

Trinity Steering Committee



August 29, 2013



North Central Texas Council of Governments



BUILDING STRONG®

Presentation Outline

- What is the CDC program
- Historical background
- CDC program goals
- Why update?
- Scope of the study
- Successes and challenges
- Findings
- Recommendations



Trinity River COMMON VISION

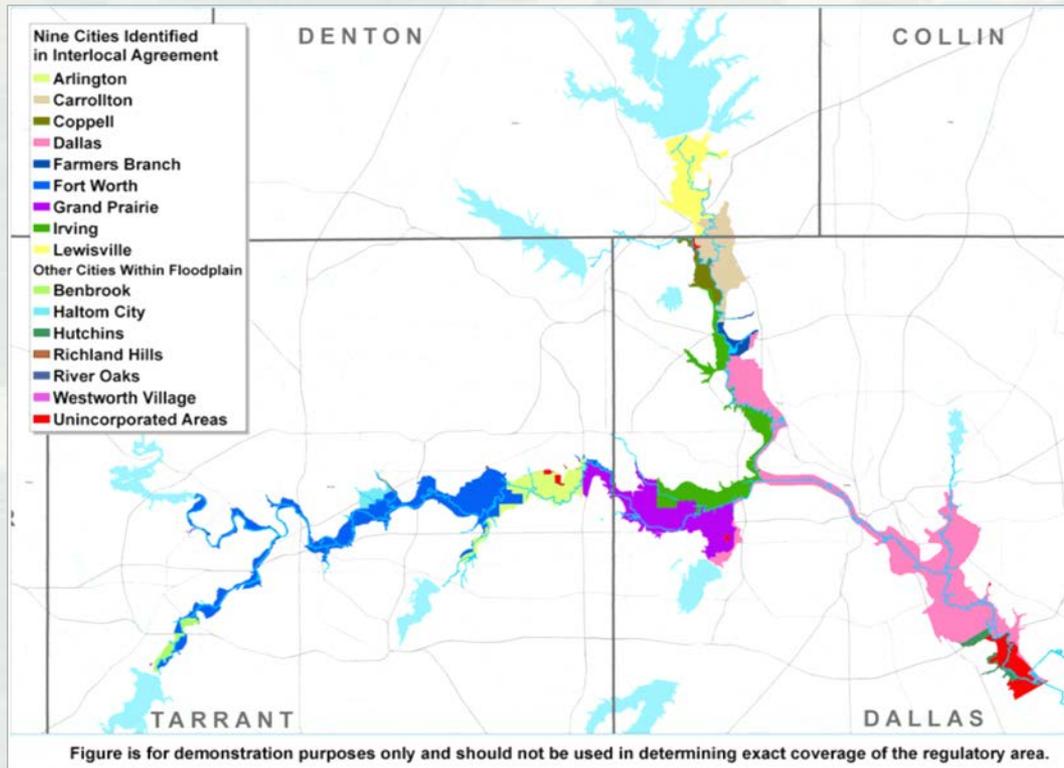


What is the program about and why is it important?

- ▶ **Developed in the late 1980's**
- ▶ **Cooperative management effort among:**
 - **Local governments**
 - **NCTCOG**
 - **USACE**
- ▶ **Comprehensive, regional approach to address:**
 - **Flood damage reduction**
 - **Recreation**
 - **Environmental quality**



Participating Communities





NCTCOG

TRINITY RIVER CORRIDOR INTERLOCAL

AGREEMENT

est. 1989

NINE CITIES:

Arlington

Dallas

Grand Prairie

Carrollton

Farmers Branch

Irving

Coppell

Fort Worth

Lewisville

THREE COUNTIES:

Dallas

Denton

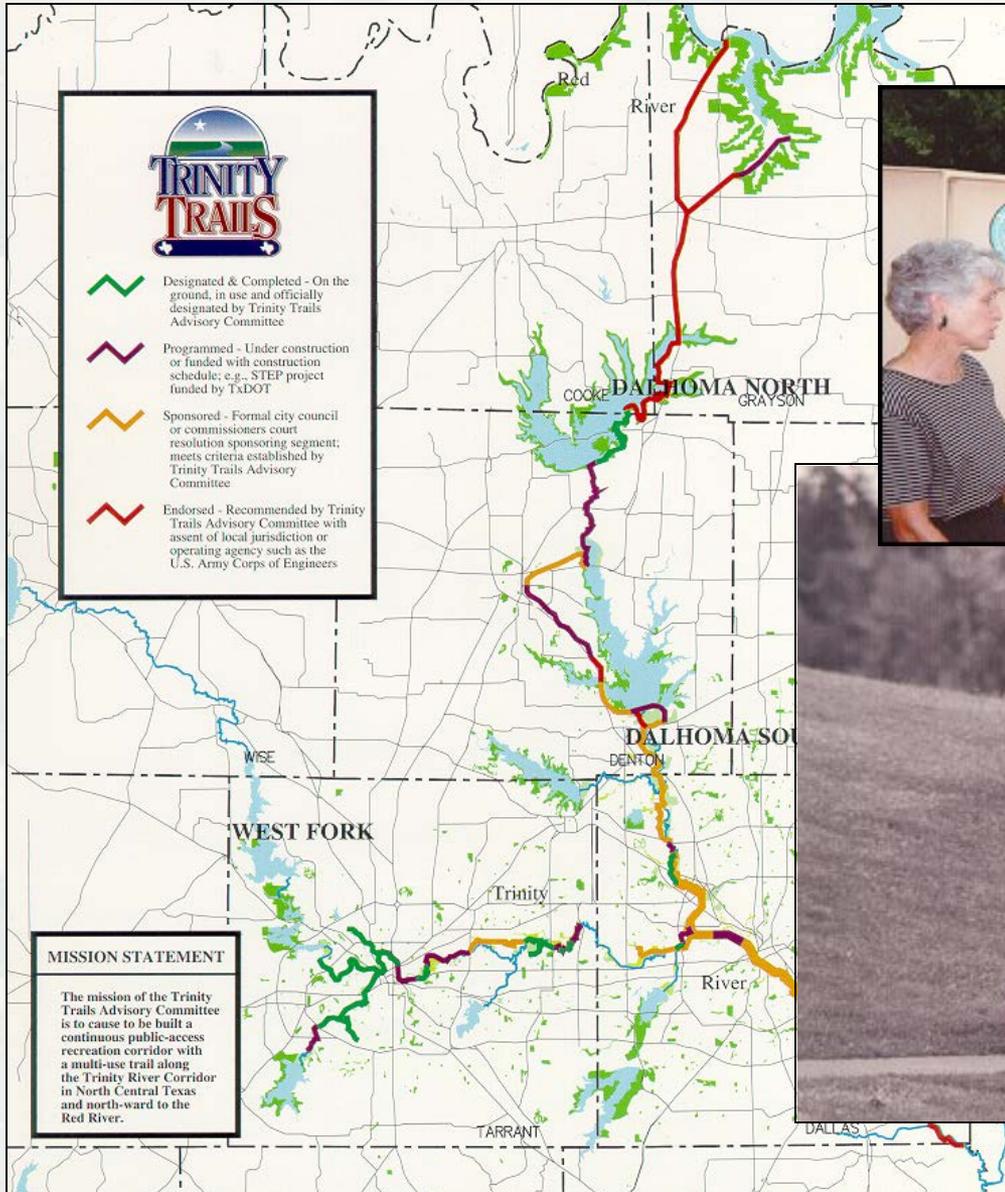
Tarrant

TWO SPECIAL DISTRICTS:

Tarrant Regional Water District

Trinity River Authority







Background Discussion

- Pre 1970's - Dallas and Fort Worth Floodways constructed by USACE
- 1972 – Clean Water Act involving USACE permits
- 1980's – Cumulative impact of floodplain reclamation projects identified as a concern
- 1988 - NEPA driven EIS & Record of Decision (ROD)
- 1988 - Member cities and NCTCOG Steering Committee formed
- 1990 – Upper Trinity River Basin Reconnaissance Report – common permit strategy based on interest of the locals
- 1990 – Inter-local Agreements signed by member cities & Congress authorizes the Upper Trinity River Feasibility Study (UTRFS)
- Flood Management Task Force formed and CDC criteria developed based on ROD
- May 1991 - 1st Edition of the Corridor Development Certificate (CDC) Manual
- Approximately 100 projects permitted and four CDC manual updates since 1991



Historical Background – EIS & ROD

- Regional Environmental Impact Statement
Trinity River and Tributaries (1988)
 - ▶ Cumulative impact of development is “Measurable and Significant”
 - ▶ Record of Decision (ROD) (1988)
 - Applied through 404 permit process
 - No rise in 100-yr water surface elevation
 - No rise in SPF water surface elevation
 - No loss of valley storage for 100 yr
 - Up to 5% loss of valley storage allowed for SPF





CDC Program Goals

- Record of Decision is the foundation of CDC the program
- Limits (but does not eliminate) the impact of floodplain encroachments for regulated streams on downstream areas
- Establishes a consistent regional criteria
- Provides a funding stream for updates and state-of-the-art models and modeling tools
- Provides oversight for projects constructed in the 100 yr and SPF flood plains
- Allows development in the floodplain
- Applies to all encroachment projects, not just those requiring 404 permits
- Allows all FMTF members to review projects for the entire regulatory footprint
- Provides a consistent review process



ROD and CDC Limitations

- Does not eliminate the impact of all upper basin floodplain development on downstream areas
 - ▶ Storage in the corridor must be the same at 100 yr and within 5% at SPF but can be redistributed which may or may not have an impact
- Does not preclude impact due to urbanization of the watershed (more efficient drainage and increase in impervious areas)
 - ▶ May or may not adversely impact DS areas

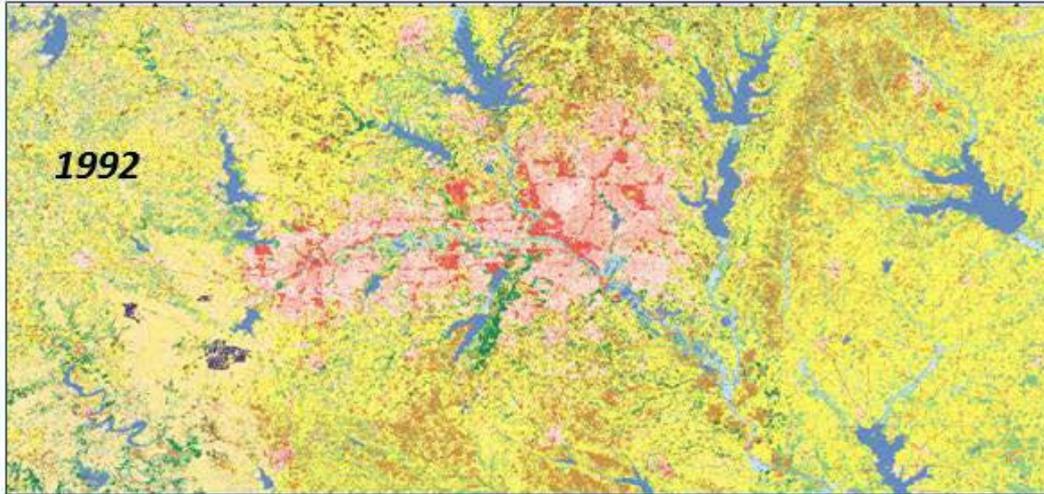


Why Update Now?

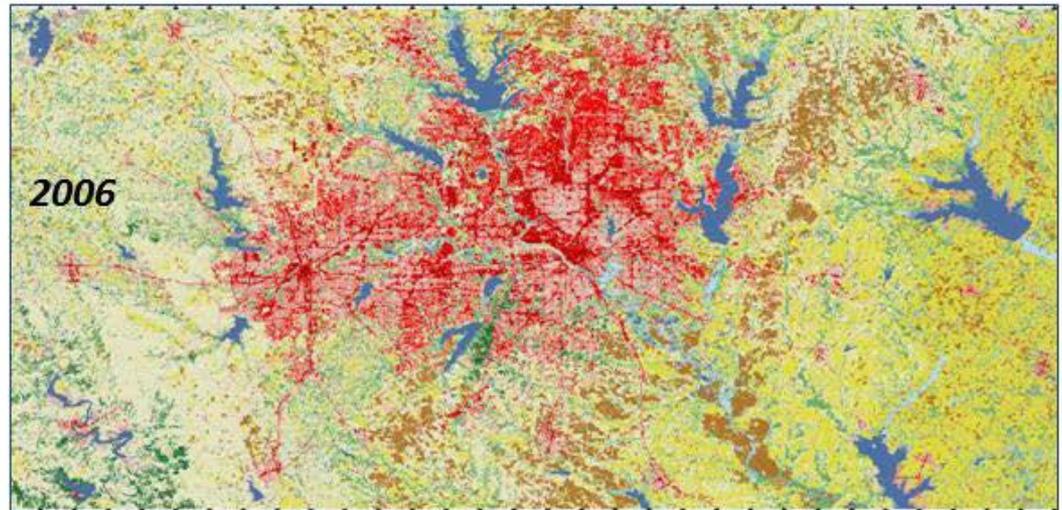
- Land use changes and higher growth rates than initially projected
 - ▶ In some areas, 2005 actual growth exceeded original 2040 projections
 - ▶ Development took place in different areas than projected
 - ▶ Urbanization impacts are significant (3.5 million to 6.5 million)
 - ▶ Impacted peak runoff rates for regulatory discharges
- Incorporate constructed and permitted projects (91) into the models
 - ▶ Evaluate impact of projects
 - ▶ Determine effectiveness of CDC program
 - ▶ Updated storage functions throughout river system
- Brought regulatory horizon from 2040 to 2055
- Brought existing conditions from 1992 to 2005
 - ▶ Sets the stage for a future FEMA update



Urbanization of Dallas-Fort Worth

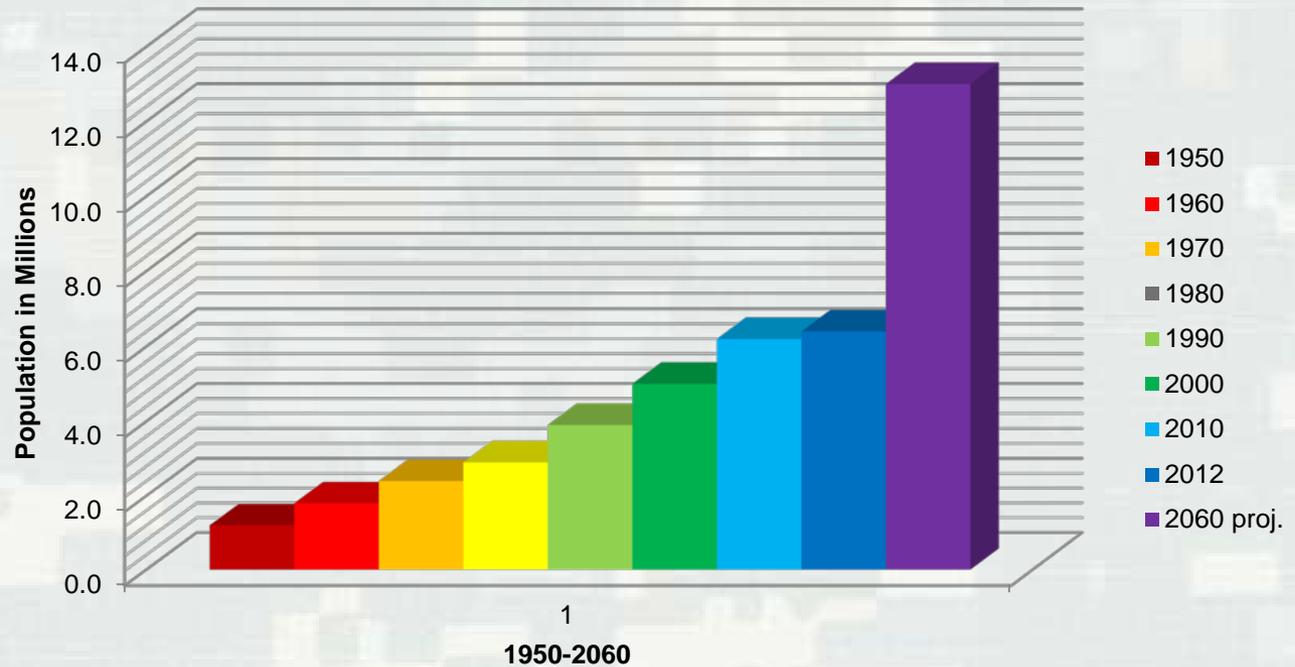


**Comparison of
Urbanization
in DFW Metroplex
1992-2006
(Melinda Luna)**



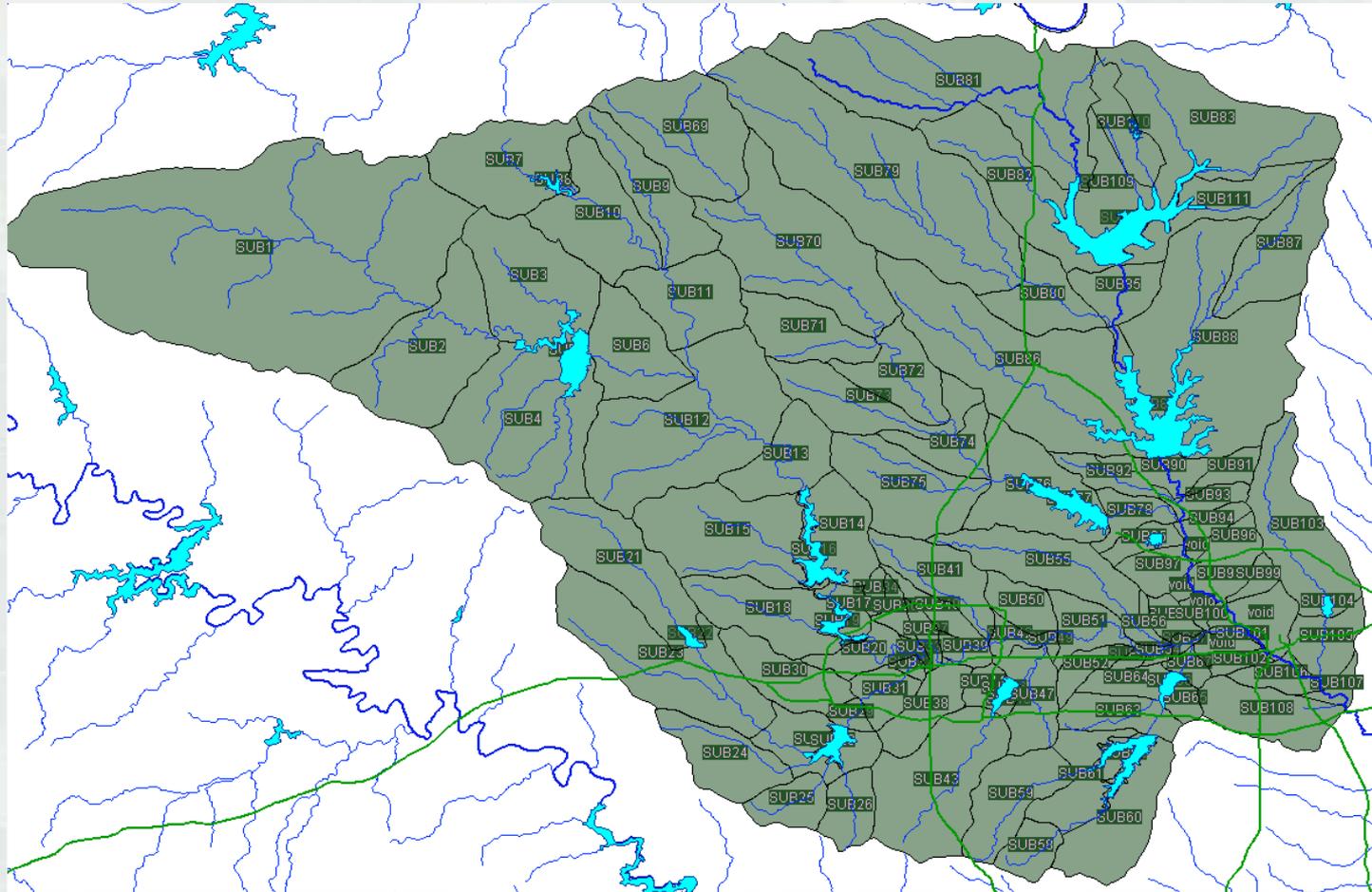
Population Growth and Watershed Development

Year	Population (million)
1950	1.2
1960	1.8
1970	2.4
1980	2.9
1990	3.9
2000	5.0
2010	6.2
2012	6.4
2060	13.0



Scope of the Study

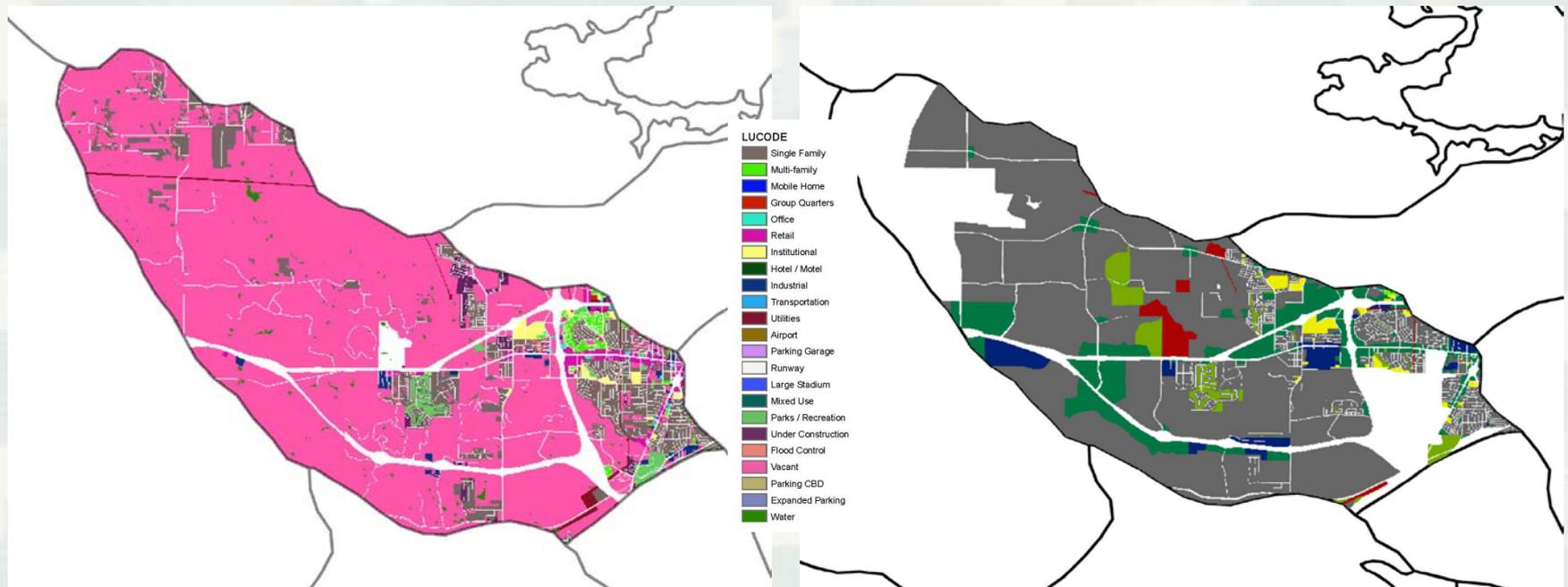
Numerical Hydrology Model



Scope of the Study Mary's Creek (SUB30)

2005

2055



100-yr = 27,400 cfs

SPF = 68,200 cfs

100-yr = 37,300 cfs

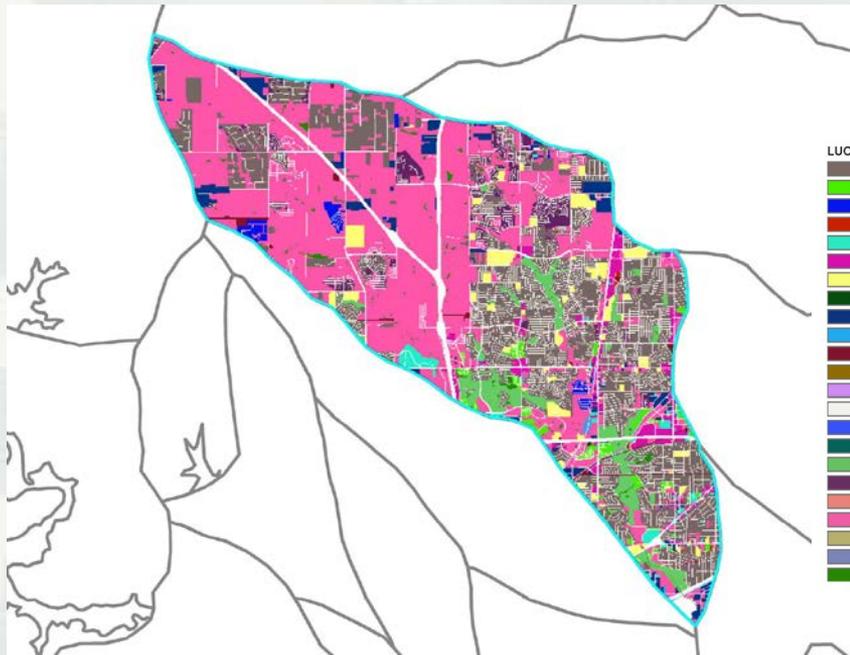
SPF = 88,800 cfs



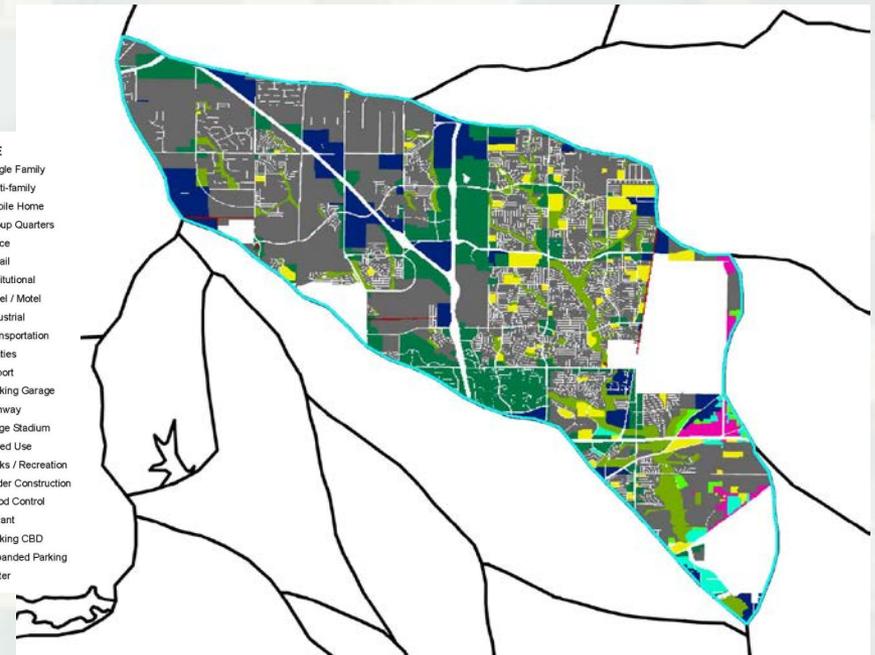
Scope of the Study Big Fossil Creek (SUB41)

2005

2055



- LUCODE
- Single Family
 - Multi-family
 - Mobile Home
 - Group Quarters
 - Office
 - Retail
 - Institutional
 - Hotel / Motel
 - Industrial
 - Transportation
 - Utilities
 - Airport
 - Parking Garage
 - Runway
 - Large Stadium
 - Mixed Use
 - Parks / Recreation
 - Under Construction
 - Flood Control
 - Vacant
 - Parking CBD
 - Expanded Parking
 - Water



100-yr = 32,200 cfs

SPF = 44,400 cfs

100-yr = 37,200 cfs

SPF = 50,000 cfs





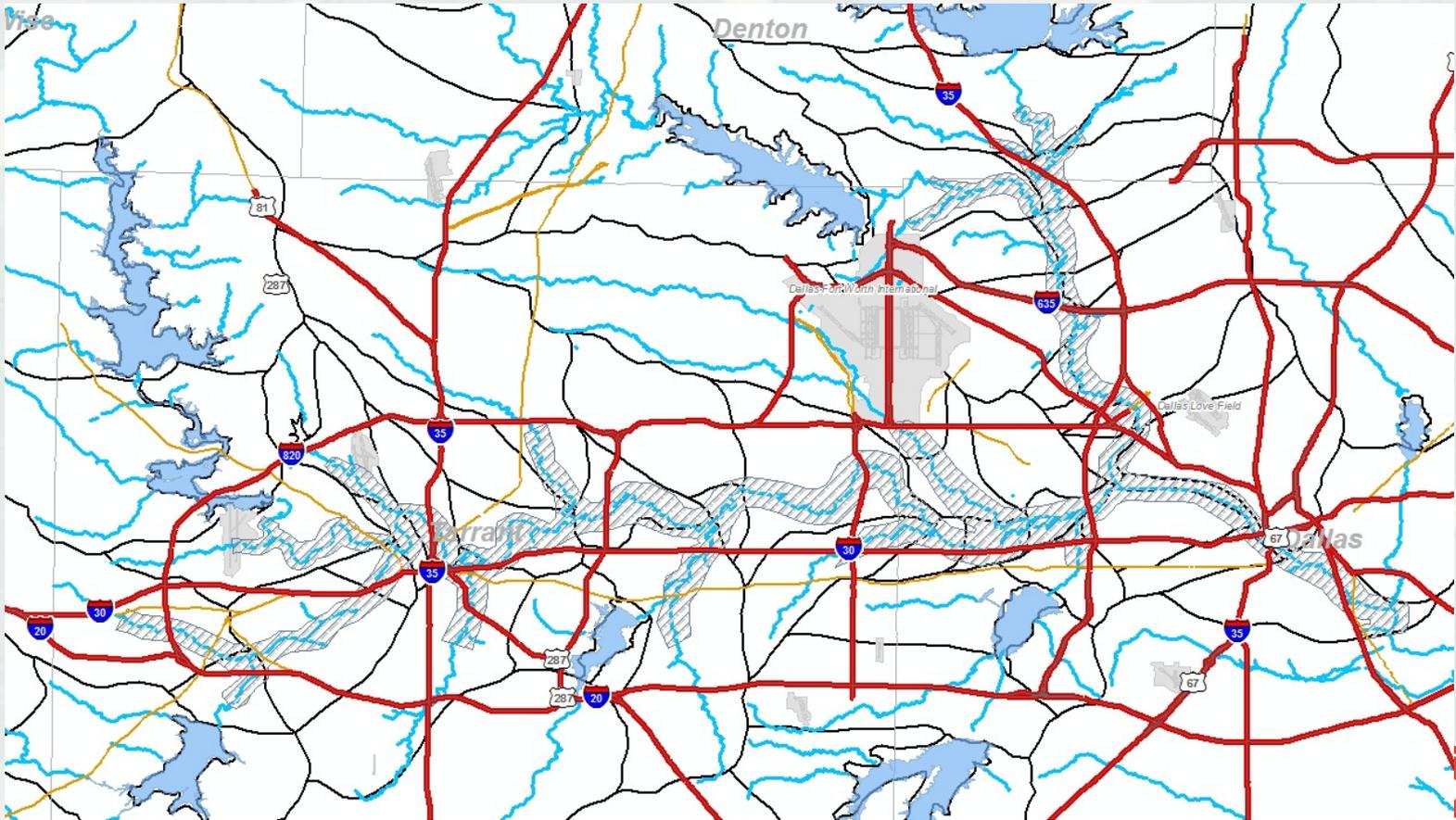
Scope of the Study

CDC Hydrology Update

- Numerical hydrology modeling
 - ▶ 110 sub-basins
 - ▶ 30 routing reaches
 - Updated valley storages for 80 constructed and planned projects
 - ▶ Conversion to the most up-to-date modeling technology (HEC-HMS)
 - ▶ Land use updates
 - ▶ New storm reproductions and calibrations
 - Verify model parameters and storages
 - ▶ Examination of statistical hydrology and other verification methods
 - Determination that statistical hydrology not useful for informing the results
 - ▶ Design storms



Scope of the Study River Hydraulics



Scope of the Study

CDC Hydraulics Update

- Hydraulic modeling
 - ▶ 133 miles of river hydraulics
 - ▶ Incorporation of approx. 91 projects
 - Describe the impacts of constructed developments on WS elevations and storages
 - ▶ Approximately 600 new cross-sections
 - ▶ 1/3 of study area has new topographic data
 - ▶ Merge of storage and conveyance models
 - ▶ Conversion to the most up-to-date modeling technology (HEC-RAS)





Scope of the Study

CDC Review Process

Reviews performed by:

- Local USACE
- FMTF members
- Local consultants
- USACE vertical team
 - ▶ Hydrology – Dr. David Williams, Ph.D., P.E.
 - ▶ Hydraulics – Michael Gee, Ph.D., PE Hydrologic Engineering Center (HEC)



Successes and Challenges

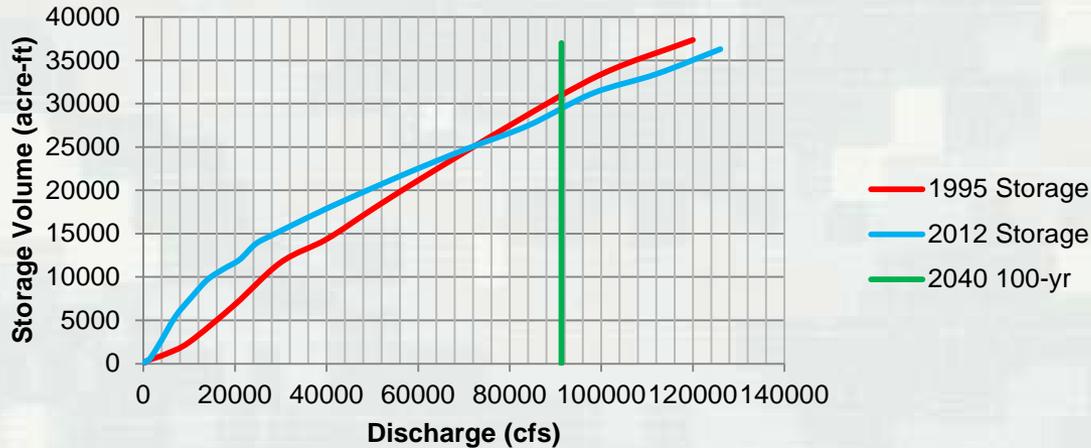
- Successes
 - ▶ State-of-the-art modeling update
 - ▶ Design storms – more realistic representation of actual runoff and fringe areas
 - ▶ Integration of new topographic data
 - ▶ Integration of constructed and proposed projects (91)
 - ▶ Reviews found techniques to be sound
 - ▶ Modeling could serve as basis for future FEMA updates
- Challenges
 - ▶ Verification of model performance is limited due to the effect of climate shifts and urbanization on watershed conditions (USACE sponsored studies)
 - ▶ Discharge and water surface increases due to upland development
 - ▶ Some storage redistribution
 - ▶ Split flow issue at Beltline Road
 - ▶ Concern over impacts on Fort Worth and Dallas Levees



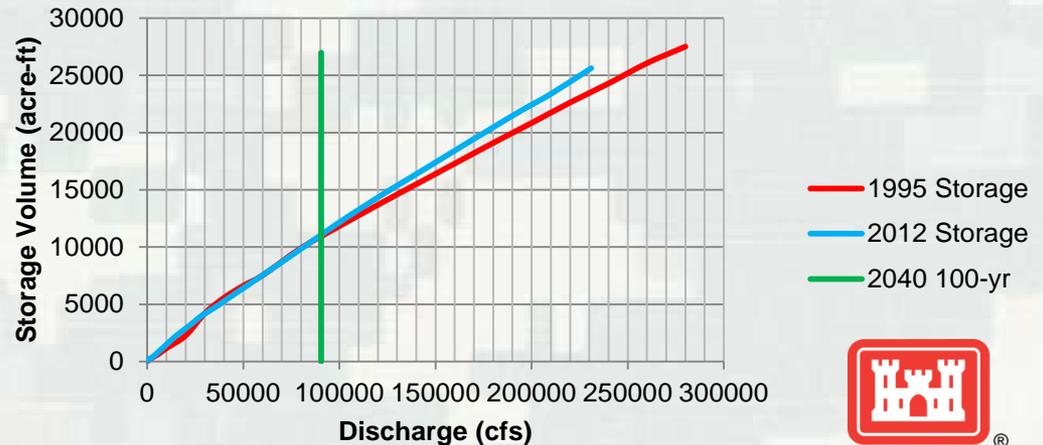
Storage Accountability



Typical



Preferred



Findings

100-Year Discharge Comparison

<i>Geographic Location</i>	<i>CDC Manual 4th Edition 2010</i>	<i>2012 Revised CDC Model Comparison</i>					
		<i>2005 vs 2040</i>			<i>2055 vs 2040</i>		
	<i>2040</i>	<i>2005</i>	<i>Δ (cfs)</i>	<i>Δ (%)</i>	<i>2055</i>	<i>Δ (cfs)</i>	<i>Δ (%)</i>
<i>Clear Fork</i>							
Clear Fork above West Fork	32,600	36,600	4,000	12%	48,300	15,700	33%
<i>West Fork</i>							
West Fork above Clear Fork	35,400	35,400	0	0%	35,000	-400	-1%
West Fork below Clear Fork (at Fort Worth Gage)	48,700	56,500	7,800	16%	69,400	20,700	30%
West Fork at State Highway 360	91,300	95,400	4,100	4%	107,400	16,100	15%
West Fork above Elm Fork	92,200	95,800	3,600	4%	103,100	10,900	11%
<i>Elm Fork</i>							
Elm Fork at Sandy Lake Road (at Carrollton gage)	51,500	43,600	-7,900	-15%	48,200	-3,300	-7%
Elm Fork above West Fork	42,700	41,400	-1,300	-3%	44,700	2,000	4%
<i>Trinity River Main Stem</i>							
Trinity River below confluence with Elm Fork/West Fork	120,400	122,200	1,800	1%	129,400	9,000	7%
Trinity River at Dallas Gage (Commerce Street)	119,700	121,600	1,900	2%	128,600	8,900	7%



Findings

100-Year Elevations Comparison

<i>Location</i>	<i>100-Year "Future" Flood</i>		
	<i>CDC Manual 4th Edition 2040</i>	<i>CDC 2012 Update 2055</i>	<i>Diff. (ft)</i>
<i>Clear Fork</i>			
University Drive	557.89	559.9	2.01
Henderson Street	539.15	541.8	2.65
<i>West Fork</i>			
SH 183	554.01	554.3	0.29
University Drive	540.81	543.1	2.29
SH 360	464.12	465.8	1.68
Belt Line Road	438.77	441.7	2.93
Loop 12	426.59	427.8	1.21
<i>Elm Fork</i>			
IH 35E	450.44	450	-0.44
Loop 12	426.73	427.8	1.07
SH 183	424.75	426	1.25
<i>Trinity River Main Stem</i>			
Commerce Street	416.83	417.9	1.07
Loop 12	403.22	403.7	0.48

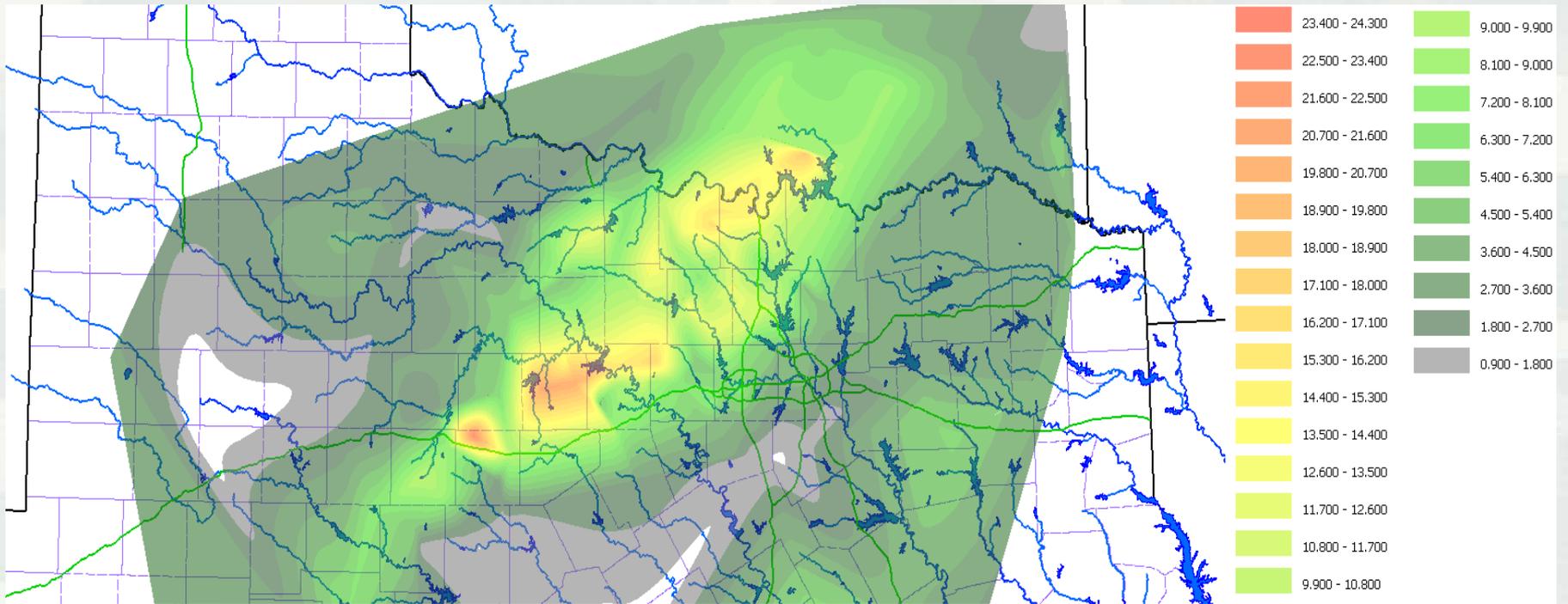


Findings

- The CDC program has been very effective in limiting the impact of development within the regulatory footprint
- Uncontrolled development/encroachment within the regulated rivers would in most instances result in increased discharges and water surface elevations
- Population growth and watershed development have occurred more rapidly and in different areas than originally predicted
- Region has extreme flooding potential from tropical systems
- The CDC program does not limit the significant impact of loss of valley storage, as well as increased urbanization and impervious cover, in non-regulated portions of the watershed
 - ▶ Discharges and water surface elevations have increased as a result of development in upstream areas not regulated by the CDC program
 - ▶ Discharges increased up to 30%
 - ▶ Water surface elevations increased up to 3 feet
 - ▶ Lower reaches of major undeveloped tributaries and regulated rivers most at risk
- Without consistent regional storm water management practices throughout the basin, discharges and water surface elevations along the Trinity River will continue to increase as the region continues to grow
- Lack of hydrologic observations and techniques to support storm water management
- The region does not have consistent storm water management goals, policies and practices



Tropical Storm Norma 1981



Recommendations

- CDC program should be maintained
 - ▶ Very effective in limiting the impact of development within the regulatory footprint
 - ▶ Recommend adoption of this update
- Need for expanded storm water management
 - ▶ Regional storm water management practices that complement CDC valley storage preservation can be an important strategy to manage increased peak discharge rates due to urbanization
 - ▶ Consistent measurable goals, policies and practices
 - ▶ Limit risk from future development in unregulated areas



Questions or Comments?

