, areas where floodway widths increase/decrease, and areas where flood zones have been modified are identifiable within this layer.

This phase of the project benefits greatly from community interaction and coordination with local technical and operations staff, providing an opportunity for FEMA and its mapping partners to engage local knowledge as the modeling is prepared. FEMA and the Arkansas CTP would like to work closely with communities to identify areas where the modeling and floodplain mapping may not agree with on the ground accounts of flooding equivalent to the 1% annual chance storm event. FEMA and the Arkansas CTP would like to use this phase to review community comments and include any available technical information prior to proceeding to the update of the Regulatory products (FIRM, FIS and DFIRM database).

The following information will be added during any Phase 2 project that may be completed in the future.

Flood Risk Review Meeting

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Two project in this watershed.

Flood Risk Review Meetings are scheduled for XXXX, 20XX. The first formal sharing of the modeling and mapping updates occurs at the Flood Risk Review Meeting. At this meeting, FEMA intends to continue community coordination efforts and discussions with a variety of watershed partners to review the effects of physical and meteorological changes within the project area.

The FEMA team remains focused on reviewing the identification of flood and other natural hazard risks, areas where modifications in the flood delineations have been identified, and changes in risk assessment, working with community and technical staff throughout the analysis/assessment processes.

The team will deliver the Phase Two (Data and Engineering) data:

- Hydrological Analysis
- Hydraulic Analysis
- Resultant BLE data

The objectives of the Flood Risk Review meeting include:

- Promote local buy-in of analysis/study results
- Review Risk Identification (engineering) results with local communities
- Review the hazard mitigation plan, compared to the study findings
- Identify risk communication needs and options
- Support identified community-driven mitigation actions
- Identify and/or resolve community comments and appeals before the regulatory products are issued
- Solicit community input on results and promote buy-in of analyses prior to moving forward
- Continue developing relationships with communities

The new analysis and products will be delivered to communities in advance of this meeting, so communities will have the chance to review and assess the modeling and mapping results prior to the in-person meeting.

FEMA would like to work with communities at each project milestone to identify and address any technical concerns with the modeling results. Because this phase of the timeline is less rigid than the statutory and regulatory timelines in Phase Three, FEMA can work more closely and intimately with the communities to review and address their concerns.

Next Steps

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Two project in this watershed.

Once the analysis is completed, FEMA will review the areas of change before determining if a project will move forward to update the regulatory products (FIS report, FIRM, and DFIRM database). A cursory review of the modeling results indicates that this study area has significant changes in floodplain width and depth.

FEMA will work with communities after delivering the hydrologic and hydraulic analysis and floodplain work maps to collect any outstanding technical inquiries within the study area. After coordinating with communities, FEMA will likely initiate the Phase Three effort to update the regulatory products.

Potential Community Activities

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Two project in this watershed.

The availability of updated flood risk information provides the community a chance to review a range of possible actions that may be taken. Some possible community activities are identified below for consideration:

Stream Specific Recommendations: This section may be expanded at a later date.

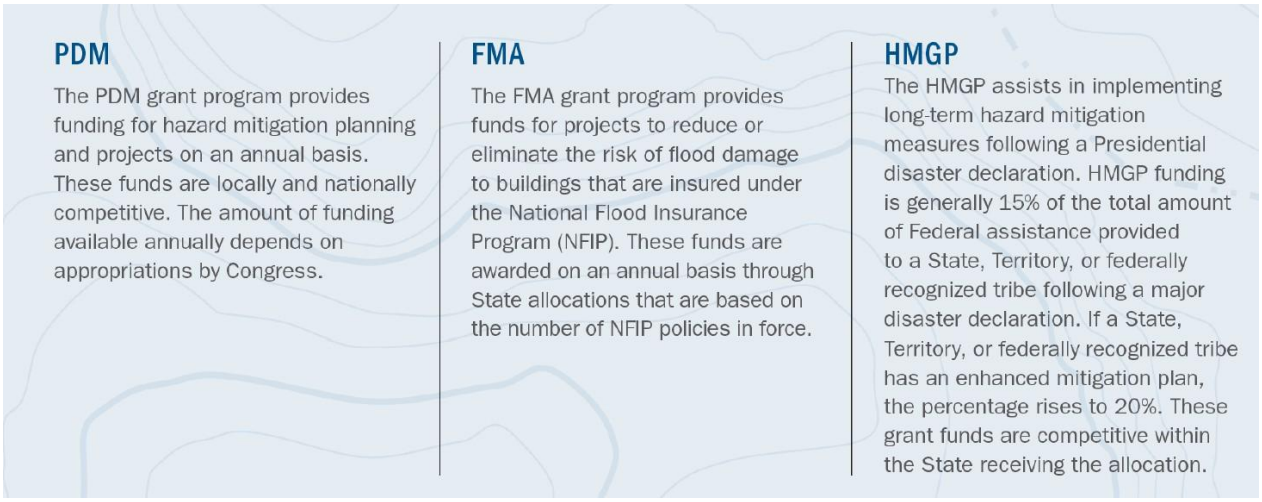
Local Hazard Mitigation Plan (Hazard Profile): The updated flood risk information provides an opportunity to review local hazard mitigation plans. The flood risk profile, hazard extent, and vulnerability assessment may be refined based on the Changes Since Last FIRM, water-surface elevation grids, flood depth grids, and percent annual chance grids. Communities should reconvene their Mitigation Plan Steering Committee to identify how these narrative sections should be refined with the additional information.

Local Hazard Mitigation Plans help to:

- Protect public safety
- Prevent damage to community assets
- Reduce costs of disaster response and recovery
- Improve community capabilities
- Create safer, more sustainable development

Local Hazard Mitigation Plan (Mitigation Strategies): Communities may review community assets, critical facilities, and other vulnerable areas within a community to identify or refine the mitigation strategies and locate future mitigation projects to reduce long-term natural hazard risk throughout the community. FEMA's publication Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards may provide some strategies and projects for the local Mitigation Plan Steering Committee to review.

Mitigation Project Scope Preparation: Each year, communities may apply for various FEMA Hazard Mitigation Assistance (HMA) grants available for implementing mitigation actions. Communities may review their critical mitigation needs and opt to prepare project submittals for one of the grant opportunities FEMA offers.



These HMA Grant Programs are managed by the State of Arkansas (grantee), which has the primary responsibility for selecting and administering the mitigation activities throughout the state. Individuals are not eligible to apply directly for HMA funds; however, communities may act as an eligible applicant or sub-applicant to apply for funding on behalf of individuals.

For specific information on available HMA grant funding and current project priorities in Arkansas, please contact the appropriate state agency.

FMA, HMGP, and PDM Grant Programs
Arkansas Department of Emergency Management

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Community Rating System (CRS): The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Communities interested in the CRS program may contact their FEMA Region 6 CRS Coordinator or the State of Arkansas CRS Coordinator.

FEMA CRS Programs
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(940) 383-7327

Arkansas CRS Programs
Arkansas Natural Resources Commission
Whitney Montague
whitney.montague@arkansas.gov
(501) 682-1611

Adoption of Higher Standards: Community participation in the NFIP is voluntary. When a community joins the NFIP, it must ensure its adopted floodplain management ordinance and enforcement procedures meet NFIP requirements. NFIP minimum requirements include requiring permits for all development in the SFHA and ensuring that the construction materials and methods used will minimize future flood damage. Higher standards, such as freeboard, land use and zoning practices, and other approaches allow communities to minimize future damages within the community by using more restrictive building codes and requirements.

Risk Reduction Activities: The NFIP's CRS Coordinator's Manual identifies a number of activities that communities can undertake to reduce their long-term risk. Higher standards, land use planning, future conditions modeling, and other approaches are available for consideration.

Severe Repetitive Loss (SRL) Strategy: The primary objective of the SRL properties strategy is to eliminate or reduce the damage to residential property and the disruption to life caused by repeated flooding. The SRL Grant Program makes funding available for a variety of flood mitigation activities. Under this program, FEMA provides funds to state and local governments to assist NFIP-insured SRL residential property owners with mitigation projects that reduce future flood losses. Projects could include acquisition or relocation of at-risk structures and conversion of the property to open space, elevation of existing structures, or dry floodproofing for historic properties.

Public Risk Awareness and Outreach Campaigns: Communities may use the new and existing flood hazard information to develop a public information and outreach campaign for their community. Since 2010, FEMA has conducted an annual nationwide study of flood risk awareness among U.S. households. Participants overwhelmingly responded that they expect and trust flood risk information when it comes from local community officials and staff.

FEMA Region 6 has also developed the Risk Communication Guidebook for Local Officials (http://www.riskmap6.com/guidebook.aspx), which identifies a number of local communication activities. The Guidebook provides tools, templates, and resources for

communities interested in developing a local outreach campaign; it is presented by Risk MAP project phases, similar to this report.

The CRS Coordinators Manual and the CRS Resources website (for Activity 300, available at http://crsresources.org/300-3) can provide additional information for communities interested in local flood hazard and risk awareness outreach campaigns.

High Water Mark (HWM) Initiative: As part of the NFIP, the HWM Initiative is a community-based program that increases residents' awareness of flood risk and encourages action to mitigate that risk.

As part of the project, communities post HWM signs in prominent places, hold a high-profile launch event to unveil the signs, conduct ongoing education to build local awareness of flood risk, and complete mitigation actions to build community resilience against future flooding.

Phase Three: Regulatory Product Update

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

During the Regulatory Product Update Phase of a Flood Risk Project, the results produced in the previous phase are used to prepare and produce three regulatory products that are produced in a county-wide manner. This phase of the project is more regimented than previous phases, there are some statutory and regulatory timelines that must be adhered to by FEMA and the communities involved in the update areas. FEMA will remain in contact with communities throughout the process.

Flood Insurance Study (FIS) Text

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

The engineering analysis results will be used to update the existing countywide FIS texts produced for communities during the Map Modernization effort. The narratives within the FIS text are updated to include specifics about the latest analysis and study effort within each county. Additionally, the Floodway Data Tables and Water Surface Elevations that provide look up information to community staff in their administration of the program are also updated to provide the most up to date information to the public and communities alike.

Flood Insurance Rate Map (FIRM) Panels

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

The revised FIRM data is based on a combination of new and existing engineering analyses of floodplain boundaries. The new engineering analysis for your county/parish is based on detailed analysis.

Detailed studies are mapped with a flood zone designation of “Zone AE”. All mileage studied by detailed methods produces a FIRM that included Base Flood Elevations (BFEs) published on the Preliminary DFIRMs. As previously described in Phase Two, studies of this nature include field surveys, hydraulic structures, modeling calibration and multiple flood frequency profiles published in the Flood Insurance Study (FIS) report delivered at Preliminary DFIRM issuance.

Some detailed mileage also includes a regulatory floodway. Floodway models are prepared to review the effect that fill or encroachment may have along a stream. Floodplain and floodway evaluations are the basis for community floodplain management programs. More information on floodway modeling is available in the Phase Two section of this report.

DFIRM Database

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

Communities receive an updated and standardized DFIRM Database which is a digital version of the FEMA flood insurance rate map designed for use with Geographic Information Systems (GIS) software.

The DFIRM Database is designed to provide the user the ability to determine the flood zone, base flood elevation and the floodway status for a particular location using its own internal GIS staff. The DFIRM database also includes data related to the NFIP community, FIRM panels, analysis cross sections and hydraulic structure information, as well as base map information like road, and stream data for reference and local use.

Letters of Map Change (LOMCs)

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

As part of the DFIRM update, the project team will review all LOMAs and LOMRs and make a determination of each case to: incorporate, revalidate/reissue or supersede the LOMAs and LOMRs, based on technical data.

The following Letters of Map Revision have been reviewed and categorized:

Case Number	Stream Name(s) & Community(ies)	Effective Date	Category
	To be completed at a later date.		

LOMAs for each county will also be reviewed in preparation for the preliminary issuance. Communities should be advised that ALL LOMAs will be included in the Preliminary Summary of Map Actions (Prelim SOMA) provided on the Preliminary release date.

Communities should review their map repositories for any Letters of Map Amendment (LOMA) or Letter of Map Revision (LOMR) within the stream areas being studied. These community files may provide additional information for historic map revisions that will assist in the review of the cases for incorporation.

Next Step: Preliminary Issuance

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

Once FEMA has received, reviewed and responded to all comments and technical data received as a result of the Flood Risk Review meeting, FEMA will prepare the preliminary FIRMs, FIS and DFIRM database for release. Preliminaries will be sent to the community Chief Executive Officer, or "CEO," and floodplain administrator, or "FPA," for an initial review.

Steps Post Preliminary Issuance

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

The post-preliminary process is initiated with the preliminary issuance of the FIRM, FIS and DFIRM Database. A number of activities will occur as highlighted in Figure 7 below.

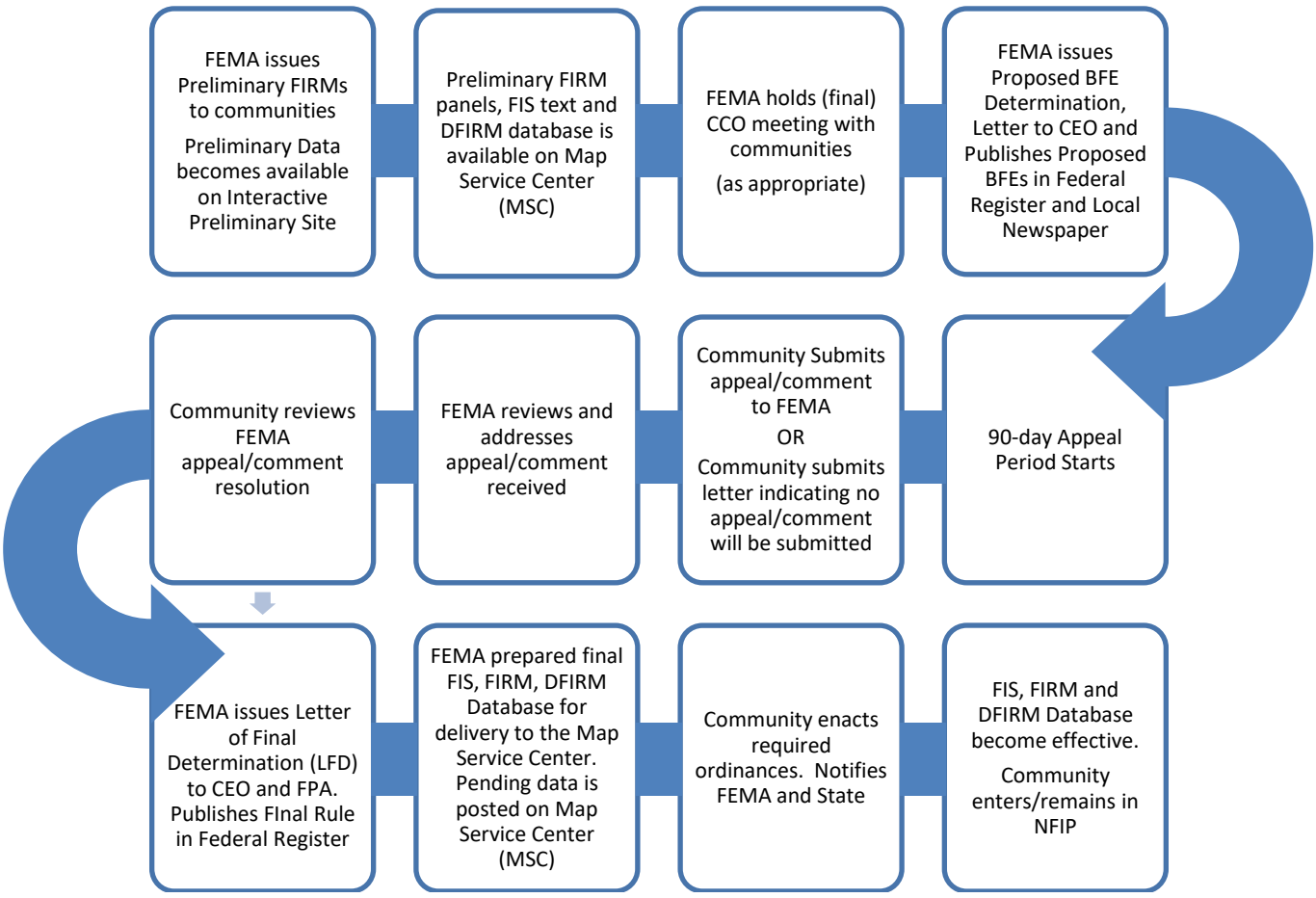


Figure 5. Post Preliminary Process

Additional information is provided for the immediate steps following preliminary issuance to provide some overview to communities prior to these activities being initiated.

Preliminary Data Available through Interactive Website. For FIRMs that are based on FEMA-contracted studies/mapping projects, Preliminary Map Viewer will be available describing information available on the site.

30-Day Community Review Period. For FIRMs that are based on FEMA-contracted studies/mapping projects, the initial community review is provided to communities. This informal review period generally lasts 30 days.

Consultation Coordination Officer (CCO) Meeting. Following the informal review of the preliminary information, FEMA holds a more formal community coordination meeting during which community officials meet with FEMA representatives.

90-Day Appeal and Comment Period Initiated: Following the CCO meeting, FEMA will issue a letter to the Community Elected Official and Local Floodplain Administrator to inform them that FEMA is moving towards the initiation of the appeal period. FEMA will work internally to publish the Proposed BFE Determination in the Federal Register and then will publish a notice in the local newspaper two times. The letter will indicate the publication date for the notice in the Federal Register and two publication dates for a local newspaper. The appeal and comment period is initiated after the second local print date and extends 90 calendar days.

During this period, community officials or citizens may appeal the proposed BFEs and/or base flood depths based on scientific or technical data. Community officials or citizens also may submit requests for changes to other information shown on the DFIRM - flood zone boundaries, regulatory floodway boundaries, road names and configurations - during the appeal period. **Communities are responsible for the collection, review and approval of appeals that are submitted during the 90-day appeal period.**

An **appeal** is a formal objection to proposed or proposed modified BFEs or base flood depths, submitted by a community official or an owner or lessee of real property within the community through the community officials during the statutory 90-day appeal period. An appeal must be based on data that show the proposed or proposed modified BFEs are scientifically or technically incorrect.

A **comment** is an objection to or comment on any information, other than proposed BFEs or base flood depths, shown on an NFIP map that is submitted by community officials or interested citizens through the community officials during the 90-day appeal period. Comments usually involve changes to items such as road locations and road names, corporate limits updates, or other base map features.

Future Physical Map Revisions

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

The release of the maps in these areas does not identify the end of coordination between the local community and FEMA. Local communities should continue their local floodplain management activities and submit Letters of Map Revision when local development alters the flood hazard in the community.

Appendix I: Community-Specific Reports

The following list depicts the county- and community-specific reports contained within this appendix.

Communities
CRAIGHEAD COUNTY
Craighead County Unincorporated Areas [1]
Jonesboro, City of [1]
CROSS COUNTY
Cross County Unincorporated Areas [1]
Cherry Valley, City of
Hickory Ridge, City of
Wynne, City of [1]
LEE COUNTY
Lee County Unincorporated Areas [1]
Haynes, Town of
Marianna, City of [1]
POINSETT COUNTY
Poinsett County Unincorporated Areas [1]
Fisher, City of [1]
Harrisburg, City of
Weiner, City of [1]
ST.FRANCIS COUNTY
St. Francis County Unincorporated Areas [1]
Caldwell, Town of
Colt, City of
Forrest City, City of [1]
Palestine, City of
WOODRUFF COUNTY
Woodruff County Unincorporated Areas [1]

[1] Community is located within more than one HUC8 watershed.

Appendix II: Points of Contact

Watershed

Subject/Topic of Interest	Name	Contact Information
FEMA Region 6 Risk MAP Team Lead *Project Outreach*	Diane Howe Risk Analysis Branch	Phone: (940) 898-5171 Email: diane.howe@fema.dhs.gov
FEMA Project Monitor (Arkansas)	John Bourdeau Risk Analysis Branch	Phone: (940) 383-7350 Email: John.BourdeauJr@fema.dhs.gov
• Floodplain Management • Floodplain Ordinance • Community Assistance Visits • Higher Standards • Flood Insurance	Pedro Perez Floodplain Management & Insurance Branch	Phone: (940) 383-7365 Email: Pedro.Perez@fema.dhs.gov
• Community Rating System • Flood Insurance	Mark Lujan	Phone: (940) 383-7327 Email: mark.lujan@fema.dhs.gov
• How to find and read FIRMs • Letters of Map Change and Elevation Certificates • Mandatory insurance purchase guidelines/ Flood zone disputes • Map Service Center (MSC) & National Food Hazard Layer	FEMA Map Information eXchange (FMIX)	Phone: 1-877-FEMA-MAP (336-2627) Email: FEMAMapSpecialist@riskmapcds.com Live Chat: https://www.floodmaps.fema.gov/fhm/fmx_main.html

State Partners

Organization/Title	Name	Partner Location	Contact Information
Arkansas Natural Resources Commission (ANRC) State NFIP Coordinator	Michael Borengasser, CFM	101 East Capitol Ave, Suite 350 Little Rock, AR 72201	Phone: (501) 682-3969 Email: michael.borengasser@arkansas.gov Web Page: http://www.anrc.arkansas.gov/
Arkansas Department of Emergency Management State Hazard Mitigation Officer	Lacye Blake	Building 9501 Camp Joseph T. Robinson North Little Rock, AR 72199	Phone: (512) 424-5489 Email: Lacye.Blake@adem.arkansas.gov Web Page: http://www.adem.arkansas.gov/

Appendix III: Resources

Arkansas Natural Resources Commission

The Arkansas Natural Resources Commission's (ANRC) mission is to manage and protect our water and land resources for the health, safety and economic benefit of the State of Arkansas.

The ANRC has been designated by state law as the State NFIP Coordinating Agency for Arkansas. Within ANRC- Water Resources Management Division, you will find Floodplain Management, where most of the flood-related information and flood planning and mitigation grant resources reside.

Organization	Contact Information	Website
Arkansas Natural Resources Commission (ANRC)	Phone: (501) 682-1611	http://www.anrc.arkansas.gov/

Arkansas Floodplain Management Association (AFMA)

The AFMA is an organization of professionals involved in floodplain management, flood hazard mitigation, the NFIP, flood preparedness, warning, and disaster recovery. The Association includes flood hazard specialists from local, state, and federal governments, the mortgage, insurance, and research communities, and the associated fields of flood zone determination, engineering, hydraulic forecasting, emergency response, water resources, Geographic Information Systems, and others.

Organization	Website
Arkansas Floodplain Management Association (AFMA)	https://www.arkansasfloods.org/

Certified Floodplain Manager (CFM) Certification

The Association of State Floodplain Managers (ASFPM) established a national program for certifying floodplain managers. This program recognizes continuing education and professional development that enhances the knowledge and performance of local, state, federal, and private-sector floodplain management professionals.

The role of the nation's floodplain managers is expanding due to increases in disaster losses, the emphasis on mitigation to alleviate the cycle of damage-rebuild-damage, and a recognized need for professionals to adequately address these issues. This certification program will lay the foundation for ensuring that highly qualified individuals are available to meet the challenge of breaking the damage cycle and stopping its negative drain on the nation's human, financial, and natural resources.

CFM® is a registered trademark and available only to individuals certified and in good standing under the ASFPM Certified Floodplain Manager Program.

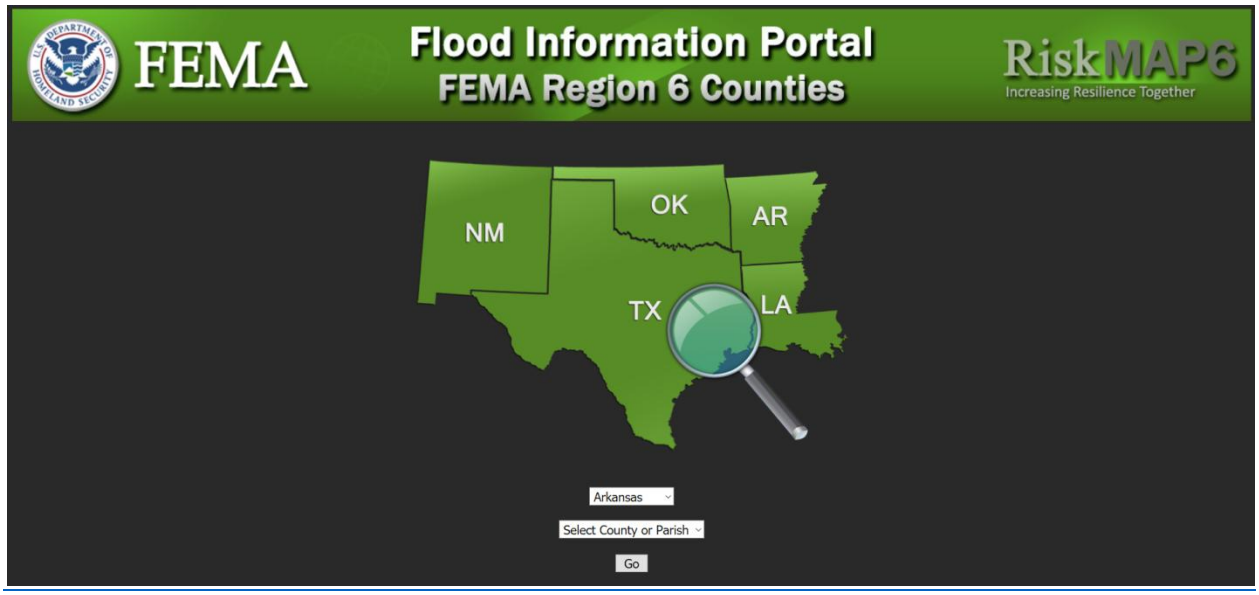
For more information, you may want to review these available CFM Awareness Videos:

- What is the CFM Program?
- Who can be a CFM?
- What are the Benefits of a CFM?

Study Materials for those interested in applying for the CFM certification can be found on the ASFPM Website at: http://www.floods.org/index.asp?menuID=215.

For information on becoming a member and the exam application process in the State of Arkansas visit https://www.arkansasfloods.org/cfm/.

Interactive Preliminary Data Viewer



To support community review of the study information and promote risk communication efforts, FEMA launched an interactive web tool accessible on-line at http://maps.RiskMAP6.com for the project areas.

Should a study be released for review, the study data may be viewed at this website.

For more information on the Interactive Preliminary Data Viewer, refer to the Region 6 Fact sheet: What is your Flood Risk?

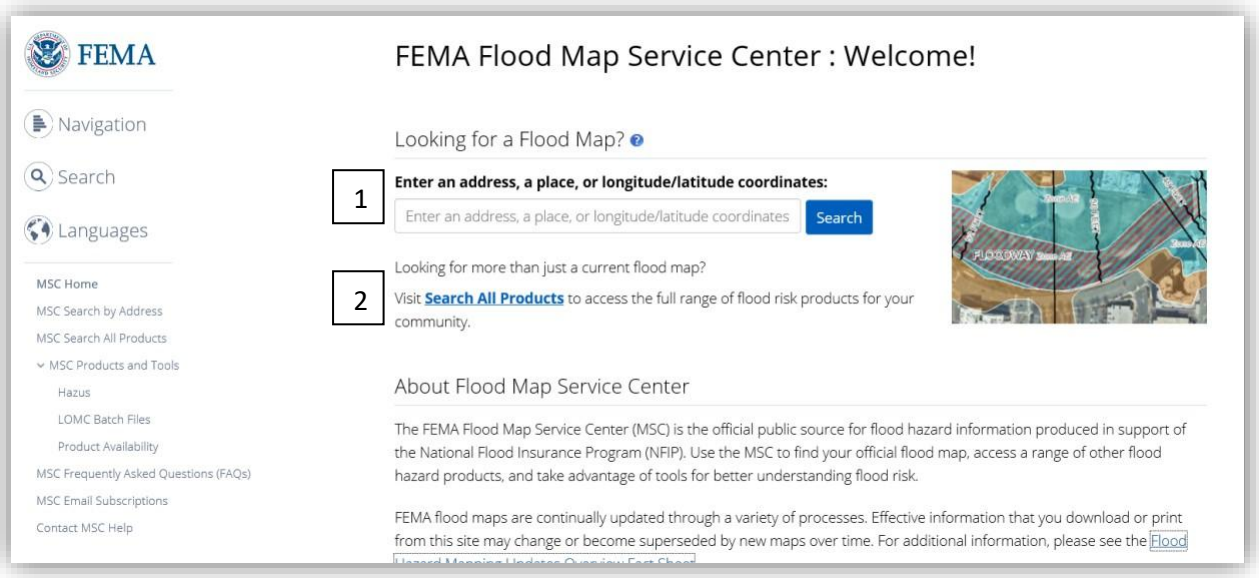
Map Service Center – Available Map Data

The FEMA Flood Map Service Center (MSC) is the official public source for flood hazard information produced in support of the NFIP. Use the MSC to find your official effective flood map, preliminary flood maps, and access a range of other flood hazard products.

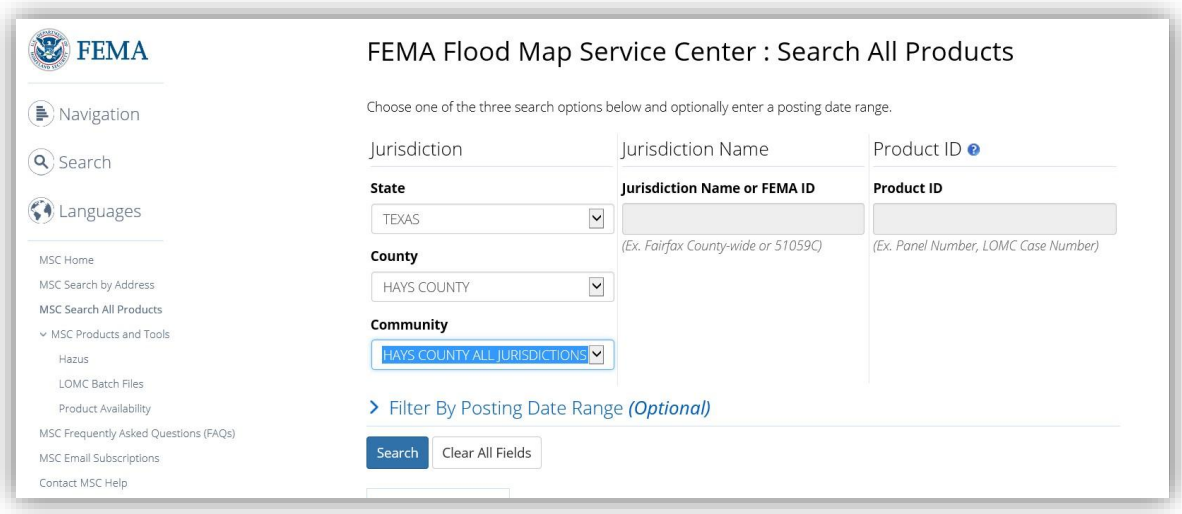
FEMA flood maps are continually updated through a variety of processes. Effective information that you download or print from this site may change or become superseded by new maps over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet.

At the MSC, there are two ways to locate flood maps in your vicinity.

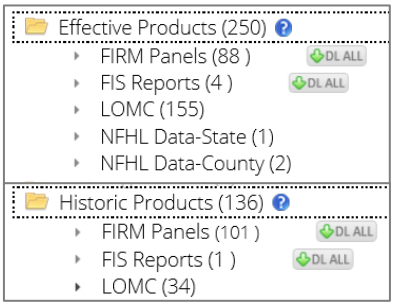
1. Enter an address, place name, or latitude/longitude coordinates and click search. This will provide the current effective FIRM panel where the location is shown.
2. Or Search All Products, which will provide access to the full range of flood risk information available.



By using the more advanced search option, “Search All Products,” users may access current, preliminary, pending, and historic flood maps. Additionally, GIS data and flood risk products may be accessed through the site with these few steps.



Using the pull down menus, select your state, county, and community of interest. For this example, we selected Hays County - All Jurisdictions. After the search button is selected, the MSC will return all items in the area. There are five types of data available.



Effective Products. The current effective FIS, FIRM, and DFIRM database (if available) is available through the MSC. If users click on the available effective products, they are presented a breakdown of the available products. FIRM panels, FIS reports, LOMRs, statewide National Flood Hazard Layer (NFHL) data, and countywide NFHL data may be available, as indicated in the breakdown on the right of the page.

Historic Products. A range of historic flood hazard maps, FIS texts, and Letters of Map Change are available through the MSC.

Flood Risk Products. The Flood Risk Report, Flood Risk Map, and

Flood Risk Database will be made available through the MSC once they have been compiled and completed. These products are made available after the flood study analysis and mapping have been reviewed and community comments incorporated.

Additional Web Resources

FLOOD MITIGATION PLANNING	http://www.adem.arkansas.gov/
NATIONAL FLOOD INSURANCE PROGRAM RESOURCES – HOW TO JOIN, SAMPLE ORDINANCES, ETC.	http://www.floodplain.ar.gov/
FLOOD GRANT PROGRAMS	http://www.adem.arkansas.gov/hazard-mitigation-grant-program http://www.floodplain.ar.gov/
FLOOD WORKSHOPS AND TRAINING SCHEDULES	http://www.floodplain.ar.gov/Conferences.html https://www.arkansasfloods.org/

Huxtable Pumping Station Photo Courtesy: US Army corps of Engineers

Lower St. Francis Watershed, AR Base Level Engineering (BLE) Results

Lower St. Francis Watershed, HUC - 08020303

Clay*, Craighead*, Crittenden *, Cross*, Greene*, Lee*, Mississippi*, Phillips*, Poinsett*, St. Francis* Counties, Arkansas and, Bollinger*, Butler*, Dunklin*, Stoddard*, and Wayne* Counties, Missouri

**Spans more than one watershed. This report covers only the area within the studied watershed.*

June 2017

Arkansas Natural Resources Commission

ftn Associates Ltd.

Project Area Community List

Community Name	CID
Arkansas	
Clay County Communities	
Clay County[1]	050423
Greenway, City of	050031
Nimmons, Town of	050332
Piggott, City of[1]	050035
Rector, City of	050366
St. Francis, City of	050037
Craighead County Communities	
Bay, City of	050045
Black Oak, Town of	050389
Brookland, City of	050047
Craighead County[1]	050427
Jonesboro, City of[1]	050048
Lake City, City of	050049
Monette, City of	050350
Crittenden County Communities	
Anthonyville, Town of	050512
Clarkedale, Town of	050513
Crawfordsville, City of	050317
Crittenden County[1]	050429
Earle, City of	050054
Edmondson, Town of	050409
Gilmore, Town of	050245
Horseshoe Lake, Town of	055057
Jennette, Town of	050514
Jericho, Town of	050515
Marion, City of	050345
Sunset, Town of	050476
Turrell, City of	050370
West Memphis, City of	050055
Cross County Communities	
Cross County[1]	050056
Parkin, City of	050059
Wynne, City of[1]	050060
Greene County Communities	
Greene County[1]	050435
Oak Grove Heights, City of	050510
Paragould, City of	050085

Lee County Communities	
Lee County[1]	050444
Mississippi County Communities	
Bassett, Town of	050489
Birdsong, Town of	050516
Blytheville, City of[1]	050140
Burdette, Town of	050602
Dell, Town of	050490
Dyess, Town of	050143
Joiner, City of	050145
Keiser, City of	050146
Luxora, City of	050148
Marie, Town of	050150
Mississippi County[1]	050452
Osceola, City of	050151
Victoria, Town of	050491
Wilson, City of	050153
Phillips County Communities	
Phillips County[1]	050166
Poinsett County Communities	
Lepanto, City of[1]	050174
Marked Tree, City of	050175
Poinsett County[1]	050172
Trumann, City of	050176
Tyronza, City of	050371
St. Francis County Communities	
Forrest City, City of[1]	050187
Hughes, City of	050188
Madison, City of	050189
St. Francis County[1]	050184
Widener, Town of	055023
Missouri	
Bollinger County Communities	
Bollinger County[1]	290787
Butler County Communities	
Butler County[1]	290044
Fisk, City of[1]	290045
Dunklin County Communities	
Cardwell, City of	290125
Dunklin County[1]	290122
Holcomb, City of[1]	290127
Kennett, City of[1]	290129

Stoddard County Communities	
Bloomfield, City of	290423
Dexter, City of[1]	290424
Dudley, City of	290615
Puxico, City of	290428
Stoddard County[1]	290845
Wayne County Communities	
Wayne County[1]	290449
[1] Community is located within more than one HUC8 watershed.	

Table of Contents

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Appendix A – WORKMAPS

1. Executive Summary

The U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) is currently implementing the Risk Mapping, Assessment, and Planning (Risk MAP) Program across the Nation. 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 a more integrated process of more accurately identifying, assessing, communicating, planning and mitigating flood risks. Risk MAP attempts to address gaps in flood hazard data and form a solid foundation for risk assessment, floodplain management, and provide State and Local entities with information needed to mitigate flood related risks.

The FEMA Region 6 office and the Arkansas Natural Resources Commission (ANRC) entered into a Cooperating Technical Partners (CTP) partnership agreement for implementation of Risk MAP in the State of Arkansas. As part of this partnership, the ANRC and its contractor, FTN Associates, Ltd. (FTN), began work on a Base Level Engineering (BLE) analysis in the Lower St. Francis Watershed in October 2016 to support FEMA's Discovery process and validation of effective Zone A Special Flood Hazard Area (SFHA).

The BLE process involves using best available data and incorporating automated techniques with existing hydrologic and hydraulic (H&H) model development procedures to produce quality flood hazard boundaries and secondary products (Water Surface Elevation grids, Depth grids, etc.) for multiple recurrence intervals. The purpose and intent of the BLE process is to validate existing Zone A flood boundaries within the existing Coordinate Needs Management Strategy (CNMS) dataset and provide updated flood risk data in the early stages of a Flood Risk Project (Discovery). An important goal of the BLE process developed by FEMA is the scalability of the results. Scalability means that the results of an BLE cannot only be used for CNMS evaluations of Zone A studies but also leveraged throughout the Risk MAP program.

The source digital terrain data used for surface model development in support of H&H analysis, as well as mapping activities were leveraged from existing Light Detection and Ranging (LIDAR) data collected by the Natural Resource Conservation Service (2012 L'Anguille and Lower St. Francis Watershed Area), the U.S. Army Corps of Engineers (2014 AR-MO LIDAR Project, 2014 Cape Girardeau-Stoddard Co., 2014 Stoddard-Mississippi Co., 2016 USACE_MVS_MO [Butler_Ripley], 2009 Duck Creek LiDAR datasets), and the United States Geological Survey (2012 Upper Black, 2013 Lower St. Francis, 2012 Dunklin County, 2012 Wappapello datasets, USGS 1/3 arc-second DEMs). The LiDAR datasets were 1-meter gridded DEM data that were reprojected to a 15 ft cell size for hydrologic processing and a 5 ft cell size for hydraulic and mapping processing in 1D areas and 15 ft cell size for 2D areas.

Flood discharges for this analysis were calculated using the National Oceanic and Atmospheric Administration's National Weather Service, Precipitation Frequency Data Server (PFDS) for Atlas 14, ESRI's ArcGIS software, the HEC-Hydrologic Modeling System (HEC-HMS) computer program, and the HEC - River Analysis System (HEC-RAS) program (versions 4.1 or 5.0.3). Initial precipitation values were obtained, based on a watershed level, from NOAA's Precipitation Frequency Data Server (PFDS) for Atlas 14, which was then processed in ESRI's ArcGIS 10.x software into a usable format. The obtained preceipitation values and resulting GIS parameters for the watershed, were then input into HEC-HMS to determine the excess rainfall that would result based on the applied conditions. For 2-D study areas, this excess rainfall was then applied to a 2-D HEC-RAS model in the form of a rain on grid scenario, which was then used compute the water surface elevations for the 10-, 4-, 2-, 1-, 0.2-percent-events and the 1-percent-minus and 1-percent

plus flood events. For 1-D study areas, a traditional HEC-HMS model was produced. In areas of were then inserted in HEC-RAS to model water surface elevations.

The modeled stream mile network for the Lower Saint Francis Watershed to include streams that extended upstream to a contributing drainage area of approximately 1 sq. mile.

2. Base Level Engineering (BLE) Methodology

This section provides guidance for the hydrologic, hydraulic and floodplain mapping steps required to create a BLE. The BLE process involves using best available data and incorporating automated techniques with existing H&H model development procedures to produce quality flood hazard boundaries and secondary products (Water Surface Elevation grids, Depth grids, etc.) for multiple recurrence intervals. The purpose and intent of the BLE process is to validate existing Zone A flood boundaries within the existing CNMS dataset and provide updated flood risk data in the early stages of a Flood Risk Project (Discovery).

The cost and effort for developing the data and estimates resulting from the BLE process are lower than standard flood production tasks. An important goal of the BLE process developed by FEMA is the scalability of the results. Scalability means that the results of an BLE cannot only be used for CNMS evaluations of Zone A studies but also leveraged throughout the Risk MAP program. The large volume of data resulting from an BLE can be used for the eventual production of regulatory and non-regulatory products, outreach and risk communication and MT-1 processing. Leveraging this data outside the Risk MAP program may also be valuable to external stakeholders.

Per the the Code of Federal Regulations, once every five years, FEMA must evaluate whether the information on Flood Insurance Rate Maps (FIRMs) reflects the current risks. This evaluation is done by examining the existing flood boundaries for changes in study attributes and physical characteristics, as specified in the CNMS Technical Reference. Additionally, this evaluation occurs using a series of critical and secondary checks to determine the validity of the existing flood hazard areas. In addition to the need for evaluating the accuracy of Zone A mapping, newer FEMA standards also require that flood risk data be provided in the early stages of a Flood Risk Project. Particularly, FEMA Program Standard SID #29 requires that during Discovery, data must be identified that illustrates potential changes in flood elevation and mapping that may result from the proposed project scope. If available data does not clearly illustrate the likely changes, an analysis is required that estimates the likely changes. This data and any associated analyses should be shared and results should be discussed with stakeholders.

Therefore, based on these requirements, the results of the BLE process are being provided to the local Floodplain Administrators (FPAs), which allows for users to have access to a model backed Zone A study that is suitable to replace the effective Zone A products. The following sections are being supplied to document the hydrologic, hydraulic, and floodplain mapping techniques used. Regardless of the individual techniques used to perform these steps, the goal of a scalable product should be adhered to throughout the entire BLE process.

2.1. Terrain

To determine the parameters for the hydrologic and hydraulic analyses, FTN obtained Digital Elevation Model (DEM) data developed from LIDAR information that was collected by the Natural Resource Conservation Service (2011 L'Anguille and Lower St. Francis Watershed Area), the U.S. Army Corps of Engineers (Crittenden_Cross, Game-Fish, Mississippi-Lauderdale, Monroe_Lee-

Phillips, Phillips_Desha, Poinsett_Craighead_Greene, and St. Francis_Lee, Cape Girardeau-Stoddard Co., Stoddard-Mississippi Co., USACE_MVS_MO [Butler_Ripley], Duck Creek, LiDAR datasets), The United States Geological Survey (FEMA_VI_Upper_Black_Watershed, FEMA_VI_Lower_St._Francis Watershed, Dunklin_MO, Wappapello datasets, and 1/3 arc-second elevation data). The bare earth DEM data was provided as 1-meter, 1/3 arc-second, or 1/9 arc-second DEMs with varying horizontal and vertical coordinate systems. Prior to use, the DEM data was resampled to a 5- and 15-foot cell size, where possible, with a horizontal coordinate system of NAD 1983 State Plane Arkansas North (feet) with a vertical datum of NAVD 88 in feet. DEMs were then mosaicked into a single DEM that covered the entire watershed. The single DEM was then processed using Environmental Systems Research Institute's (ESRI) ArcMap Geographic Information System (GIS) 10.2.2 software and the ArcHydro toolset to develop the hydrologic parameters needed for the time of concentration and longest flow path lengths required for developing flow estimates.

A terrain and workmap index has been prepared and is attached to the end of this report and included in Appendix A – Workmaps.

2.2. Hydrology

Excess runoff for the 10-, 4-, 2-, 1-, 0.2-percent-events and the 1-percent-minus and 1-percent plus flood events were calculated using NOAA's Precipitation Frequency Data Server (PFDS) for Atlas 14. This task was completed by processing raster data for the study events based on a HUC-10 level. The excess rainfall values were spatially averaged from raster data using the zonal statistics toolset in ESRI's ArcGIS. The maximum rainfall values, based on a HUC 10 level were selected as input for the resulting HEC-HMS model.

In addition to the Atlas 14 precipitation values, ESRI's ArcGIS software and supporting toolsets were used to process the initial terrain data, delineate drainage basins, and develop basin parameters for the study area. In addition, drainage points were obtained around the basin in such a way that there is a point upstream of the confluences in each of the stream and also at the downstream. In addition, drainage points were also created on the top of structures. Drainage basins for each of these drainage points were then established.

For this BLE analysis, the SCS Cuver Number Method was used for the Loss Method due to varying landuses. For the curve number calculations, the weighted Curve Numbers were developed using the 2011 National Land Cover Database, NRCS's SSURGO Soil Surveys, TR-55 runoff curve numbers, and ESRI's ArcGIS software. The watershed was assumed to be at Antecedent Moisture Condition II (average moisture condition).

The SCS Lag Method was used for the Transform Method. As this is not considered a detailed analysis, this method uses imperical methods to develop representative parameters for each subwatershed. Additionally, the SCS Type II rainfall distribution was used to distribute the rainfall across the basin. Table 1, shown below, lists the initial and excess rainfall used for the hydrologic analysis.

As this analysis uses both 1-D and 2-D analyses, additional details regarding the hydrologic modeling are described below:

1-D: Upon completion of the base hydrologic data, a complete hydrologic model was developed based on HUC-10 boundaries using the parameters discussed above and reach routing techniques. The routing method used for this project is the Modified Puls Routing Method. Storage-discharge relationships for each reach were developed by establishing an initial HEC-RAS model. The HEC-RAS model consisted of a reach for each drainage basin, and each reach was represented by 2 - 4 cross sections with flows ranging from 5 cfs to 400,000 cfs (upper limit varies based on size of stream). Cross sections were drawn initially using an automated routine based on the stream sinuosity. However, these cross sections were then refined manually to account for structures and other obstructions that might impact the flow of water downstream. Additionally, the hydraulic routing model used normal depth slope methods for the downstream boundary condition.

Once all parameters were developed, a final HUC 10 basin HEC-HMS model was produced, with the resulting flows being reviewed and then incorporated into the hydraulic modeling.

2-D: Upon completion of the base hydrologic data, the hydrologic model was run to determine the excess rainfall that would be translated to runoff. As the SCS Curve Number method was used, some of the initial rainfall is determined to remain. This is referred to as initial abstraction. Initial abstraction is the fraction of the storm depth after which runoff begins. After determining the excess runoff in HEC-HMS for the watershed, this information was then applied to the 2-D hydraulic model as a rain on grid scenario.

Tables 1 - 5, shown below, lists the initial and excess rainfall used for the various model extents shown in the hydrologic analysis.

Table 1: List of rainfall and peak runoff volume at different recurrence interval (Missouri 2-D Area)

Recurrence Interval (% chance)	Missouri 2D area	
	NOAA Atlas 14 Rainfall (in)	Excess Volume (in)
10	5.44	3.18
4	6.66	4.24
2	7.66	5.14
1	8.71	6.12
0.2	11.42	8.71
1-plus	11.27	8.57
1-minus	6.53	4.13

Table 2: List of rainfall and peak runoff volume at different recurrence interval (West 2-D Area)

Recurrence Interval (% chance)	West 2D Area	
	NOAA Atlas 14 Rainfall (in)	Excess Volume (in)
10	5.39	3.24
4	6.39	4.15
2	7.17	4.85
1	7.97	5.6
0.2	9.96	7.53
1-plus	9.97	7.55
1-minus	6.23	4.03

Table 3: List of rainfall and peak runoff volume at different recurrence interval (Northeast 2-D Area)

Recurrence Interval (% chance)	Northeast 2D Area	
	NOAA Atlas 14 Rainfall (in)	Excess Volume (in)
10	5.46	3.32
4	6.49	4.23
2	7.27	5.0
1	8.11	5.76
0.2	10.09	7.63
1-plus	10.2	7.72
1-minus	6.27	4.05

Table 4: List of rainfall and peak runoff volume at different recurrence interval (Southeast 2-D Area)

Recurrence Interval (% chance)	Southeast 2D Area	
	NOAA Atlas 14 Rainfall (in)	Excess Volume (in)
10	5.44	3.62
4	6.45	4.53
2	7.23	5.28
1	7.98	6.02
0.2	9.95	7.89
1-plus	9.93	7.85
1-minus	6.29	4.37

Table 5: List of rainfall at different recurrence interval (1-D Study sreams)

Recurrence Interval (% chance)	1D Area
	NOAA Atlas 14 Rainfall (in)
10	5.51
4	6.48
2	7.25
1	8.04
0.2	9.98
1-plus	9.76
1-minus	6.48

2.3. Hydraulics

For 1D and 2D areas, all streams identified in the Lower St. Francis Watershed, the BLE process uses ESRI ArcGIS software and toolsets to create the HEC-RAS layers used for geometric data development and extraction. Additionally, the hydraulic modeling and mapping for this BLE process was conducted using the USACE's HEC-RAS software package, versions 4.1 (1D) and 5.0.3 (2D). Figure 1. Study Areas provides additional details as to the location of each of the study zones.

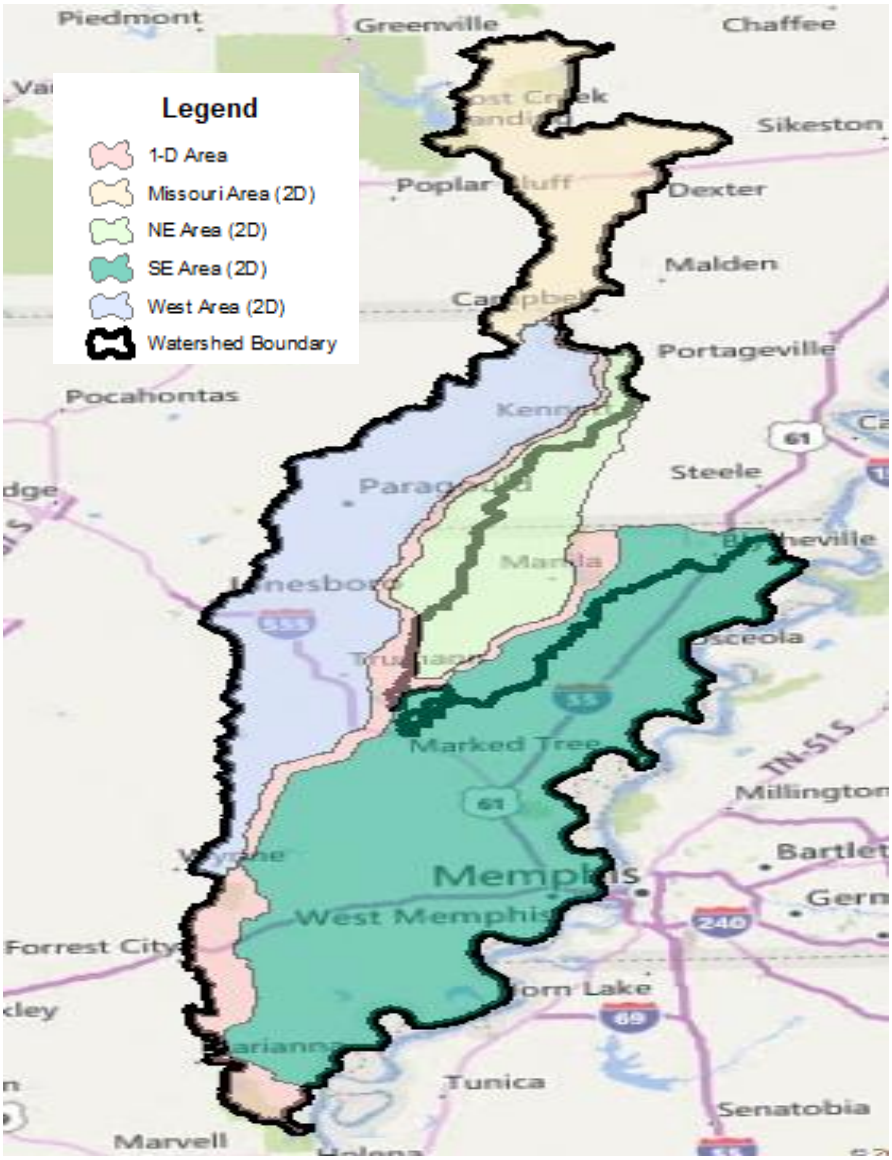

Figure 1. Study Areas

Streams

The streamlines used for determining what areas needed to be modeled were taken from the CNMS dataset. They were then expanded to include streams that extended up to a contributing drainage area of approximately 1 sq. mile. These streams were then reviewed and updated to match aerial imagery and detailed topographic data, as needed.

Cross Sections (1-D analysis)

1-D: For the remaining streams, the hydraulic approach for BLE analysis for the Dardanelle Reservoir watershed consisted of using the terrain data described in Section 2.1, in combination with the hydrology discharges computed Section 2.2, to establish water surface elevations using 1-D steady state analysis. HEC-RAS 4.1.0 was chosen to compute water surface elevations on a stream by stream basis within the watershed. ESRI's ArcGIS computer program and supporting HEC-GeoRAS toolset were also used to establish streams, cross section layouts and stationing, assign Manning's "n" values to cross sections, and to develop all input files for the HEC-RAS program.

Initial cross section layouts were developed using an automated routine based on the stream sinuosity. These cross sections were then edited manually, as needed, and additional cross sections were placed upstream and downstream or structures and along the top of the structure, considering bridges or culverts will impact the flow of water downstream. Cross sections were also placed across easily identifiable watershed dams, as the number of dams located on a stream was minimal. Additionally, attempts were made to ensure that cross sections contained all flows modeled (particularly the 0.2- and 1%-plus-annual-chance events); however, due to the possibility of basin overflows or common floodplains, there are some cross sections that may have vertical extensions.

The channel banks used in the hydraulic models were based on offsetting the main channel stream centerline by a 30-ft interval. After testing sensitivity of the bank station locations, it was determined that the manual adjustment of the bank stations to more realistic locations was not warranted at this time. Likewise, the reach lengths were determined by offsetting the stream centerline by a 150-ft interval. This approach was again used to allow for more automated processes to be conducted to more efficiently develop the hydraulic modeling.

Significant effort was made to start all tributaries below the receiving water surface elevations but this was not always achieved, particularly in wide, flat floodplains where small tributaries ran parallel to large streams or where road crossings or dams interfered with cross section alignments.

2-D: Hydraulic modeling for the Cache Watershed BLE Analysis was computed using 2-D analyses to better reflect the large, flat, and interconnected floodplains. To perform this modeling, 2-D capabilities of the HEC-RAS 5.0.3 was utilized. With a 2-D model, the area is modeled using a topographic mesh rather than a series of cross sections down the longitudinal axis of the stream reach, as is done in a 1-D model. The HEC-RAS mesh consists of computational cells that are assigned elevations and roughness values along the cell faces that represent the topographic surface and frictional characteristics of the area and and volumetric relationships for the cell area, respectively. The use of the 2-D model allows for more detailed resolution in water surface elevations, velocities, and flows than is possible with a 1-D model that is only capable of computing the average water surface elevations, velocities, and flows for three general regions at a cross section. Based on engineering judgement, breaklines were defined along the levees, dams, roads, culverts and elevated berms as seen on the topography. It is necessary to draw breaklines as it makes sure that the flow across the cell faces is blocked by the elevation of the structure along the break line.

Parameter Estimation

The Manning's "n" values used were based on engineering judgment and using the 2011 National Land Cover Data (NLCD) dataset. Table 6 lists the landuse and roughness coefficients used in this analysis.

Table 6: Manning's "n" Coefficients

Material Type	Manning's "n"
Open Water	0.01
Developed, Open Space	0.04
Barren Land (Rock/Sand/Clay)	
Grassland/Herbaceous	0.05
Pasture/Hay	
Emergent Herbaceous Wetlands	
Developed, Low Intensity	0.06
Shrub/Scrub	
Cultivated Crops	
Developed, Medium Intensity	0.08
Developed High Intensity	0.10
Deciduous Forest	
Evergreen Forest	
Mixed Forest	
Woody Wetlands	

Boundary Conditions

For this BLE analysis, the downstream boundary conditions are set to be normal depth slope. The computed slope is based on topographic data from the downstream limits of the modeling.

Model Calibrations

No calibration was performed on these streams, although streams with gages were reviewed for consistency with respect to estimated and observed discharges and gage heights.

2.4. Quality Control

Throughout the BLE analysis, quality checks were performed. These checks included review of topographic data processing, hydrologic parameters being applied, checking for complete model coverage, adjusting the mesh cell sizes, adjusting mesh boundaries, adding breaklines along structures, as required, and review of the final mapping results.

2.5. Mapping

Following the hydraulic analysis, the model results were then imported into the HEC-RAS RAS Mapper tool to map floodplain boundaries for the model extent. This tool uses a routine that develops water surface elevation grids based on the elevation datasource. For this BLE analysis, mapping results were developed for seven (7) events. These events were the 10-, 4-, 2-, 1-, 0.2-percent-events and the 1-percent-minus and 1-percent plus boundaries.

Once the floodplain boundaries were created, the resulting floodplain data were smoothed and small polygons (less than 0.25 acres) and small disconnected fragments were removed. After the initial boundary edits, the resulting floodplain boundaries were merged into a single watershed based map boundary. For this BLE process, only the 1-percent-annual-chance floodplain is reported on the workmaps. Workmaps were generated to provide a graphical comparison of the effective floodplain boundaries to that of the BLE processed streams. These workmaps are provided in Appendix A – Workmaps.

Once the map boundaries were cleaned, the resulting rasters (Water Surface Elevation, Depth, etc.) were developed with the raster set to correspond in extent to the cleaned polygon boundary. This ensures that the water surface raster and the floodplain boundary are consistent with each other. The depth raster product was created by performing a raster subtraction with the water surface elevation raster and the ground DEM. Once complete, the resultant depth grids were used to perform an updated Flood Loss Analysis for the watershed using the HAZUS program.

3. Submittal

All information, data, and files for the Lower St. Francis Watershed BLE process are uploaded to the FEMA MIP and provided digitally in electronic format in a directory structure provided below.

08020303\Lower St. Francis Watershed BLE

\General

- Project Narrative (PDF)

\Hydraulic_Models

\<HUC-8>\<Stream Name> *(St. Francis River and 2D models)*

- HEC-RAS models

\<HUC-10>\<Stream Name>

- HEC-RAS models

\Spatial_Files

- Lower St. Francis_Watershed (file geodatabase format)

\Supplemental_Data

\CNMS_Update

- CNMS database update (file geodatabase format)

\HAZUS

- Loss Analysis project

\Mapping

- BLE Mapping files (multiple events)

\Workmaps

- Terrain and Workmap Index (PDF)
- Workmaps (PDF)
- Workmap Index (SHP format)
- Community Map Index (if needed)

4. References

1. USGS. Multi-Resolution Land Characteristics Consortium. *National Land Cover Database 2011*. (http://www.mrlc.gov/nlcd2011.php).

2. NOAA. Precipitation-Frequency Atlas of the United States, Atlas 14. (http://hdsc.nws.noaa.gov/hdsc/pfds/).

3. Chow, Ven T. *Open Channel Hydraulics*. Caldwell, NJ: Blackburn, 1959. Print.

4. U.S. Army Corps of Engineers, Hydrologic Engineering Center. (January 2010). HEC-RAS River Analysis System, Version 4.1.0. Davis, California.

5. U.S. Army Corps of Engineers, Hydrologic Engineering Center. (September 2016). HEC-RAS River Analysis System, Version 5.0.3. Davis, California.

6. FEMA, "Guidance for Automated Engineering", May 2016.(http://www.fema.gov/media-library-data/1469144112748-3c4ecd90cb927cd200b6a3e9da80d8a/Automated_Engineering_Guidance_May_2016.pdf).

Marked Tree Siphon, 2013 Photo Courtesy of Melissa Brawner

Flood Risk Report

Lower St. Francis Watershed, AR

HUC8 08020203

December 2017

Version Number	Version Date	Summary
1.0	12/29/2017	Initial Report Development

Preface

The Department of Homeland Security, Federal Emergency Management Agency's (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) program provides states, tribes, and local communities with flood risk information, datasets, risk assessments, and tools that they can use to increase their resilience to flooding and better protect their residents. By pairing accurate floodplain maps with risk assessment tools and planning and outreach support, Risk MAP transforms the traditional flood mapping efforts into an integrated process of identifying, assessing, communicating, planning for, and mitigating flood-related risks.

The Flood Risk Report (FRR) is one of the tools created though the Risk MAP program. An FRR provides non-regulatory information to help local or tribal officials, floodplain managers, planners, emergency managers, and others. Local, federal, and state officials can use the information in the FRR to establish a better understanding of their flood risk, take steps to mitigate those risks, and communicate those risks to their residents and local businesses.

The FRR serves as a guide when communities update local hazard mitigation plans, community comprehensive plans, and emergency operations and response plans. It is meant to communicate risk to officials and inform them of the modification of development standards, as well as assist in identifying necessary or potential mitigation projects. The report extends beyond community limits to provide flood risk data for the Lower St. Francis Watershed.

Flood risk is always changing, and studies, reports, or other sources may be available that provide more comprehensive information. This report is not intended to be the regulatory nor the final authoritative source of all flood risk data in the watershed. Rather, it should be used in conjunction with other data sources to provide a comprehensive picture of flood risk within the project area.

Table of Contents

Executive Summary

The Flood Risk Report has two goals: (1) inform communities of their risks related to certain natural hazards and (2) enable communities to act to reduce their risk. The information within this Risk Report is intended to assist federal, state, and local officials with the following goals:

- Communicate risk – Local officials can use the information in this report to communicate with property owners, business owners, and other residents about risks and areas of mitigation interest.
- Update local hazard mitigation plans and community comprehensive plans – Planners can use risk information to develop and/or update hazard mitigation plans, comprehensive plans, future land use maps, and zoning regulations. For example, zoning codes can be changed to provide for more appropriate land uses in high-hazard areas.
- Update emergency operations and response plans – Emergency managers can identify high-risk areas for potential evacuation and low-risk areas for sheltering. Risk assessment information may show vulnerable areas, facilities, and infrastructure for which continuity of operations plans, continuity of government plans, and emergency operations plans would be essential.
- Inform the modification of development standards – Planners and public works officials can use information in this report to support the adjustment of development standards for certain locations.
- Identify mitigation projects – Planners and emergency managers can use this risk assessment to determine specific mitigation projects of interest. For example, a floodplain manager may identify critical facilities that need to be elevated or removed from the floodplain.

This Risk Report showcases risk assessments, which analyze how a hazard affects the built environment, population, and local economy, to identify mitigation actions and develop mitigation strategies.

The information in this Risk Report should be used to identify areas in need of mitigation projects and to support additional efforts to educate residents on the hazards that may affect them. The areas of greatest hazard impact are identified in the Areas of Mitigation Interest section of this report, which can serve as a starting point for identifying and prioritizing actions a community can take to reduce its risks.

About the FEMA Risk Mapping, Assessment, and Planning (Risk MAP) Program

Flood risk is continually changing over time due to factors such as new building and development and weather patterns. The goal of the Federal Emergency Management Agency's (FEMA) Risk MAP program is to work with federal, state, tribal, and local partners to identify and reduce flood risk across communities. These projects are conducted using watershed boundaries, bringing together multiple communities to identify broader mitigation actions and create consistency across the watershed. The program provides resources and support that are tailored to each community to help mitigate their risk and work towards a reduction in risk and future loss.

Through coordination and data sharing, the communities in the watershed work as partners in the mapping process. In addition to providing data, the communities can also provide insight into flooding issues and flood prevention within their areas. To prepare for a future study and assist in mitigation,

FEMA provides a number of data sources that include information from the community, such as the following:

- Areas of repeated flooding and insurance claims
- Future development plans
- Areas of low water crossings
- High water marks from recent flooding events
- Areas of evacuation during high water
- Master drainage plans, flood risk reduction projects, and large areas of fill placement
- Local flood studies
- Other flood risk information

For more information about ways communities can take action or take advantage of available resources, please review the attached appendices.

Part of the data that FEMA is providing communities during the Risk MAP process is Base Level Engineering (BLE) for select watersheds. BLE is a form of hydrologic and hydraulic modeling which, when completed, can provide modeled flood hazard data in existing Zone As or where no effective flood hazard zone has been designated. Knowing the extent of flooding during the 1-percent-annual-chance flooding event supports risk reduction efforts and supports more resilient community planning. Completed BLE data is provided to watershed communities for planning, risk communication, floodplain management, and permitting activities, and to inform future flood study needs.

For information on BLE in the Lower St. Francis Watershed, see the Phase Zero: Investment section of this report.

About the Lower St. Francis Watershed

The Lower St. Francis Watershed (HUC 08020203) encompasses an area of approximately 3,024 square miles and extends across ten counties in Arkansas (Clay, Craighead, Crittenden, Cross, Greene, Lee, Mississippi, Phillips, Poinsett, and St. Francis) and three counties in Missouri (Butler, Dunklin, and Stoddard) in the northeastern portion of Arkansas and southeast portion of Missouri between the St. Francis and Mississippi Rivers. The major communities in the watershed include portions of the cities of Forrest City, Jonesboro, Marion, Paragould, Trumann, and West Memphis. Smaller communities include Brookland, Earle, Osceola, and Piggott. The communities in the Lower St. Francis Watershed and their NFIP status are listed in Table 1. The watershed and its communities are shown on Figure 2.

The Lower St. Francis Watershed is located in northeastern Arkansas bounded on the east by Crowley's Ridge and on the west by the Mississippi River. The Lower St. Francis Watershed consists of flat, low-lying areas with numerous interconnected channels. During past events, local communities have experienced flooding issues, some of which are due to localized development in and around the floodplain and while other issues are due to the nature of the watershed.

The Lower St. Francis River is a tributary of the Mississippi River. Its largest tributaries are Gibson Bayou and North Alligator Bayou. The Lower St. Francis River originates in southeast Missouri.

Table 1: NFIP Status of Project Area Communities.

County	Community Name	Community Identification Number (CID)	Participating Community?	CRS Rating
Arkansas Counties and Communities				
Clay	Clay County Unincorporated Areas [1]	050423	Yes	N/A
Clay	Greenway, City of	050031	Yes	N/A
Clay	Nimmons, Town of	050332	Yes	N/A
Clay	Piggott, City of[1]	050035	Yes	N/A
Clay	Rector, City of	050366	Yes	N/A
Clay	St. Francis, City of	050037	Yes	N/A
Craighead	Craighead County Unincorporated Areas [1]	050427	Yes	N/A
Craighead	Bay, City of	050045	Yes	N/A
Craighead	Black Oak, Town of	050389	Yes	N/A
Craighead	Brookland, City of	050047	Yes	N/A
Craighead	Jonesboro, City of	050048	Yes	8
Craighead	Lake City, City of	050049	Yes	N/A
Craighead	Monette, City of	050350	No	N/A
Crittenden	Crittenden County Unincorporated Areas [1]	050429	Yes	N/A
Crittenden	Anthonyville, Town of	050512	Yes	N/A
Crittenden	Clarkedale, Town of	050513	Yes	N/A
Crittenden	Crawfordsville, City of	050317	Yes	N/A
Crittenden	Earle, City of	050054	Yes	N/A
Crittenden	Edmondson, Town of	050409	Yes	N/A
Crittenden	Gilmore, Town of	050245	No	N/A
Crittenden	Horseshoe Lake, Town of	055057	Yes	N/A
Crittenden	Jennette, Town of	050514	No	N/A
Crittenden	Jericho, Town of	050515	No	N/A
Crittenden	Marion, City of	050345	Yes	N/A
Crittenden	Sunset, Town of	050476	No	N/A
Crittenden	Turrell, City of	050370	Yes	N/A
Crittenden	West Memphis, City of	050055	Yes	7
Cross	Cross County Unincorporated Areas [1]	050056	Yes	N/A
Cross	Parkin, City of	050059	Yes	N/A
Cross	Wynne, City of	050060	Yes	N/A
Greene	Greene County Unincorporated Areas [1]	050435	Yes	N/A
Greene	Oak Grove Heights, City of	050510	Yes	N/A
Greene	Paragould, City of	050085	Yes	N/A

County	Community Name	Community Identification Number (CID)	Participating Community?	CRS Rating
Arkansas Counties and Communities				
Lee	Lee County Unincorporated Areas [1]	050444	Yes	N/A
Mississippi	Mississippi County Unincorporated Areas [1]	050452	Yes	N/A
Mississippi	Bassett, Town of	050489	No	N/A
Mississippi	Birdsong, Town of	050516	No	N/A
Mississippi	Blytheville, City of[1]	050140	Yes	9
Mississippi	Burdette, Town of	050602	Yes	N/A
Mississippi	Dell, Town of	050490	No	N/A
Mississippi	Dyess, Town of	050143	Yes	N/A
Mississippi	Joiner, City of	050145	Yes	N/A
Mississippi	Keiser, City of	050146	Yes	N/A
Mississippi	Luxora, City of	050148	Yes	N/A
Mississippi	Marie, Town of	050150	No	N/A
Mississippi	Osceola, City of	050151	Yes	N/A
Mississippi	Victoria, Town of	050491	No	N/A
Mississippi	Wilson, City of	050153	No	N/A
Phillips	Phillips County Unincorporated Areas [1]	050166	Yes	N/A
Poinsett	Poinsett County Unincorporated Areas [1]	050172	Yes	N/A
Poinsett	Lepanto, City of[1]	050174	Yes	N/A
Poinsett	Marked Tree, City of	050175	Yes	N/A
Poinsett	Trumann, City of	050176	Yes	N/A
Poinsett	Tyronza, City of	050371	Yes	N/A
St. Francis	St. Francis County Unincorporated Areas [1]	050184	Yes	N/A
St. Francis	Forrest City, City of[1]	050187	Yes	N/A
St. Francis	Hughes, City of	050188	Yes	N/A
St. Francis	Madison, City of	050189	Yes	N/A
St. Francis	St. Francis County[1]	050184	Yes	N/A
St. Francis	Widener, Town of	055023	No	N/A
Missouri Counties and Communities				
Bollinger	Bollinger County Unincorporated Areas [1]	290787	Yes	N/A
Butler	Butler County Unincorporated Areas [1]	290044	Yes	N/A
Butler	Fisk, City of	290045	Yes	N/A
Dunklin	Dunklin County Unincorporated Areas [1]	290122	Yes	N/A
Dunklin	Cardwell, City of	290125	Yes	N/A
Dunklin	Holcomb, City of	290127	Yes	N/A

County	Community Name	Community Identification Number (CID)	Participating Community?	CRS Rating
Missouri Counties and Communities				
Dunklin	Kennett, City of	290129	Yes	N/A
Stoddard	Stoddard County Unincorporated Areas [1]	290845	Yes	N/A
Stoddard	Bloomfield, City of	290423	Yes	N/A
Stoddard	Dexter, City of	290424	Yes	N/A
Stoddard	Dudley, City of	290615	Yes	N/A
Stoddard	Puxico, City of	290428	Yes	N/A
Wayne	Wayne County Unincorporated Areas [1]	290449	Yes	N/A

[1] Community is located within more than one HUC8 watershed.

WATERSHED AND COMMUNITIES MAP

LOWER ST. FRANCIS (HUC 08020203)

FEMA

0 2.5 5 Miles

N W E S

County Seat
Interstate
U.S. Highway
City Limits
County Boundary
Major Reaches of Watershed
Other Waters
Large Waterbody
Watershed

Project Location

FIGURE 1

DATE: 6/27/2017

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Introduction

Flood Risk

Floods are naturally occurring phenomena that can and do happen almost anywhere. In its most basic form, a flood is an accumulation of water over normally dry area. Floods become hazardous to people and property when they inundate an area where development has occurred, causing losses. Mild flood losses may have little impact on people or property, such as damage to landscaping or the accumulation of unwanted debris. Severe flood losses can destroy buildings and crops and cause severe injuries or death.

Calculating Flood Risk

It is not enough to simply identify where flooding may occur. Even if people know where a flood might occur, they may not know the level of flood risk in that area. The most common method for determining flood risk, also referred to as vulnerability, is to identify both the probability and the consequences of flooding:

> **Flood Risk** (or Vulnerability) **= Probability x Consequences**; where
> **Probability** = the likelihood of occurrence
> **Consequences** = the **estimated** impacts associated with the occurrence on life, property, and infrastructure

The probability of a flood is the likelihood that it will occur. The probability of flooding can change based on physical, environmental, and/or engineering factors. These factors will also have an effect on the area that is impacted by the flood, increasing or decreasing the size of the affected area. The ability to assess the probability of a flood, and the level of accuracy for that assessment, are also influenced by modeling methodology advancements, better knowledge, and longer periods of record for the water body in question.

The consequences of a flood are the estimated effects associated with its occurrence. Consequences relate to human activities within an area and how a flood affects the natural and built environment. It is important that individuals and communities have an accurate and current understanding of their risk because anyone can be vulnerable to flooding. Individuals that are located outside of the Special Flood Hazard Area (SFHA) file more than 20 percent of insurance claims and receive 1/3 of disaster assistance for flooding. Having an awareness of risk can allow communities and their residents to address the potential consequences. Understanding risk can also allow for long-term development planning, opportunities for revitalization efforts, and modifications in how interaction occurs with the existing risk.

FEMA relies heavily on information and data provided at a local level for a holistic community approach to risk identification and mapping. Flood Risk Projects are focused on identifying (1) areas where current flood hazard inventory does not provide adequate detail to support local floodplain management activities, (2) mitigation interest areas that may require more detailed engineering information than currently available, and (3) determine community intent to reduce the risk throughout the watershed to assist FEMA's future investment in these project areas. Watersheds are selected for Discovery based on evaluations of flood risk, data need, availability of elevation data, regional knowledge of technical issues, identification of a community supported mitigation projects,

and/or input from the federal, state, and local partners. The status of Discovery watersheds in Arkansas is shown in Figure 1.

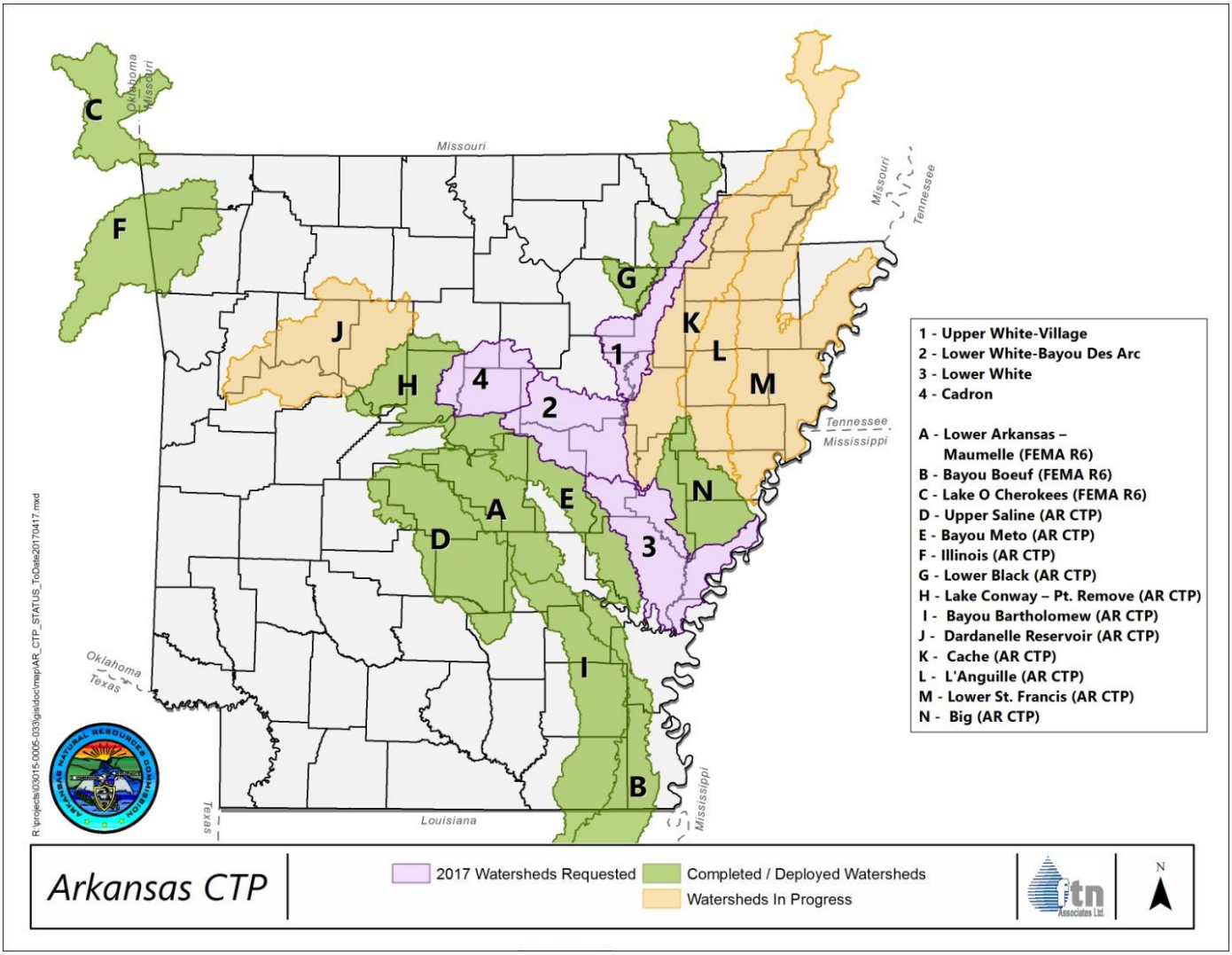


Figure 2. Arkansas CTP Discovery watershed status.

Watershed Basics

Background

The Lower St. Francis Watershed (HUC 08020203) encompasses an area of approximately 3,024 square miles and extends across ten counties in Arkansas (Clay, Craighead, Crittenden, Cross, Greene, Lee, Mississippi, Phillips, Poinsett, and St. Francis) and three counties in Missouri (Butler, Dunklin, and Stoddard) in the northeastern portion of Arkansas and southeast portion of Missouri between the St. Francis and Mississippi Rivers. The major communities in the watershed include portions of the cities of Forrest City, Jonesboro, Marion, Paragould, Trumann, and West Memphis. Smaller communities include Brookland, Earle, Osceola, and Piggott. The communities in the Lower St. Francis Watershed and their NFIP status are listed in Table 1. The watershed and its communities are shown on Figure 2.

Population

According to the 2010 Census, the total population of the watershed is estimated to be 198,628 people. Populations for the counties that intersect the Lower St. Francis Watershed experienced an overall average population decrease of approximately 0.15 percent between the 2000 and 2010 censuses, although the largest population source, Craighead County, saw an average increase of approximate 1.6 percent. Since 2010, population growth has increased with the 2016 population estimate at 3.3 percent above the number reported in the 2010 census. Based on 2010 Census data, the major communities in the watershed, Jonesboro and West Memphis, had total populations of 67,627 (22,447 in the watershed) and 26,245, respectively in 2010 (see Table 2).

Watershed Land Use

The Lower St. Francis Watershed is located in northeastern Arkansas bounded on the west by Crowley's Ridge and on the east by the Mississippi River. The Lower St. Francis Watershed consists of flat, low-lying areas with numerous interconnected channels except for Crowley's Ridge, a geological ridge formation that makes up the northwestern border of the watershed. During past events, local communities have experienced flooding issues, some of which are due to localized development in and around the floodplain and while other issues are due to the nature of the watershed.

Table 2: Population and Area Characteristics [3]

Risk MAP Project	Total Population in Deployed Area (2010)	Average % Population Growth/Yr. (2000-2010)	Predicted Population * (by 2021)	Land Area (mi^2)	Developed Area	Open Water
LOWER ST. FRANCIS WATERSHED	198,628	-0.15%	490,275	3,024	3.3%	1.5%

[3] Data obtained from the U.S. Census Bureau; ESRI Demographic 5-year Projections; and National Land Cover Database

* Predicted Population by County, which may include areas outside of watershed.

National Flood Insurance Program Status and Regulation

In order to be a participant in the National Flood Insurance Program (NFIP), all interested communities must adopt and submit floodplain management ordinances that meet or exceed the minimum NFIP regulations. These regulations can be found in the Code of Federal Regulations and most of the community ordinance requirements are in Parts 59 and 60. The level of regulation depends on the level of information available and the flood hazards in the area. The levels are as follows:

- A: The Federal Emergency Management Agency (FEMA) has not provided any maps or data – 60.3(a)
- B: Community has maps with approximate A zones – 60.3(b)
- C: Community has a Flood Insurance Rate Map (FIRM) with Base Flood Elevations (BFE) – 60.3(c)
- D: Community has a FIRM with BFEs and floodways – 60.3(d)
- E: Community has a FIRM that shows coastal high hazard areas (V zones) – 60.3(e)

There are 50 communities in the watershed in Arkansas that participate in the NFIP. Of the 50 communities that participate, their level of regulations depend on the date of the effective mapping and if the community was modernized into a countywide format.

There are 12 incorporated communities in the Arkansas portion of the Lower St. Francis Watershed that are not participating in the NFIP. This means that they are not required to follow FEMA regulations; however, certain opportunities such as federal flood insurance and some forms of federal disaster assistance are not available to the residents of those areas.

Hazard Mitigation Plan

State and local governments must develop and adopt hazard mitigation plans in order to be eligible for certain types of funding. To remain eligible, communities need to update and resubmit their plans every 5 years for FEMA approval. Hazard mitigation plans are created to increase education and awareness, identify strategies for risk reduction, and identify other ways to develop long-term strategies to reduce risk and protect people and property. Two of the counties in Arkansas in the Lower St. Francis Watershed have Hazard Mitigation Plans that are complete. Lee County does not have a Hazard Mitigation Plan. Seven counties in Arkansas have plans that are in progress. The plans effectively allow for FEMA to assess hazards identified through local, state, and federal partnerships and mitigation action items that communities have identified.

Community Rating System

The Community Rating System (CRS) is a voluntary incentive-based program that recognizes and encourages community floodplain management activities that communities undertake in addition to the minimum requirements they must meet when joining the NFIP. Individuals that carry flood insurance in a community that participates in the CRS program can receive a discount on their flood insurance premium. Discounts can range from 5 to 45 percent. Three communities of the 50 Arkansas communities participating in the NFIP are participating in the CRS program. The City of West Memphis is currently rated a class 7 and therefore structures located both inside and outside of the SFHA are eligible for a 15-percent premium discount. The City of Jonesboro is currently rated a class 8 and therefore structures located both inside and outside of the SFHA are eligible for a 10-percent premium discount. The City of Blytheville is currently rated at a class 9 and therefore structures

located both inside and outside of the SFHA are eligible for a 5-percent premium discount. Table 3 depicts NFIP and CRS participation status and provides an overview of the effective flood data availability.

Table 3: NFIP and CRS Participation for Communities in Arkansas [4]

Risk MAP Project	Participating NFIP Communities/ Total Communities	Number of CRS Communities	CRS Rating Class Range	Average Years since FIRM Update (Range 1980-2011)	Level of Regulations (44 CFR 60.3)
LOWER ST. FRANCIS WATERSHED	50/60	3	7-9	10.8	CFR 60.3 (a), CFR 60.3 (b), CFR 60.3 (c), CFR 60.3 (d)

[4] Data obtained from the FEMA Community Information System

Dams and Levees

As recorded by the U.S. Army Corps of Engineers (USACE) in the National Inventory of Dams, 17 dams are within the portion of the counties that make up the Lower St. Francis Watershed. The owners and operators of the 5 dams considered high hazard are required to develop and maintain Emergency Action Plans (EAPs) to reduce the risk of loss of life and property if the dam fails. Table 4 provides the characteristics of the dams identified in the project area.

There are multiple levees within the watershed that are associated with the St. Francis River and the Mississippi River. Some are accredited while the majority is not for one reason or another. Table 5 provides the characteristics of the levees identified in the project area.

Table 4: Risk MAP Project Dam Characteristics[5]

Risk MAP Project	Total Number of Identified Dams	Number of Dams			Number of Dams Requiring EAP	Percentage of Dams without EAP (Total)	Average Years since Inspection	Average Storage (acre-feet)
		High Hazard	Significant Hazard	Low Hazard				
LOWER ST. FRANCIS WATERSHED	17	5	5	7	5	82.4%	20+	620

[5] Data obtained from the ANRC State Database and USACE National Inventory of Dams

Table 5: Risk MAP Project Levee Characteristics[6]

Levee Segment Name	Levee System Name	Flooding Source	Authorization Type	Length	USACE Inspection Rating
Big Lake, Oak Donnick and St. Francis East Levee	Big Lake and St. Francis Floodway East System	St. Francis River	USACE Constructed & Maintained	122.47	Minimally Acceptable
MO-AR Line to Mouth of St. Francis River @ MS River Levee - 46/49+60 to 218/0+00	Commerce MO - St. Francis River System	Mississippi River	USACE Constructed & Maintained	156.55	Minimally Acceptable
Inter-River Levee	Inter-River Levee System	St. Francis River	USACE Constructed & Maintained	31.13	N/A
Ditch 81 - Right Bank	St. Francis East to Big Lake West System	St. Francis River	USACE Constructed & Maintained	2.56	Unacceptable
SF River LB and RHC Little River RB in AR			USACE Constructed & Maintained	61.45	Unacceptable
St. Francis River Levee, Left Bank 0/5+00 to 15/11+00			USACE Constructed & Maintained	15.01	Unacceptable
St. Francis River Levee, Left Bank 15/11+66 to 31/42+25			USACE Constructed & Maintained	16.86	Unacceptable
St. Francis River Levee, Left Bank 26/50+00 to 43/43+00			USACE Constructed & Maintained	16.87	Unacceptable
Eight Mile Creek Levee, Right Bank 43/28+00 to 45/24+00	West Bank St. Francis Floodway System	St. Francis River	USACE Constructed & Maintained	1.92	Unacceptable
SF River WB in Craighead, Poinsett & Cross Counties			USACE Constructed & Maintained	63.1	Unacceptable
St. Francis City Levee			USACE Constructed & Maintained	1.5	Unacceptable
St. Francis River Levee, Right Bank 1/44+72 to 38/23+33			USACE Constructed & Maintained	44.22	Unacceptable
St. Francis River Levee, Right Bank 38/23+33 to 45/13+00			USACE Constructed & Maintained	6.94	Unacceptable

[6] Data obtained from the USACE National Levee Inventory

Flood Insurance Rate Maps

The average age of the effective FIRMs within the Lower St. Francis Watershed is over 10 years. The oldest effective maps are for the City of Wynne, which are 37 years old and have an effective date of August 15, 1980. The newest FIRMs are dated August 3, 2016, for Clay County.

Project Phases and Map Maintenance

Background

FEMA manages several risk analysis programs, including Flood Hazard Mapping, National Dam Safety, the Earthquake Safety Program, Multi-Hazard Mitigation Planning, and the Risk Assessment Program, all of which assess the impact of natural hazards and lead to effective strategies for reducing risk. These programs support the Department of Homeland Security's objective to "strengthen nationwide preparedness and mitigation against natural disasters."

Flood-related damage between 1980 and 2013 totaled $260 billion, but the total impact to our Nation was far greater—more people lose their lives annually from flooding than any other natural hazard.

FEMA, "Federal Flood Risk Management Standard (FFRMS)" (2015)

FEMA manages the NFIP, which is the cornerstone of the national strategy for preparing American communities for flood hazards. In the nation's comprehensive emergency management framework, the analysis and awareness of natural hazard risk remains challenging. A consistent risk-based assessment approach and a robust communication system are critical tools to ensure a community's ability to make informed risk management decisions and take mitigation actions. Flood hazard mapping is a basic and vital component for a prepared and resilient nation.

In Fiscal Year 2009, FEMA's Risk MAP program began to synergize the efforts of federal, state, and local partners to create timely, viable, and credible information identifying natural hazard risks. The intent of the Risk MAP program is to share resources to identify the natural hazard risks a community faces and ascertain possible approaches to minimizing them. Risk MAP aims to provide technically sound flood hazard information to be used in the following ways:

- To update the regulatory flood hazard inventory depicted on FIRMs and the National Flood Hazard Layer
- To provide broad releases of data to expand the identification of flood risk (flood depth grids, water-surface elevation grids, etc.)
- To support sound local floodplain management decisions
- To identify opportunities to mitigate long-term risk across the nation's watersheds

How are FEMA's Flood Hazard Maps Maintained?

FEMA's flood hazard inventory is updated through several types of revisions.

Community-submitted Letters of Map Change. First and foremost, FEMA relies heavily on the local communities that participate in the NFIP to carry out the program's minimum requirements. These requirements include the obligation for communities to notify FEMA of changing flood hazard information and to submit the technical support data needed to update the FIRMs.

Under the current minimum NFIP regulations, a participating community commits to notifying FEMA if changes take place that will affect an effective FIRM no later than 6 months after project completion.

Section 65.3, Code of Federal Regulations

Although revisions may be requested at any time to change information on a FIRM, FEMA generally will not revise an effective map unless the changes involve modifications to SFHAs. Be aware that the best floodplain management practices and proper assessments of risk result when the flood hazard maps present information that accurately reflects current conditions.

Letters of Map Amendment (LOMAs). The scale of an effective FIRM does not always provide the information required for a site-specific analysis of a property's flood risk. FEMA's LOMA process provides homeowners with an official determination on the relation of their lot or structure to the SFHA. Requesting a LOMA may require a homeowner to work with a surveyor or engineering professional to collect site-specific information related to the structure's elevation; it may also require the determination of a site-specific BFE. Fees are associated with collecting the survey data and developing a site-specific BFE. Local surveying and engineering professionals usually provide an Elevation Certificate to the homeowner, who can use it to request a LOMA. A successful LOMA may remove the federal mandatory purchase requirement for flood insurance, but lending companies may still require flood insurance if they believe the structure is at risk.

FEMA-Initiated Flood Risk Project. Each year, FEMA initiates a number of Flood Risk Projects to create or revise flood hazard maps. Because of funding constraints, FEMA can study or restudy only a limited number of communities, counties, or watersheds each year. As a result, FEMA prioritizes study needs based on a cost-benefit approach whereby the highest priority is given to studies of areas where development has increased and the existing flood hazard data has been superseded by information based on newer technology or changes to the flooding extent. FEMA understands communities require products that reflect current flood hazard conditions to best communicate risk and implement effective floodplain management.

Flood Risk Projects may be delivered by FEMA or one of its Cooperating Technical Partners (CTPs). The CTP initiative is an innovative program created to foster partnerships between FEMA and participating NFIP communities, as well as regional and state agencies. Qualified partners collaborate in maintaining up-to-date flood maps. In FEMA Region 6, which includes the State of Arkansas, CTPs are generally statewide agencies that house the State Floodplain Administrator. However, some Region 6 CTPs are also large River Authorities or Flood Control Districts. They provide enhanced coordination with local, state, and federal entities, engage community officials and technical staff, and provide updated technical information that informs the national flood hazard inventory.

Risk MAP has modified FEMA's project investment strategy from a single investment by fiscal year to a multi-year phased investment, which allows the Agency to be more flexible and responsive to the findings of the project as it moves through the project lifecycle. Flood Risk Projects are funded and completed in phases.

General Flood Risk Project Phases

Each phase of the Flood Risk Project provides both FEMA and its partner communities with an opportunity to discuss the data that has been collected and to determine a path forward. Local engagement throughout each phase enhances the opportunities for partnership, furthers the discussion on current and future risk, and helps identify local projects and activities to reduce long-term natural hazard risk.

Flood Risk Projects may be funded for one or more of the following phases:

- Phase Zero – Investment
- Phase One – Discovery
- Phase Two – Risk Identification and Assessment
- Phase Three – Regulatory Product Update

Local input is critical throughout each phase of a Flood Risk Project. More details about the tasks and objectives of each phase are included below.

Phase Zero: Investment

Phase Zero of a Flood Risk Project initiates FEMA's review and assessment of the inventories of flood hazards and other natural hazards within a watershed area. During the Investment Phase, FEMA reviews the availability of information to assess the current floodplain inventory. FEMA maintains several data systems to perform watershed assessments and selects watersheds for a deeper review of available data and potential investment tasks based on the following factors:

Availability of High-Quality Ground Elevation Data. FEMA reviews readily available and recently acquired ground elevation data. This information helps identify development and earth-moving activities near streams and rivers. Where necessary, FEMA may partner with local, state, and other federal entities to collect necessary ground elevation information within a watershed.

If high-quality ground elevation data is both available for a watershed area and compliant with FEMA's quality requirements, FEMA and its mapping partners may prepare engineering data to assess, revise, replace, or add to the current flood hazard inventory.

Mile Validation Status within Coordinated Needs Management Strategy (CNMS). FEMA uses the CNMS database to track the validity of the flood hazard information prepared for the NFIP. The CNMS database reviews 17 criteria to determine whether the flood hazard information shown on the current FIRM is still valid.

Communities may also inform and request a review or update of the inventory through the CNMS website at https://msc.fema.gov/cnms/. The CNMS Tool Tutorial provides an overview of the online tool and explains how to submit requests.

Local Hazard Mitigation Plans. Reviewing current and historic hazard mitigation plans provides an understanding of a community's comprehension of its flood risk and other natural hazard risks. The mitigation strategies within a local hazard mitigation plan provide a lens to local opportunities and underscore a potential for local adoption of higher standards related to development or other actions to reduce long-term risk.

Cooperating Technical Partner State Business Plans. In some states, a CTP generates an annual state business plan that identifies future Flood Risk Project areas that are of interest to the state. The Arkansas Natural Resources Commission works to develop user-friendly data. In this project area, FEMA has worked closely with ANRC to develop the project scope and determine the necessary project tasks.

Communities that have identified local issues are encouraged to indicate their data needs and revision requests to the State CTP so that they can be prioritized and included in the State Business Plans.

Possible Investment Tasks. After a review of the data available within a watershed, FEMA may choose to (1) purchase ground elevation data and/or (2) create some initial engineering modeling against which to compare the current inventory, also known as Base Level Engineering (BLE) modeling.

Phase One: Discovery

Phase One, the Discovery Phase, provides opportunities both internally (between the state and FEMA) and externally (with communities and other partners interested in flood potential) to discuss local issues with flooding and examine possibilities for mitigation action. This effort is made to determine where communities currently are with their examination of natural hazard risk throughout their community and to identify how state and federal support can assist communities in achieving their goals.

The Discovery process includes an opportunity for local communities to provide information about their concerns related to natural hazard risks. Communities may continue to inform the project identification effort by providing previously prepared survey data, as-built stream crossing information, and engineering information.

For a holistic community approach to risk identification and mapping, FEMA relies heavily on the information and data provided at the local level. Flood Risk Projects are focused on identifying (1) areas where the current flood hazard inventory does not provide adequate detail to support local floodplain management activities, (2) areas of mitigation interest that may require more detailed engineering information than is currently available, and (3) community intent to reduce the risk throughout the watershed to assist FEMA's future investment in these project areas. Watersheds are selected for Discovery based on these evaluations of flood risk, data needs, availability of elevation data, Regional knowledge of technical issues, identification of a community-supported mitigation project, and input from federal, state, and local partners.

Possible Discovery Tasks. Discovery may include a mix of interactive webinar sessions, conference calls, informational tutorials, and in-person meetings to reach out to and engage with communities for input. Data collection, interviews, and interaction with community staff and data-mining activities provide the basis for watershed-, community-, and stream-level reviews to determine potential projects that may benefit the communities. A range of analysis approaches are available to determine the extent of flood risk along streams of concern. FEMA and its mapping partners will work closely with communities to determine the appropriate analysis approach, based on the data needs throughout the community. These potential projects may include local training sessions, data development activities, outreach support to local communities wanting to step up their efforts, or the development of flood risk datasets within areas of concern to allow a more in-depth discussion of risk.

Phase Two: Risk Identification and Assessment

Phase Two (Risk Identification and Assessment) continues the risk awareness discussion with communities through watershed analysis and assessment. Analyses are prepared to review the effects of physical and meteorological changes within the project watershed. The new or updated analysis provides an opportunity to identify how development has affected the amount of stormwater generated during a range of storm probabilities and shows how effectively stormwater is transported through communities in the watershed.

Coordination with a community's technical staff during engineering and model development allows FEMA and its mapping partners to include local knowledge, based on actual on-the- ground experience, when selecting modeling parameters.

The information prepared and released during Phase Two is intended to promote better local understanding of the existing flood risk by allowing community officials to review the variability of the risk throughout their community. As FEMA strives to support community-identified mitigation actions, it also looks to increase the effectiveness of community floodplain management and planning practices, including local hazard mitigation planning, participation in the NFIP, use of actions identified in the CRS Manual, risk reduction strategies for repetitive loss and severe repetitive loss properties, and the adoption of stricter standards and building codes.

FEMA is eager to work closely with communities and technical staff to determine the current flood risk in the watershed. During the Risk Identification and Assessment phase, FEMA would like to be alerted to any community concerns related to the floodplain mapping and analysis approaches being taken. During this phase, FEMA can engage with communities and review the analysis and results in depth.

Possible Risk Identification and Assessment Tasks. Phase Two may include a mixture of interactive webinars, conference calls, informational tutorials, and in-person meetings to reach out to and engage with communities for input. Flood Risk Project tasks may include hydrologic or hydraulic engineering analysis and modeling, floodplain mapping, risk assessments using Hazus-Multi Hazard software, and preparation of flood risk datasets (water-surface elevation, flood depth, or other analysis grids). Additionally, projects may include local training sessions, data development activities, outreach support to local communities that want to step up their efforts, or the development of flood risk datasets within areas of concern to allow a more in-depth discussion of risk.

Phase Three: Regulatory Products Update

If the analysis prepared in the previous Flood Risk Project phases indicates that physical or meteorological changes in the watershed have significantly changed the flood risk since the last FIRM was printed, FEMA will initiate the update of the regulatory products that communities use for local floodplain management and NFIP activities.

Delivery of the preliminary FIRM and Flood Insurance Study (FIS) report begins another period of coordination between community officials and FEMA to discuss the required statutory and regulatory steps both parties will perform before the preliminary FIRM and FIS report can become effective. As in the previous phases, FEMA and its mapping partners will engage with communities through a variety of conference calls, webinars, and in-person meetings.

Once the preliminary FIRMs are prepared and released to communities, FEMA will initiate the statutory portions of the regulatory product update. FEMA will coordinate a Consultation Coordination Officer meeting and initiate a 90-day comment and appeal period. During this appeal period, local developers and residents may coordinate the submittal of their comments and appeals through their community officials to FEMA for review and consideration.

FEMA welcomes this information because additional proven scientific and technical information increases the accuracy of the mapping products and better reflects the community's flood hazards identified on the FIRMs.

Communities may host or hold Open House meetings for the public. The Open House layout allows attendees to move at their own pace through several stations, collecting information in their own time. This format allows residents to receive one-on-one assistance and ask questions pertinent to their situations or their interests in risk or flood insurance information.

All appeals and comments received during the statutory 90-day Appeal Period, including the community's written opinion, will be reviewed by FEMA to determine the validity of the appeal. Once FEMA issues the appeal resolution, the associated community and all appellants will receive an appeal resolution letter and FEMA will revise the preliminary FIRM if warranted. A 30-day period is provided for review and comment on successful appeals. Once all appeals and comments are resolved, the flood map is ready to be finalized.

After the Appeal Period, FEMA will send community leaders a Letter of Final Determination stating that the preliminary FIRM will become effective in 6 months. The letter also discusses the actions each affected community participating in the NFIP must take to remain in good standing in the NFIP.

After the preceding steps are complete and the 6-month compliance period ends, the FIRMs are considered effective maps and new building and flood insurance requirements become effective.

That is a brief general overview of a Flood Risk Project. Next, the Flood Risk Report will provide details on the efforts in the Lower St. Francis Watershed.

Phase Zero: Investment

The Lower St. Francis Watershed (HUC 08020203) encompasses an area of approximately 3,024 square miles and extends across ten counties in Arkansas (Clay, Craighead, Crittenden, Cross, Greene, Lee, Mississippi, Phillips, Poinsett, and St. Francis) and three counties in Missouri (Butler, Dunklin, and Stoddard) in the northeastern portion of Arkansas and southeast portion of Missouri between the St. Francis and Mississippi Rivers. The major communities in the watershed include portions of the cities of Forrest City, Jonesboro, Marion, Paragould, Trumann, and West Memphis. Smaller communities include Brookland, Earle, Osceola, and Piggott. The communities in the Lower St. Francis Watershed and their NFIP status are listed in Table 1. The watershed and its communities are shown on Figure 2.

The Lower St. Francis Watershed is located in northeastern Arkansas bounded on the east by Crowley's Ridge and on the west by the Mississippi River. The Lower St. Francis Watershed consists of flat, low-lying areas with numerous interconnected channels. During past events, local communities have experienced flooding issues, some of which are due to localized development in and around the floodplain and while other issues are due to the nature of the watershed.

The Lower St. Francis River is a tributary of the Mississippi River. Its largest tributaries are Gibson Bayou, Little River, and North Alligator Bayou. The Lower St. Francis River originates in southeast Missouri.

Area of Interest Selection Factors

A number of factors and criteria are reviewed for watershed selection: flood risk, age of current flood hazard data, population growth trends and potential for growth, recent flood claims, and disaster declaration history. Local data and high quality ground elevation data availability are reviewed for use in flood hazard data preparation. The Coordinated Needs Management Strategy (CNMS) database is reviewed to identify areas of large unknown and unverified mileage. The Arkansas CTP, State NFIP Coordinator, and State Hazard Mitigation Officer coordinate to identify watersheds for study by FEMA.

The Lower St. Francis Watershed was selected by the Arkansas CTP in coordination with FEMA Region 6, for the reasons summarized below.

- Topographic data developed from a Light Detection and Ranging System (LiDAR) is available throughout the watershed aiding in providing quality data.
- Within the State of Arkansas, losses in the watershed have exceeded $22.8 million from 1978 through 2017, and there are approximately 1,680 policies. These reported values include entire counties which may or may not be wholly located in the watershed.
- Cross and Lee Counties are the only counties not considered modernized. Craighead and Cross Counties have Preliminary FIRM maps dated 01/29/2010 and 06/26/2009, respectively. Mississippi, Phillips, and St. Francis Counties have countywide maps, but they are older. All of these studies were completed without quality topographic data.
- Since 2001, the Lower St. Francis Watershed has had declared federal disasters in every year except 2004, 2007, 2012, and 2013.
- The communities of Blytheville, Jonesboro, Lepanto, Marked Tree, Marion, Paragould, Trumann, West Memphis, Wynne, Crittenden County, Cross County, and Poinsett County

have multiple claims listed as BCX Claims, which are claims that occur outside the mapped floodplain. This indicates the need for additional review to determine if the effective maps are in need of update.

- Two of the ten counties in the watershed have Hazard Mitigation Plans that are approved. Seven counties have Plans that are in progress. Lee County does not have a Plan.

Flood Risk: The Lower St. Francis River and its tributaries are not strangers to flood events, with a historical record of numerous flooding events. The Lower St. Francis Watershed has historically flooded and has experienced major flooding as recently as January 2016 on its tributaries as well as the Lower St. Francis River. The recent major floods in every year since 2001, except 2004, 2007, and 2012, have illustrated the ongoing flood threat for the Lower St. Francis Watershed.

Growth Potential: Although the Lower St. Francis Watershed is largely rural in nature; it is undergoing urbanization along the Interstates 40 and 55 and US Highway 63 corridors. These locations include the areas around the cities of Jonesboro, Forrest City, and West Memphis.

Age of Current Flood Information: Cross and Lee Counties are the only counties not considered modernized. Craighead and Cross Counties have Preliminary FIRM maps dated 01/29/2010 and 06/26/2009, respectively. Mississippi, Phillips, and St. Francis Counties have countywide maps, but they are older. All of these studies were completed without quality topographic data.

Local Data Availability. The City of Jonesboro has undertaken large studies to improve drainage throughout the City. The first phase of this study was completed in 2015 with another expected to start in 2016. These studies are to provide drainage improvement concepts and plans to help alleviate future flooding events.

Additionally, Craighead County and its communities are undergoing a Phase 2 Risk Identification and Assessment project, which is currently being performed by the Arkansas CTP.

Availability of High Quality Ground Elevation Data. As a result of FEMA's efforts in teaming with other federal and state agencies, high quality ground elevation data was available for the Lower St. Francis Watershed. This data provides a great basis for hydrologic and hydraulic modeling preparation. The source and date of LiDAR coverage is included in Table 5.

Table 6. Summary of Topographic Data

Collection	Beginning and End Points of Topo Data Collection	New/Existing OR Leveraged	Accuracy & Year Acquired	Source/ Data Vendor	Contact Information	Use Restrictions
2014 AR-MO LIDAR Project	2013 - 2015	Existing	QL2 (Vert. Acc. 9.25 cm)	Public domain	USACE – St. Louis District	None
2014 Cape Girardeau-Stoddard Co. LIDAR Project	2013 - 2014	Existing	QL2 (Vert. Acc. 9.25 cm)	Public domain	The National Map / Missouri Spatial Data Information Service	None
2014 Stoddard-Mississippi Co. LIDAR Project	2014 - 2015	Existing	QL2 (Vert. Acc. 9.25 cm)	Public domain	The National Map / Missouri Spatial Data Information Service	None
2016 USACE MVS MO LIDAR Project (Butler & Ripley Cos.)	2016	Existing	QL2 (Vert. Acc. 9.25 cm)	Public domain	Missouri Spatial Data Information Service	None
2009 Duck Creek LIDAR Project	2009	Existing	QL3 (Vert. Acc. 11.8 cm)	Public domain	The National Map / Missouri Spatial Data Information Service	None
2012 Upper Black LIDAR Project	2012	Existing	QL3 (Vert. Acc. 11.8 cm)	Public domain	The National Map	None
2013 Lower St. Francis LIDAR Project	2013	Existing	QL3 (Vert. Acc. 11.8 cm)	Public domain	Arkansas GIS Office	None
2012 Dunklin County LIDAR Project	01/2012	Existing	QL3 (Vert. Acc. 11.8 cm)	Public domain	The National Map / Missouri Spatial Data Information Service	None
2012 Wappapello datasets LIDAR Project	2012	Existing	QL2 (Vert. Acc. 9.25 cm)	Public domain	Missouri Spatial Data Information Service	None
2012 FEMA/USGS Lower St. Francis River	04/2012 – 05/2012	Existing	QL3 (Vert. Acc. 11.8 cm)	Public domain	Arkansas GIS Office	None
2011 L'Anguille Watershed Area	03/2011 – 04/2011	Existing	QL2 (Vert. Acc. 9.25 cm)	Public domain	Arkansas GIS Office	None
USGS 1/3 arc-second	N/A	Existing	Unknown	Public domain	The National Map	None

Coordinated Needs Management Strategy Database Review: Coordinated Needs Management Strategy (CNMS) Database Review The CNMS database indicates the validity of FEMA's flood hazard inventory. Streams that are indicated as ***Unverified*** or ***Unknown*** in the database indicate that the information that developed the floodplain currently shown on the FIRMs is inaccessible or that a complete evaluation of the Critical and Secondary CNMS elements could not be performed. The Lower St. Francis Watershed stream coverage is not homogenous across the counties that intersect the basin. The H&H analysis behind majority of the basin flood hazard information is dated and in need of an update. The current inventory within the watershed is approximately 3,750 miles. Of this mileage 768 miles is currently considered valid, mainly due to modernized inventory. The remaining mileage is a mixture of unverified and unknown mileage indicating that more than 79.5% of the existing inventory may require further review.

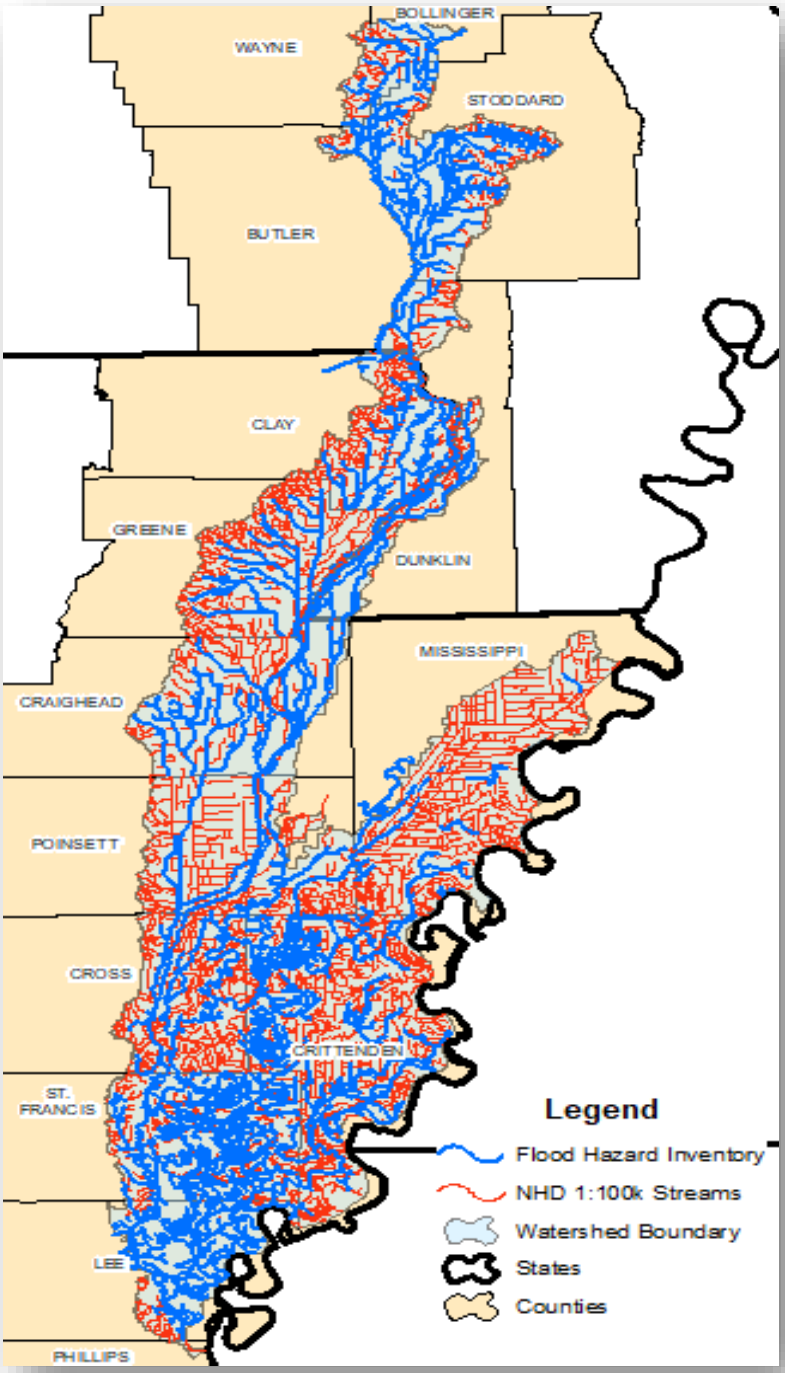


Figure 3. Flood Hazard Inventory

Unmapped Stream Coverage: FEMA and the Arkansas CTP also review the current stream coverage and compare the coverage against detailed terrain streams contributing up to 1 square mile drainage area or National Hydrography Dataset (NHD). The detailed terrain streams and NHD high resolution data inventoried by the US Geological Survey (USGS) Maps created at a 1:24,000 scale is used to review the water courses within the HUC8s of concern. The watershed as a whole is reviewed for additional mileage to be inventoried. The intent of this review is to identify streams and water courses where additional study may be required or to create a complete stream network for Base Level Engineering data preparation.

Base Level Engineering

The Arkansas CTP is coordinating with FEMA on Base Level Engineering (BLE). This approach prepares multi-profile hydrologic (how much water) and hydraulic (how is water conveyed in existing drainage) data for a large stream network or river basin to generate floodplain and other flood risk information for the basin area.

Base Level Engineering provides an opportunity for FEMA to produce and provide non-regulatory flood risk information for a large watershed area in a much shorter period of time. The data prepared in the Base Level Engineering approach provides planning level data which is prepared to meet FEMA's Standards for Floodplain Mapping.

FEMA Investment (2016). In Fiscal Year 2016, FEMA and the Arkansas CTP initiated Base Level Engineering on the Lower St. Francis HUC8 sub basin. Figure 4 shows the network of streams that is being analyzed using the Base Level Engineering approach. The Base Level Engineering approach will provide the following items for use in the Lower St. Francis Watershed:

- Hydrologic rain on grid modeling for 10%, 4%, 2%, 1%, 1-%, 1+%, and 0.2% storm events
- Hydraulic (HEC-RAS 4.1.0) modeling for all study streams using 1-Dimensional (1D) modeling techniques, and hydraulic (HEC-RAS 5.0.3) modeling for all study streams using 2-Dimensional (2D) modeling techniques.
- Floodplain boundaries, Water Surface Elevation grids, and Flood Depth Grids for all modeled storm events.
- Approximate Mapping Change layer to distinguish areas of changes between BLE and effective mapping for 1% storm event.
- Hazus flood analysis for watershed.

The Base Level Engineering approach will

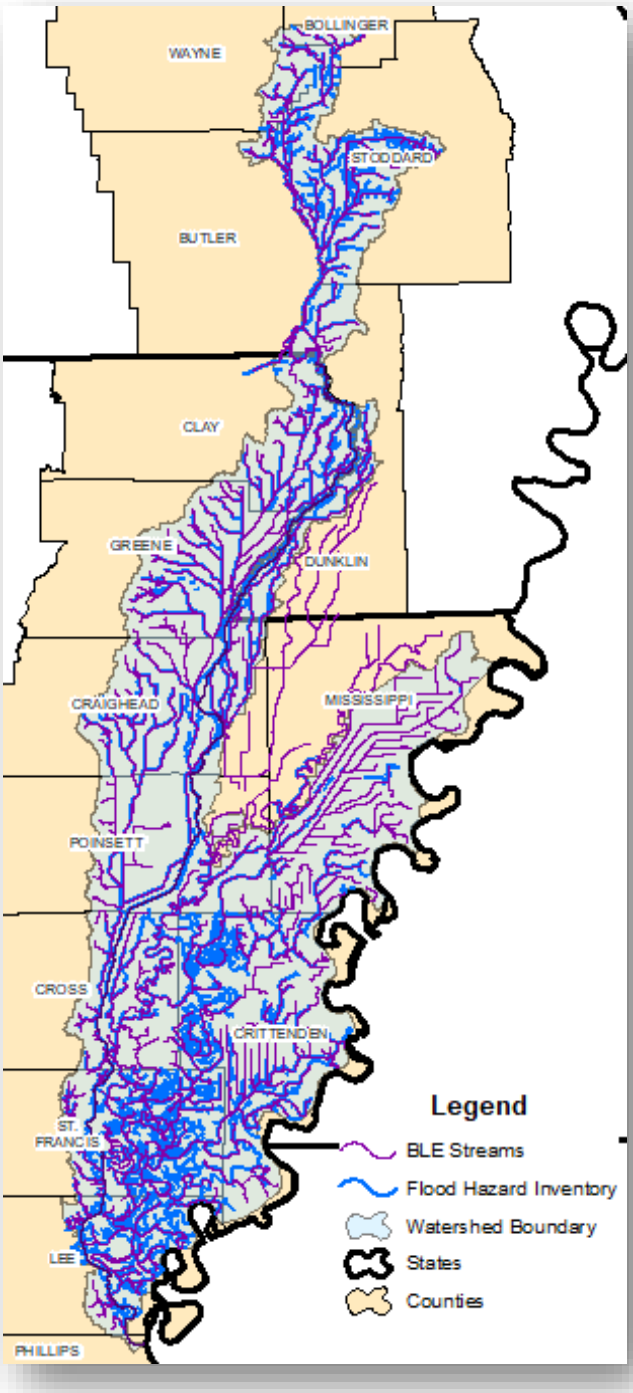


Figure 4. Base Level Engineering Study Streams

prepare flood hazard information for approximately 3,195 miles which reduces 555 stream miles in total but adds more detailed flood hazard information for communities throughout the basin. Once completed the Base Level Engineering information will be provided to the communities throughout the basin for planning, risk communication, floodplain management and permitting activities.

Creating BLE data is a cost effective way to provide communities with updated information on their flood risk. BLE provides an opportunity for FEMA to produce and provide non-regulatory flood risk information for a large watershed area in a much shorter period of time. The data prepared through BLE provides planning-level data that meets FEMA's Standards for Floodplain Mapping. This approach prepares multi-profile hydrologic (how much water) and hydraulic (how is water conveyed in existing drainage) data for a large stream network or river basin to generate floodplain and other flood risk information for the basin area. To create the BLE data, the best available information was utilized. This information included terrain data, flood discharges, and hydrologic and hydraulic analysis.

CNMS Validation and Assessment. FEMA has compared the BLE results to the current flood hazard inventory identified in the CNMS database. This assessment allows FEMA to compare the updated flood hazard information to the current effective floodplain mapping of the watershed communities. BLE results for Zone A Validation denoted no miles to be New, Validated, or Updated Engineering (NVUE) compliant.

Community Coordination. FEMA will share the BLE results with communities throughout the project area. Access to workshops and training to support the use of BLE for planning, floodplain management, permitting, and risk communication activities will be made publicly available to communities and other interested parties. FEMA will work with communities to review, interpret, and incorporate the BLE information into their daily and future community management and planning activities.

Follow-On Phase Project Decisions. The BLE results and the current inventory have been compared to identify any areas of significant change. If the results show large areas of change (expansions and contractions of the floodplain, increases and decreases of the computed BFEs, and increases in expected flow values), FEMA will continue to coordinate with the communities to identify the streams that should be considered if the FIRMs are updated.

To identify other streams for future refinement, community growth patterns and potential growth corridors should be discussed with FEMA. These areas of expected community growth and development may benefit from updated flood hazard information. BLE can be further refined to provide detailed study information for a FIRM update.

Areas of communities that were developed prior to 1970 (pre-FIRM areas) may include repetitive and severe repetitive loss properties. They may also be areas where redevelopment is likely to occur. Having updated flood hazard information before redevelopment and reconstruction activities take place may benefit communities by providing guidance to mitigate future risk.

FEMA and the Arkansas CTP will work with communities following the delivery of Base Level Engineering to identify a sub set of streams for update and inclusion on the Flood Insurance Rate Maps, if required. Communities may wish to review the possible areas and provide feedback once the BLE data has been received. Base Level Engineering information may be refined by local communities and submitted through the Letter of Map Revision process to refine existing flood hazard information and maintain the Flood Insurance Rate Maps throughout their community.

Phase One: Discovery

Pre-Discovery

As part of the CTP partnership, the ANRC and its contractor, FTN Associates, Ltd. (FTN), began the Discovery process in the Lower St. Francis Watershed (08020205) in October 2016 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. The watershed location can be seen on Figure 2.

Through the Discovery process, FEMA and the Arkansas CTP can determine which areas of the Hydrologic Unit Code (HUC) 8 (HUC-8) watersheds may be examined for further flood risk identification and assessment in a collaborative manner, taking into consideration the information collected from local communities during this process. Discovery initiates open lines of communication and relies on local involvement for productive discussions about flood risk. The process provides a forum for a watershed-wide effort to understand how the included watershed community's flood risks are related to flood risk throughout the watershed. In Risk MAP, projects are analyzed on a watershed basis, so Discovery Meetings target numerous stakeholders from throughout the watershed on local, regional, State, and Federal levels.

Discovery Meeting

In July 12 and July 13, 2017, the Arkansas CTP held Discovery Meetings in this watershed to discuss the Discovery process and where the communities can go from there with future studies. The Discovery meeting provided an opportunity to present the BLE results to the communities and how they could be used for future planning, risk communication, floodplain management, and permitting activities. At the meeting the communities were provided with digital copies of this Flood Risk Report, the modeling files for all of the BLE studied streams, including the floodplain boundaries, Water Surface Elevation Grids, and Flood Depth Grids, and a short tutorial on the use of the BLE products.

The results of the Discovery process was presented as part of this Flood Risk Report, a watershed scale Discovery Map and the digital data that was gathered or developed under the fiscal year 2016 CTP Agreement, EMW-2015-CA-00143, Mapping Activity Statement (MAS) 16, between FEMA and the Arkansas CTP. During Discovery, the Arkansas CTP and FEMA reached out to local communities to:

- Gather information about local flood risk and flood hazards;
- Obtain and ultimately 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 each community to participate and assist in the development of a watershed vision.

This document includes the portion of the Flood Risk Report that describes the Discovery process and provides the results to the watershed communities. The digital data submitted with this report contains correspondence, exhibits to be used at the Discovery meetings, GIS data, mapping documents (PDF, shapefiles, personal geodatabases and ESRI ArcGIS 10.x Map Exchange Documents [MXDs]), or other supplemental information. Graphics in this Pre-Discovery report are available as larger format graphics files for printing and as GIS data that may be printed and used at any map scale.

Watershed Findings

Engineering review of community comments:

At the Discovery meeting, Risk MAP Action Surveys were provided to each community in attendance so that general information and concerns about each community could be provided back to the Arkansas CTP. For those that did not attend the Discovery Meeting, Risk MAP Action Surveys were distributed via mail to the leaders of each community, with additional notices being distributed to secondary points of contact. Out of the 60 communities located within the watershed in Arkansas, only 10 were returned for engineering review. From the information provided, most communities are very proactive with purchasing equipment and improving structures to address localized drainage needs. A brief summary of the findings is summarized below:

As part of a the BLE projects associated with this watershed, it is noted that the effective mapping in many areas does not reflect what the BLE mapping is showing. It appears from review of the BLE mapping, it would be beneficial to the communities in areas that have not been modernized to be updated with the better information.

Poinsett County has performed localized maintenance (improve structures, clean ditches, remove debris) to improve local drainage. Additionally, they have identified an area of concern. Around Payneway along Highway 14 and Interstate 555 experiences flooding, and the County mentions if the levee along the St. Francis River was extended further downstream, then the issue of flooding would be significantly reduced. A levee analysis could be a future course of action.

The City of Jonesboro is working to perform an updated drainage study for the City, as its maps are outdated and do not appear to reflect the accurate risk. This project started from past Map Modernization efforts in Craighead County.

The City of Earle provided the following areas as points of concern due to flooding. From review many of these appear to be localized drainage issues, possibly due to inadequate storm sewer capacities, or simply localized low areas.

- Cartwright Street from Bailey to Patterson
- 3rd Street from Commerce to Central
- Applo Acre subdivision: Shephard St, Shirra Ave, Armstrong St
- At the city park around Desha and Tennessee Street
- Bailey Street from 2nd to 3rd Street
- Barton and 2nd Street intersection
- Main and Exchange Street intersection
- Park and 2nd Street intersection

The City of West Memphis provided the area around Oliver Avenue (East of the intersection with Avalon Street) as a point of concern due to flooding. From review of the BLE data, the new information shows an increased floodplain extent in this area.

Hydrology: The review of hydrologic data was limited to Base Level Engineering hydrologic processing which includes Peak Discharges and partial gage analysis in the watershed. The 1-percent–annual-chance peak discharge data for Base Level Engineering analysis for the entire watershed was reviewed for any anomalies. Development, sinks, and flood control structures were noted to determine if they had an impact on the hydrology flows. Available gage information for the entire watershed was also reviewed and compared to the Base Level Engineering hydrology, when possible to identify discrepancies and possible anomalies stemming from outdated, overestimated, or underestimated sub-basin analyses.

Hydraulics and floodplain analysis: Base Level Engineering was conducted for this watershed. As a result, CNMS evaluations were conducted to compare the effective mapping to new mapping. The effective mapping was assembled from current National Flood Hazard Layer (modernized counties) and Q3 floodplain mapping data (non-modernized areas). Some noteworthy obstacles observed include the fact that the Zone A floodplains do not match between most of the community and county boundaries, and there are discrepancies on the mapping for the 0.2% annual-chance-events throughout the watershed.

CNMS Concerns within the Watershed: It is important to note that for the watershed as a whole, most of the CNMS streams are considered unverified. Comparisons of the effective mapping to the draft Base Level Engineering results showed that the effective mapping should be revised based on better source data and processes. The three main concerns found in the area were non-digital FIRMs, vast areas of Unknown approximate studies which were not backed by technical data, and some communities that contained zero miles of detailed studies.

Non-digital FIRMs: Craighead County, Cross County, Lee County, and St. Francis County in Arkansas and Bollinger County, Dunklin County, and Stoddard County in Missouri.

Unknown Approximate Studies: Clay County, Craighead County, Crittenden County, Cross County, Greene County, Lee County, Mississippi County, Phillips County, Poinsett County, and St. Francis County in Arkansas and Bollinger County, Butler County, Dunklin County, Stoddard County, and Wayne County in Missouri.

Zero Miles of Detailed Study: Cross County (complete area). There are other parts of individual communities that do not have detail study streams within their jurisdictions.

Discovery Wrap-Up Meeting

At present, the Arkansas CTP plans to hold the Wrap-Up Meeting in association with additional advanced Base Level Engineering training throughout the area. A summary of the findings will be presented at those meeting opportunities.

Future Investments for Refinement

Watershed-wide Recommendations:

Based on comments from Poinsett County representatives, performing a more detailed analysis along the St. Francis River to examine if structural measures (levee, channel improvements, etc.) may be beneficial and feasible should be considered as a future possibility.

County-specific Recommendations:

Cross County, Lee County, and St. Francis County have non-modernized FIRMs. One goal of the Arkansas CTP is to update all non-modernized FIRMs. Once a county has been covered by Discovery and Base Level Engineering projects, it is recommended to move to Phase 2 or 3 to produce a modernized and digital FIRM with Flood Risk Products.

Currently, Craighead County is going through a Phase 2 countywide study to address existing mapping issues. This includes the City of Bay and should include, as it is completed and updated to FEMA standards, the City of Jonesboro Drainage Study.

Clay County, Crittenden County, Greene County, Mississippi County, and Poinsett County have modernized FIRMs. However, those studies were conducted on lesser detailed terrain data, and as such could be revised as well.

City/Town-specific Recommendations:

There are multiple communities and /or unincorporated areas that have no or only minor amounts detailed studies within their boundaries. It is recommended that for areas of need (population sources, possible development areas, etc) detailed studies be evaluated based on the community need and desire.

Phase Two: Risk Identification and Assessment

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Two project in this watershed.

During the Risk Identification and Assessment Phase of a project, engineering modeling and analysis is refined to further enhance the identification of flood risk. Existing modeling has been updated using a more detailed methodology for calculating the amount of water (hydrology) expected during a storm event, plus additional detail and gage analysis.

Hydraulic models include additional refinement to the cross sections and stream crossings (Figure 5) that may restrict flow in larger events, and the channel and structure information in existing models could be improved based on field surveys.

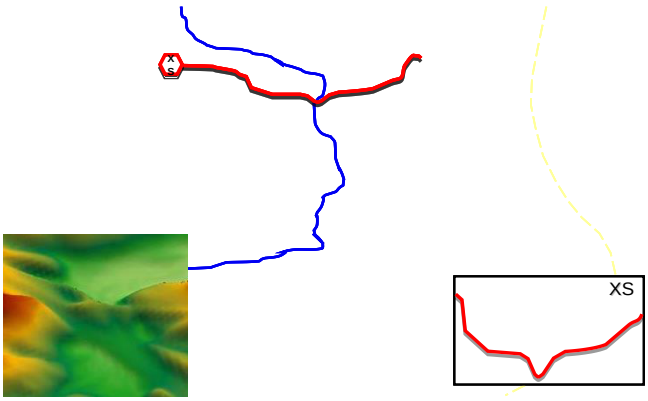


Figure 5. Hydraulic Cross-Section

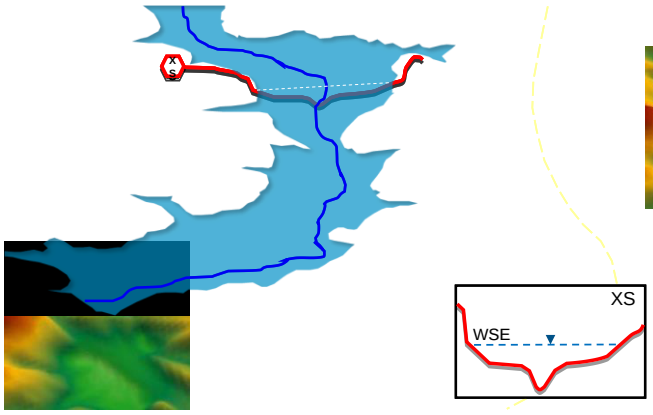


Figure 6. Floodplain Mapping of Peak Water Surface Elevation

Engineering modeling applies the flow volume calculated for a certain storm interval and places that water into the natural channel described in the hydraulic software. As tributaries and other drainage features are added to the main stream, the flow volume increases downstream. The modeling calculates the peak water-surface elevation (Figure 6) determined at each cross section, and these peak values are graphically described in a profile. The peak values are then mapped on ground elevation information to produce a floodplain delineation that identifies the expected flood extent during the analyzed storm event.

These models have been used to produce a range of flood risk datasets that describe the variability of flooding within the delineated floodplain. These flood risk datasets include:

- **Water-Surface Elevation Grid –** This two-dimensional grid describes the water-surface elevation and profile for the length of the study area. Interpolated values are produced between each analyzed cross section.
- **Flood Depth Grid –** This grid provides an estimated flood depth at any location within the floodplain, allowing the variability of flood depth to be better represented for the stream channel and the floodplain areas.
- **Annual Percent Chance Grid –** This grid is produced using statistical analysis to describe multiple percentages of the chance of flooding within the determined floodplain.
- **30-Year Percent Chance Grid –** Further statistical methodology is used to determine the percent chance of flooding within a 30-year window. The 30-year window was chosen because a 30-year period is common for home mortgages.
- **Changes Since Last FIRM –** This polygon file identifies each location where modifications are identified by the revised and updated hydrologic and hydraulic analysis. Areas where floodplain widths increase/decrease, areas where floodway widths increase/decrease, and areas where flood zones have been modified are identifiable within this layer.

This phase of the project benefits greatly from community interaction and coordination with local technical and operations staff, providing an opportunity for FEMA and its mapping partners to engage local knowledge as the modeling is prepared. FEMA and the Arkansas CTP would like to work

closely with communities to identify areas where the modeling and floodplain mapping may not agree with on the ground accounts of flooding equivalent to the 1% annual chance storm event. FEMA and the Arkansas CTP would like to use this phase to review community comments and include any available technical information prior to proceeding to the update of the Regulatory products (FIRM, FIS and DFIRM database).

The following information will be added during any Phase 2 project that may be completed in the future.

Flood Risk Review Meeting

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Two project in this watershed.

Flood Risk Review Meetings are scheduled for XXXX, 20XX. The first formal sharing of the modeling and mapping updates occurs at the Flood Risk Review Meeting. At this meeting, FEMA intends to continue community coordination efforts and discussions with a variety of watershed partners to review the effects of physical and meteorological changes within the project area.

The FEMA team remains focused on reviewing the identification of flood and other natural hazard risks, areas where modifications in the flood delineations have been identified, and changes in risk assessment, working with community and technical staff throughout the analysis/assessment processes.

The team will deliver the Phase Two (Data and Engineering) data:

- Hydrological Analysis
- Hydraulic Analysis
- Resultant BLE data

The objectives of the Flood Risk Review meeting include:

- Promote local buy-in of analysis/study results
- Review Risk Identification (engineering) results with local communities
- Review the hazard mitigation plan, compared to the study findings
- Identify risk communication needs and options
- Support identified community-driven mitigation actions
- Identify and/or resolve community comments and appeals before the regulatory products are issued
- Solicit community input on results and promote buy-in of analyses prior to moving forward
- Continue developing relationships with communities

The new analysis and products will be delivered to communities in advance of this meeting, so communities will have the chance to review and assess the modeling and mapping results prior to the in-person meeting.

FEMA would like to work with communities at each project milestone to identify and address any technical concerns with the modeling results. Because this phase of the timeline is less rigid than the statutory and regulatory timelines in Phase Three, FEMA can

work more closely and intimately with the communities to review and address their concerns.

Next Steps

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Two project in this watershed.

Once the analysis is completed, FEMA will review the areas of change before determining if a project will move forward to update the regulatory products (FIS report, FIRM, and DFIRM database). A cursory review of the modeling results indicates that this study area has significant changes in floodplain width and depth.

FEMA will work with communities after delivering the hydrologic and hydraulic analysis and floodplain work maps to collect any outstanding technical inquiries within the study area. After coordinating with communities, FEMA will likely initiate the Phase Three effort to update the regulatory products.

Potential Community Activities

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Two project in this watershed.

The availability of updated flood risk information provides the community a chance to review a range of possible actions that may be taken. Some possible community activities are identified below for consideration:

Stream Specific Recommendations: This section may be expanded at a later date.

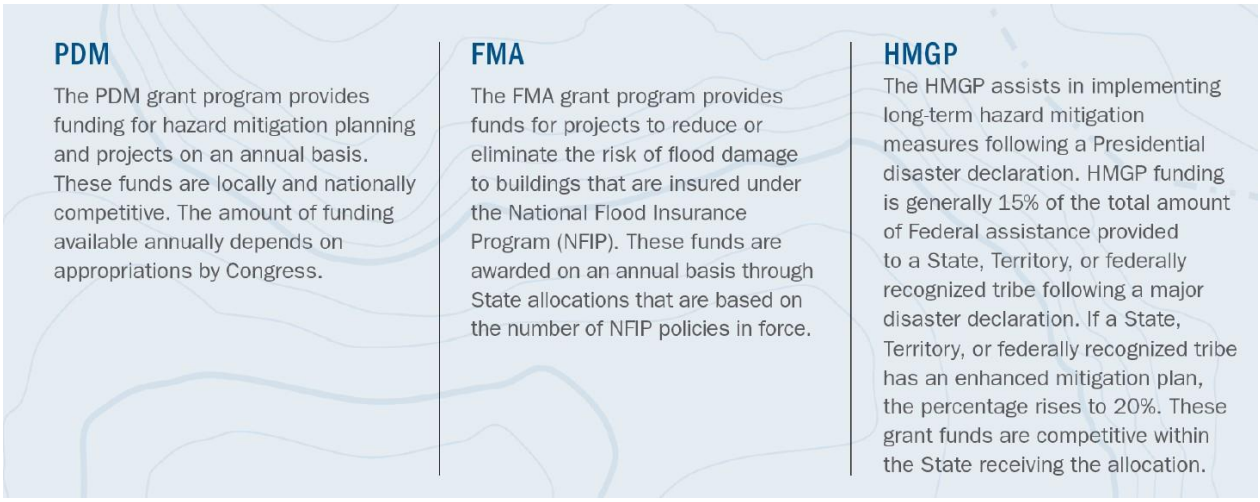
Local Hazard Mitigation Plan (Hazard Profile): The updated flood risk information provides an opportunity to review local hazard mitigation plans. The flood risk profile, hazard extent, and vulnerability assessment may be refined based on the Changes Since Last FIRM, water-surface elevation grids, flood depth grids, and percent annual chance grids. Communities should reconvene their Mitigation Plan Steering Committee to identify how these narrative sections should be refined with the additional information.

Local Hazard Mitigation Plans help to:

- Protect public safety
- Prevent damage to community assets
- Reduce costs of disaster response and recovery
- Improve community capabilities
- Create safer, more sustainable development

Local Hazard Mitigation Plan (Mitigation Strategies): Communities may review community assets, critical facilities, and other vulnerable areas within a community to identify or refine the mitigation strategies and locate future mitigation projects to reduce long-term natural hazard risk throughout the community. FEMA's publication Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards may provide some strategies and projects for the local Mitigation Plan Steering Committee to review.

Mitigation Project Scope Preparation: Each year, communities may apply for various FEMA Hazard Mitigation Assistance (HMA) grants available for implementing mitigation actions. Communities may review their critical mitigation needs and opt to prepare project submittals for one of the grant opportunities FEMA offers.



These HMA Grant Programs are managed by the State of Arkansas (grantee), which has the primary responsibility for selecting and administering the mitigation activities throughout the state. Individuals are not eligible to apply directly for HMA funds; however, communities may act as an eligible applicant or sub-applicant to apply for funding on behalf of individuals.

For specific information on available HMA grant funding and current project priorities in Arkansas, please contact the appropriate state agency.

FMA, HMGP, and PDM Grant Programs
Arkansas Department of Emergency Management

Lacye Blake
Lacye.Blake@adem.arkansas.gov
(501) 683-6700

Arkansas Natural Resources Commission Management

Veronica Villalobos-Pogue
Veronica.Villalobos-Pogue@arkansas.gov
(501) 683-6700

Community Rating System (CRS): The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Communities interested in the CRS program may contact their FEMA Region 6 CRS Coordinator or the State of Arkansas CRS Coordinator.

FEMA CRS Programs
FEMA Region 6
Mark Lujan
mark.lujan@fema.dhs.gov
(940) 383-7327

Arkansas CRS Programs
Arkansas Natural Resources Commission
Whitney Montague
whitney.montague@arkansas.gov
(501) 682-1611

Adoption of Higher Standards: Community participation in the NFIP is voluntary. When a community joins the NFIP, it must ensure its adopted floodplain management ordinance and enforcement procedures meet NFIP requirements. NFIP minimum requirements include requiring permits for all development in the SFHA and ensuring that the construction materials and methods used will minimize future flood damage. Higher standards, such as freeboard, land use and zoning practices, and other approaches allow communities to minimize future damages within the community by using more restrictive building codes and requirements.

Risk Reduction Activities: The NFIP's CRS Coordinator's Manual identifies a number of activities that communities can undertake to reduce their long-term risk. Higher standards, land use planning, future conditions modeling, and other approaches are available for consideration.

Severe Repetitive Loss (SRL) Strategy: The primary objective of the SRL properties strategy is to eliminate or reduce the damage to residential property and the disruption to life caused by repeated flooding. The SRL Grant Program makes funding available for a variety of flood mitigation activities. Under this program, FEMA provides funds to state and local governments to assist NFIP-insured SRL residential property owners with mitigation projects that reduce future flood losses. Projects could include acquisition or relocation of at-risk structures and conversion of the property to open space, elevation of existing structures, or dry floodproofing for historic properties.

Public Risk Awareness and Outreach Campaigns: Communities may use the new and existing flood hazard information to develop a public information and outreach campaign for their community. Since 2010, FEMA has conducted an annual nationwide study of flood risk awareness among U.S. households. Participants overwhelmingly responded that they expect and trust flood risk information when it comes from local community officials and staff.

FEMA Region 6 has also developed the Risk Communication Guidebook for Local Officials (http://www.riskmap6.com/guidebook.aspx), which identifies a number of local communication activities. The Guidebook provides tools, templates, and resources for communities interested in developing a local outreach campaign; it is presented by Risk MAP project phases, similar to this report.

The CRS Coordinators Manual and the CRS Resources website (for Activity 300, available at http://crsresources.org/300-3) can provide additional information for communities interested in local flood hazard and risk awareness outreach campaigns.

High Water Mark (HWM) Initiative: As part of the NFIP, the HWM Initiative is a community-based program that increases residents' awareness of flood risk and encourages action to mitigate that risk.

As part of the project, communities post HWM signs in prominent places, hold a high-profile launch event to unveil the signs, conduct ongoing education to build local awareness of flood risk, and complete mitigation actions to build community resilience against future flooding.

Phase Three: Regulatory Product Update

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

During the Regulatory Product Update Phase of a Flood Risk Project, the results produced in the previous phase are used to prepare and produce three regulatory products that are produced in a county-wide manner. This phase of the project is more regimented than previous phases, there are some statutory and regulatory timelines that must be adhered to by FEMA and the communities involved in the update areas. FEMA will remain in contact with communities throughout the process.

Flood Insurance Study (FIS) Text

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

The engineering analysis results will be used to update the existing countywide FIS texts produced for communities during the Map Modernization effort. The narratives within the FIS text are updated to include specifics about the latest analysis and study effort within each county. Additionally, the Floodway Data Tables and Water Surface Elevations that provide look up information to community staff in their administration of the program are also updated to provide the most up to date information to the public and communities alike.

Flood Insurance Rate Map (FIRM) Panels

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

The revised FIRM data is based on a combination of new and existing engineering analyses of floodplain boundaries. The new engineering analysis for your county/parish is based on detailed analysis.

Detailed studies are mapped with a flood zone designation of “Zone AE”. All mileage studied by detailed methods produces a FIRM that included Base Flood Elevations (BFEs) published on the Preliminary DFIRMs. As previously described in Phase Two, studies of this nature include field surveys, hydraulic structures, modeling calibration and multiple flood frequency profiles published in the Flood Insurance Study (FIS) report delivered at Preliminary DFIRM issuance.

Some detailed mileage also includes a regulatory floodway. Floodway models are prepared to review the effect that fill or encroachment may have along a stream. Floodplain and floodway evaluations are the basis for community floodplain management programs. More information on floodway modeling is available in the Phase Two section of this report.

DFIRM Database

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

Communities receive an updated and standardized DFIRM Database which is a digital version of the FEMA flood insurance rate map designed for use with Geographic Information Systems (GIS) software.

The DFIRM Database is designed to provide the user the ability to determine the flood zone, base flood elevation and the floodway status for a particular location using its own internal GIS staff. The DFIRM database also includes data related to the NFIP community, FIRM panels, analysis cross sections and hydraulic structure information, as well as base map information like road, and stream data for reference and local use.

Letters of Map Change (LOMCs)

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

As part of the DFIRM update, the project team will review all LOMAs and LOMRs and make a determination of each case to: incorporate, revalidate/reissue or supersede the LOMAs and LOMRs, based on technical data.

The following Letters of Map Revision have been reviewed and categorized:

Case Number	Stream Name(s) & Community(ies)	Effective Date	Category
	To be completed at a later date.		

LOMAs for each county will also be reviewed in preparation for the preliminary issuance. Communities should be advised that ALL LOMAs will be included in the Preliminary Summary of Map Actions (Prelim SOMA) provided on the Preliminary release date.

Communities should review their map repositories for any Letters of Map Amendment (LOMA) or Letter of Map Revision (LOMR) within the stream areas being studied. These community files may provide additional information for historic map revisions that will assist in the review of the cases for incorporation.

Next Step: Preliminary Issuance

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

Once FEMA has received, reviewed and responded to all comments and technical data received as a result of the Flood Risk Review meeting, FEMA will prepare the preliminary FIRMs, FIS and DFIRM database for release. Preliminaries will be sent to the community Chief Executive Officer, or "CEO," and floodplain administrator, or "FPA," for an initial review.

Steps Post Preliminary Issuance

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

The post-preliminary process is initiated with the preliminary issuance of the FIRM, FIS and DFIRM Database. A number of activities will occur as highlighted in Figure 7 below.

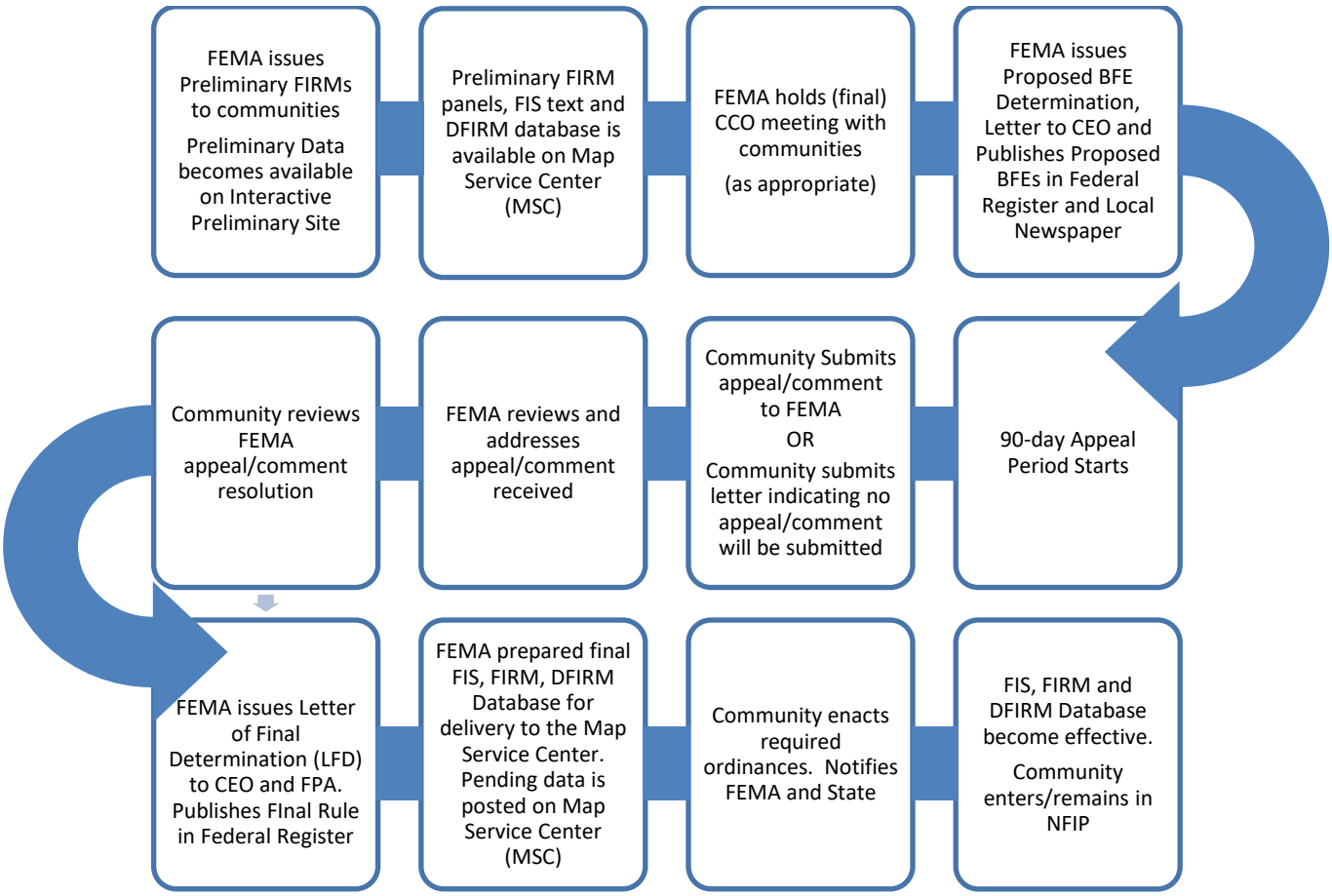


Figure 7. Post Preliminary Process

Additional information is provided for the immediate steps following preliminary issuance to provide some overview to communities prior to these activities being initiated.

Preliminary Data Available through Interactive Website. For FIRMs that are based on FEMA-contracted studies/mapping projects, Preliminary Map Viewer will be available describing information available on the site.

30-Day Community Review Period. For FIRMs that are based on FEMA-contracted studies/mapping projects, the initial community review is provided to communities. This informal review period generally lasts 30 days.

Consultation Coordination Officer (CCO) Meeting. Following the informal review of the preliminary information, FEMA holds a more formal community coordination meeting during which community officials meet with FEMA representatives.

90-Day Appeal and Comment Period Initiated: Following the CCO meeting, FEMA will issue a letter to the Community Elected Official and Local Floodplain Administrator to inform them that FEMA is moving towards the initiation of the appeal period. FEMA will work internally to publish the Proposed BFE Determination in the Federal Register and then will publish a notice in the local newspaper two times. The letter will indicate the publication date for the notice in the Federal Register and two publication dates for a local newspaper. The appeal and comment period is initiated after the second local print date and extends 90 calendar days.

During this period, community officials or citizens may appeal the proposed BFEs and/or base flood depths based on scientific or technical data. Community officials or citizens also may submit requests for changes to other information shown on the DFIRM - flood zone boundaries, regulatory floodway boundaries, road names and configurations - during the appeal period. **Communities are responsible for the collection, review and approval of appeals that are submitted during the 90-day appeal period.**

An **appeal** is a formal objection to proposed or proposed modified BFEs or base flood depths, submitted by a community official or an owner or lessee of real property within the community through the community officials during the statutory 90-day appeal period. An appeal must be based on data that show the proposed or proposed modified BFEs are scientifically or technically incorrect.

A **comment** is an objection to or comment on any information, other than proposed BFEs or base flood depths, shown on an NFIP map that is submitted by community officials or interested citizens through the community officials during the 90-day appeal period. Comments usually involve changes to items such as road locations and road names, corporate limits updates, or other base map features.

Future Physical Map Revisions

This section may be completed at a later date if the Arkansas CTP and FEMA decide to proceed with a Phase Three project in this watershed.

The release of the maps in these areas does not identify the end of coordination between the local community and FEMA. Local communities should continue their local floodplain management activities and submit Letters of Map Revision when local development alters the flood hazard in the community.

Appendix I: Community-Specific Reports

The following list depicts the county- and community-specific reports contained within this appendix.

Communities
ARKANSAS COUNTIES AND COMMUNITIES
CLAY COUNTY
Clay County Unincorporated Areas [1]
Greenway, City of
Nimmons, Town of
Piggott, City of[1]
Rector, City of
St. Francis, City of
CRAIGHEAD COUNTY
Craighead County Unincorporated Areas [1]
Bay, City of
Black Oak, Town of
Brookland, City of
Jonesboro, City of
Lake City, City of
Monette, City of
CRITTENDEN COUNTY
Crittenden County Unincorporated Areas [1]
Anthonyville, Town of
Clarkedale, Town of
Crawfordsville, City of
Earle, City of
Edmondson, Town of
Gilmore, Town of
Horseshoe Lake, Town of
Jennette, Town of
Jericho, Town of
Marion, City of
Sunset, Town of
Turrell, City of
West Memphis, City of

Communities
ARKANSAS COUNTIES AND COMMUNITIES
CROSS COUNTY
Cross County Unincorporated Areas [1]
Parkin, City of
Wynne, City of
GREENE COUNTY
Greene County Unincorporated Areas [1]
Oak Grove Heights, City of
Paragould, City of
LEE COUNTY
Lee County Unincorporated Areas [1]
MISSISSIPPI COUNTY
Mississippi County Unincorporated Areas [1]
Bassett, Town of
Birdsong, Town of
Blytheville, City of[1]
Burdette, Town of
Dell, Town of
Dyess, Town of
Joiner, City of
Keiser, City of
Luxora, City of
Marie, Town of
Osceola, City of
Victoria, Town of
Wilson, City of
PHILLIPS COUNTY
Phillips County Unincorporated Areas [1]
POINSETT COUNTY
Poinsett County Unincorporated Areas [1]
Lepanto, City of[1]
Marked Tree, City of
Trumann, City of
Tyronza, City of

Communities
ARKANSAS COUNTIES AND COMMUNITIES
ST. FRANCIS COUNTY
St. Francis County Unincorporated Areas [1]
Forrest City, City of[1]
Hughes, City of
Madison, City of
St. Francis County[1]
Widener, Town of
MISSOURI COUNTIES AND COMMUNITIES
BOLLINGER COUNTY
Bollinger County Unincorporated Areas [1]
BUTLER COUNTY
Butler County Unincorporated Areas [1]
Fisk, City of
DUNKLIN COUNTY
Dunklin County Unincorporated Areas [1]
Cardwell, City of
Holcomb, City of
Kennett, City of
STODDARD COUNTY
Stoddard County Unincorporated Areas [1]
Bloomfield, City of
Dexter, City of
Dudley, City of
Puxico, City of
WAYNE COUNTY
Wayne County Unincorporated Areas [1]

[1] Community is located within more than one HUC8 watershed.

Appendix II: Points of Contact

Watershed

Subject/Topic of Interest	Name	Contact Information
FEMA Region 6 Risk MAP Team Lead *Project Outreach*	Diane Howe Risk Analysis Branch	Phone: (940) 898-5171 Email: diane.howe@fema.dhs.gov
FEMA Project Monitor (Arkansas)	John Bourdeau Risk Analysis Branch	Phone: (940) 383-7350 Email: John.BourdeauJr@fema.dhs.gov
• Floodplain Management • Floodplain Ordinance • Community Assistance Visits • Higher Standards • Flood Insurance	Pedro Perez Floodplain Management & Insurance Branch	Phone: (940) 383-7365 Email: Pedro.Perez@fema.dhs.gov
• Community Rating System • Flood Insurance	Mark Lujan	Phone: (940) 383-7327 Email: mark.lujan@fema.dhs.gov
• How to find and read FIRMs • Letters of Map Change and Elevation Certificates • Mandatory insurance purchase guidelines/ Flood zone disputes • Map Service Center (MSC) & National Food Hazard Layer	FEMA Map Information eXchange (FMIX)	Phone: 1-877-FEMA-MAP (336-2627) Email: FEMAMapSpecialist@riskmapcds.com Live Chat: https://www.floodmaps.fema.gov/fhm/fmx_main.html

State Partners

Organization/Title	Name	Partner Location	Contact Information
Arkansas Natural Resources Commission (ANRC) State NFIP Coordinator	Michael Borengasser, CFM	101 East Capitol Ave, Suite 350 Little Rock, AR 72201	Phone: (501) 682-3969 Email: michael.borengasser@arkansas.gov Web Page: http://www.anrc.arkansas.gov/
Arkansas Department of Emergency Management State Hazard Mitigation Officer	Lacye Blake	Building 9501 Camp Joseph T. Robinson North Little Rock, AR 72199	Phone: (512) 424-5489 Email: Lacye.Blake@adem.arkansas.gov Web Page: http://www.adem.arkansas.gov/

Appendix III: Resources

Arkansas Natural Resources Commission

The Arkansas Natural Resources Commission's (ANRC) mission is to manage and protect our water and land resources for the health, safety and economic benefit of the State of Arkansas.

The ANRC has been designated by state law as the State NFIP Coordinating Agency for Arkansas. Within ANRC- Water Resources Management Division, you will find Floodplain Management, where most of the flood-related information and flood planning and mitigation grant resources reside.

Organization	Contact Information	Website
Arkansas Natural Resources Commission (ANRC)	Phone: (501) 682-1611	http://www.anrc.arkansas.gov/

Arkansas Floodplain Management Association (AFMA)

The AFMA is an organization of professionals involved in floodplain management, flood hazard mitigation, the NFIP, flood preparedness, warning, and disaster recovery. The Association includes flood hazard specialists from local, state, and federal governments, the mortgage, insurance, and research communities, and the associated fields of flood zone determination, engineering, hydraulic forecasting, emergency response, water resources, Geographic Information Systems, and others.

Organization	Website
Arkansas Floodplain Management Association (AFMA)	https://www.arkansasfloods.org/

Certified Floodplain Manager (CFM) Certification

The Association of State Floodplain Managers (ASFPM) established a national program for certifying floodplain managers. This program recognizes continuing education and professional development that enhances the knowledge and performance of local, state, federal, and private-sector floodplain management professionals.

The role of the nation's floodplain managers is expanding due to increases in disaster losses, the emphasis on mitigation to alleviate the cycle of damage-rebuild-damage, and a recognized need for professionals to adequately address these issues. This certification program will lay the foundation for ensuring that highly qualified individuals are available to meet the challenge of breaking the damage cycle and stopping its negative drain on the nation's human, financial, and natural resources.

CFM® is a registered trademark and available only to individuals certified and in good standing under the ASFPM Certified Floodplain Manager Program.

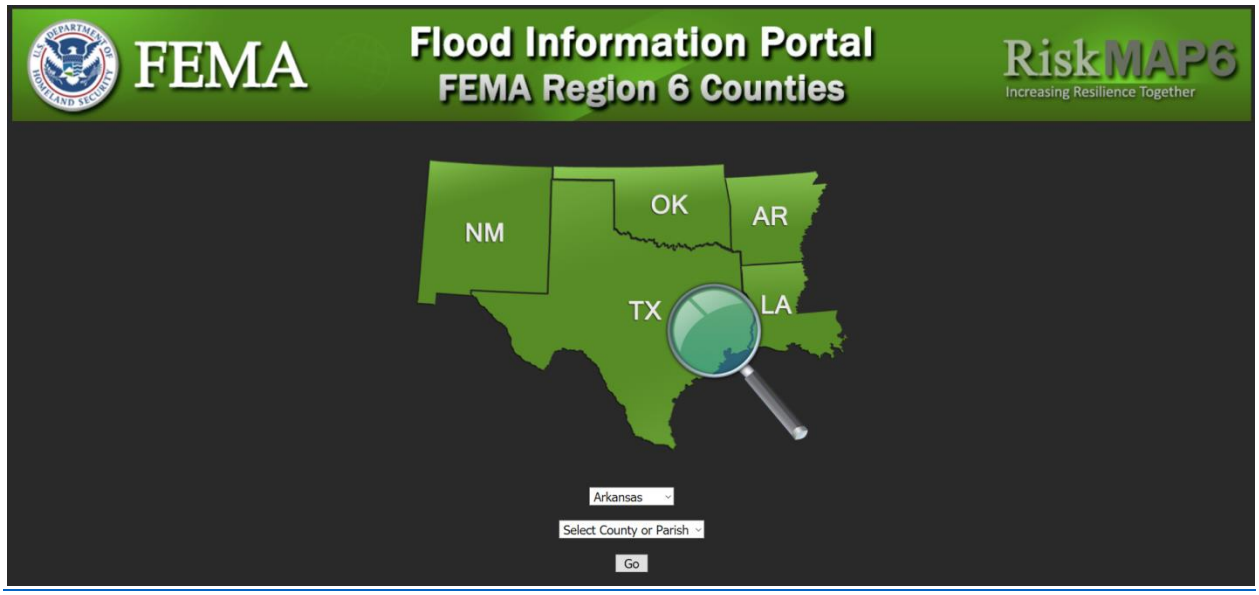
For more information, you may want to review these available CFM Awareness Videos:

- What is the CFM Program?
- Who can be a CFM?
- What are the Benefits of a CFM?

Study Materials for those interested in applying for the CFM certification can be found on the ASFPM Website at: http://www.floods.org/index.asp?menuID=215.

For information on becoming a member and the exam application process in the State of Arkansas visit https://www.arkansasfloods.org/cfm/.

Interactive Preliminary Data Viewer



To support community review of the study information and promote risk communication efforts, FEMA launched an interactive web tool accessible on-line at http://maps.RiskMAP6.com for the project areas.

Should a study be released for review, the study data may be viewed at this website.

For more information on the Interactive Preliminary Data Viewer, refer to the Region 6 Fact sheet: What is your Flood Risk?

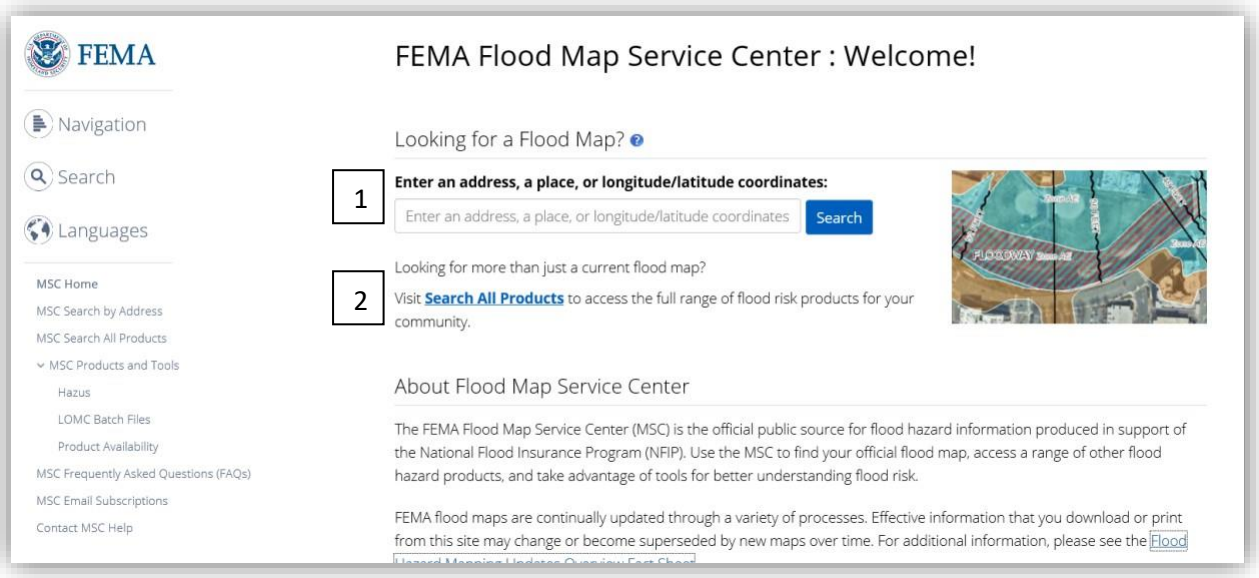
Map Service Center – Available Map Data

The FEMA Flood Map Service Center (MSC) is the official public source for flood hazard information produced in support of the NFIP. Use the MSC to find your official effective flood map, preliminary flood maps, and access a range of other flood hazard products.

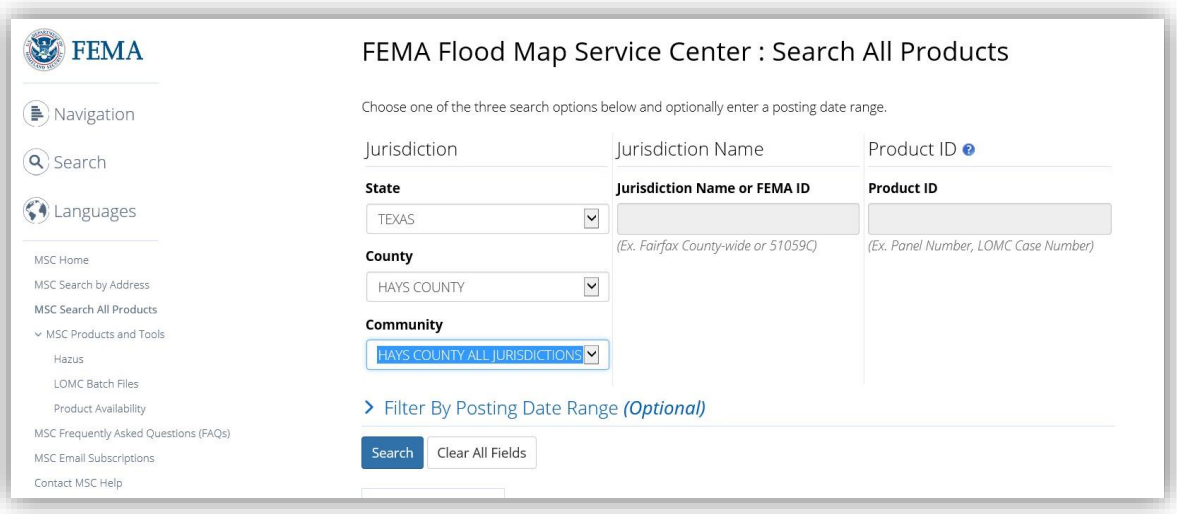
FEMA flood maps are continually updated through a variety of processes. Effective information that you download or print from this site may change or become superseded by new maps over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet.

At the MSC, there are two ways to locate flood maps in your vicinity.

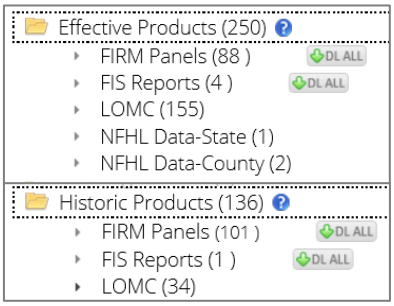
1. Enter an address, place name, or latitude/longitude coordinates and click search. This will provide the current effective FIRM panel where the location is shown.
2. Or Search All Products, which will provide access to the full range of flood risk information available.



By using the more advanced search option, “Search All Products,” users may access current, preliminary, pending, and historic flood maps. Additionally, GIS data and flood risk products may be accessed through the site with these few steps.



Using the pull down menus, select your state, county, and community of interest. For this example, we selected Hays County - All Jurisdictions. After the search button is selected, the MSC will return all items in the area. There are five types of data available.



Effective Products. The current effective FIS, FIRM, and DFIRM database (if available) is available through the MSC. If users click on the available effective products, they are presented a breakdown of the available products. FIRM panels, FIS reports, LOMRs, statewide National Flood Hazard Layer (NFHL) data, and countywide NFHL data may be available, as indicated in the breakdown on the right of the page.

Historic Products. A range of historic flood hazard maps, FIS texts, and Letters of Map Change are available through the MSC.

Flood Risk Products. The Flood Risk Report, Flood Risk Map, and

Flood Risk Database will be made available through the MSC once they have been compiled and completed. These products are made available after the flood study analysis and mapping have been reviewed and community comments incorporated.

Additional Web Resources

FLOOD MITIGATION PLANNING	http://www.adem.arkansas.gov/
NATIONAL FLOOD INSURANCE PROGRAM RESOURCES – HOW TO JOIN, SAMPLE ORDINANCES, ETC.	http://www.floodplain.ar.gov/
FLOOD GRANT PROGRAMS	http://www.adem.arkansas.gov/hazard-mitigation-grant-program http://www.floodplain.ar.gov/
FLOOD WORKSHOPS AND TRAINING SCHEDULES	http://www.floodplain.ar.gov/Conferences.html https://www.arkansasfloods.org/

City of Jonesboro

300 S. Church Street
Jonesboro, AR 72401

Legislation Details (With Text)

File #:	RES-20:031	**Version:**	1	**Name:**	
Type:	Resolution			**Status:**	To Be Introduced
File created:	2/26/2020			**In control:**	Public Works Council Committee
On agenda:				**Final action:**	
Title:	A RESOLUTION REQUESTING FREE UTILITY SERVICES FROM CITY WATER AND LIGHT FOR TRAFFIC SIGNALS				
Sponsors:	Engineering				
Indexes:					
Code sections:					
Attachments:					

Date	Ver.	Action By	Action	Result

A RESOLUTION REQUESTING FREE UTILITY SERVICES FROM CITY WATER AND LIGHT FOR TRAFFIC SIGNALS
A RESOLUTION REQUESTING FREE UTILITY SERVICES FROM CITY WATER AND LIGHT FOR TRAFFIC SIGNALS

WHEREAS, the City of Jonesboro is requesting that City Water and Light provide free utilities are the following locations:

4821 E Nettleton Avenue (Temporary Traffic Signal)
4301-B E Nettleton Avenue (Permanent Traffic Signal)

NOW THEREFORE BE IT RESOLVED BY THE CITY COUNCIL FOR THE CITY OF JONESBORO, ARKANSAS THAT:

Section 1: That City Water and Light be requested by this resolution to provide free utilities to the locations listed above.

Section 2: To permit such services to be provided without charge, the City of Jonesboro hereby affirms to City Water and Light that the ultimate use of CWL utilities so provided is now and shall remain a use or purpose which the City is engaged in as part of its governmental or proprietary functions under authority to it by state law.