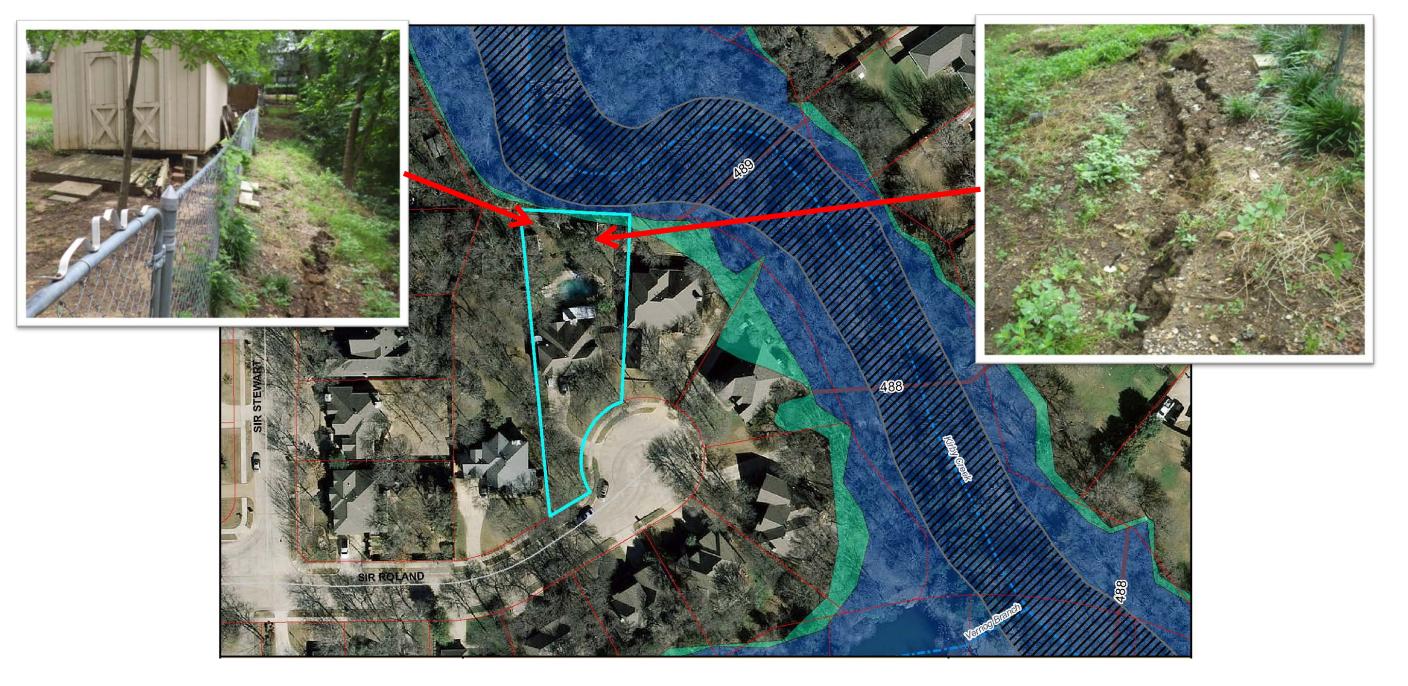


Today's Agenda

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

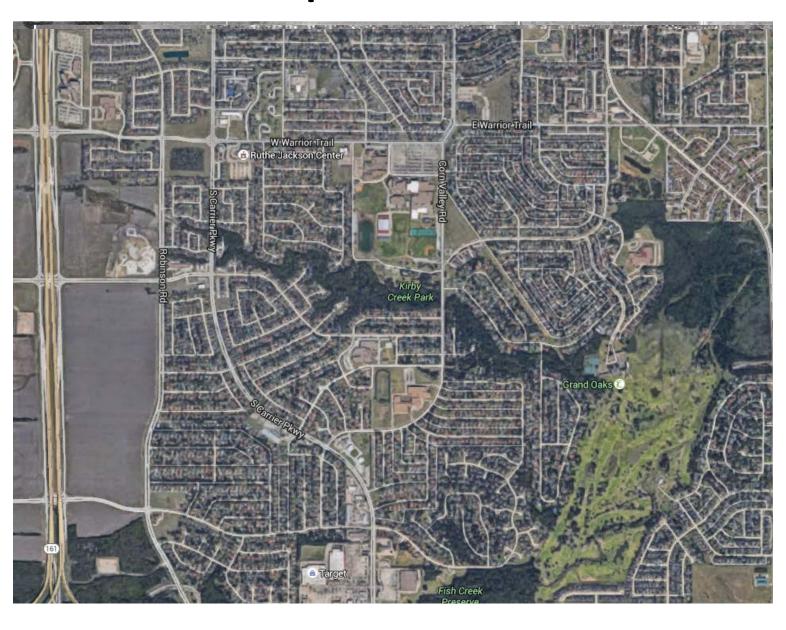


Why do urbanized streams erode?





Increased development over time



1958

1984

Current

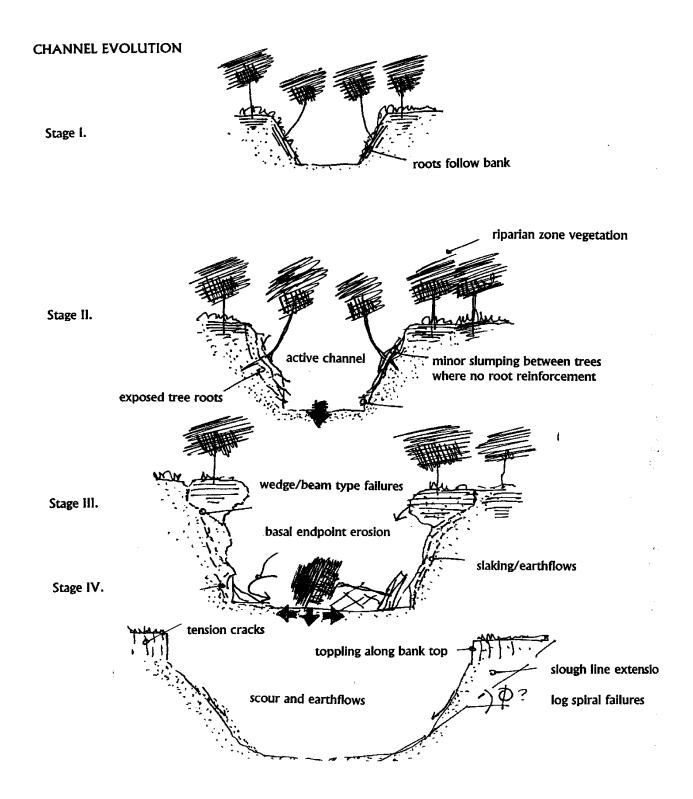


Increased stream flows = higher velocities



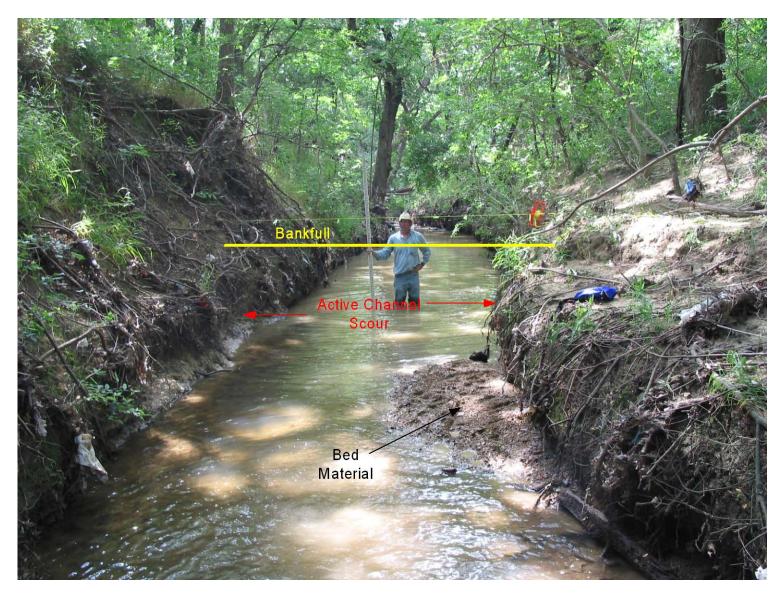


- Channel Evolution Model
 - Low flow, more frequent storm events
 - Drought conditions then heavy storms (i.e. 2015)
 - Erosion compounds itself
 - Hard substrata leads to widening/meandering
- Geomorphological assessment





- Streams want to reach equilibrium slope
 - Downcutting





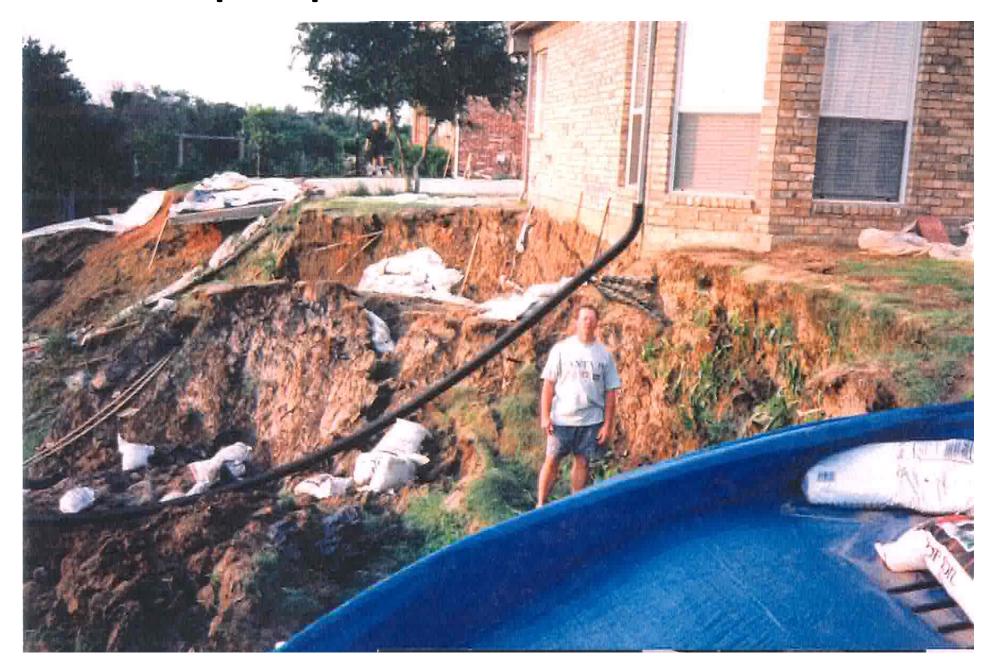
- Streams want to reach equilibrium slope
 - Meandering



- Streams want to reach equilibrium slope
 - Widening



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)



Overview





Study – 1999



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







- 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



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



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!





2001

2009

Today



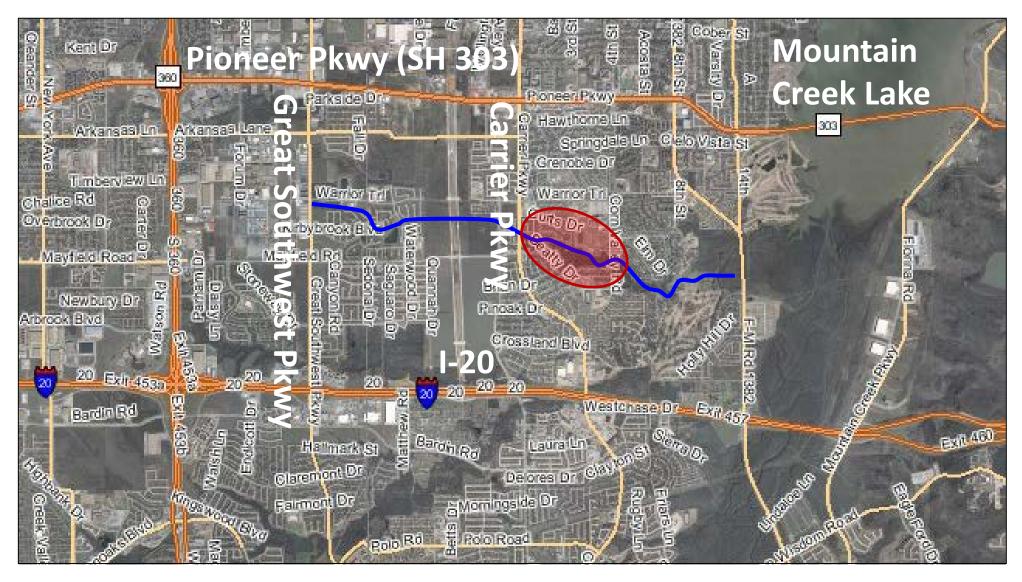
• 2009







Overview

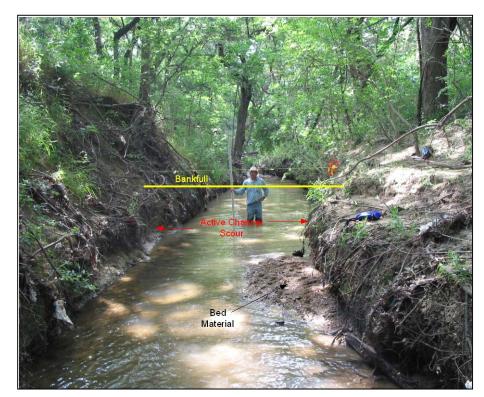




Channel Stability Assessment - 2004







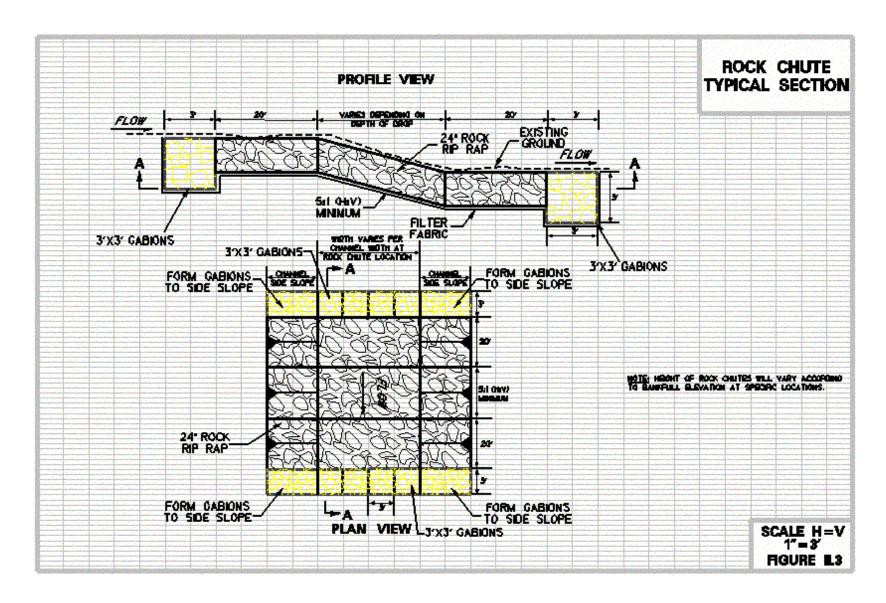
Severe Scour

Toe Failures

Downcutting



- Grade Stabilization Rock Chutes
 - At knickpoints
 - Straight reach





Construction - 2007









Construction - 2007



At 96" RCP Outfall near Christopher Drive



• 2009



At 96" RCP Outfall near Christopher Drive



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 (2018)





City Perspective



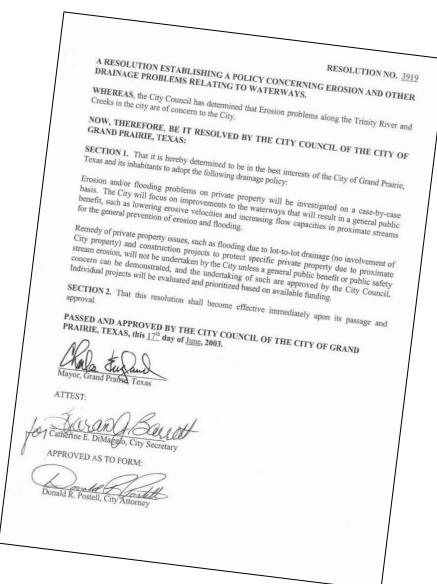




City Perspective Resolution No. 3919 (2003)

(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

RESOLUTION NO. 4812-2016

A RESOLUTION OF THE CITY OF GRAND PRAIRIE, TEXAS, POLICY CONCEDNING FROSION AND OTHER A RESOLUTION OF THE CITY OF GRAND FRAIRIE, LEAAS, ESTABLISHING A POLICY CONCERNING EROSION AND OTHER DRAINAGE PROBLEMS RELATING TO WATERWAYS

WHEREAS, the City Council has determined that erosion problems along the Trinity River and

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF

SECTION 1. THAT it is hereby determined to be in the best interests of the City of Grand Prairie,

Erosion and/or flooding problems on private property will be investigated on a caseby-case basis. 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 in a general public benefit, such as lowering crossive velocities and increasing now capacities in proximate streams for the general prevention of erosion and flooding those improvements that are required to protect public City capacities in proximate streams for the general prevention of crosion and mooning and to include those improvements that are required to protect public City Utilities such as Water, Wastewater and Drainage facilities.

Remedy of private property issues, such as flooding due to lot-to-lot drainage (no remery or private property issues, such as mouning one to not-no-not manage (no involvement of City property); and construction projects to protect specific private arrangement which is proving a stream existing will not be undertaken by the City molece a property due to proximate stream erosion; will not be undertaken by the City unless a general public benefit or public safety concern can be demonstrated, eminent danger general public bettern or public safety concern can be demonstrated, entirent danger to Private habitable structures due to erosion based on engineering criteria for the structure of such are subject to to Frivate nantame structures one to crosson based on engineering criteria for voluntary buy-out consideration and the undertaking of such are subject to

City will encourage the property owners to purchase of flood insurance for habitable

Individual projects will be evaluated and prioritized based on available funding.

The following general engineering criteria shall be followed to help determine if only The following general engineering criteria snail be followed to help determine it only the habitable structure (excluding, fences, Sheds, Swimming pools, etc.) is in eminent

- danger;

 Evident head scarp associated with a rotational slide is within three feet or less from Development of tension cracks on the slope face as well as on the top

- Development of "cut bank" less than 15 feet where the top of the bank is located closer to the foundation than the height of the bank (H) plus 5 feet (H+5'). For cut banks 15 feet and higher, the foundation should be a minimum distance of 1.5
- Sudden lateral and or leaning movement of site paving, retaining walls, fences or trees indicating sliding or rotation failure within three feet of the foundation.



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

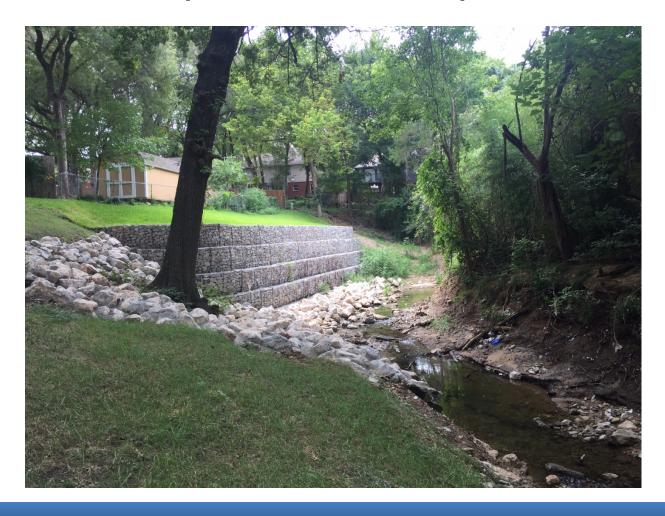
- Windhurst Drive (Kirby Creek) Solution
- Two houses appeared to qualify for the voluntary buyout option
- Only one house met the Resolution requirements
- House is demolished
- Property is dedicated and maintained as Stormwater Management Area



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?

