SUCCESS STORIES
AN OFMA PERSPECTIVE

Janet K. Meshek, PE, CFM, SR/WA, Meshek & Associates, LLC

OFMA Past Chair

OWRB - FROM THE 2011 OKLAHOMA COMPREHENSIVE WATER PLAN

Moving forward, floodplain management cannot be based solely in a desire to comply with federal regulations. If floodplain management is undertaken only as a means to the end of making flood insurance available in a community, the opportunity to capitalize on relationships between floodplains and other aspects of water resources will never be realized, and the opportunity to mitigate the impacts of flooding on the lives of Oklahomans will be lost.

THE OKLAHOMA FLOODPLAIN MANAGEMENT ASSOCIATION (OFMA) WAS OFFICIALLY ORGANIZED IN NOVEMBER 1990, WITH THE INTENT OF BRINGING TOGETHER THOSE INDIVIDUALS WHO HAVE A COMMON INTEREST IN FLOODPLAIN MANAGEMENT.

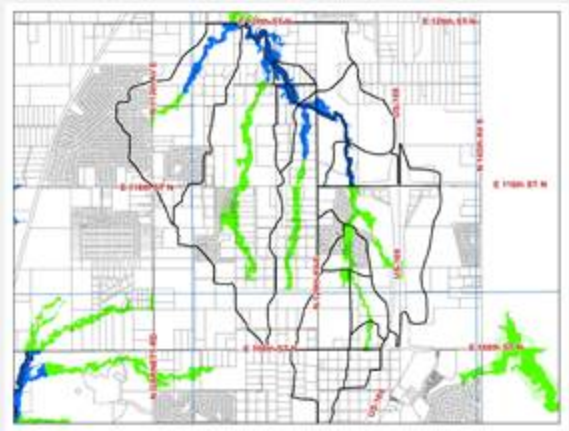
OFMA OBJECTIVES

- Promote interest in flood damage abatement
- Improve cooperation among various related local, state and federal agencies
- *Encourage innovative approaches to managing Oklahoma's floodplains*

We believe a unified membership can present one strong voice to communicate with the state legislature on flood-related issues.

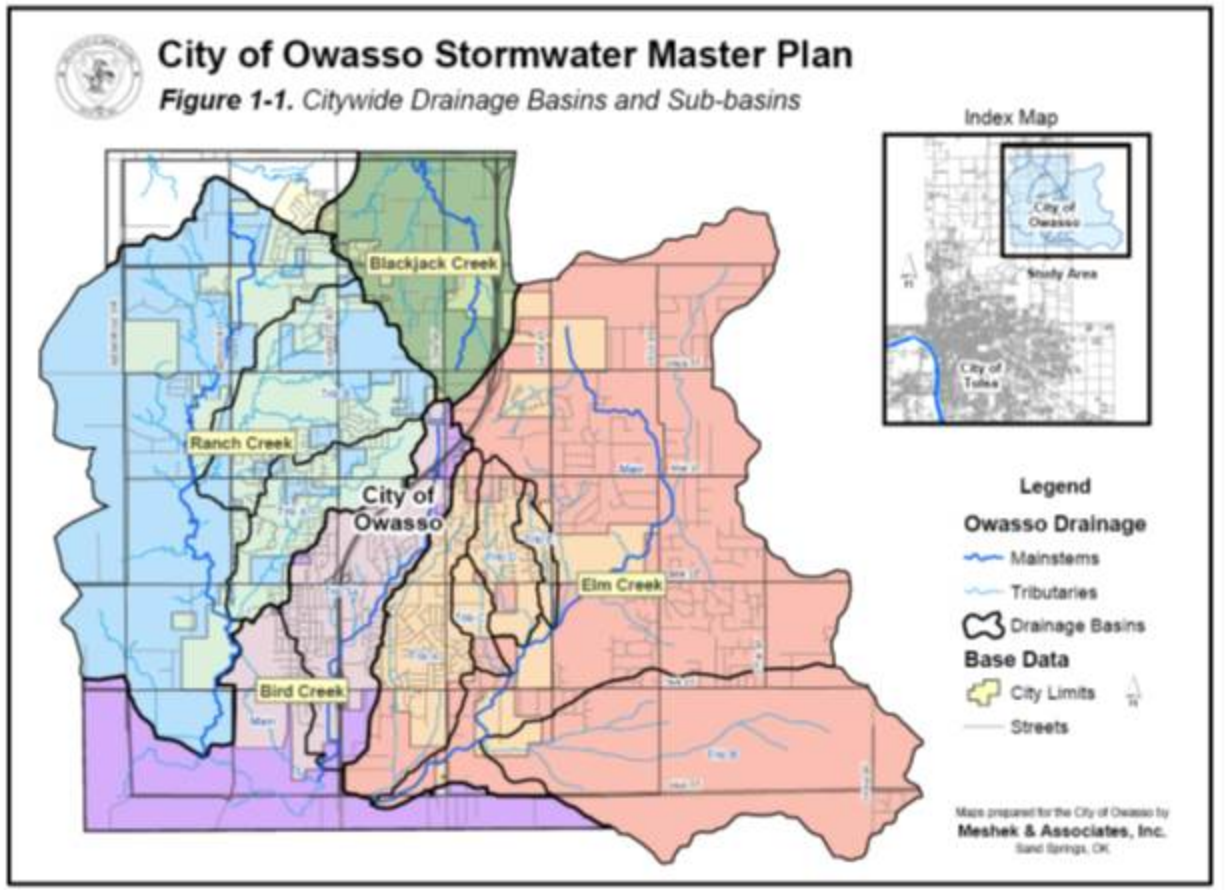
OWASSO'S CHALLENGES

- Floodplains exist upstream from the FEMA floodplain limits!
- Development Hidden Problems
  - Upstream developed flows not detained
  - Buildings placed over the old watercourse
  - Undersized storm sewers
  - Missed upstream drainage basin (56 acres)
- Development Visible Problems
  - Overflows following the old watercourse
  - Water filling the streets in small storms
  - "Sump" areas become impassible



THE MASTER DRAINAGE PLAN

- Obtain Public Input
- Identify Problem Areas
- Develop Hydrology & Hydraulic Models
- Identify Alternatives to Mitigate Flooding
- Make Recommendations
- Develop Prioritization Plan
- Evaluate Funding Options
- Final Report With Cost Estimates & Prioritization Plan



OWASSO'S PRIORITIES

PROJECT - TOTAL VALUES - SORTED BY VALUE

Area 3G - Home Depot Pond Improvements	239
Area 5G - Proposed upstream Reg. Det. Facility	219
Area 2B - Hale Acres	217
Area 5F - Silver Creek Drainage Improvements	215
Area 1C - Birch, 20th St., Woods Dr., 96th & Garnett Reg. Detention	209
Area 5C - Elm Creek Pond Drainage Improvements	205
Area 3H - Owasso Market Pond Improvements	203
Area 4D - Brookfield Crossing Drainage Improvements	193
Area 5A - Preston Lakes, 86th St. No. Culvert	189
Area 3J - Three Lakes III Pond Improvements near 89th St. No.	181
Area 2C - Meadowcrest	167
Area 3F - Storm sewer improvements near 18th and Elm	167
Area 3E - Localized flooding near 1st Street and Atlanta St.	165
Area 3A - Drainage Improvements at 2nd Street	159

PROJECT - TOTAL VALUES - SORTED BY VALUE - CONTINUED

Area 1A - El Rio Vista II	157
Area 2A - 101st & Garnett	141
Area 3B - Overflows at US169 North of 8th Street	139
Area 3C - Flooding between 2nd street and 4th Street	139
Area 3D - Smithview Channel and Storm Sewer Improvements	138
Area 3I - Three Lakes Pond Enlargement	137
Area 5E - 91st Place No.	109
Area 5D - Central Park Pond and Channel	97
Area 1B - Bailey Ranch Estates	0
Area 2D - Regional Detention in Sawgrass Tributary	0
Area 2E - Owasso Sports Complex	0
Areas 4A, 4B and 4C - Inadequate Bridges and Culverts	0
Area 5B - 73rd St. No. (outside city limits)	0

PROJECT - TOTAL VALUES - SORTED BY VALUE	Complete	MDP	Actual	Funding
Area 3G - Home Depot Pond Improvements	Yes	$ 72,000	$ -	Developer
Area 5G - Proposed upstream Reg. Det. Facility	Yes/Partial	$ 8,000,000	$ -	Developer
Area 2B - Hale Acres	Pending	$ 720,000	$ -	
Area 5F - Silver Creek Drainage Improvements	Yes	$ 1,300,000	$ 1,621,433	City/Developer
Area 1C - Birch, 20th St., Woods Dr., 96th & Garnett Reg. Detention	Yes	$ 1,500,000	$ 3,091,977	City/ARRA
Area 5C - Elm Creek Pond Drainage Improvements	Design	$ 320,000	$ -	City Parks
Area 3H - Owasso Market Pond Improvements	Yes	N/A	$ -	Developer
Area 4D - Brookfield Crossing Drainage Improvements	Yes	$ 450,000	$ 650,813	City Stormwater
Area 5A - Preston Lakes, 86th St. No. Culvert	Yes/Partial	$ 2,900,000	$ -	Developer
Area 3J - Three Lakes III Pond Improvements near 89th St. No.	Yes	$ 350,000	$ 425,893	City
Area 2C - Meadowcrest	No	$ 260,000	$ -	Tulsa County
Area 3F - Storm sewer improvements near 18th and Elm	Yes	$ 190,000	$ 133,505	City Stormwater

OWASSO SUCCESS STORY

- City Council Support
- Identifies Funding Needs
- Coordination with ODOT and Tulsa County
- Higher Development Standards
- Developers Coordinate with City Up Front

Instead of Problems, Development became part of the solution!

MOORE'S STORY

- Population Growth from 1,783 in 1960 to 55,081 in 2014!
- Lots of Development – pun intended!
- Tornadoes!

Year	Rating	Homes Destroyed
1999	F5	911
2003	F3	836
2013	F5	1091

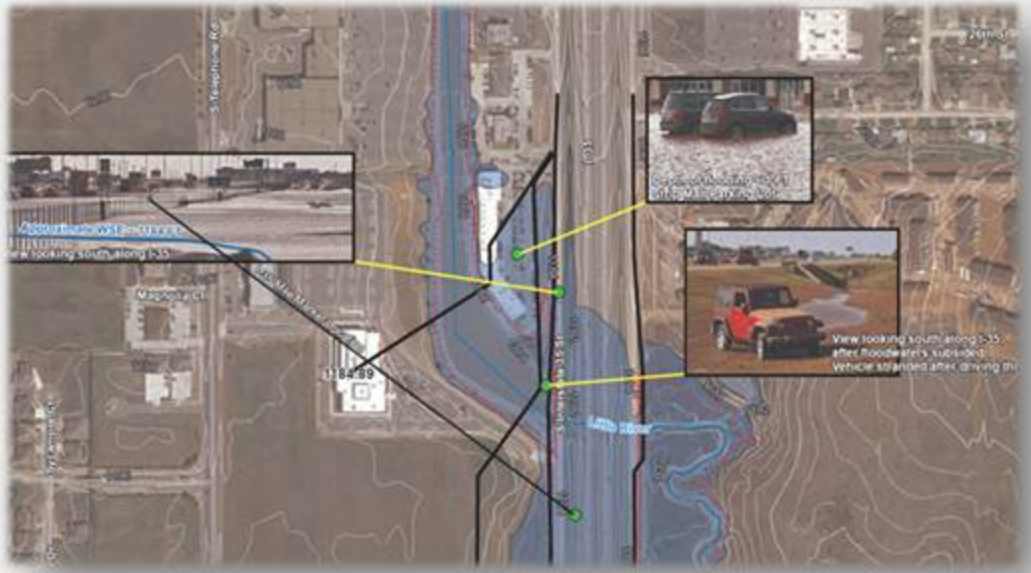
WISE USE OF FUNDING

CDBG-DR Funding of $52.2M

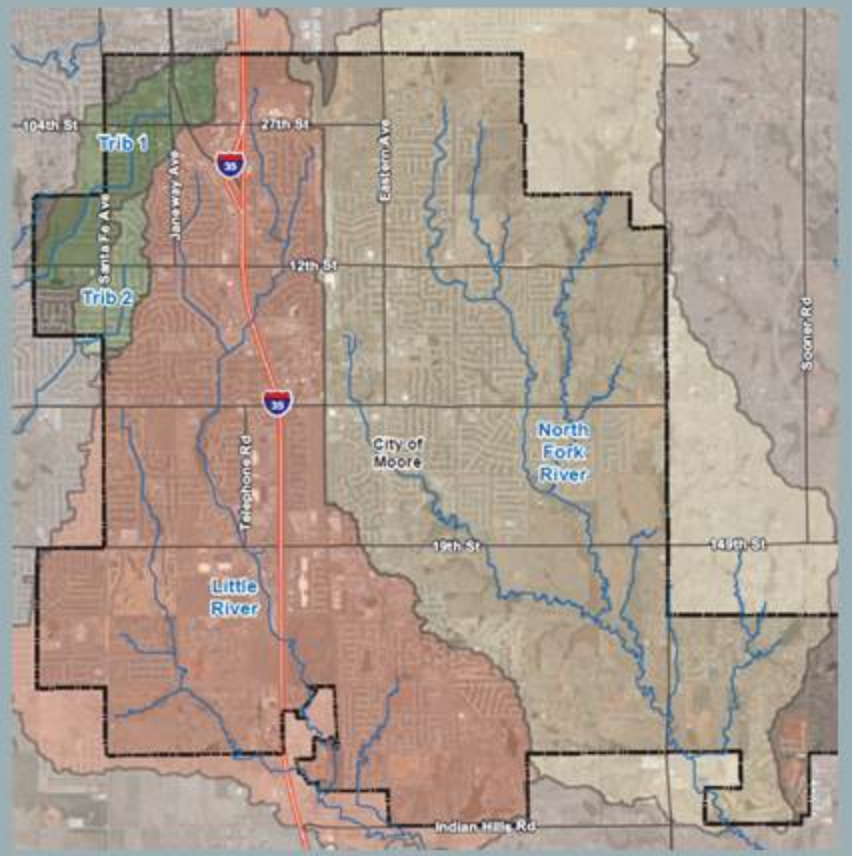
Activity	Allocation
Housing	$16,000,000
Infrastructure	$18,000,000
Public Facilities	$ 2,000,000
Economic Revitalization	$ 0
Resiliency	$ 5,760,000
Administration	$ 2,610,000
Planning	$ 7,830,000
Total	$52,200,000

$7.8M in Planning Projects

- Comprehensive Plan Update
- Master Drainage Plan
- Infrastructure Recovery and Implementation Plan
- Mobile Home Park Redevelopment



DEVELOPMENT WITH LIMITED CONTROL RESULTS IN FLOODING



North Fork Watershed

Little River Watershed

Canadian River Tributaries

Tributary 1 Watershed

Tributary 2 Watershed

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MASTER DRAINAGE PLAN RECOMMENDATIONS

Proirity	Basin	Problem Area	Project Description	Cost	Score
Short-Term	Section 3 - Little River	Problem Area 3	Janeway Ave. at Little River	$ 5,500,000	100.9
Short-Term	Section 6 - North Fork River	Problem Area 5	N. Bryant & North Fork River	$ 1,000,000	78.8
Short-Term	Section 3 - Little River	Problem Area 6	Acquisition, Channel and Storm Sewer Improvements	$ 364,500	76.6
Short-Term	Section 6 - North Fork River	Problem Area 12	Ramblin Oaks Storm Sewer	$ 4,702,000	74.9
Short-Term	Section 3 - Little River	Problem Area 13	19th & BNSF Storm Sewer Improvements	$ 1,763,300	61.9
Short-Term	Section 3 - Little River	Problem Area 23	S. Bristow Storm Sewer	$ 389,500	61.9
Short-Term	Section 3 - Little River	Problem Area 10	Broadmoore Drainage Improvements	$ 421,400	60.8
Short-Term	Section 4 - Stream E	Problem Area 7	31st & Santa Fe (Oak Ridge) - Storm Sewer & Grading	$ 650,200	57.9
Short-Term	Section 6 - North Fork River	Problem Area 16	20th & Lincoln Storm Sewer Improvements	$ 2,207,900	57.0
Short-Term	Section 6 - North Fork River	Problem Area 11	5th & Post Oak Detention	$ 246,400	56.5
Mid-Term	Section 3 - Little River	Problem Area 4	Irving Dr. at Little River	$ 3,998,400	54.1
Mid-Term	Section 6 - North Fork River	Problem Area 20	Foxfire Subdivision Storm Sewer & Channel	$ 348,400	54.0
Mid-Term	Section 3 - Little River	Problem Area 11	24th & Eastern Drainage Improvements	$ 68,800	53.5
Mid-Term	Section 6 - North Fork River	Problem Area 8	Stream A 34th & Sooner Culvert	$ 468,200	52.9
Mid-Term	Section 6 - North Fork River	Problem Area 6	NE 12th St	$ 1,351,600	51.8
Mid-Term	Section 3 - Little River	Problem Area 2	Alternative 2: Detention and I-35 Culvert	$ 1,644,700	50.9
Mid-Term	Section 6 - North Fork River	Problem Area 19	Bryant & NE 15th Culvert	$ 26,000	46.9
Mid-Term	Section 6 - North Fork River	Problem Area 2	Anns Pl Flooding	$ 108,500	46.9
Mid-Term	Section 3 - Little River	Problem Area 22	North Nail Parkway Improvements	$ 1,322,600	46.8
Mid-Term	Section 6 - North Fork River	Problem Area 10	The Falls Drainage Improvements	$ 21,100	44.9
Mid-Term	Section 3 - Little River	Problem Area 16	5th & Howard Channel Improvements	$ 45,200	43.9
Long-Term	Section 6 - North Fork River	Problem Area 7	Stream A and Sooner Dr Detention	$ 414,900	43.0
Long-Term	Section 7 - Stream D	Problem Area 2	SE 12th & Eastern Culvert	$ 199,700	42.9
Long-Term	Section 7 - Stream D	Problem Area 1	Autum Dr Cul-de-sac	$ 15,700	42.6
Long-Term	Section 5 - Canadian River Tribs	Problem Area 4	Hillcrest Ave between Cass Ave & NW 27th	$ 29,400	37.0
Long-Term	Section 4 - Stream E	Problem Area 9	34th & Pin Oak Culvert	$ 27,000	35.9
Long-Term	Section 7 - Stream D	Problem Area 6	Craig Dr & Highlander Dr	$ 88,200	33.9
Long-Term	Section 5 - Canadian River Tribs	Problem Area 3	Robinson & 7th Pl	$ 17,600	30.9
Long-Term	Section 6 - North Fork River	Problem Area 18	Park Pl & 23rd St Channel	$ 29,400	29.9
Long-Term	Section 7 - Stream D	Problem Area 3	Cindy Brook Lane Cul-de-sac	$ 95,000	29.9
Long-Term	Section 3 - Little River	Problem Area 15	South Howard Drainage Imrpovements	$ 363,900	29.8
Long-Term	Section 6 - North Fork River	Problem Area 15	Wyndemere Lakes Dr Storm Sewer	$ 48,000	26.9
Long-Term	Section 3 - Little River	Problem Area 12	28th & Elmo Drainage Improvements	$ 14,800	25.8
Long-Term	Section 3 - Little River	Problem Area 24	1st & Bristow Channel Improvement	$ -	19.8
Long-Term	Section 3 - Little River	Problem Area 9	Detention for Westermeir Subdivision Flooding	$ -	19.0
			Total	$ 27,992,300	

USING CDBG-DR FUNDS FOR MULTIPLE PURPOSES

North

Detention For New Development = Economic Development Impacts

Streambank Stabilization = Storm water Quality Impacts

Recreation Opportunities = Quality of Life Impacts

South

Blighted Mobile Home Park purchased after 2013 tornado

Redevelop 200 housing units on 14 acres

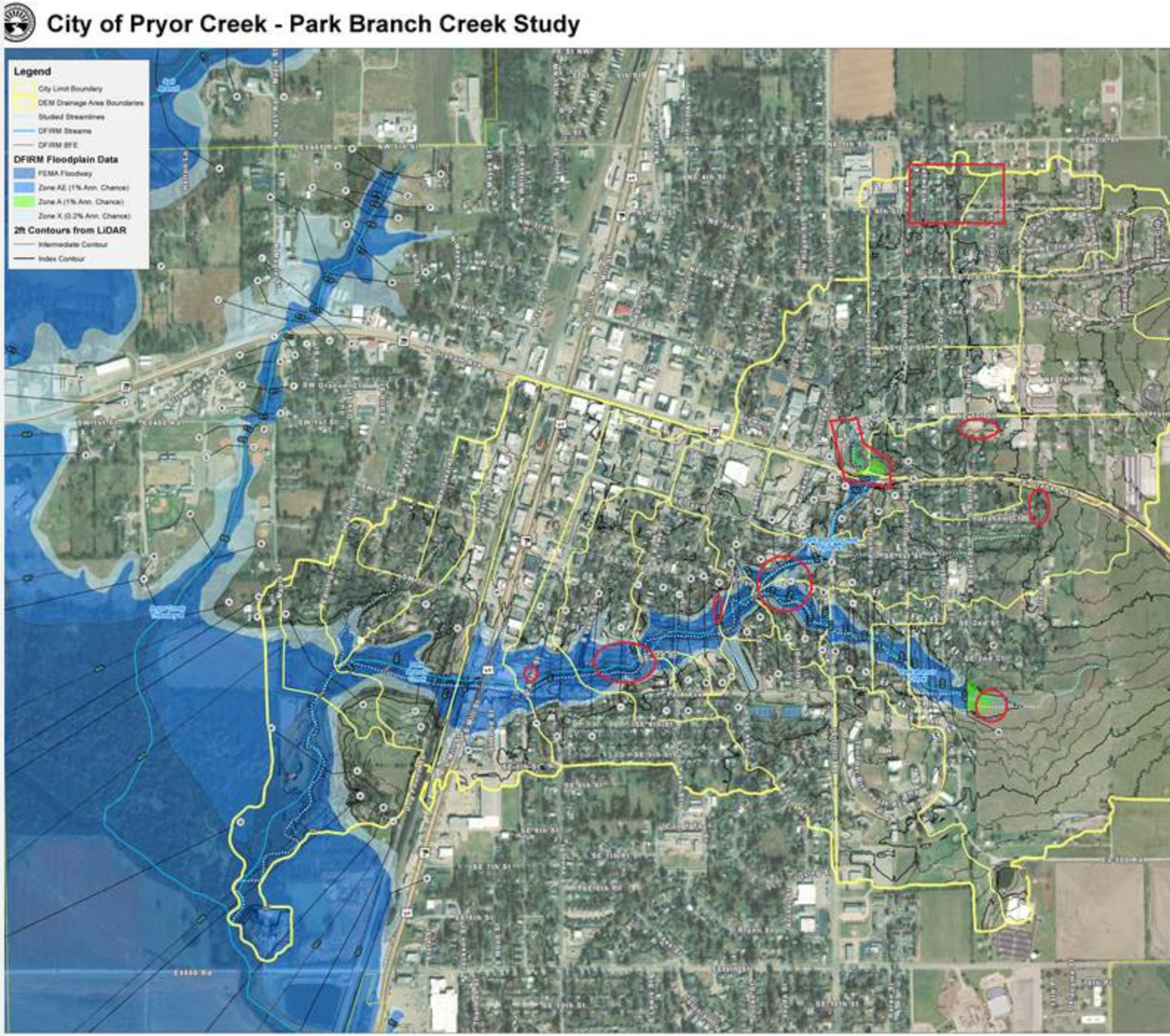
Creek serves as the backbone of the development

MOORE LESSONS LEARNED AND IMPLEMENTED!

- Increased scrutiny at Planning Commission and City Council level on developments within floodplains
- More emphasis placed on drainage evaluations
- Proper stormwater management incorporated into comprehensive plan
- Reviewing development ordinances for floodplain preservation
- Updating Stormwater Design Criteria for No Adverse Impact

PRYOR/MAYES COUNTY MDP

- Pryor Population - 9,400
- Park Branch Creek – most developed drainage basin in the City
- Flooding is a constant problem and occurs at 3 inches of rainfall
- Numerous buildings flood and Highway 59 has been closed on occasion
- Pryor is the first Oklahoma applicant to receive an HMGP planning grant for a Master Drainage Plan



PRYOR CREEK, OKLAHOMA – LEADERS IN FLOODPLAIN MANAGEMENT

- Former Mayor and Floodplain Administrator Jimmy Tramel led the charge for a barricade law that gives police the ability to ticket motorists who ignore the warnings to "TURN AROUND DON'T DROWN" and requiring reimbursement for those expenses involved in rescuing those violators City has funded.
- HB 2249 strengthens HB 1232 that added "flooded highways" to the barricade law and carries forward with the push made by Mayor Trammel, and strongly supported by OFMA.
- Current Floodplain Administrator and Emergency Management Director Johnny Janzen continues the tradition, receiving the first HMGP planning grant for a Master Drainage Plan

During floods, Kingfisher Creek cuts off the north side of town, nowadays cutt
Highway 81 going to the north. This photograph is dated May 8, 1912. The unf
office is just off the edge of the photograph to the left.

KINGFISHER'S LONG FLOODING HISTORY FROM 1912 TO 2007

1912 (upper photo)

2007 – 13" rainfall caused one death

STATE LISTENS TO KINGFISHER

- City leaders met with State Representative(s)
- 2009 Legislature allocated $25 Million to repair damage to "conservation infrastructure" from flood events
- OCC allocated $4 Million to Kingfisher
  - To prepare and implement a Watershed Plan for Kingfisher Creek
- Kingfisher County Conservation District took lead role
  - Chose to acquire flooded buildings using a FEMA HMGP grants
  - 75% of the $4 Million used as Local Match
  - To date, 100 properties have been purchased moving people out of harms way!

JENKS DRAINAGE CRITERIA – RIVER SIDE OF THE LEVEE

- Article 12 – Flood Damage Prevention; Provisions for Flood Hazard Reduction
  - Section 16-12-2 – Specific Standards (A) (2) Nonresidential Construction:
  - Also, the minimum development criteria for projects outside the levee and within the boundaries of the Arkansas River Floodplain, but not within the river channel or floodway, is all structures shall be built at a height *one foot above the 1986 flood event (approximately 350-year floodplain or a 306,000 cfs release from Keystone Dam)* along with the requirement for zero rise to the 100-year floodplain allowing the same conveyance for floodwaters.

OFMA VISION

The Oklahoma Floodplain Managers Association advocates the protection of the natural functions of the floodplain through education, training and service to Oklahomans.

OFMA MISSION

We encourage and support, with our partners, flood-safe development and flood mitigation.

We promote sound floodplain management practices and the natural and cultural benefits of the floodplain.

We support the floodplain management profession through education and certification.

Saving lives and reducing property loss from floods are our ultimate goals!

OFMA INITIATIVES

- BFE Newsletter
- Education – Floodplain 202
- Spring Technical Workshop
- Stormwater Technical Workshop
- OFMA Annual Fall Conference
- Certified Floodplain Manager (CFM) program

OFMA RECOMMENDATIONS FROM THE ASFPM FLOOD SYMPOSIUM, MARCH 2017

Incorporate	• Incorporate Economic Development and Community Revitalization into Hazard Mitigation and Disaster Recovery
Expedite	• Expedite the Risk Identification Process and Remove Barriers to Mapping Product Release
Restructure	• Restructure Training Curriculum to Address Intermediate Needs and Add Offerings for County and Rural Floodplain Administration
Create	• Create a Mechanism for Federal Funding of Master Drainage Plans
Develop	• Develop a Certification Program for Flood-Resilient Neighborhoods

THE TULSA EXAMPLE

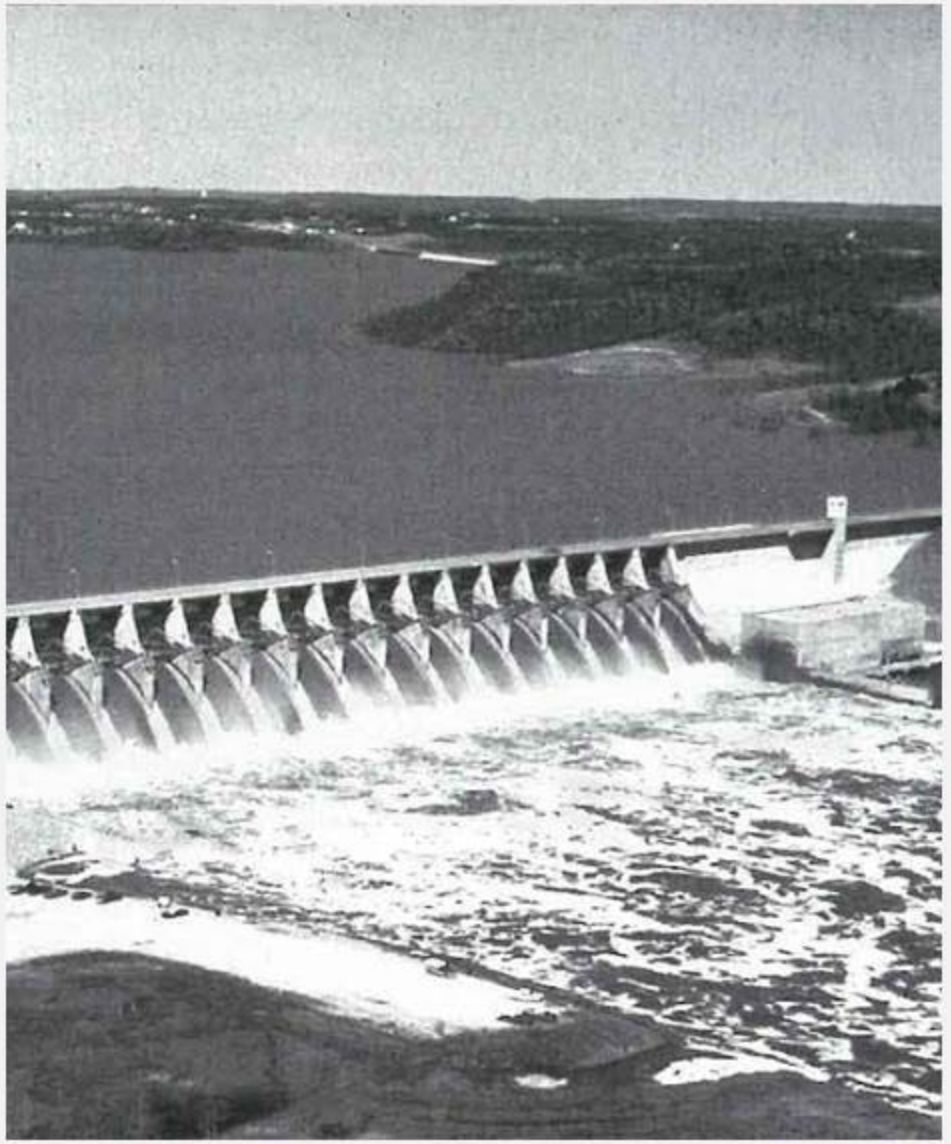
EARLY EFFORTS IN THE CITY OF TULSA

1943: Levees constructed to control flooding and protect oil refineries following Arkansas River Flood

Post WWII development occurred without adequate criteria for stormwater

1964: Keystone Dam constructed

Floods struck every two to four years during the 1960s and early 1970s.



1974

- April and May floods that left $744,000 in damages on Bird Creek
- June 8 - widespread flooding on Joe, Fry, Haikey and Mingo creeks, with more than $18 million in damages
- Labor Day floods hit Flat Rock, Bird and Haikey creeks, and many suburban communities
- In December, Bird Creek flooded again
- Tulsa joined the NFIP's "regular" program, adopted a new 100-year flood standard, and promised to regulate floodplain land use.

- Angry flood victims demanded action

1976 MEMORIAL DAY FLOOD

A three-hour, 10- inch deluge was centered over the headwaters of Mingo, Joe and Haikey creeks. ***The resulting flood killed three and caused $40 million in damages to more than 3,000 buildings***

By this time, the victims were becoming skilled lobbyists and gathering sympathizers city-wide. They stormed City Hall.

1976 RESPONSE

- Newly elected city commissioners responded:
  - enacted a floodplain building moratorium;
  - hired the city's first full-time hydrologist;
  - developed comprehensive floodplain management policies, regulations and drainage criteria;
  - enacted stormwater detention regulations for new developments;
  - instituted a fledgling alert and warning system;
  - adopted an earth change ordinance; and
  - began master drainage planning for major creeks.

1984 MEMORIAL DAY FLOOD

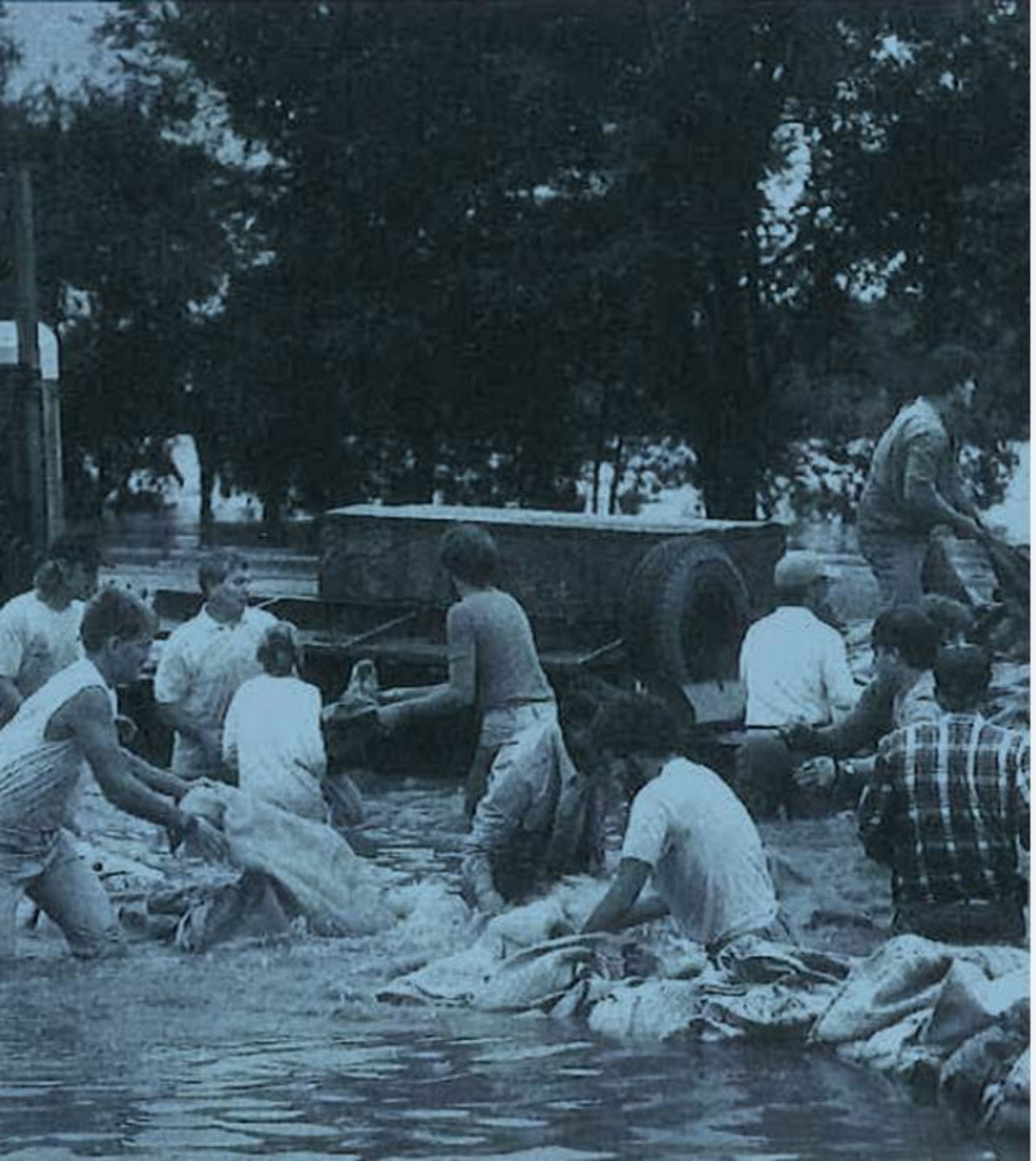
- 15 inches of rainfall centered over Mingo Creek but also extending across most of the city
- killed 14
- injured 288,
- damaged or destroyed nearly 7,000 buildings
- left $180 million in damages
- Mingo Creek alone accounted for $125 million of the damages

1984 RESPONSE

Within days, a new approach to Tulsa flood response and recovery was born.

As ultimately completed, the program included:

- Acquisition and/or relocation of 300 flooded homes and a 228-pad mobile home park,
- $10.5 million in flood control works, and
- $2.1 million for Master Drainage Plans.
- A stormwater utility fee was established by ordinance in 1986 to operate the program.
  - The utility fee ensures stable funds for maintenance and management, independent of fickle political winds.
  - The ordinance allots the entire fee exclusively for floodplain and stormwater management activities.



1986 ARKANSAS RIVER FLOOD

- The 1986 Arkansas River Flood was a first test of the new stormwater management program.
- It also served as a reminder of the finite protection of Keystone Dam.
- In Sept. and Oct. 1986, Keystone Reservoir filled to capacity, forcing a release of 307,000 CFS.
- Downstream flooding was inevitable.
- At Tulsa, a private west bank levee failed, causing $1.3 million in damages to 64 buildings.
- The city fielded its hazard-mitigation team and cleared 13 substantially damaged structures.

TULSA – THE NATION'S FIRST (2003) CRS CLASS 2 COMMUNITY

Since Tulsa adopted comprehensive drainage regulations, they have no record of flooding in any structure built in accordance with those regulations

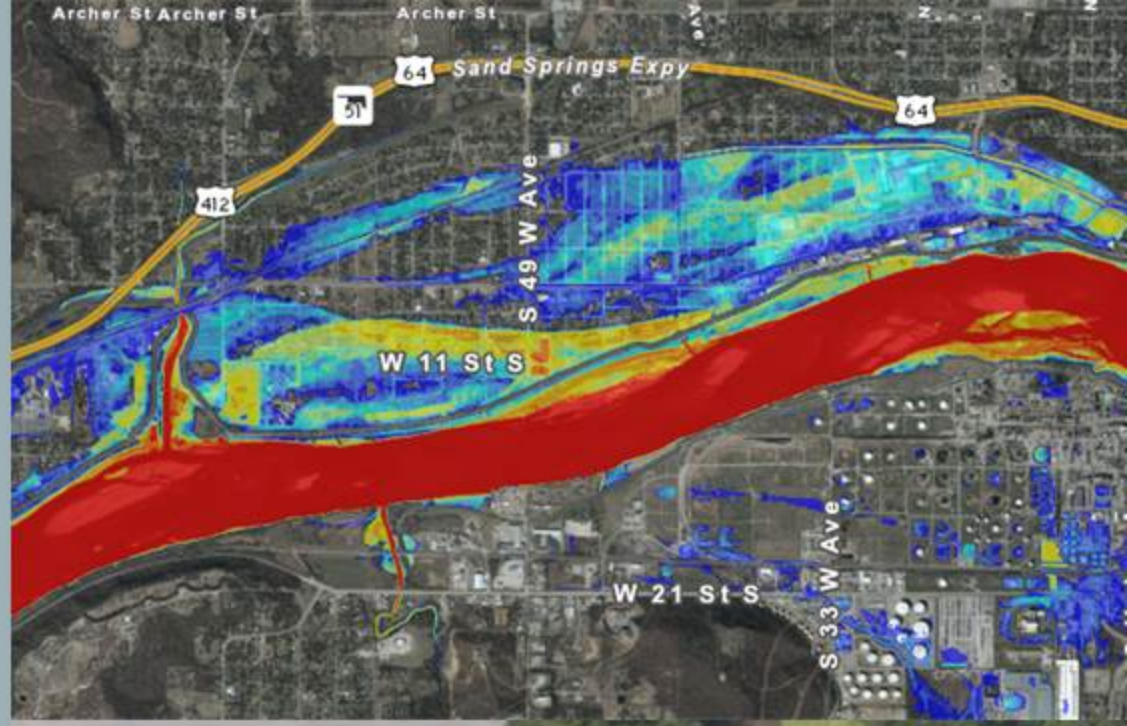
ARKANSAS RIVER FLOODING 2019

20+ inches of rain above Keystone Lake produce long periods of high flows, up to 275,000 cfs

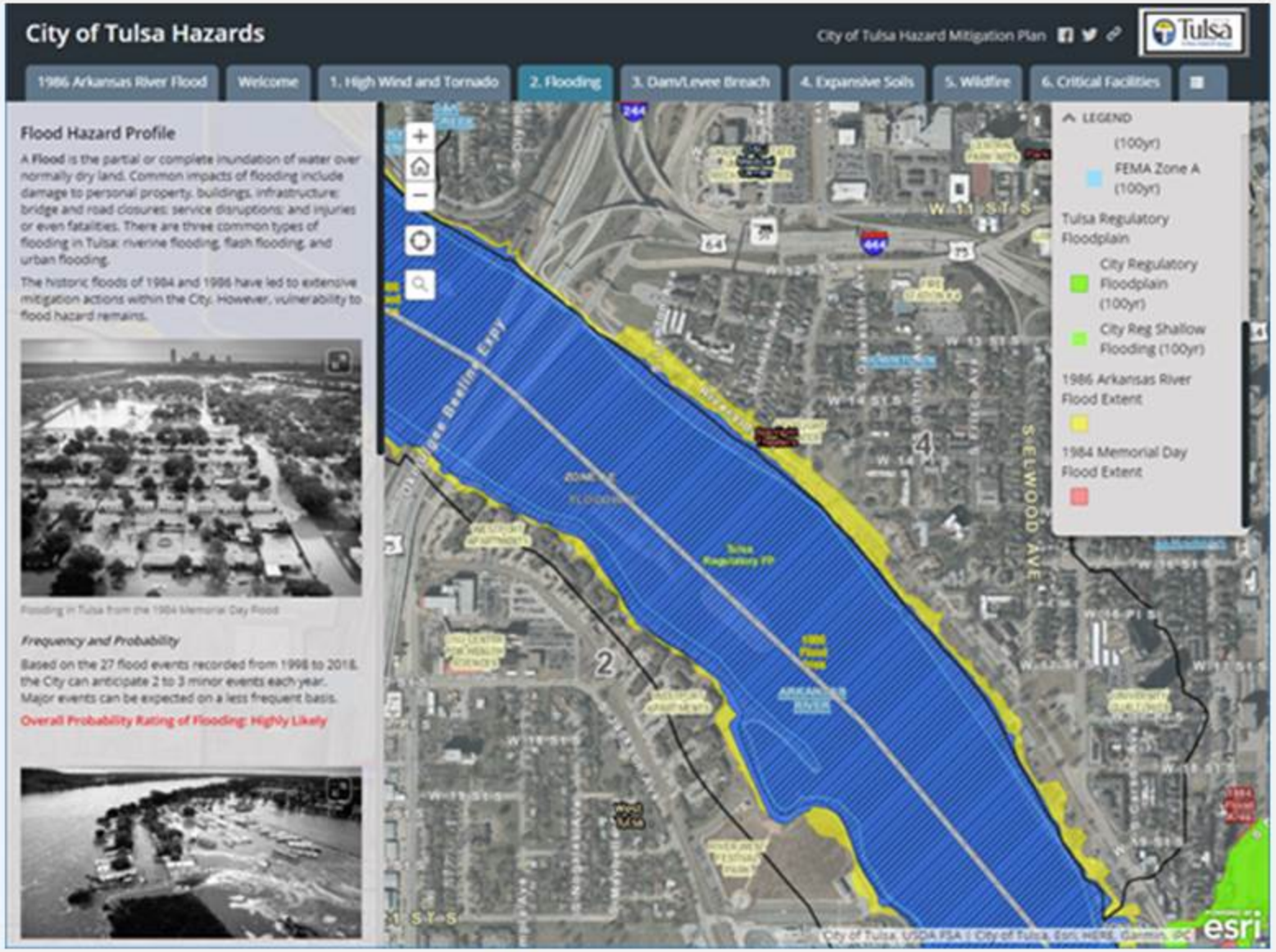
Tulsa had mapping available at different release rates on both sides of the levees

Emergency managers had what they needed to make decisions about potential evacuations

Communications with the Governor and the USACE were specific in need assessment



- **Decision was made to use the 1986 flood map for the time being, while latest modeling and mapping was produced (overnight)**
- **1986 flood mapping was already available in the public Tulsa Hazard Mitigation Plan online viewer**
- **"But can you make it work on a phone?"**



MAY 22

April 6 13 20 27 May 4 11 18 25 June 1 8 15

No buildings permitted by the City of Tulsa flooded during the 2019 Arkansas River flood event

TULSA'S SUCCESS STORY

TULSA STORMWATER PROGRAM

In 2019 – There are 30 Master Drainage Plans covering the entire City of Tulsa

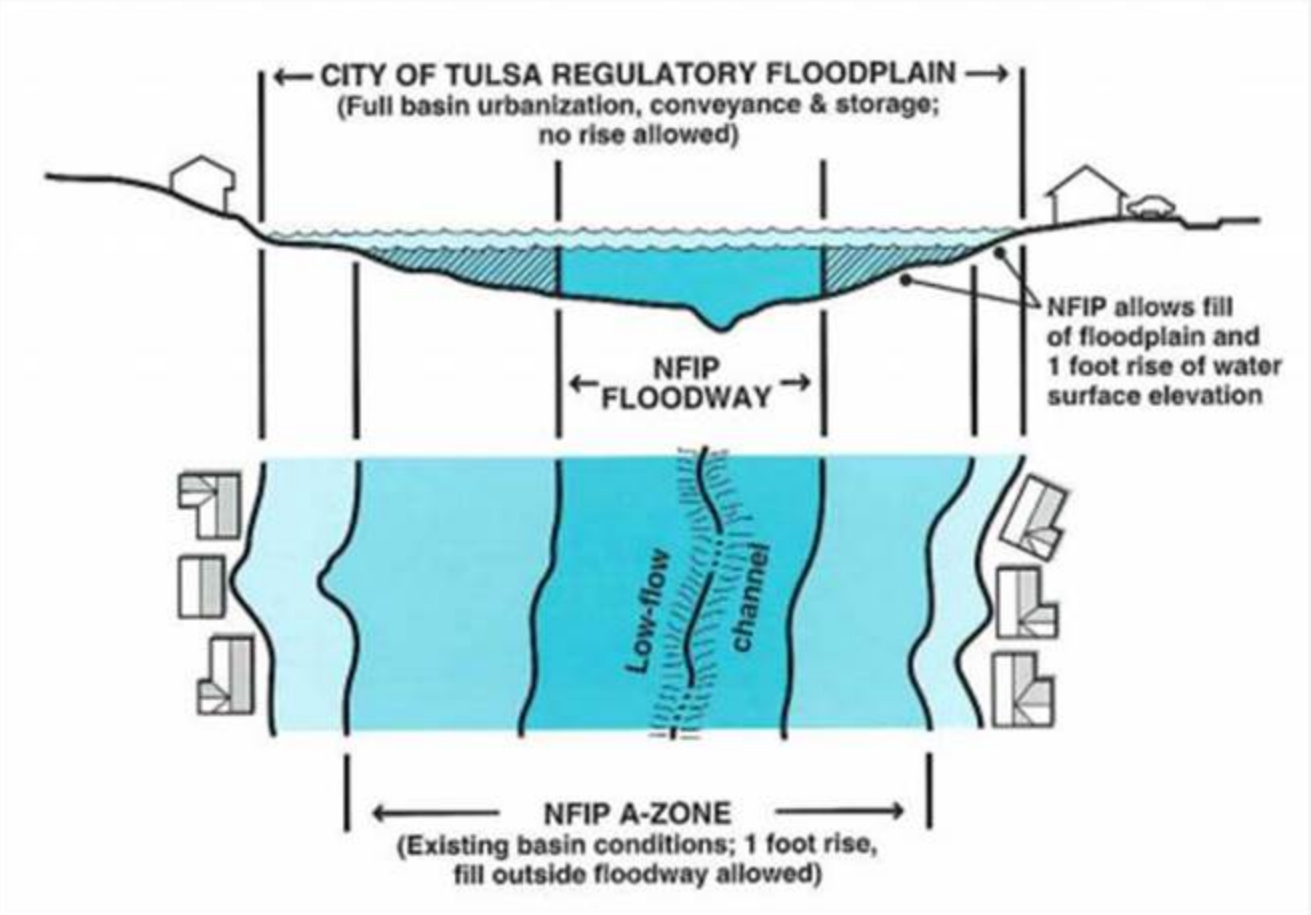
Tulsa separately maintains a list of all recommended projects from all MDPs prioritized for funding based on 10 criteria

Projects with a potential BCA of 1 or greater are at the top in order to apply for HMGP/PDM funding

Tulsa maintains a funding source for local match (25%)

TULSA HIGHER STANDARDS: NO ADVERSE IMPACT

- Uses Flood Insurance Study (FIS) Zone AE as its floodway
- Uses the fully urbanized floodplain as its Regulatory Floodplain
- Requires compensatory storage for any fill in the floodplain fringe
- Tulsa is Class 2 Community Rating System (CRS) community – flood insurance premiums are reduced by 40% for those in the Special Flood Hazard Area (SFHA)



OFMA PROMOTES THE CONCEPT THAT PREVENTION OF FLOOD PROBLEMS IS MORE COST EFFECTIVE THAN MITIGATING FLOODING

Master Drainage Planning

- Invests in Master Drainage Plans and maintain the hydrologic and hydraulic computer models as development or other watershed changes occur

NAI Drainage Design Criteria

- Prepares, updates and enforces conservative drainage design criteria

Maintain Floodplain Storage

- Maintains floodplain storage and requires compensatory storage for any fill in the floodplain

Onsite Stormwater Detention

- Requires onsite stormwater detention for developments where it is effective and conveyance improvements for development where that is effective

Regional Stormwater Detention

- Constructs regional stormwater detention in advance of development and for that purpose

Fully Urbanized Standard

- Has Adopted Fully Urbanized Floodplain standard

Promotes Flood Insurance

- Promotes Flood Insurance – 30 to 40% of all flood claims are located outside the SFHA where premium costs are low

- Tom Leatherbee, FPM for Del City denies a floodplain permit for a storm shelter for a resident's mother in the SFHA – twice!
- Angry resident applies political pressure
- Del City holds firm
- May 2013 storms flood the property while tornado sirens are wailing
- Resident calls afterward to thank Tom Leatherbee
- His mother would have drowned if allowed to build the storm shelter
- Floodplain management is often difficult and nearly always unpopular. But when it saves a life it becomes crystal clear why it is so important.
- Kudos to the City of Del City for a Job Well Done!

DEL CITY – NO COMPROMISE! STORM SHELTER PERMIT IN THE FLOODPLAIN DENIED IN 2013

State of Oklahoma

OWRB

WATER RESOURCES BOARD

the water agency

OFMA

OKLAHOMA

FLOODPLAIN MANAGERS ASSOCIATION