

URBANIZED STREAM CORRIDOR: COMMUNITY APPROACH TO ADDRESS EROSION

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NCTCOG Public Works Roundup

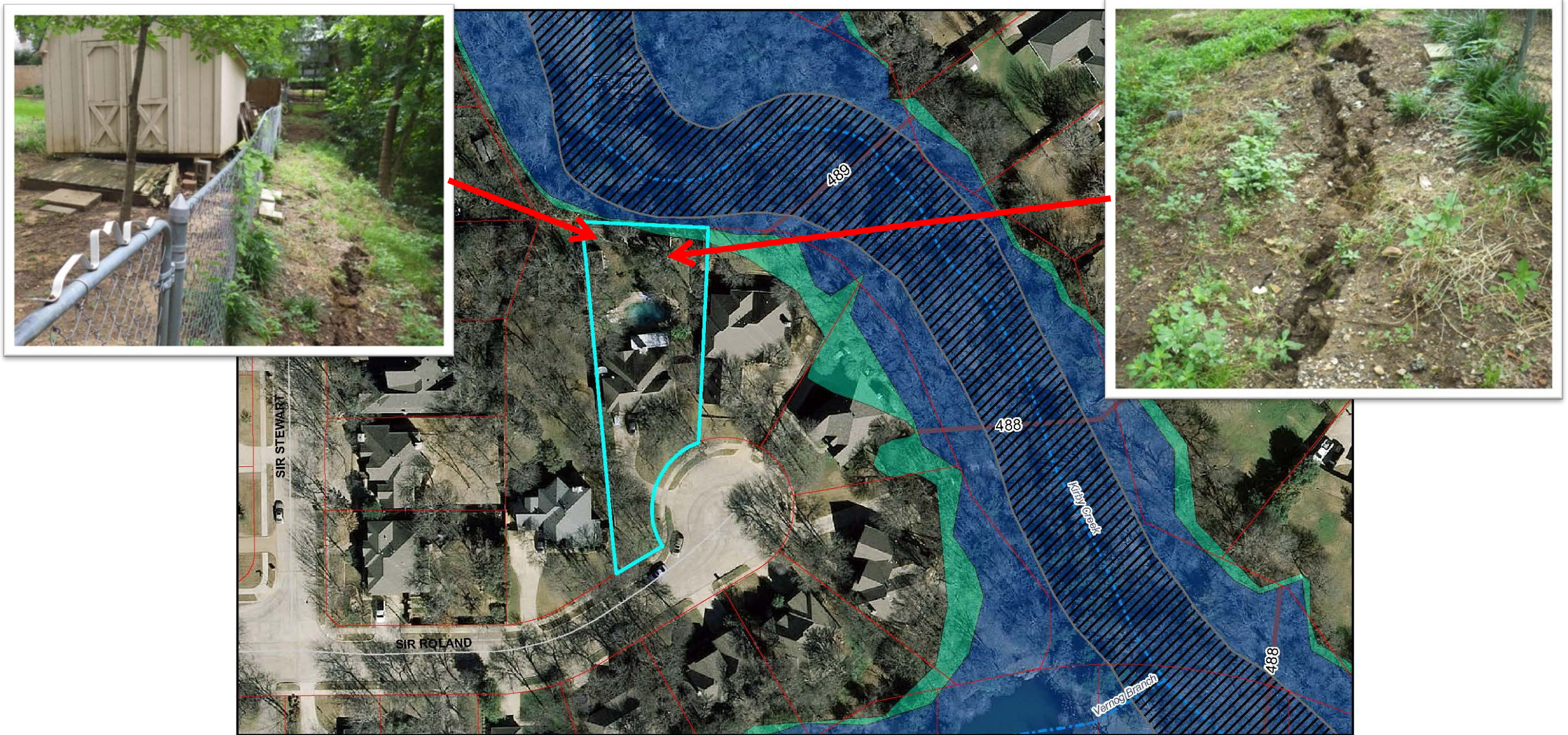
MAY 23, 2018

Today's Agenda

- Urbanized Stream Erosion
- Solving Stream Erosion Problems
 - Case Studies
- City Perspective – Grand Prairie
- Closing Thoughts

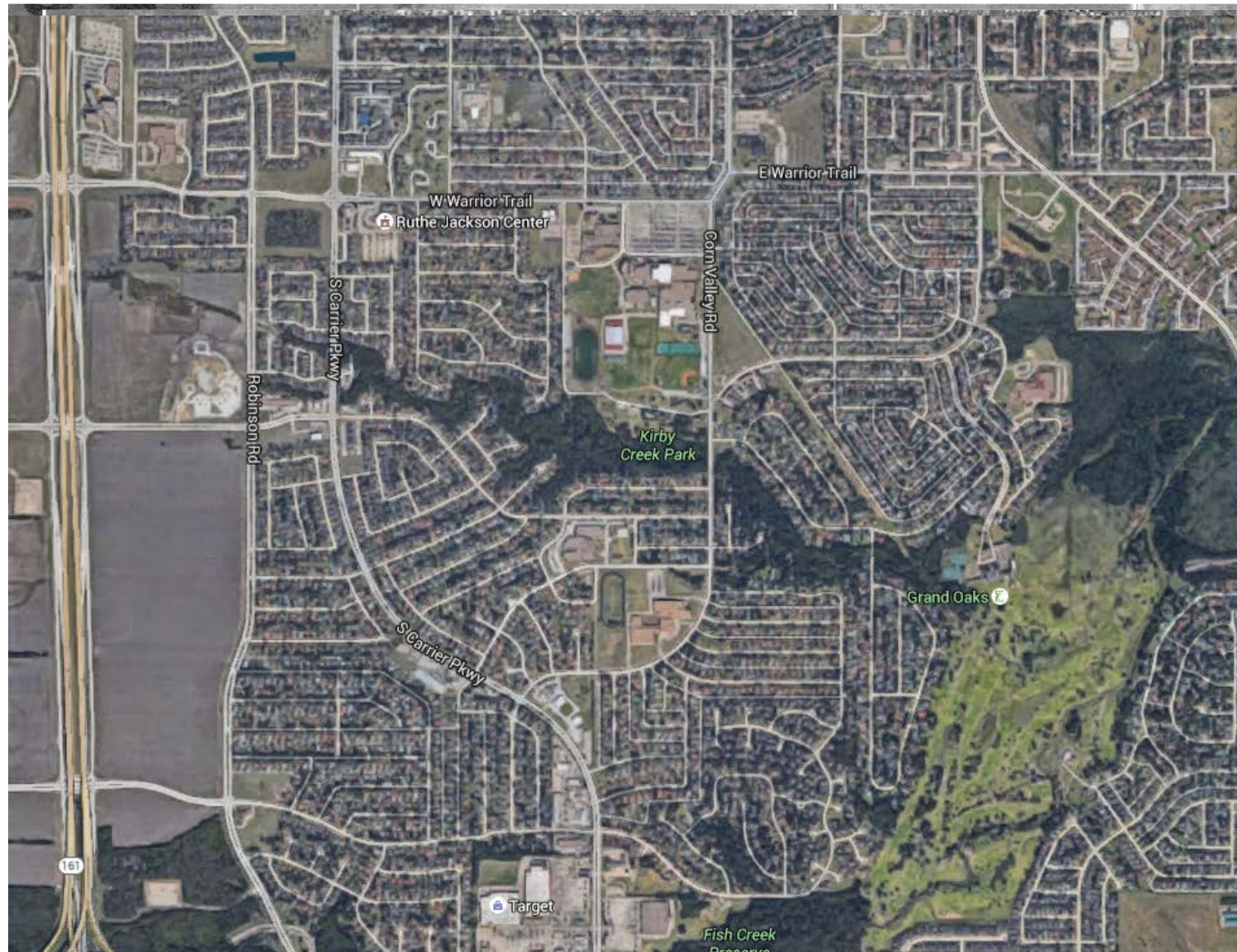
Urbanized Stream Erosion

- Why do urbanized streams erode?



Urbanized Stream Erosion

- Increased development over time



1958

1984

Current

Urbanized Stream Erosion

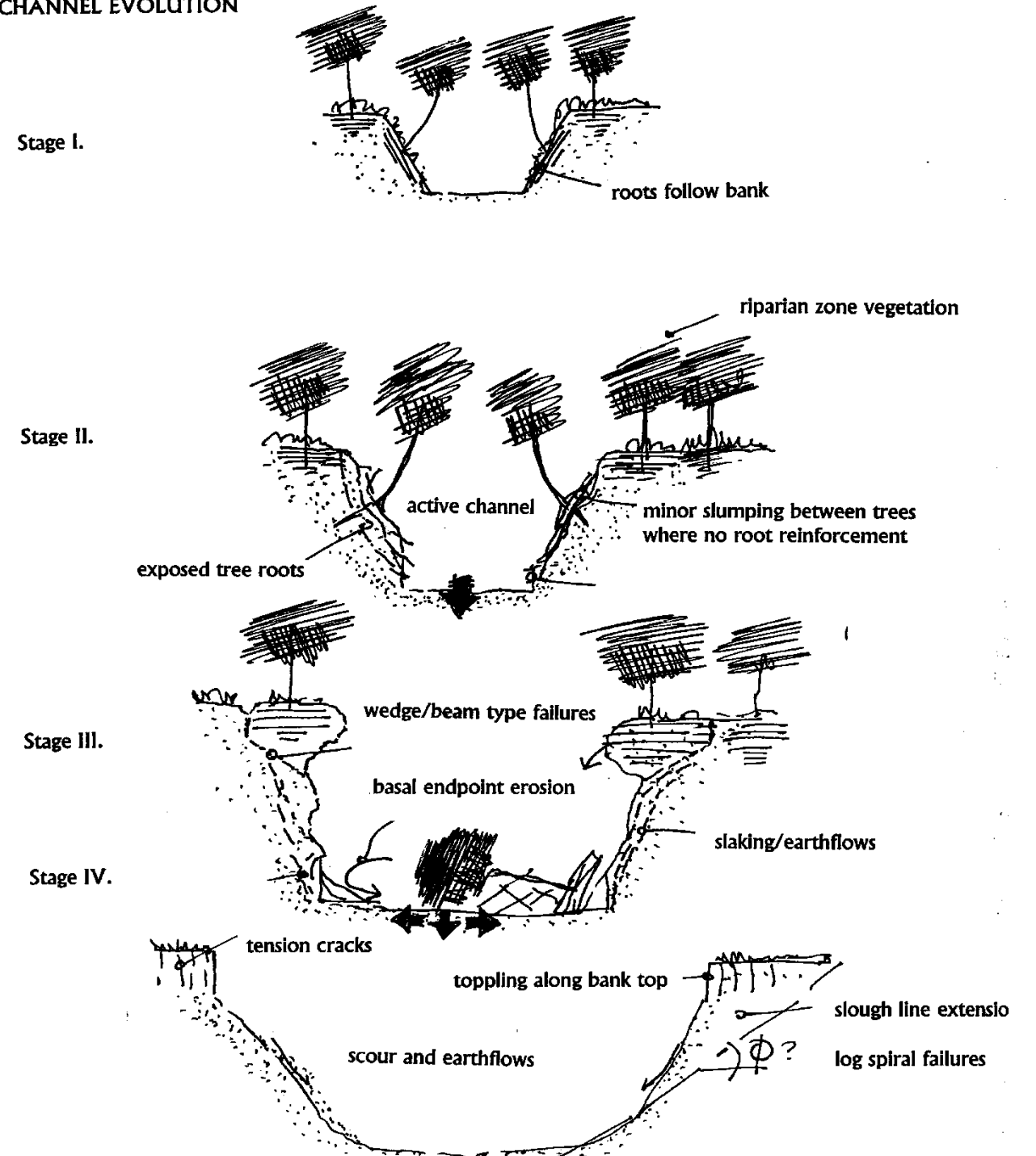
- Increased stream flows = higher velocities



Urbanized Stream Erosion

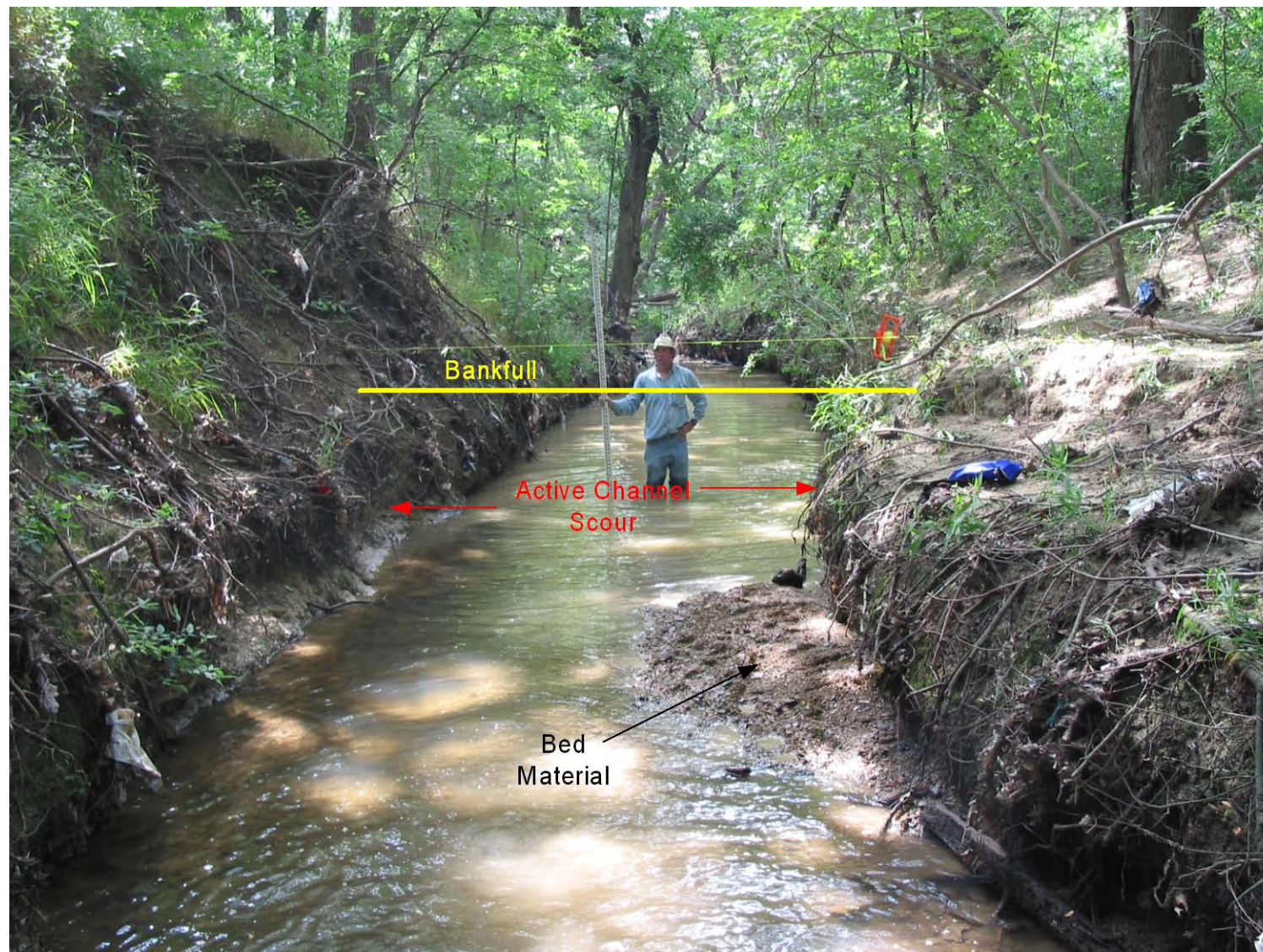
- Channel Evolution Model
 - Low flow, more frequent storm events
 - Drought conditions – then heavy storms (i.e. 2015)
 - Erosion compounds itself
 - Hard substrata leads to widening/meandering
- Geomorphological assessment

CHANNEL EVOLUTION



Urbanized Stream Erosion

- Streams want to reach equilibrium slope
 - Downcutting



Urbanized Stream Erosion

- Streams want to reach equilibrium slope
 - Meandering



Urbanized Stream Erosion

- Streams want to reach equilibrium slope
 - Widening



Urbanized Stream Erosion

- Threat to properties and infrastructure



Solving Stream Erosion Problems



Solving Stream Erosion Problems

- Variety of solutions will work
- Consider what is preferable to use for your City
- Structural solutions:
 - Channel Banks (Public or Private)
 - Turf reinforcement mats/vegetation, gabions, rock rip-rap, concrete bag walls, pre-cast block walls
 - Channel Bottom (Public)
 - Rock chutes, drop structures, vanes, riffle pools
 - Overflow weirs and diversions

Solving Stream Erosion Problems

- Case Studies

- Jackson Creek – City of Colleyville (2001)
- Kirby Creek – City of Grand Prairie (2007)
- Lennox Lane – City of Arlington (2015)

Jackson Creek - Colleyville

- Overview



Jackson Creek - Colleyville

- Study – 1999



Approx. 600 LF of natural channel downstream of U-shaped concrete-lined flume



Jackson Creek - Colleyville

- Study (1999) - Challenges
 - High velocities from upstream concrete U-channel
 - Plunge pool downstream of U-channel
 - Low water crossing at Sherwood Lane
 - **Meandering & channel migration**
 - **Widening occurring due to larger storm events**

Jackson Creek - Colleyville

- Study (1999) - Solutions
 - Rock riprap & gabion mattress at U-channel outfall
 - Re-align meander (less than 300 linear feet)
 - Bench channel 10-20 feet away from homes
 - Gabion mattress protection near structures
 - Vegetated TRMs on all other slopes
 - Raise Sherwood Lane & install box culverts to provide 100-year flood protection

Jackson Creek - Colleyville

- Construction – 2001-02



Gabion & Riprap
Protection at CLC outfall

Gabion mattress
side slopes



Box culverts @ Sherwood
Lane = 100-yr flood protection

Slopes laid back,
vegetated TRM and
pretty trees!

Jackson Creek - Colleyville



2001

2009

Today

Jackson Creek - Colleyville

- 2009

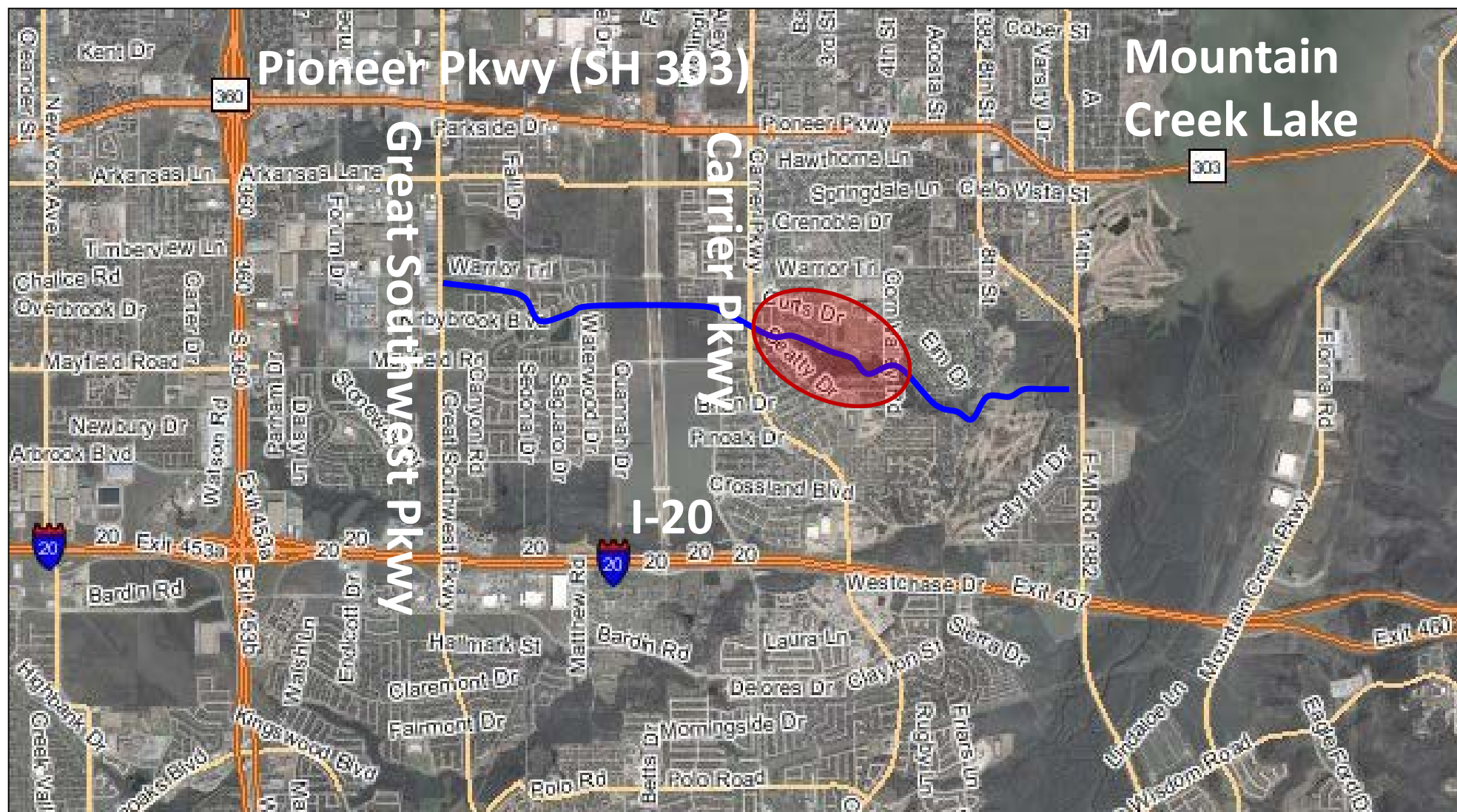


- Today



Kirby Creek – Grand Prairie

- Overview



Kirby Creek – Grand Prairie

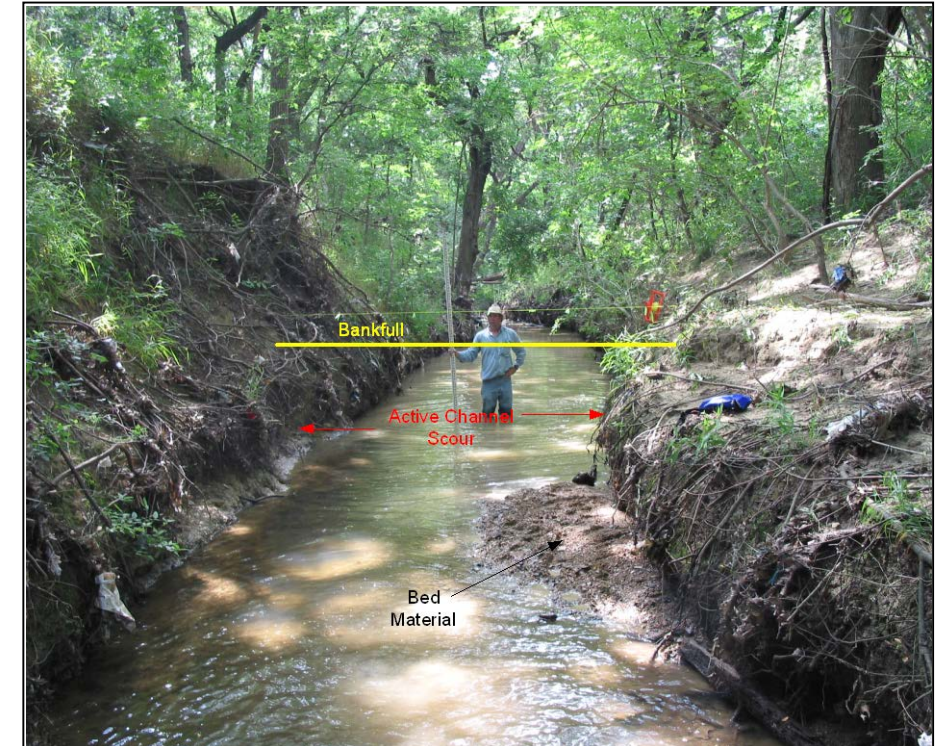
- Channel Stability Assessment - 2004



Severe Scour



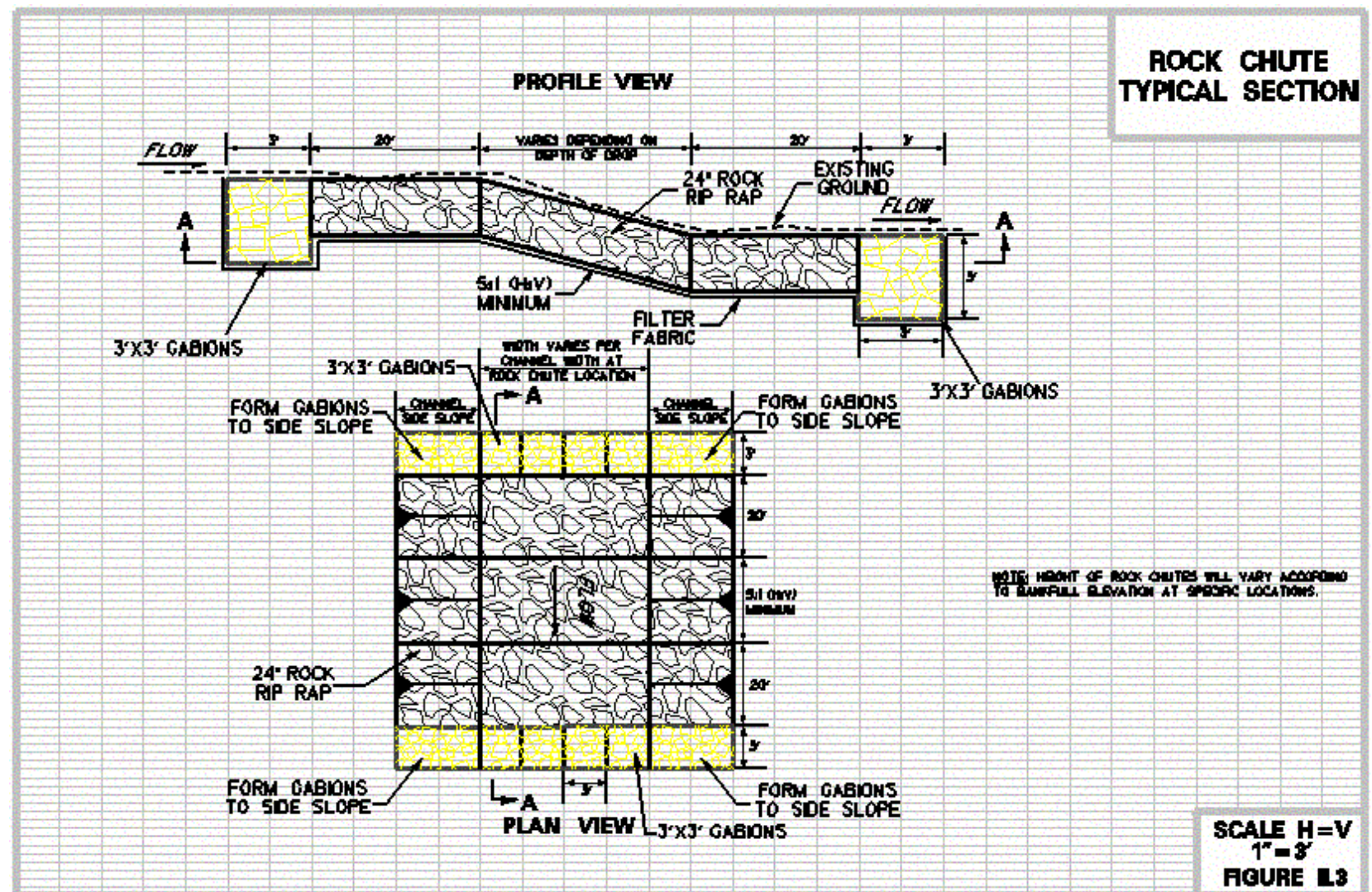
Toe Failures



Downcutting

Kirby Creek – Grand Prairie

- Grade Stabilization – Rock Chutes
 - At knickpoints
 - Straight reach



Kirby Creek – Grand Prairie

- Construction - 2007



Kirby Creek – Grand Prairie

- Construction - 2007



At 96" RCP Outfall near Christopher Drive

Kirby Creek – Grand Prairie

- 2009



At 96" RCP Outfall near Christopher Drive

Kirby Creek – Grand Prairie

- Today



At 96" RCP Outfall near Christopher Drive

Lennox Lane - Arlington

- Overview
 - Erosion after May-June 2015 floods
 - **Meandering & channel migration**
 - Emergency Repair
- Solutions
 - Gabion basket wall
 - Sanitary sewer relocation

Lennox Lane – Arlington (May 2015)



Lennox Lane – Arlington (May 2015)



Lennox Lane – Arlington (June 2015)



Lennox Lane – Arlington (Jan 2016)



Lennox Lane – Arlington (Jan 2016)



Lennox Lane – Arlington (Jan 2016)



Lennox Lane – Arlington (Jan 2016)



Lennox Lane – Arlington (2017)



Lennox Lane – Arlington (2018)



City Perspective

Grand Prairie
T E X A S

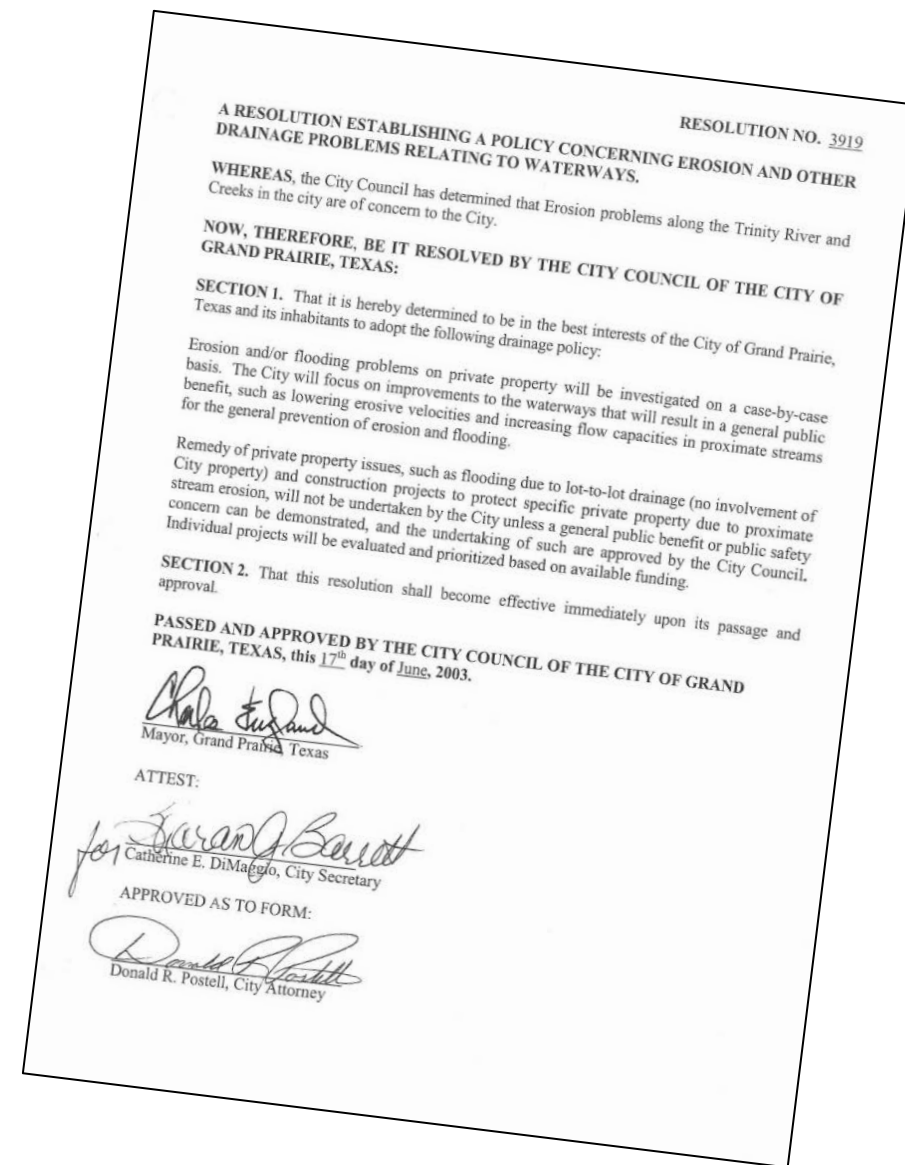


City Perspective

Resolution No. 3919 (2003)

(Defines Public and Private Improvements)

- “ ... The City will focus on improvements to the waterways that will result in a general public benefit, such as lowering erosive velocities and increasing flow capacities in proximate streams for the general prevention of erosion and flooding.”
- Focus is on the Master Plan approach.



City Perspective

Drainage Master Plans

- Provide recommendations for public improvements
- Provide suggestions for private property improvements
- Address erosion hazard setbacks
- Consider existing and fully developed conditions

City Perspective

Previous Erosion Projects

- Bluegrass Drive (Fish Creek) - 1998
 - Construction for gabion wall & stabilization ✓



City Perspective

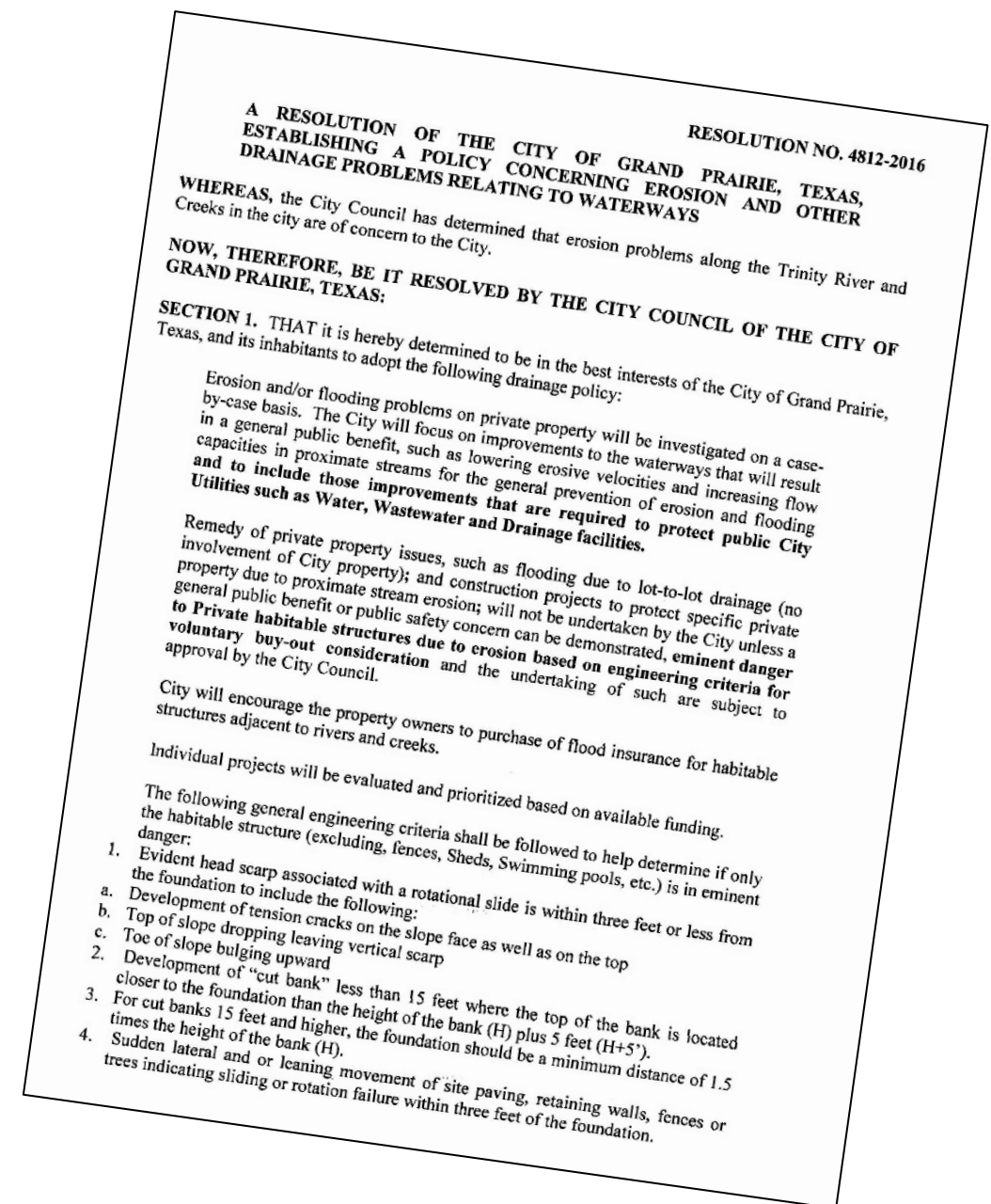
How Should Grand Prairie Address Erosion?

- Public/Private defined in Res. 3919 (2003)
- Projects deemed as private responsibility are too costly for residents
- Public projects start out as a small cost to fix but become very expensive to maintain/repair long-term
- Additional cost-effective solution should be considered
 - Voluntary buyout for public and private erosion

City Perspective

Resolution No. 4812 (2016)

- Adopted April 2016
- Keeps previous language
- Provides option for voluntary buyout to address private erosion
- Protect existing utilities



City Perspective

Resolution No. 4812 (2016)

- Case-by-case situation
- If qualifications met, then
 - Property owner signs “Request for Consideration for Voluntary Buyout Program Investigation and Permission to Appraise”
 - Property owner obtains flood insurance for the duration of the buyout process
 - City hires geotechnical engineer to perform more detailed evaluation (bore samples)
 - City obtains appraisal
 - Funding included for Budget consideration
 - City Council makes final decision

City Perspective

Erosion Projects under Res. 4812

- Windhurst Drive (Kirby Creek)



City Perspective

Erosion Projects under Res. 4812

- Windhurst Drive (Kirby Creek)
- Options Considered
 - Gabion wall for residents to design & install (\$859k)
 - Purchase property and demo house (\$178,900)

City Perspective

Erosion Projects under Res. 4812

- Windhurst Drive (Kirby Creek) - Solution
- Two houses appeared to qualify for the voluntary buyout option
- Only one house met the Resolution requirements
- House is demolished
- Property is dedicated and maintained as Stormwater Management Area

City Perspective

Erosion Projects under Res. 4812

- Sir Roland Drive (Kirby Creek) – 2017 Completion
 - Slope failure & public utility repairs ✓



CLOSING THOUGHTS



CLOSING THOUGHTS

- Establish a defined Erosion Policy or Ordinance
 - Voluntary buyouts for severe private erosion issues
 - Set Erosion Hazard Setbacks for new development
- Structural solutions
 - Determine channel evolution stage (geomorphology)
 - Determine type(s) of erosion to understand solutions
 - Focus CIPs on Public Improvements
 - Factor in costs and sustainability
 - Contractor experience is important
 - Inspectors should understand project goals
 - Check NCTCOG resources

Questions?

