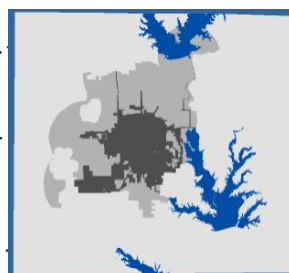
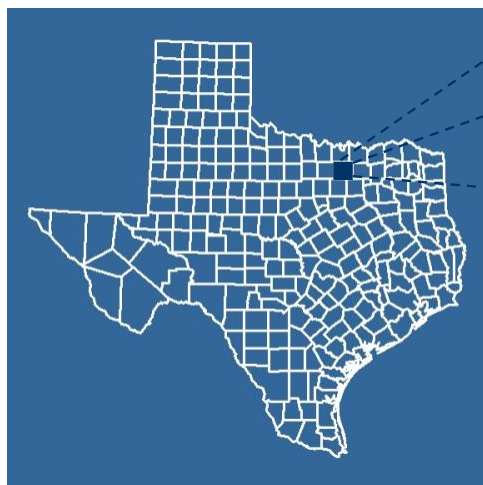


## Protecting Riparian Areas, Streams, and Environmentally Sensitive Areas with Municipal Code

Kenneth Banks and Deborah Viera  
Environmental Services



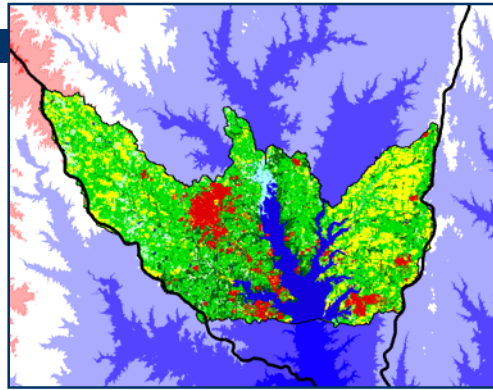
## Study Area – Denton, Texas



- Population ~120,000
- Denton City Limits ~160 sq km
- Denton ETJ ~207 sq km
- Rainfall averages 99 cm / yr
- One of top 10 fastest growing cities

## Conditions Around Lake Lewisville

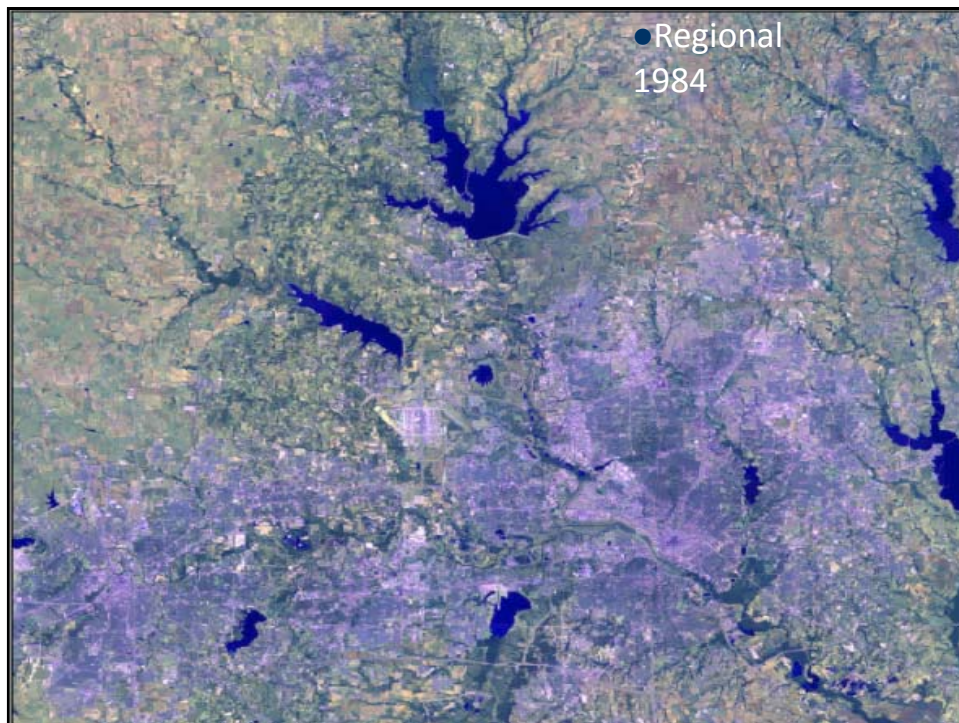
- Rapid growth in watershed.
- 25 municipalities
- Growth Centers: Denton, Frisco, and The Colony.
- Approximately 69% of the watershed is still cropland or rangeland
- Rural lands converted to urban at a rapid rate

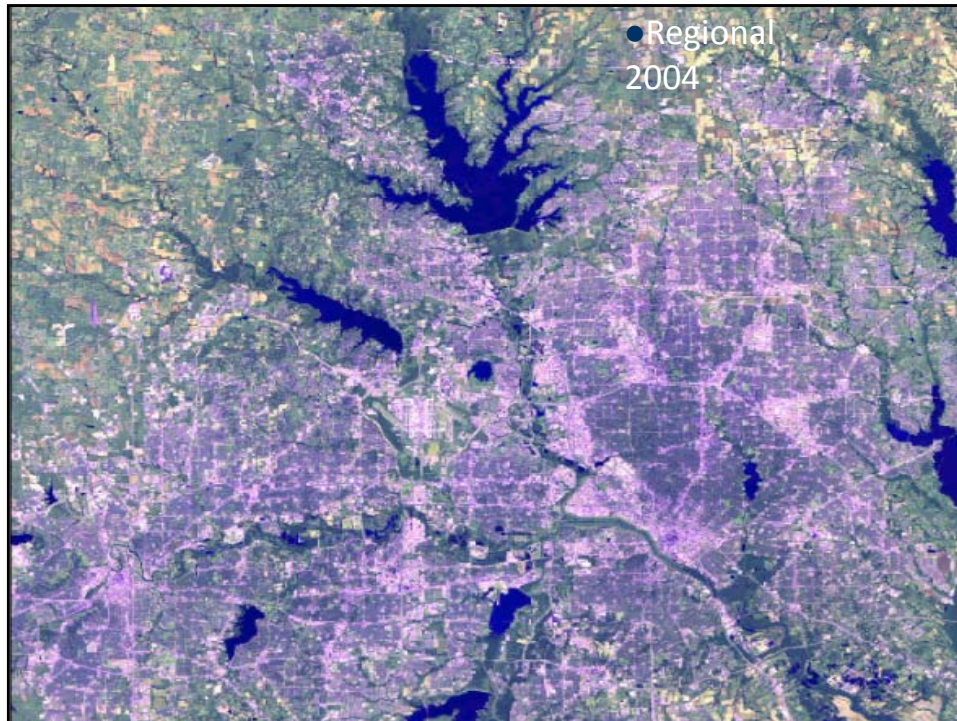


Urban Forest Pasture Wetlands Agricultural Lake Lewisville









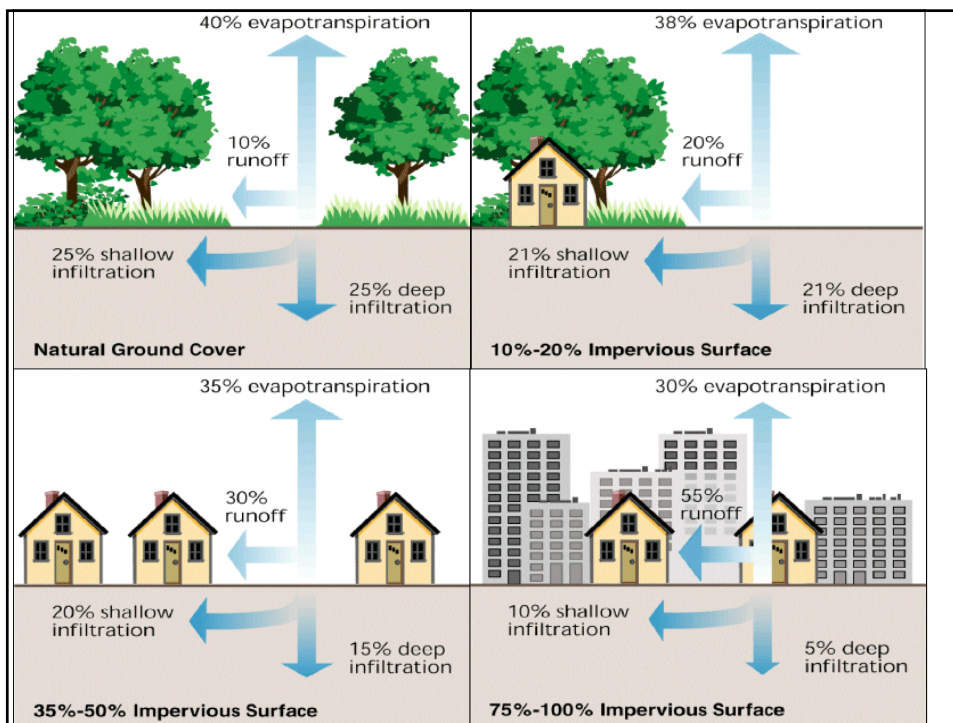
## **General Environmentally Sensitive Areas (ESA) concerns for Denton**

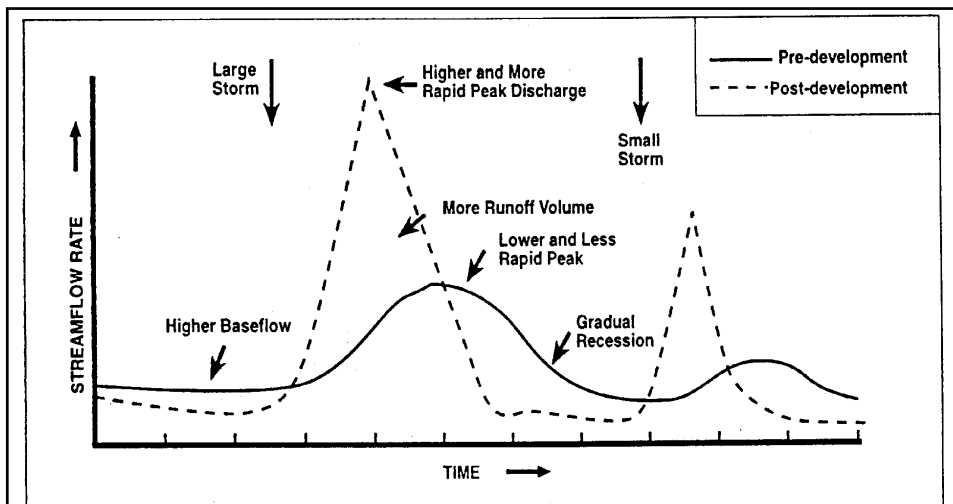
- Rapid development in watersheds, rural to suburban / urban
- Watersheds drain to large water supply and recreational reservoir
- Drainage infrastructure old, not up to current standards, “landlocked”, and in need of substantial capital for new projects and O&M.
- Substantial Environmentally Sensitive Areas (ESAs) in the City
- Substantial, long term education for citizens and decision makers about the importance of preserving these areas
- Ultimately developed ESA protection code



## Hydrological Concerns without action

- Impacts to natural water balance – water supply concerns, impacts to reservoir
- Increased flood peaks
- Increased stormwater runoff
- More frequent flooding (large flood event in 2007)
- Increased frequency of short term bankfull flows
- Lower dry weather flows
- Impacts to drainage infrastructure and resulting capital needs





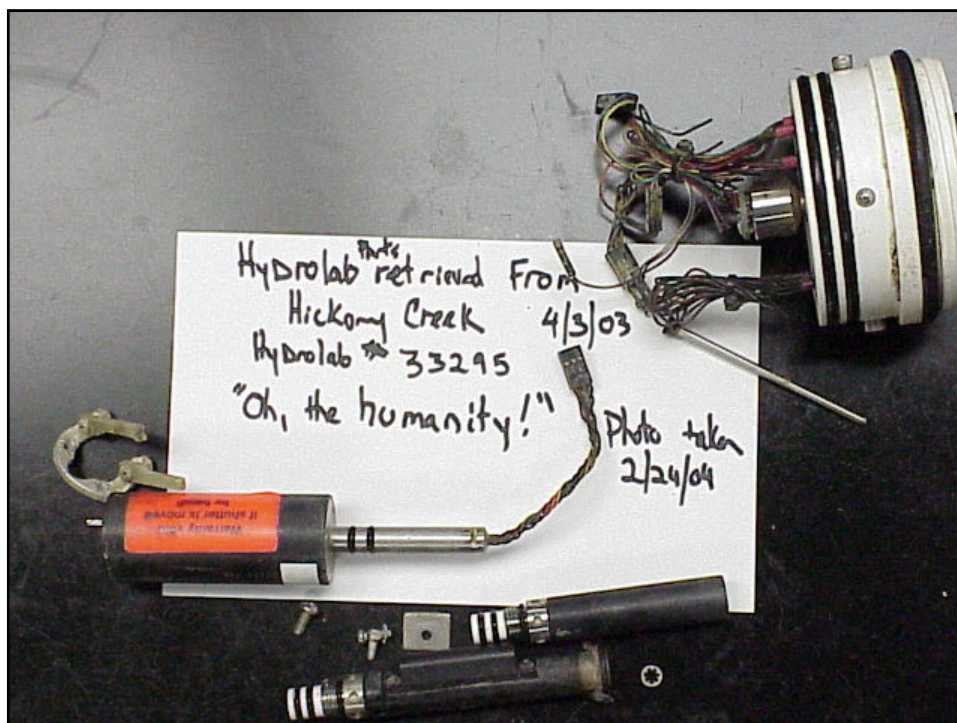
- In pre-developed conditions, flow gradually increases and descends.
- In urban conditions, flow rapidly increases and sharply descends, often to a lower flow condition than pre-development.









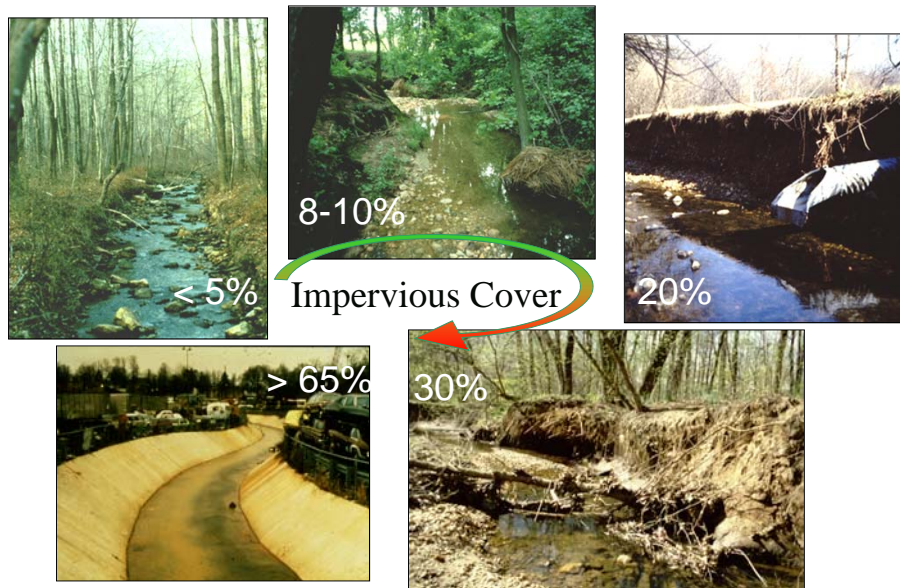




## Geomorphological Concerns w/o action

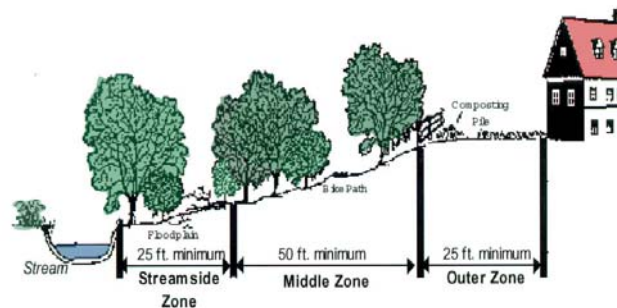
- Stream widening & erosion
- Degradation of habitat structure
- Decreased channel stability
- Loss of pool-riffle structure
- Fragmentation of riparian tree canopy
- Embeddedness
- Decreased substrate quality

## Stream Quality compared Impervious Cover



## ESA protection strategies

- Restrictions on development for certain landuse categories
- Several ESAs in Denton ... most are “riparian buffers” of various types



## Developing the ESA protection strategy

- Define the term, education for “no action” outcomes
- Initial discussions about ESA benefits
- Use what you already have (tree preservation, floodplain)
- Long, arduous battles through the political process, (round 1). You will encounter pushback / challenges
- Assuming you survive, draft the code (rounds 2-4)
- Long arduous battles through the political process to get to adoption (rounds 4 through 20???)



## Structure of ordinance – ESA classes

- **Developed floodplain**: FEMA 100-year floodplain, but developed (before ordinance was in place)
- **Undeveloped floodplain**: same, but undeveloped
- **Riparian buffers**: areas immediately adjacent to a surface water conveyance. 50ft to 100ft, depending on drainage basin size. **No drainage area size cutoff**
- **Water Related Habitats**: Wetlands or areas containing significant hydrophytic vegetation
- **Upland habitat**: remnants of the Eastern Crosstimbers forests, 10 acres in size or larger.

## Let's Start With Riparian Buffer ESAs

- **Vegetated area, including trees, shrubs, and herbaceous vegetation, that exists or is established to protect a stream system, lake, reservoir, or coastal estuarine area.” (EPA’s Aquatic Buffer Model Ordinance)**
- Sounds good. How wide, how are they protected, how do they interface with drainage infrastructure, how is new development handled, etc????



## Benefits of Riparian Buffers

- Flood mitigation
- Water quality
- Bank stability
- Recreation
- Wildlife habitat
- Economic benefits (development amenities, landscape requirements)



## Challenges

- Benefits can be difficult to convey to decision makers
- Perceived economic impacts and takings claims
- Use and maintenance of the area over time
- Some operated by HOAs with restrictions, some are easements with minimal maintenance ..... Issues!!





## Riparian Buffers - Fixed Buffer Width

- Fixed, uniform buffer width for all streams (50ft or 100ft) based on drainage area
- Easy to administer, harder to justify scientifically or from property owner standpoint.
- May not protect adjacent habitat, may be excessive in some locations



## Suburban Watershed

**Protection Begins At 320 Acres**

**288,884 ft. Stream Buffered**

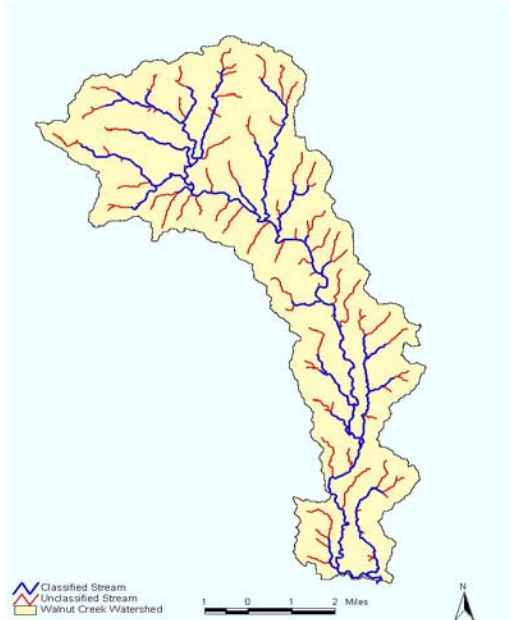


●slide provided by Mike Lyday, City of Austin

## Suburban Watershed

**64 Acre  
Drainage area  
Protected**

**553,381 ft.  
Stream  
Buffered**

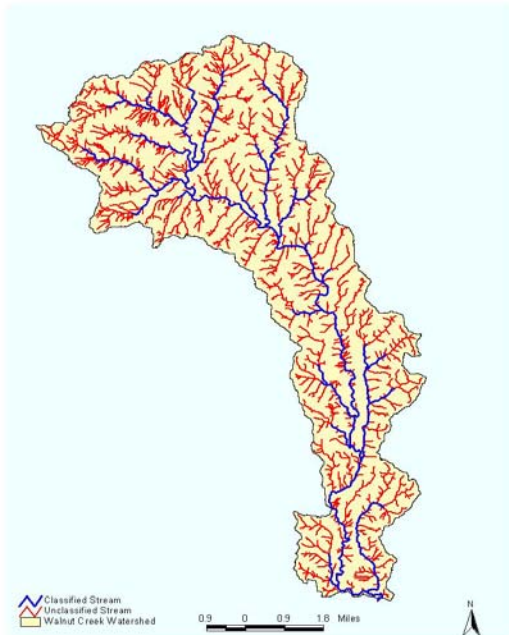


●slide provided by Mike Lyday, City of Austin

## Suburban Watershed

**5 Acre  
Protection**

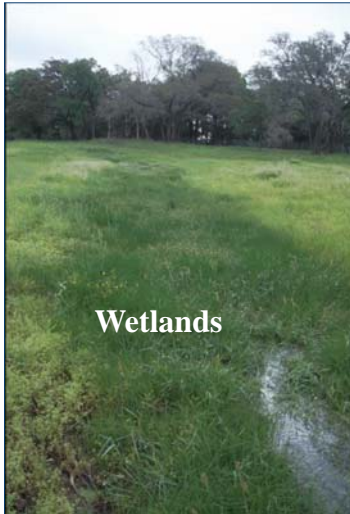
**1,638,372 ft.  
Headwater  
Protection**



●slide provided by Mike Lyday, City of Austin



## Headwaters are a crucial component!



**Drainage size “cutoffs” in  
buffer design work against  
headwater protection**

## HEADWATER VALUES

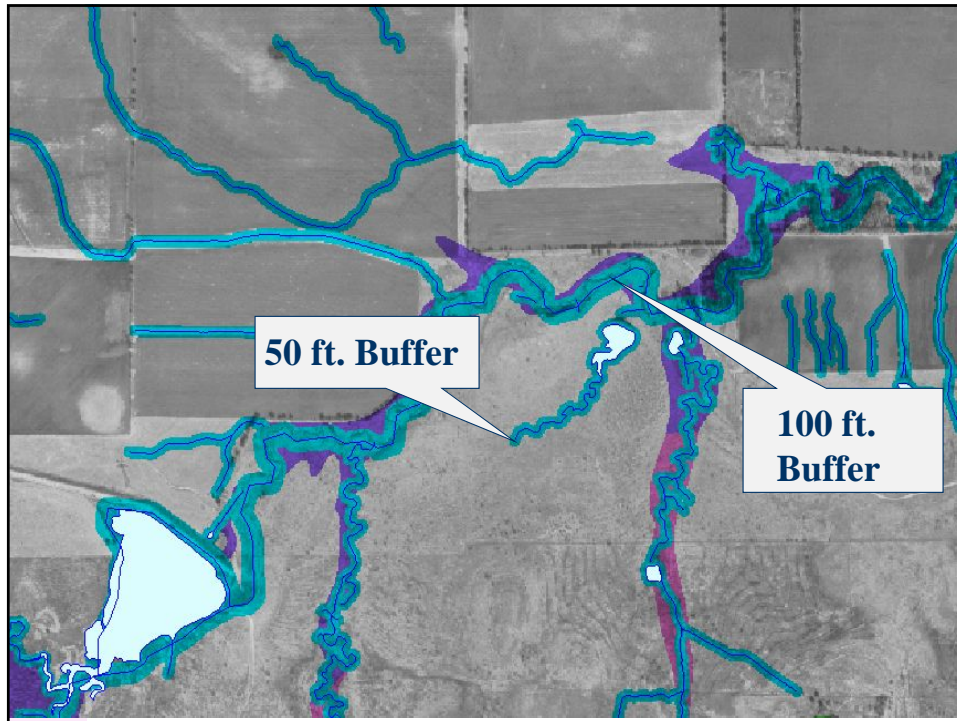


- mitigate flooding and erosion via storage
- Habitat
- Sediment mitigation

**Groundwater / surface water  
interaction zones – recharge**

**LIKE CAPILLARIES**





## Expand Protection to Floodplains

- **Developed floodplains** – basically, only FEMA fill requirements and local drainage code, but requires CLOMR / LOMR before allowed on unstudied
- **Undeveloped floodplain, riparian buffers and water related resources:**
  - No land disturbing, tree, or understory removal
  - No handling, processing, or storing hazardous wastes
  - Riparian buffers are “nested” in floodplain

## **Include Water related Habitat**

- Basically wetlands
- No disturbance unless authorized by a USACE 404 letter of permission
- No structures of any kind

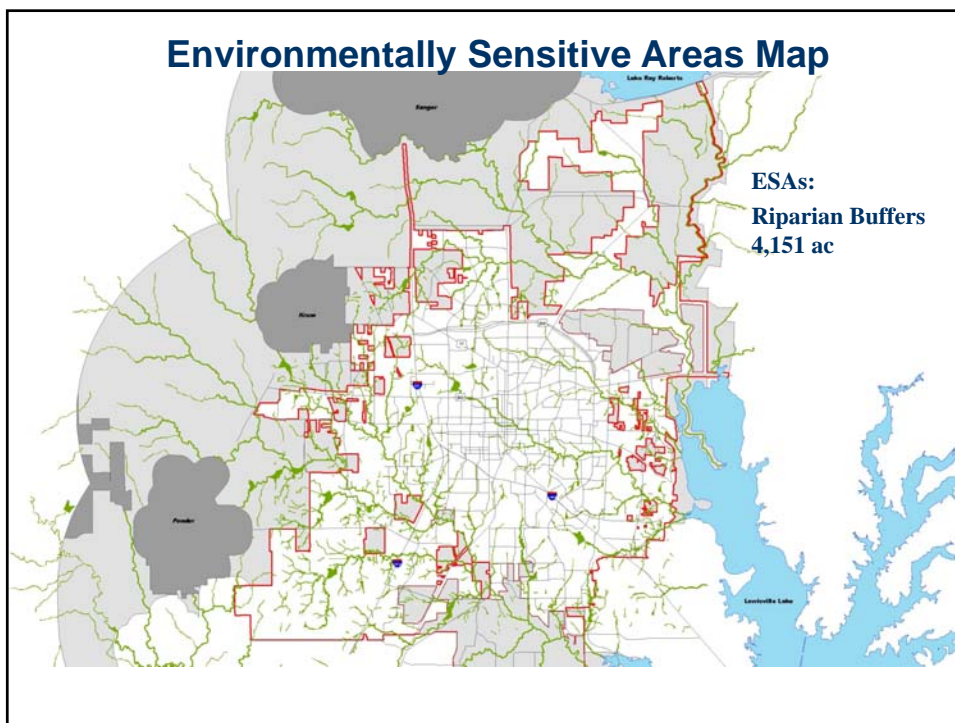
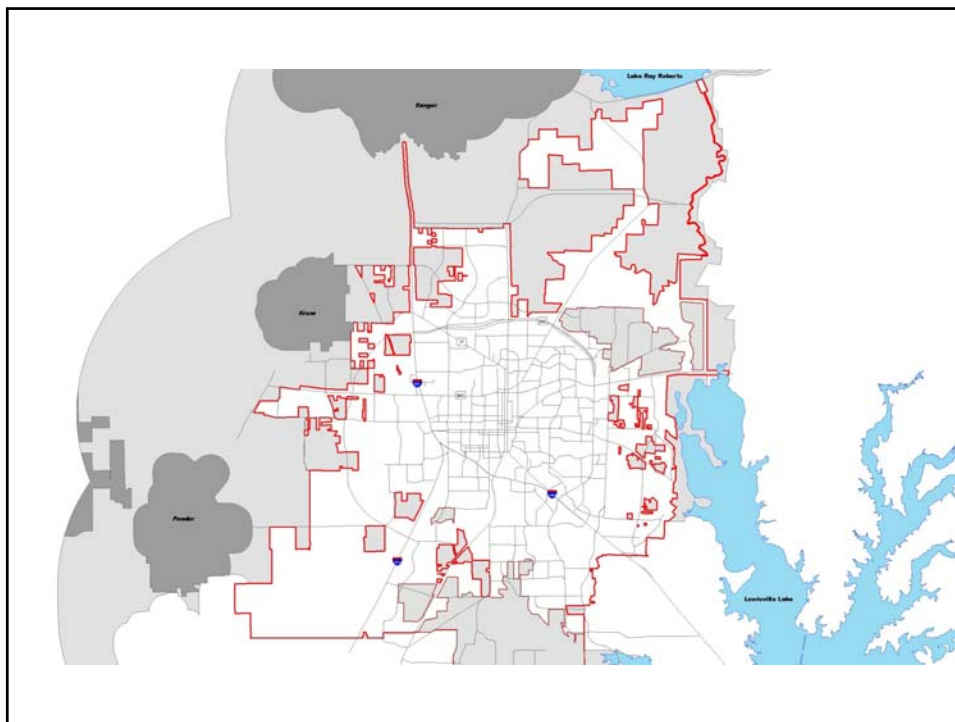


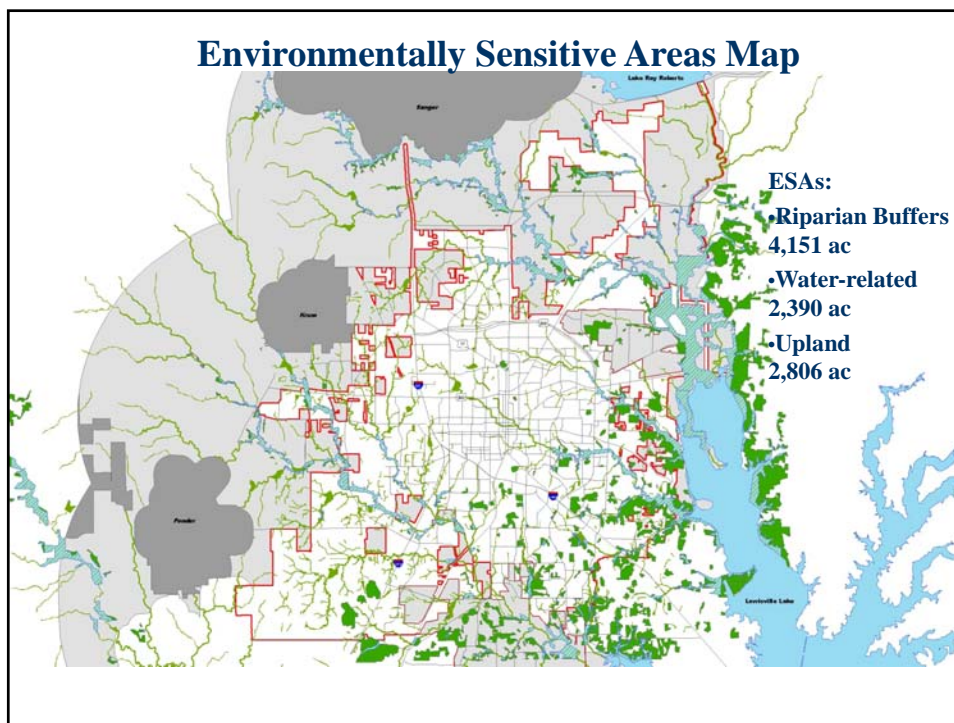
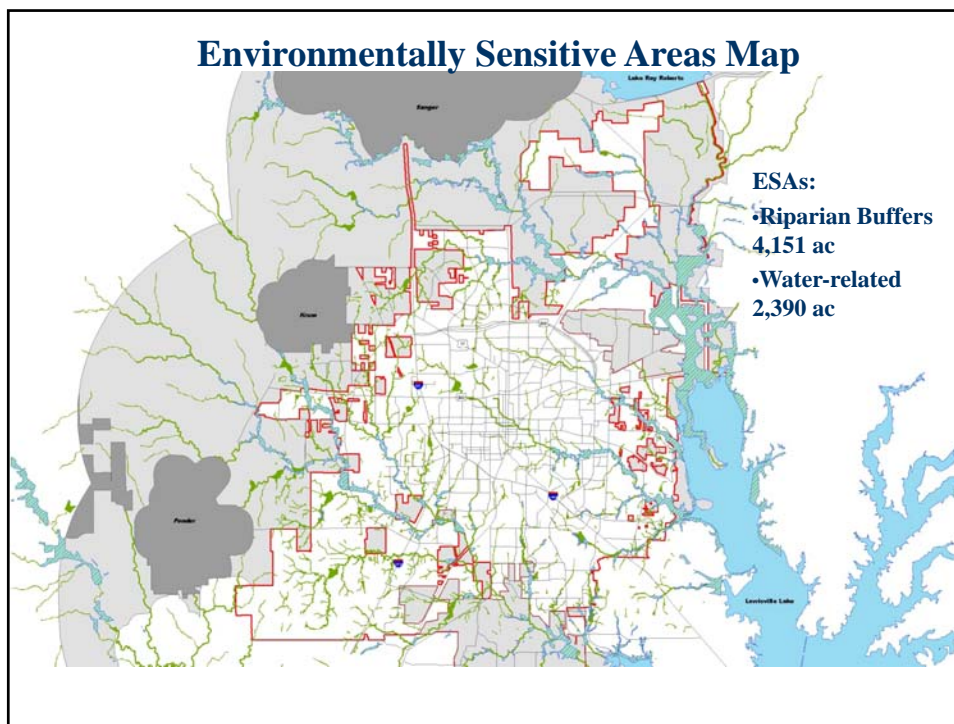
## **Additional ESA for Denton Upland Habitat**

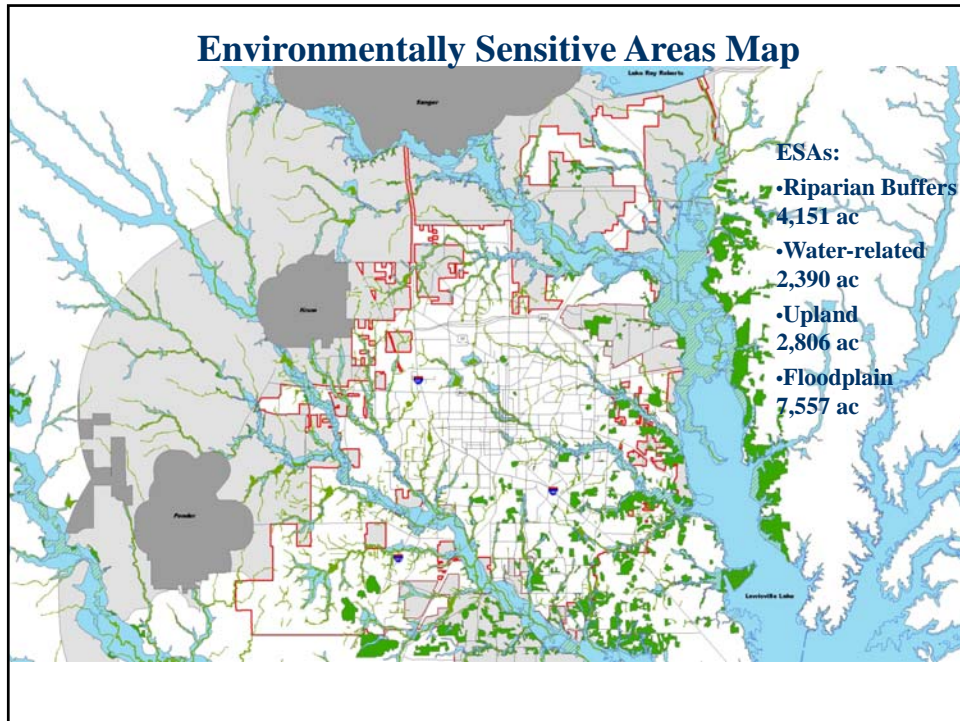
- Eastern Cross Timbers, 10 acres or more, contiguous
- Protected for residential land uses, must maintain 50% canopy cover. Tree preservation code on commercial









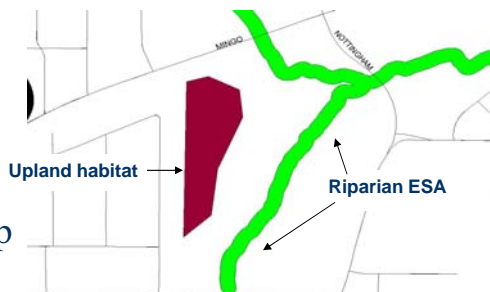



ESA	Acreage
All ESAs (net)	11,952
Undeveloped Floodplain	7,557
Water-related Habitat	2,390
Riparian Buffers	4,151
Inside Floodplain	2,562
Outside Floodplain	1,569
Upland Habitat	2,806



## Implementation and Review

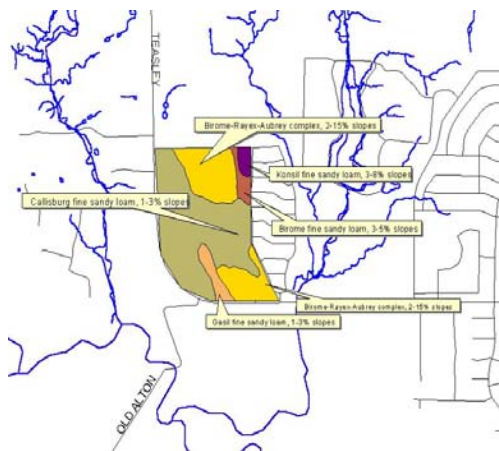
- ESAs delineated during pre-construction review
- Developer can request a site assessment
- Site assessment uses modified USEPA RSAT
- **CRUCIAL** to do this step right to protect against takings claim



 <b>Riparian / ESA Assessment Form</b> <small>Version 1</small>	
Owner: <u>Pine Creek (Trans-Atlas Financial Inc)</u> Traktit #: <u>ESA08-0020</u>	
Address or Location: <u>701 E. Windsor St. - the eastern channel</u>	
Stream Name: <u>tributary to Cooper Creek</u> Approximate Width: <u>1'</u> Order: <u>1st</u>	
<b>General Land Use (current)</b>	
<input type="checkbox"/> Forest	<input type="checkbox"/> Commercial / Industrial
<input checked="" type="checkbox"/> Agricultural (fallow)	<input type="checkbox"/> Recreational
<input type="checkbox"/> Residential (low intensity, high intensity)	<input type="checkbox"/> Other: _____
<b>Purpose of Riparian Buffer (check all that apply)</b>	
<input checked="" type="checkbox"/> intercept sediment	<input checked="" type="checkbox"/> Intercept nutrients / fertilizers
<input type="checkbox"/> intercept pesticides	<input checked="" type="checkbox"/> intercept other pollutants
<input type="checkbox"/> lower water temperature	<input type="checkbox"/> help stabilize streambank
<input type="checkbox"/> Improve fish habitat	<input type="checkbox"/> improve wildlife habitat
<input type="checkbox"/> aesthetics	(species of interest: _____)
<input type="checkbox"/> Privacy	
<b>Stream Bank Condition</b>	
Evidence of frequent water level changes (Yes / <b>No</b> )	Existing plant cover: little - none / moderate / <b>well vegetated</b>
Slope of bank: <b>45°</b>	Cover type: cement / bare / <b>grass</b> / shrub / forest young / forest old
Type of soil: <b>clay</b> / sand / sandy loam / gravel / ledge	Large leaning trees? <b>No</b>
Active erosion: <b>slight</b> / moderate / severe	Invasive exotics present? <b>No</b>
	Approximate area of infestation: <b>N/A</b>

## Additional information that may be required for assessment

- Current Land Cover and uses
- Pictures of site
- Soils information
- Other requirements as needed



## RSAT follows ESA assessment form if applicable



### Supplemental RSAT Form

Rapid Stream Assessment Techniques version 1

RSAT Evaluation Category	General Rating Categories and Associated Point Ranges				
	Excellent	Good	Fair	Poor	Points
1. Channel Stability	9-11	6-8	3-5	0-2	
2. Channel Scouring / Deposition	7-8	5-6	3-4	0-2	
3. Physical In-stream Habitat	7-8	5-6	3-4	0-2	
4. Water Quality	7-8	5-6	3-4	0-2	
5. Riparian Habitat Conditions	6-7	4-5	2-3	0-2	
6. Biological Indicators	7-8	5-6	3-4	0-2	
Enter NA for not applicable categories					<b>Total</b>

Total Points \_\_\_\_\_

Verbal Ranking \_\_\_\_\_

Total Score \_\_\_\_\_

or \_\_\_\_\_ % of total

42-50 Excellent (or  $\geq 84$  percent of total)  
 30-41 Good (60  $\leq$  percent of total  $> 84$ )  
 16-29 Fair (32  $\leq$  percent of total  $> 60$ )  
 <16 Poor (less than 32 percent of total)

(if NA is entered on any category)

## Other options for developers - ADP

- Can request an Alternative ESA plan (zoning amendment)
- Review by Planning and Zoning / approved by City Council.
- Long process, no guarantee of success.
- Shall result in **high quality** development **meeting the intent** of the Development Code
- A few Alternative Plans accepted – many times the applicant decides that the time, expense, and uncertainty is not worth it.
- This process is also crucial as a defense against a takings claim.

## Incentives in the code

- May be used to meet landscape requirements
- May be used to meet tree canopy requirements
- May be used to meet parkland dedication requirements and drainage requirements
- Clustering of development allowed for preserving ESAs. Basically a transfer of density between lots under common ownership.
- So far, conflicts with other code requirements have made clustering unworkable.



## Challenges and Areas for Improvement

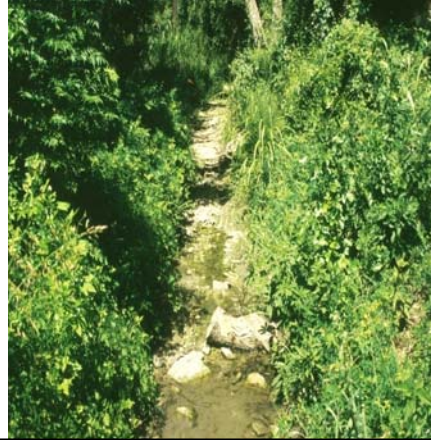
- Takings argument
- Road crossings and similar “unavoidable” impacts
- Apply in ETJ and in recently annexed areas?
- Encouraging connectivity of ESAs as cohesive units
- Regulatory flexibility, trading, mitigation, etc.? Have done this through overlays for MPCs
- Conflicting incentives – density with street design, parks dedication being “shorted”, concerns with “insufficient” landscape.

## Challenges and Areas for Improvement

- Must address during development review, which requires staff time
- Must keep up with maps – correcting errors, adding field assessments, changing when FEMA changes floodplain maps
- Can create development challenges
- Alternative development plan is needed to provide flexibility. However, this requires staff and developer time to administer and is uncertain
- Preservation of ESAs through easements

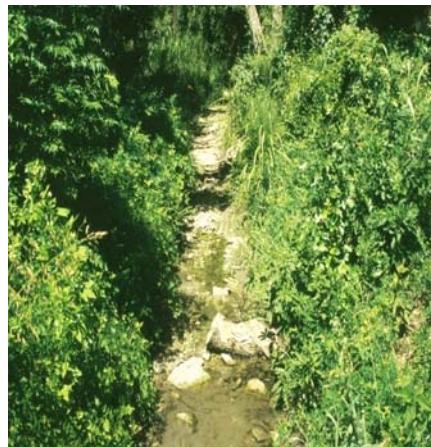
## Conclusions for ESAs in Denton

- Educate decision makers and citizens on importance of ESAs
- Set up a process that is ecologically based, supported by local code
- Without data showing quality and quantity of remaining riparian habitat, education and conservation are difficult
- Develop a highly defensible field assessment process.



## Conclusions for ESAs in Denton

- Build on what you have – many places have floodplain protection, tree preservation, landscape requirements, park dedication, etc.
- Connect ESAs whenever you can (upland to riparian to floodplain)
- Provide incentives if possible. Stormwater incentives may be particularly attractive



## Contact Information

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Code available at [www.cityofdenton.com](http://www.cityofdenton.com)

Go to “Government”, then City Charter and Ordinances

Chapter 17 of the Denton Development Code

Thank you for your time!

