Water Quality, Watershed Planning and Riparian Issues

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Texas Water Resources Institute & Texas A&M Institute of Renewable Natural Resources

Texas Water Resources Institute
make every drop count

Texas Riparian Association

Managing for Water is Complicated!

Texas Water Picture

- Population increase from 26 million to 46 million by 2060
- Water Use about 18 MAF today
- Water use maybe be 22 MAF in 2060
- Cities need more water
- Total Capital Costs for all 2012 recommended strategies $53 Billion
- Water Supplies
  - *Surface Water: Fully appropriated/big deals by public agencies*
  - *Groundwater: Still available but new rules*

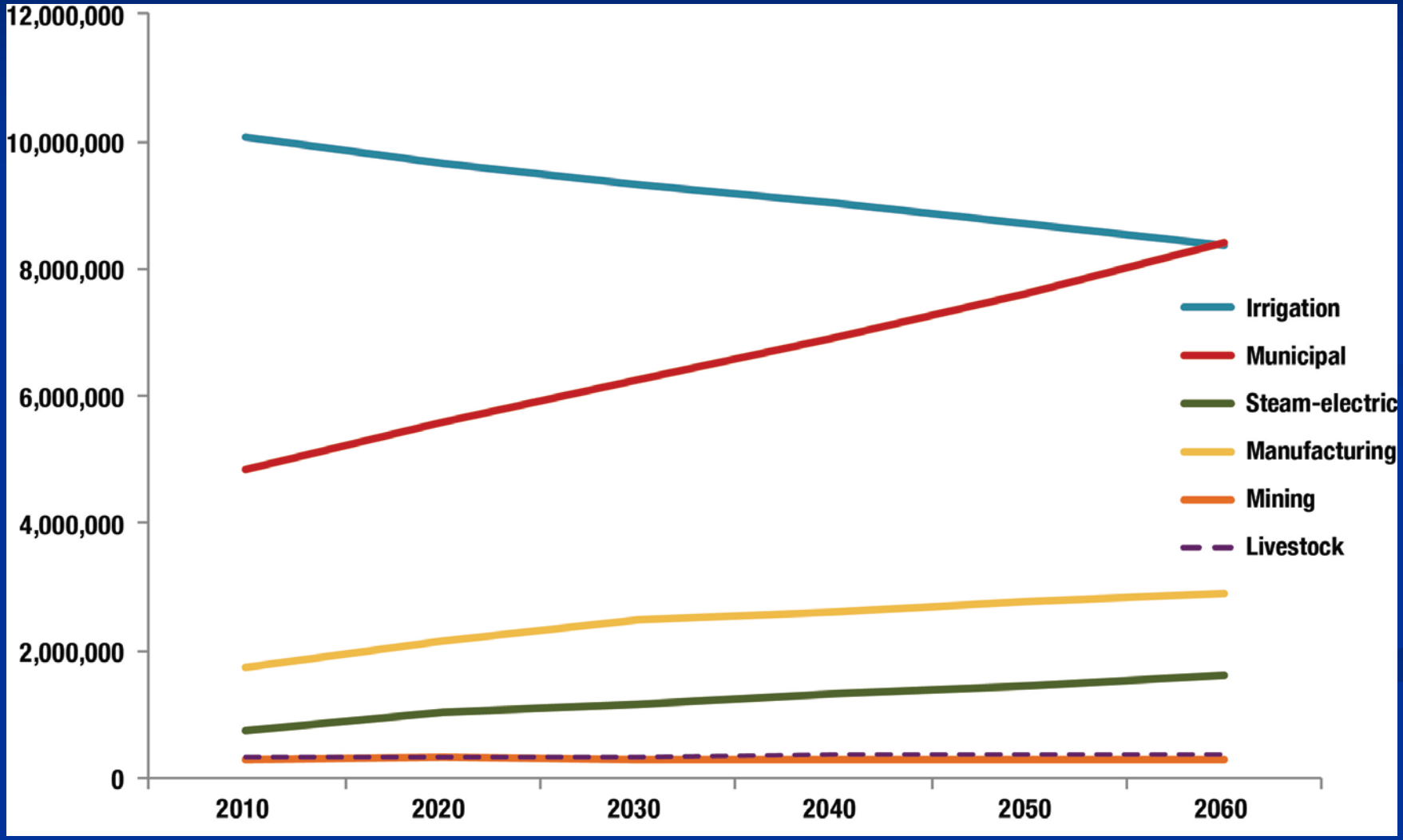
Water Factoids

- Use and Source
  - About 17 MAF: 60% groundwater/40% surface
  - Groundwater supports agriculture (80% for irrigation)
  - Surface Water supports municipal and industrial uses
- *Users of Texas Water*
  - *Agriculture 60% (10maf)- - 80% from groundwater*
  - *Municipal 30% (5 maf) - -65% surface water*
  - *Industrial/Other 10% (2 maf) - - 65 % surface water*

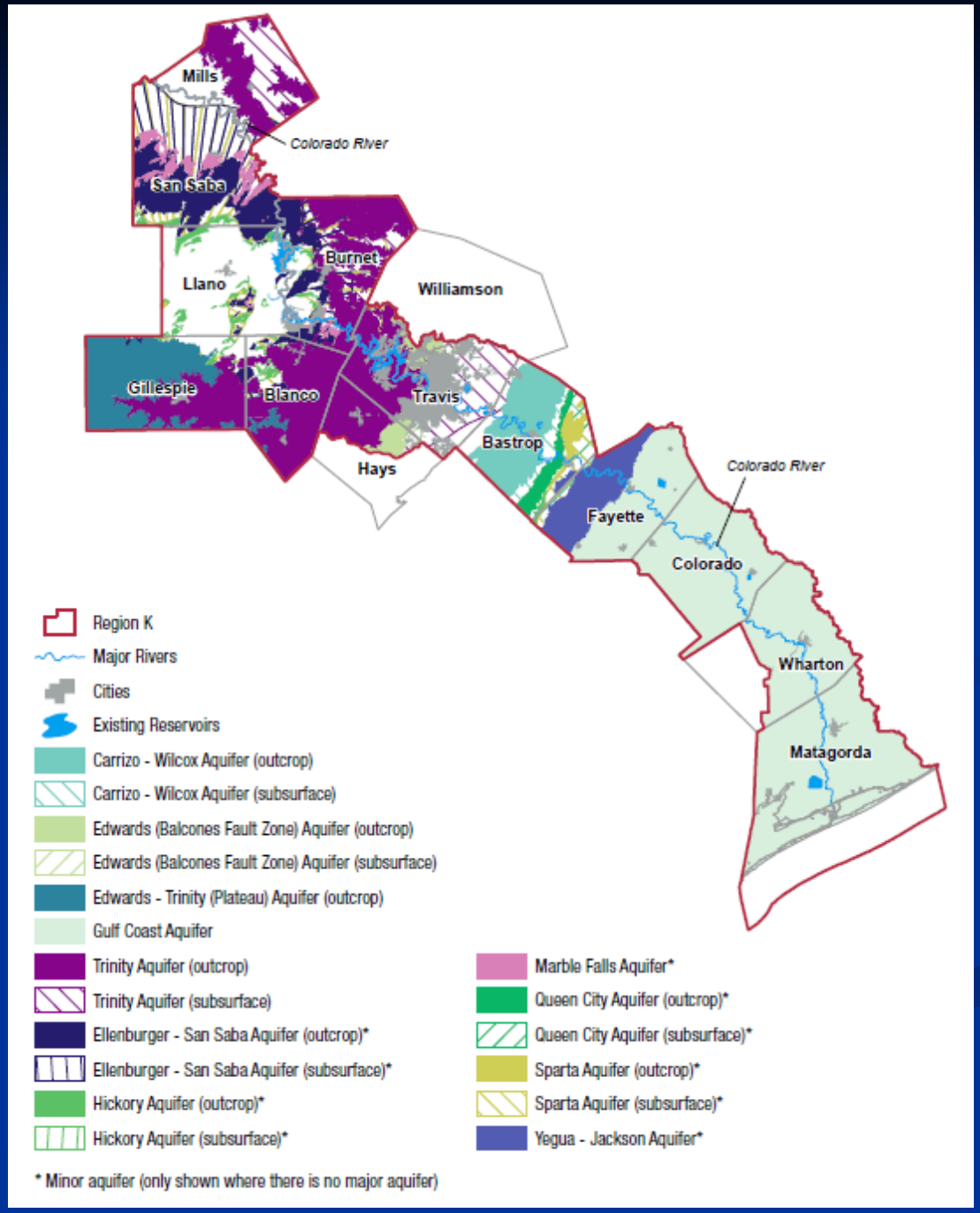
Water Use Factoids

- <u>MUNICIPAL USES (5.0 maf- 30%)</u>
  - Dallas/Houston/ San Antonio Regions
    - *70 % of all Municipal Use in these 3 regions*
    - *60% of Industrial Use in these 3 regions*
- <u>IRRIGATION USE (10 maf-60%)</u>
  - High Plains/ Lower Rio Grande Valley/Winter Gardens
    - *75% of all Irrigation Use*

Water Demand Projections (acre-ft per year)



Lower Colorado: Region K



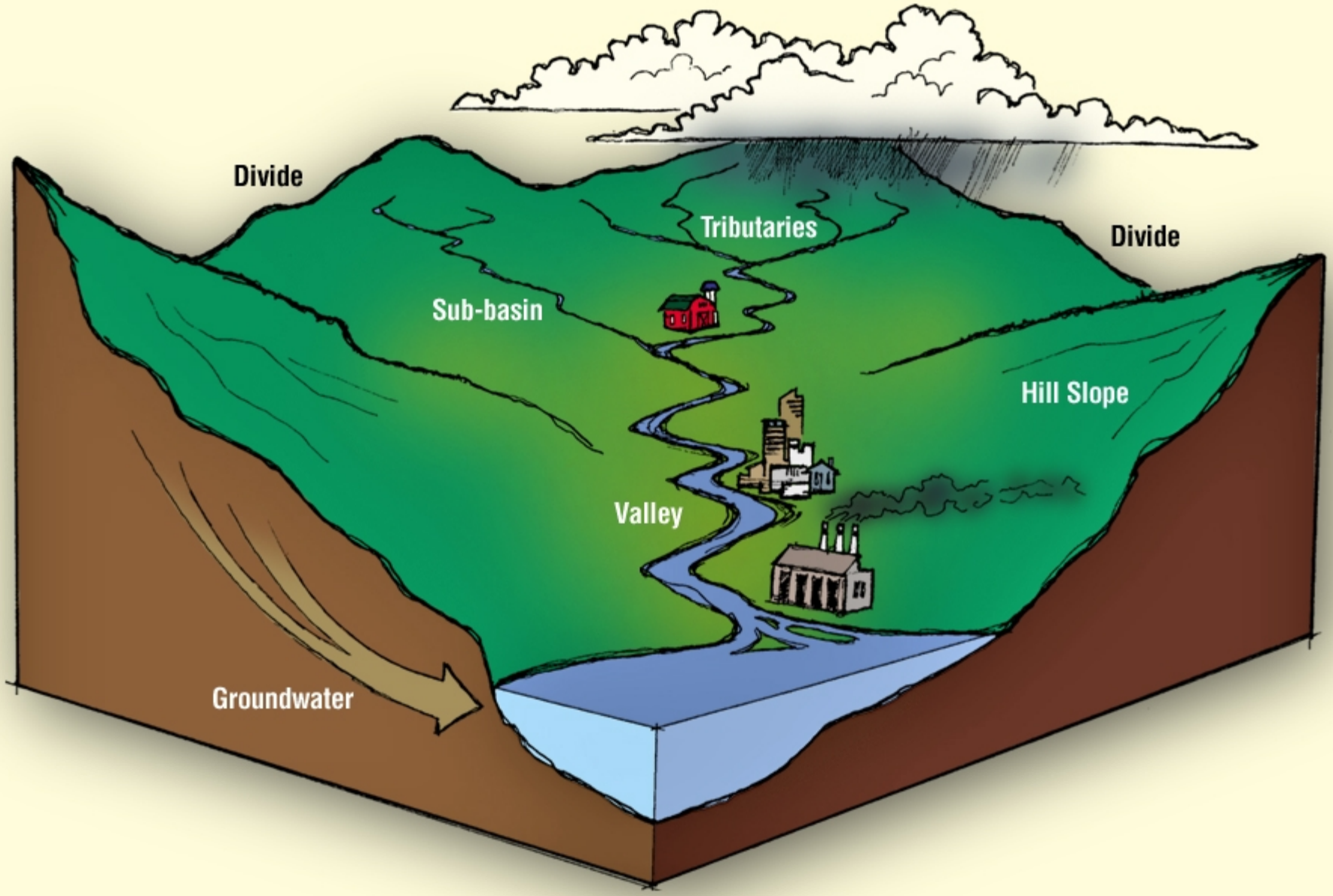
Lower Colorado: Region K

- Nearly 6% of Texas population projected to increase by 100%
- 77% of supply from groundwater
- Irrigation is the main water user but will be surpassed by municipal by 2060.
- Additional supply needed in 2060—367,671 acre-feet per year
- All 6 water users need additional water by 2060
- Total capital cost—$907 million
- Conservation accounts for 37 percent of 2060 strategy volumes
- One new major reservoir (Lower Colorado River Authority/San Antonio Water System Project Off-Channel)
- Reuse accounts for 21 percent of 2060 strategy volumes

Reflections for Central & South Texas

- AGRICULTURAL IRRIGATION USE TO DECLINE
  - Conservation measures
  - Declining aquifer levels
  - Increased Urbanization
- CITIES TO ACCESS MORE GROUNDWATER
- REUSING TREATED EFFLEUENT TO INCREASE
- DESALINATION EXPENSIVE FOR CITIES
- SMALLER COMMUNITIES AT GREATER RISK
- NEW RESERVOIRS FOR SOUTH TEXAS
- CONFLICTS TO INCREASE AS DROUGHT CONTINUES

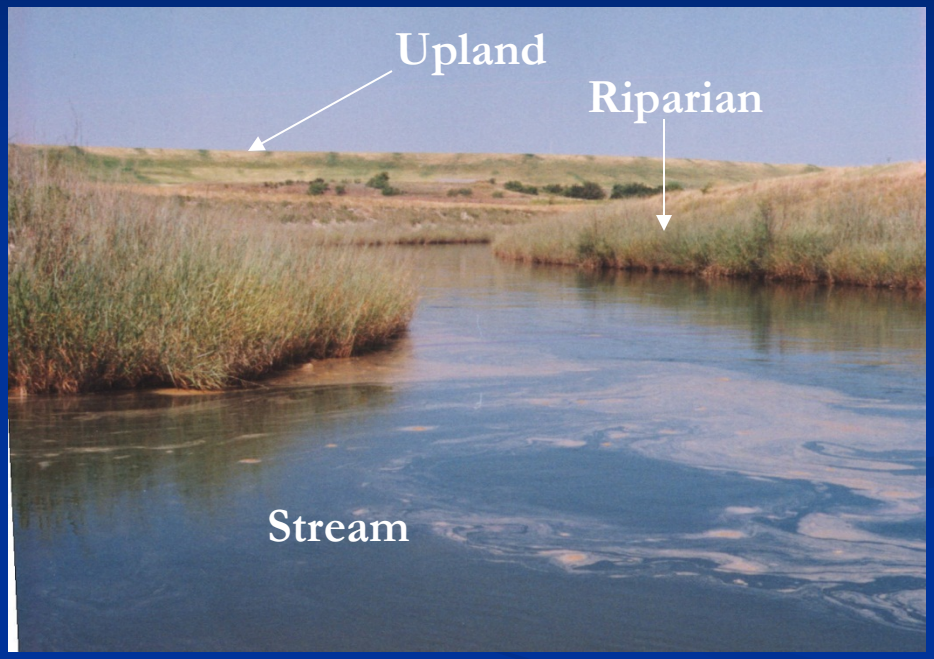
What is a WATERSHED?



Watershed

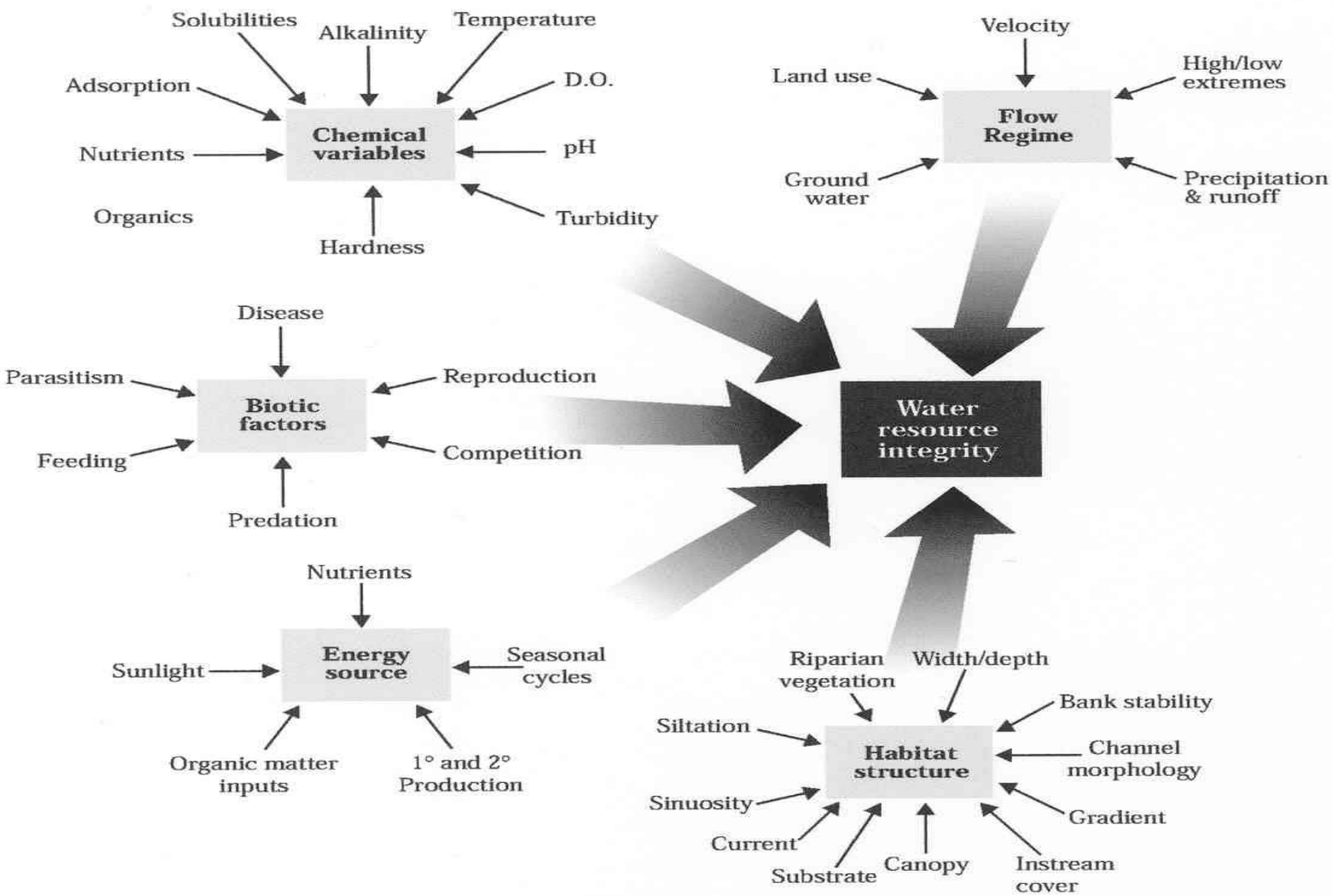
A Watershed can be characterized as consisting of:

- Upland
- Riparian zone and
- stream system



Each watershed functions as an ecosystem, i.e., each component affects the rest of the system including the benefits or negative impacts. As water flows through the system the impacts are cumulative.

Watersheds are Complex Systems



Characteristics of a Healthy Upland Watershed

- A Healthy Watershed is a catchment, i.e., rainfall is captured on-site. It acts as a sponge storing water to later release.
- "High" infiltration rates due to good vegetation cover and soil organic matter/structure and depth.
- Water flowing from the uplands as runoff & subsurface flow to springs and aquifers is "clean" and is slowly released down slope.

Unhealthy Watersheds?

Most streams and rivers in Texas have been adversely affected by past natural and human activities resulting in:

- Increasingly damaging floods
- Lower base flows
- High sediment loads
- Reduced reservoir storage capacity
- Invasion of exotic species
- Loss of natural riparian habitats
- Degraded water quality

Texas Rivers

Legend

1. Canadian
2. Red
3. Sulphur
4. Cypress
5. Sabine
6. Neches
7. Neches-Trinity
8. Trinity
9. Trinity-San Jacinto
10. San Jacinto
11. San Jacinto-Brazos
12. Brazos
13. Brazos-Colorado
14. Colorado
15. Colorado-Lavaca
16. Lavaca
17. Lavaca-Guadalupe
18. Guadalupe
19. San Antonio
20. San Antionio-Nueces
21. Nueces
22. Nueces-Rio Grande
23. Rio Grande

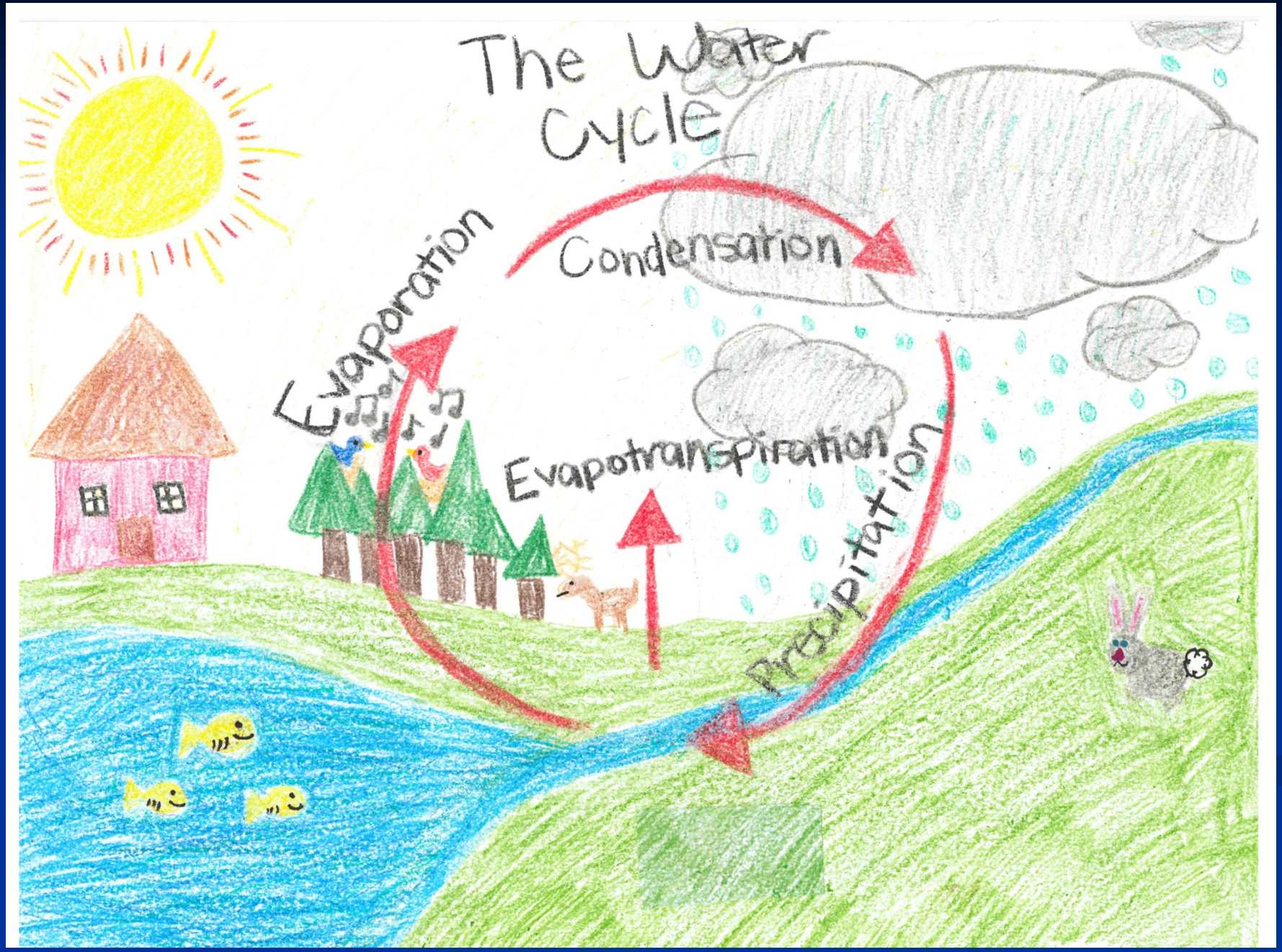
Source: Texas Water Development Board

Functions of a Stream

- Transport water
- Transport and deposit sediment
- Transport and replenish nutrients
- Biological functions (food, shelter, shading, movement, etc.)

Why should we be concerned about the health of the stream and riparian areas?

- **Cumulative impacts of natural and man induced disturbances in the drainage area.**
- **Management not only affects the individual landowner but everyone else downstream.**
- **Stream and riparian systems are the water pipelines in Texas.**
- **They are one of the most important resources found on private and public lands in Texas.**


The Water Cycle
Condensation
Evaporation
Evapotranspiration
Precipitation

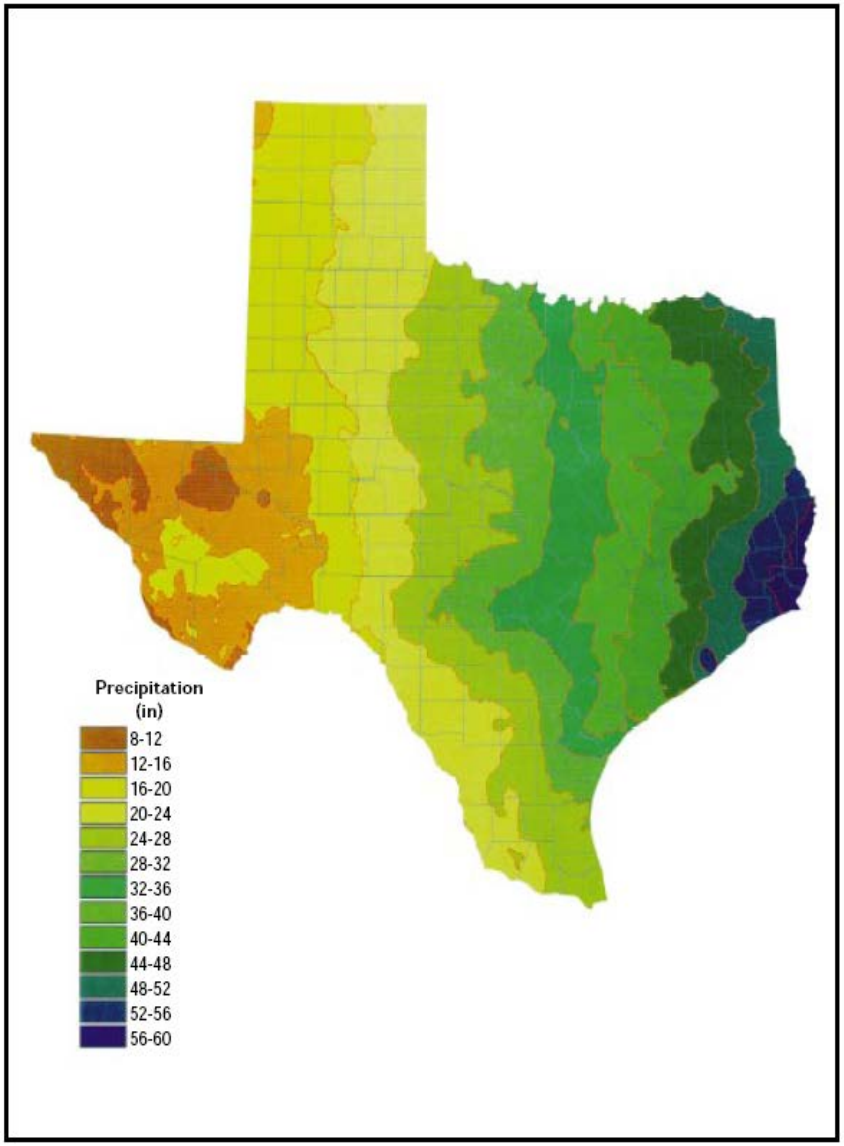
Rain is Precious: Factors Affecting the Fate of Rainfall

Many factors determine what happens to the rainfall received. Some of the primary factors include:

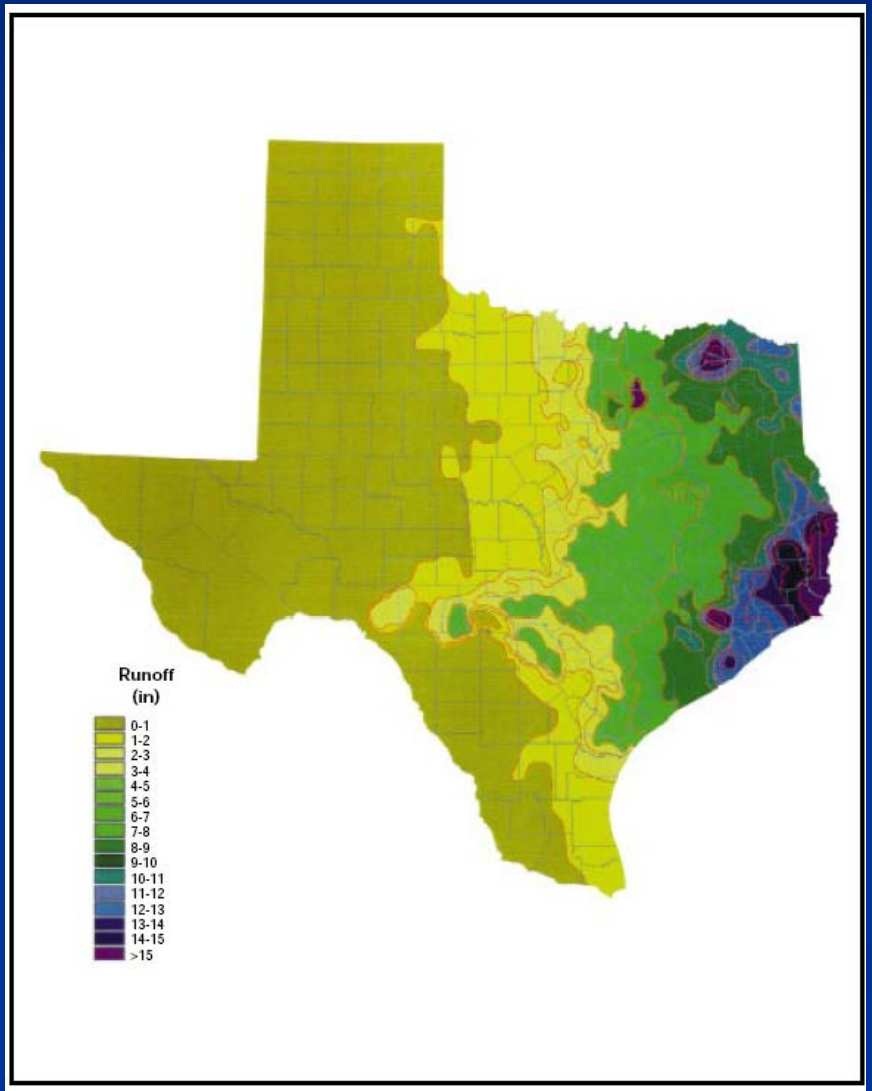
- type, quantity, and density of vegetative cover;
- storm intensity and duration;
- soil moisture prior to the storm event;
- soil water holding capacity;
- and slope.

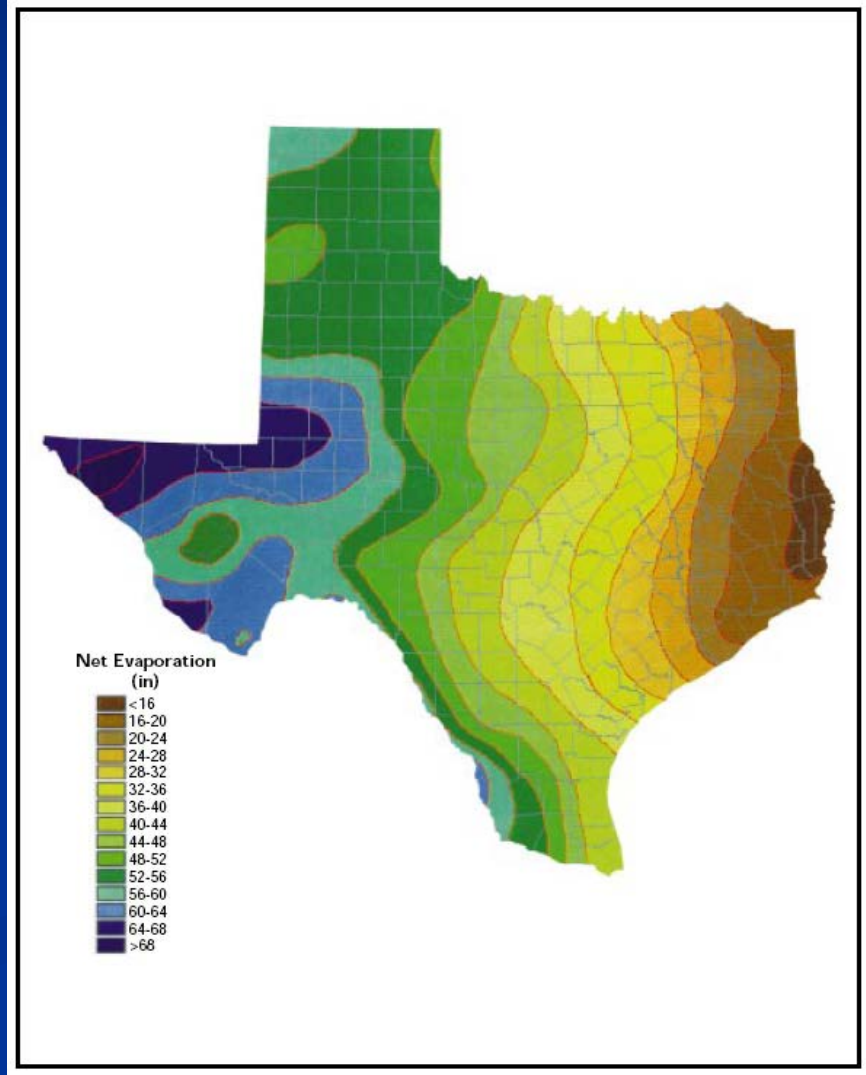
These factors affect how much evaporates, infiltrates, moves through vegetation, and the amount and velocity of overland flow which may erode the soil surface and enter the stream.

Long-Term Average Annual Rainfall Across Texas from 1961-1990



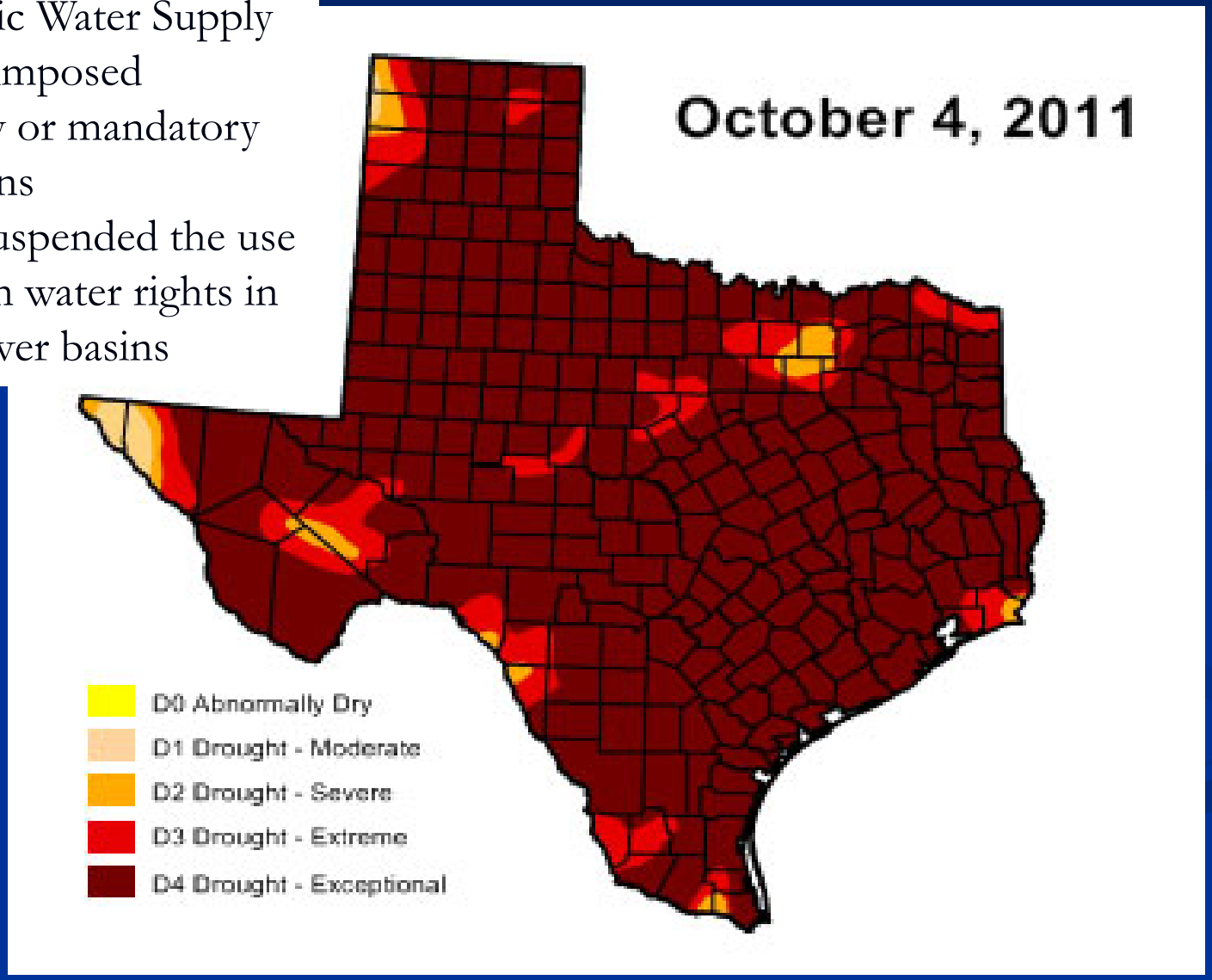
Average Annual Runoff and Evaporation Rates 1961-1997 (TWDB 1997)





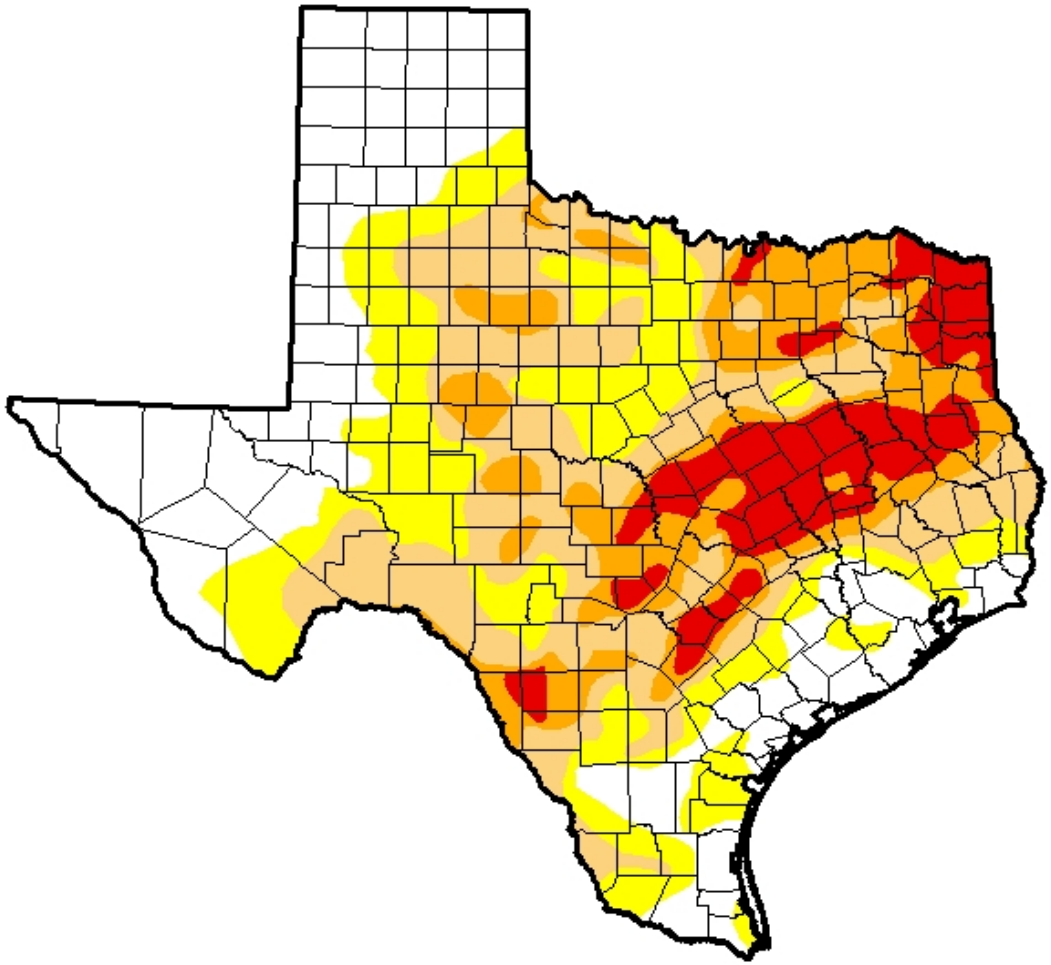
The Drought

- County Burn Bans
- 902 Public Water Supply Systems imposed voluntary or mandatory restrictions
- TCEQ suspended the use of certain water rights in several river basins



U.S. Drought Monitor

Texas



October 6, 2015

(Released Thursday, Oct. 8, 2015)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	29.70	70.30	48.43	24.66	10.17	0.00
Last Week *9/29/2015*	34.51	65.49	38.32	17.55	6.27	0.00
3 Months Ago *7/7/2015*	95.37	4.63	0.25	0.00	0.00	0.00
Start of Calendar Year *12/30/2014*	34.37	65.63	44.68	25.73	11.70	3.17
Start of Water Year *9/29/2015*	34.51	65.49	38.32	17.55	6.27	0.00
One Year Ago *10/7/2014*	29.64	70.36	49.29	29.49	11.78	2.88

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

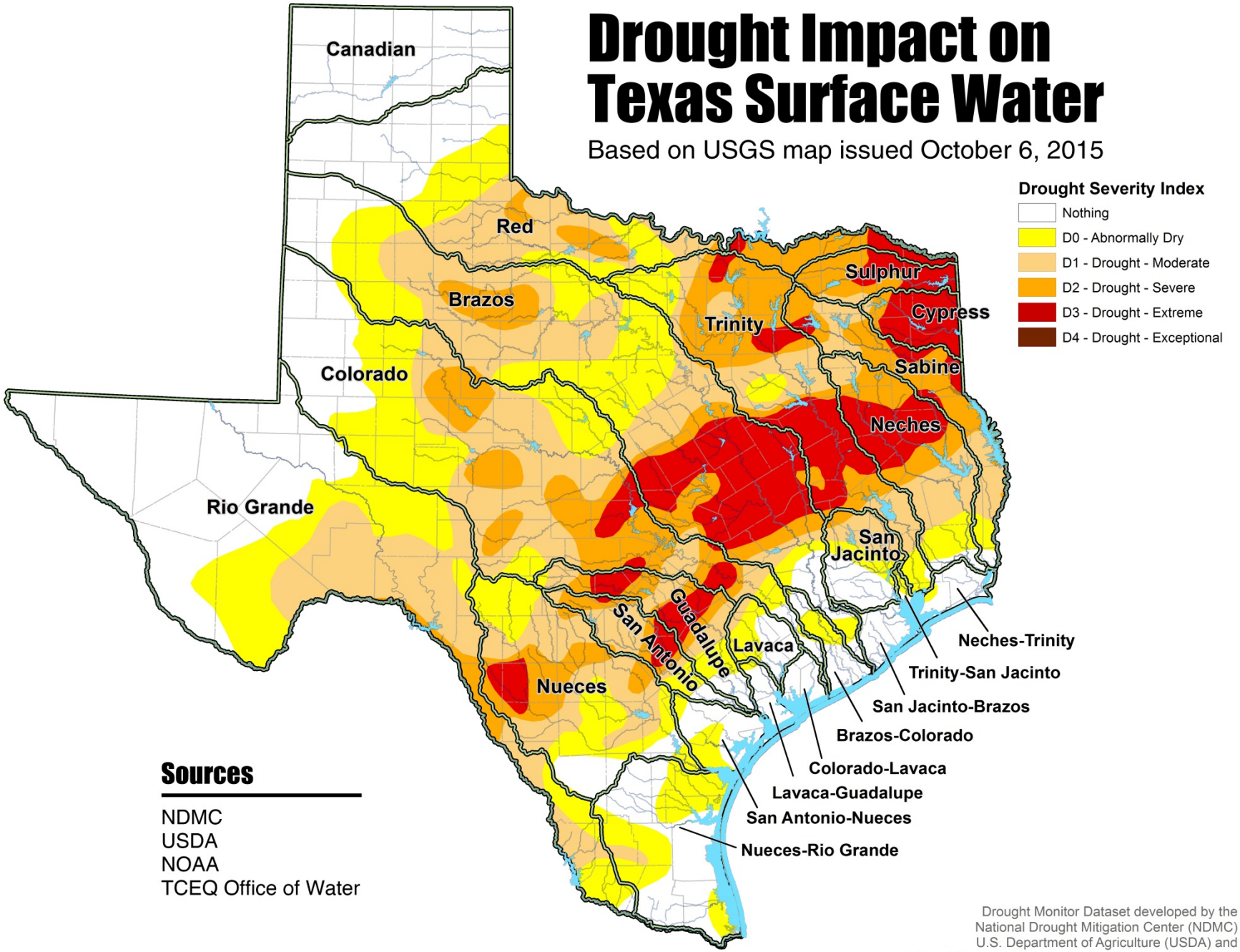
David Miskus

NOAA/NWS/NCEP/CPC

http://droughtmonitor.unl.edu/

Drought Impact on Texas Surface Water

Based on USGS map issued October 6, 2015



Sources

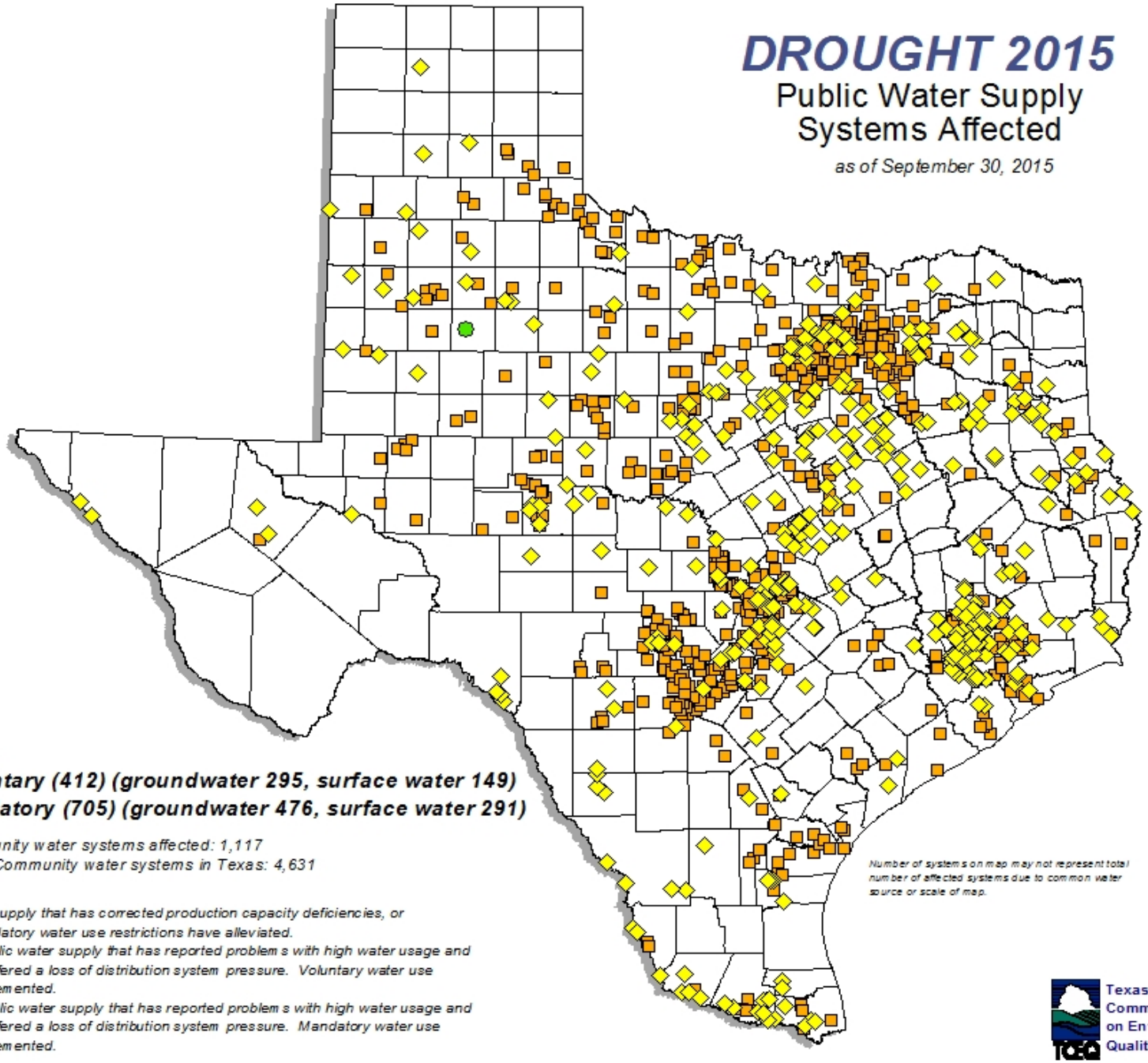
NDMC
USDA
NOAA
TCEQ Office of Water

Drought Monitor Dataset developed by the National Drought Mitigation Center (NDMC) U.S. Department of Agriculture (USDA) and National Oceanic & Atmospheric Administration (NOAA)

DROUGHT 2015

Public Water Supply Systems Affected

as of September 30, 2015



RESOLVED (1)

WATCH - Voluntary (412) (groundwater 295, surface water 149)

WATCH - Mandatory (705) (groundwater 476, surface water 291)

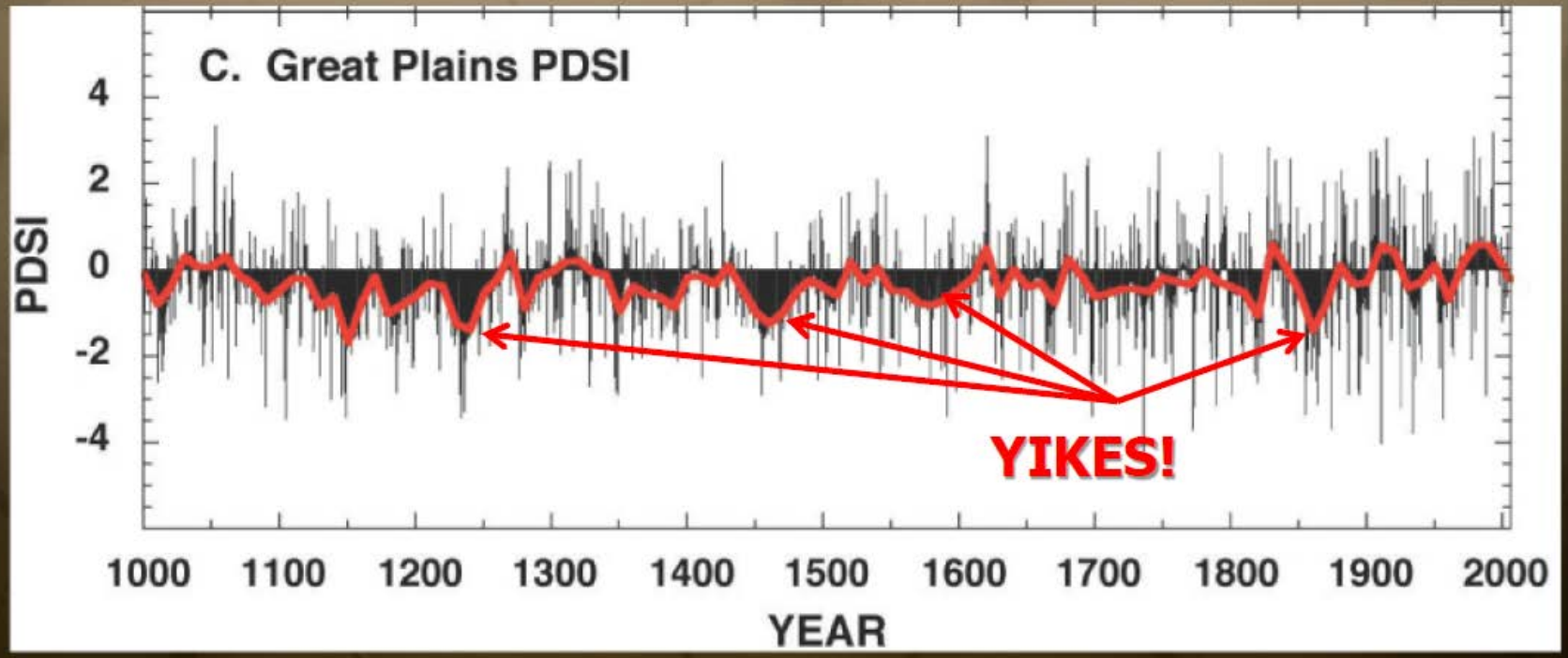
Total number of Community water systems affected: 1,117
Total number of active Community water systems in Texas: 4,631

Number of systems on map may not represent total number of affected systems due to common water source or scale of map.

Resolved *A public water supply that has corrected production capacity deficiencies, or drought conditions for mandatory water use restrictions have alleviated.*
Watch - Voluntary *A public water supply that has reported problems with high water usage and production, but has not suffered a loss of distribution system pressure. Voluntary water use restrictions have been implemented.*
Watch - Mandatory *A public water supply that has reported problems with high water usage and production, but has not suffered a loss of distribution system pressure. Mandatory water use restrictions have been implemented.*

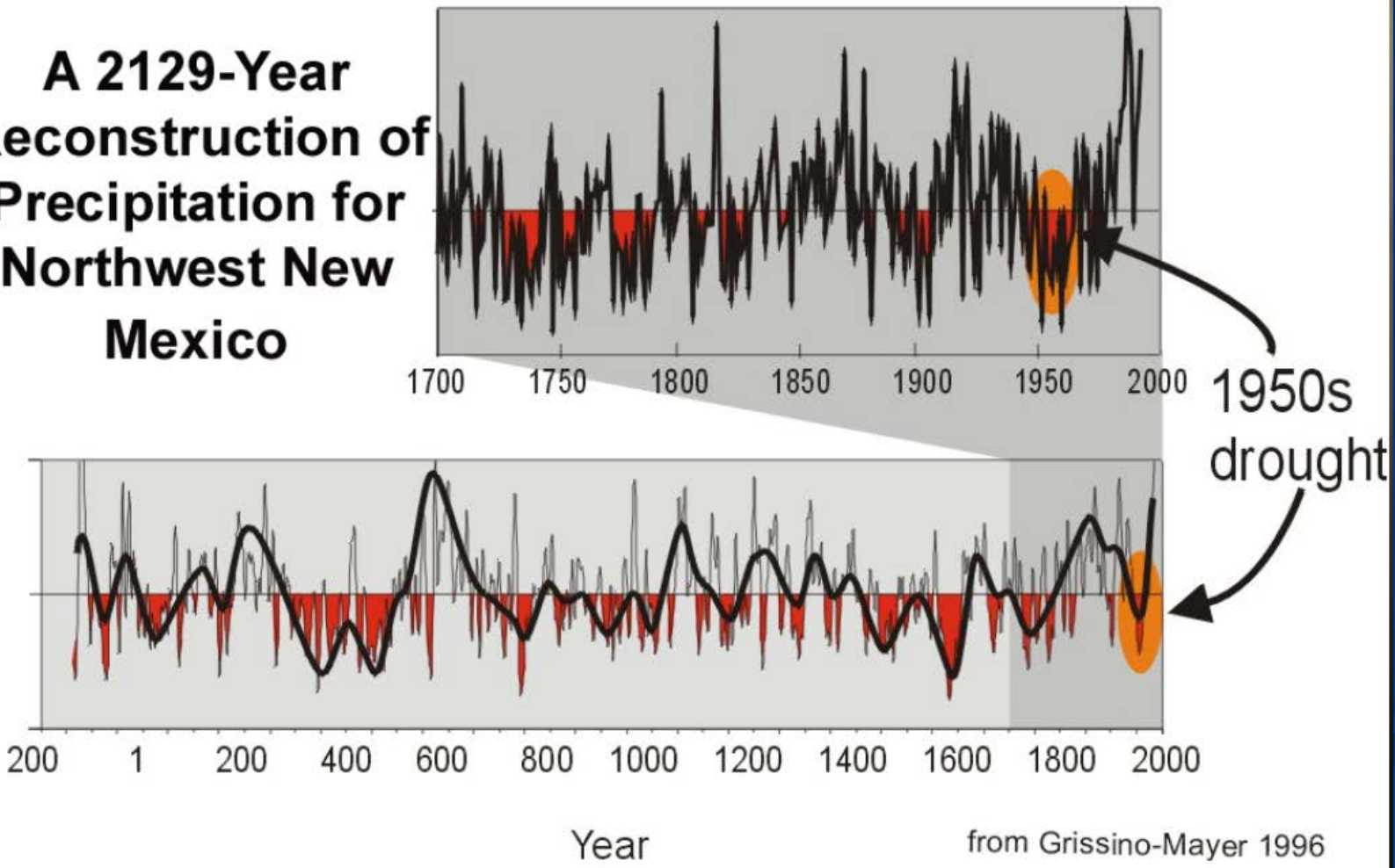
Texas Commission on Environmental Quality

Recent droughts are infants!



Mega-droughts dot our past

A 2129-Year Reconstruction of Precipitation for Northwest New Mexico

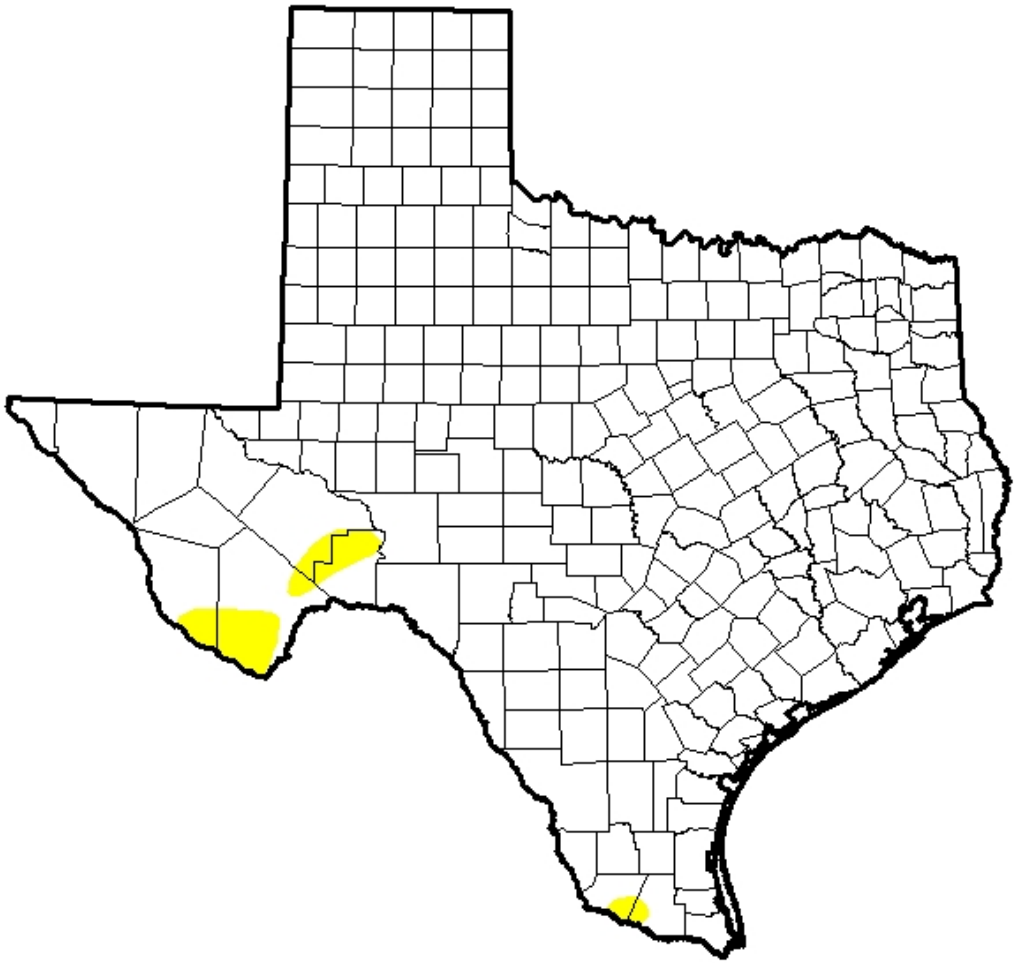


from Grissino-Mayer 1996

Floods

U.S. Drought Monitor

Texas



January 26, 2016

(Released Thursday, Jan. 28, 2016)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	98.05	1.95	0.00	0.00	0.00	0.00
Last Week 1/19/2016	98.31	1.69	0.00	0.00	0.00	0.00
3 Months Ago 10/27/2015	56.34	43.66	15.67	2.85	0.00	0.00
Start of Calendar Year 12/29/2015	95.48	4.52	0.00	0.00	0.00	0.00
Start of Water Year 9/29/2015	34.51	65.49	38.32	17.55	6.27	0.00
One Year Ago 1/27/2015	41.42	58.58	39.22	23.93	11.24	3.05

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

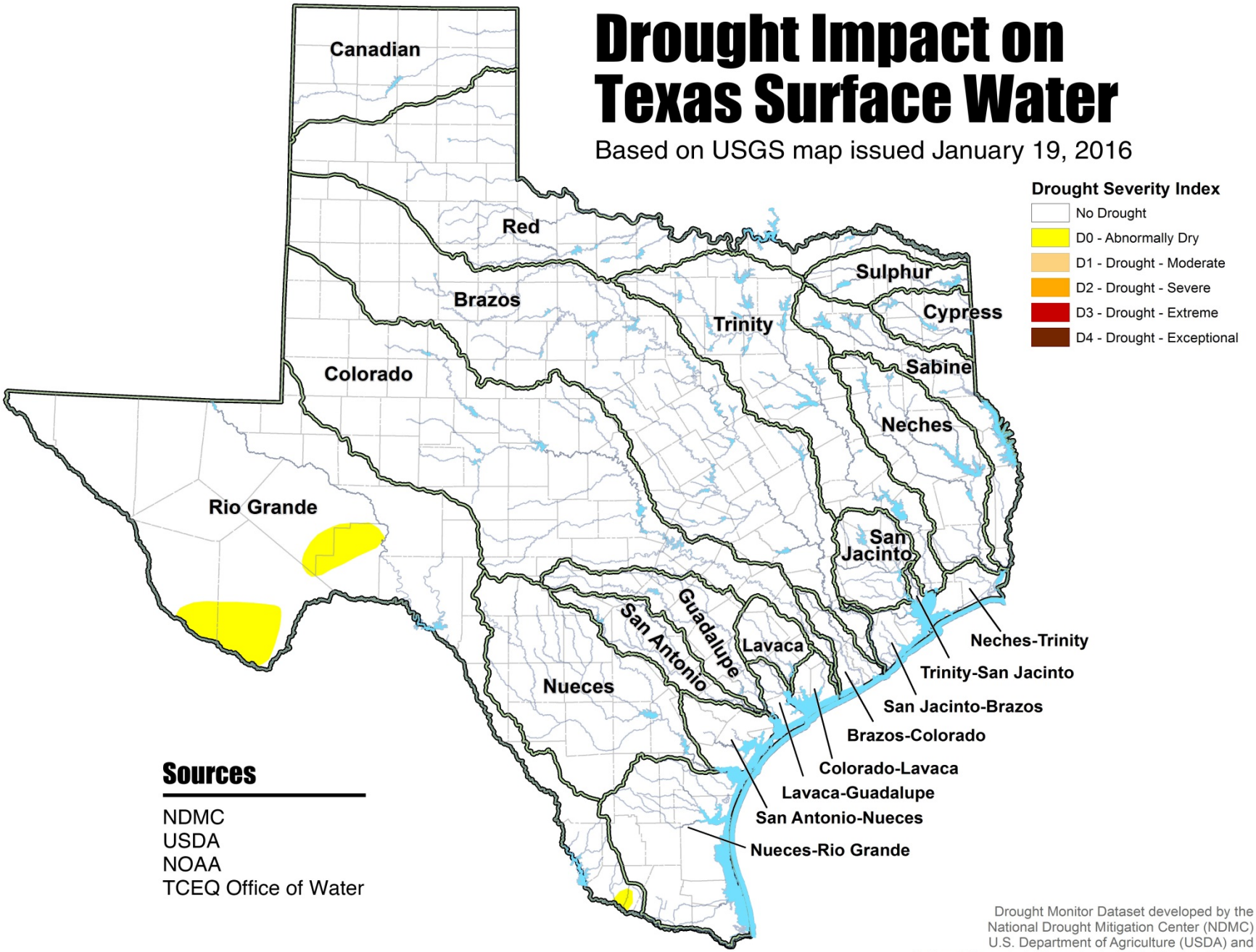
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Mark Svoboda
National Drought Mitigation Center

http://droughtmonitor.unl.edu/

Drought Impact on Texas Surface Water

Based on USGS map issued January 19, 2016



Sources

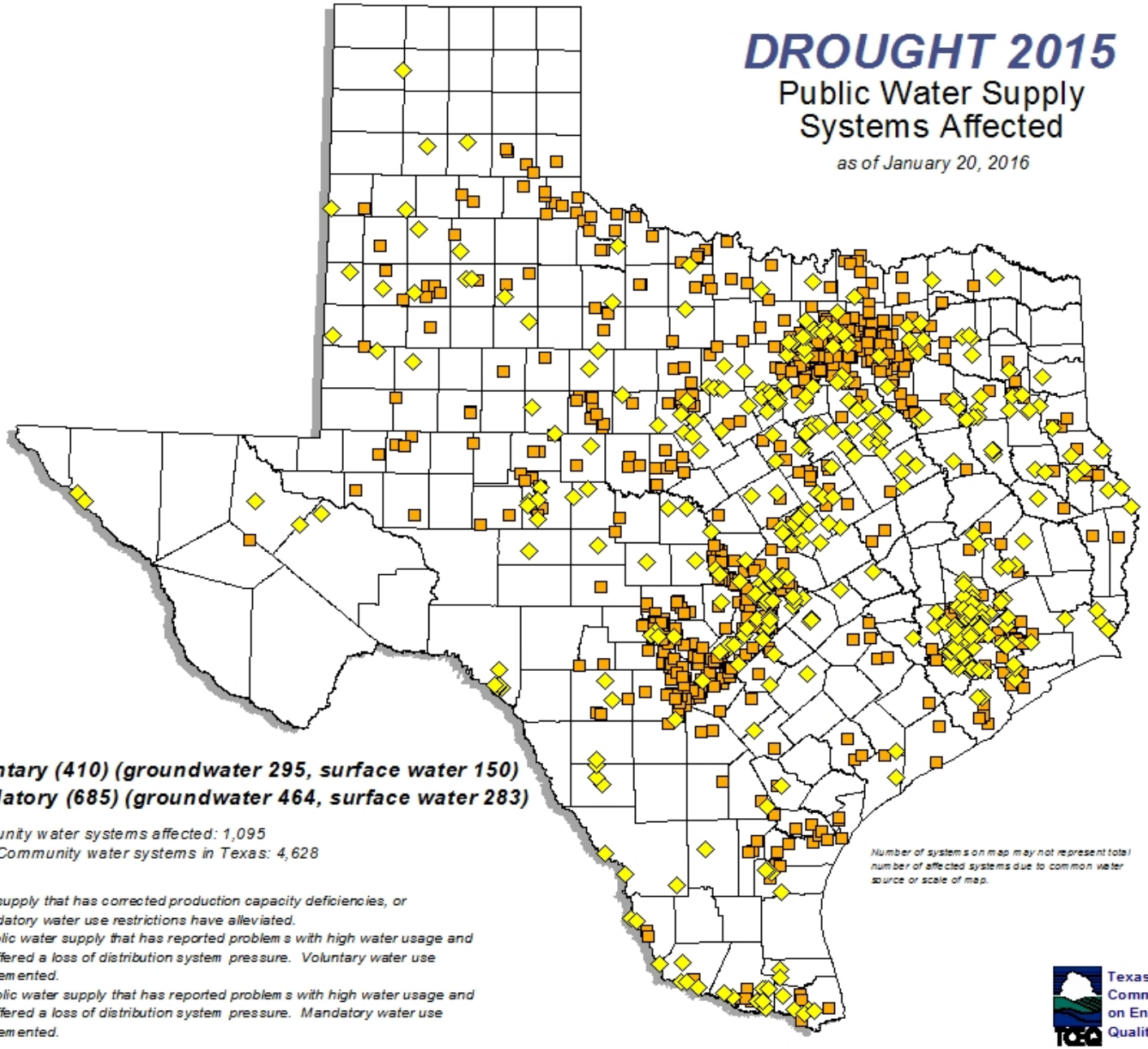
NDMC
USDA
NOAA
TCEQ Office of Water

Drought Monitor Dataset developed by the National Drought Mitigation Center (NDMC) U.S. Department of Agriculture (USDA) and National Oceanic & Atmospheric Administration (NOAA)

DROUGHT 2015

Public Water Supply Systems Affected

as of January 20, 2016



RESOLVED (0)

WATCH - Voluntary (410) (groundwater 295, surface water 150)

WATCH - Mandatory (685) (groundwater 464, surface water 283)

Total number of Community water systems affected: 1,095
Total number of active Community water systems in Texas: 4,628

Number of systems on map may not represent total number of affected systems due to common water source or scale of map.

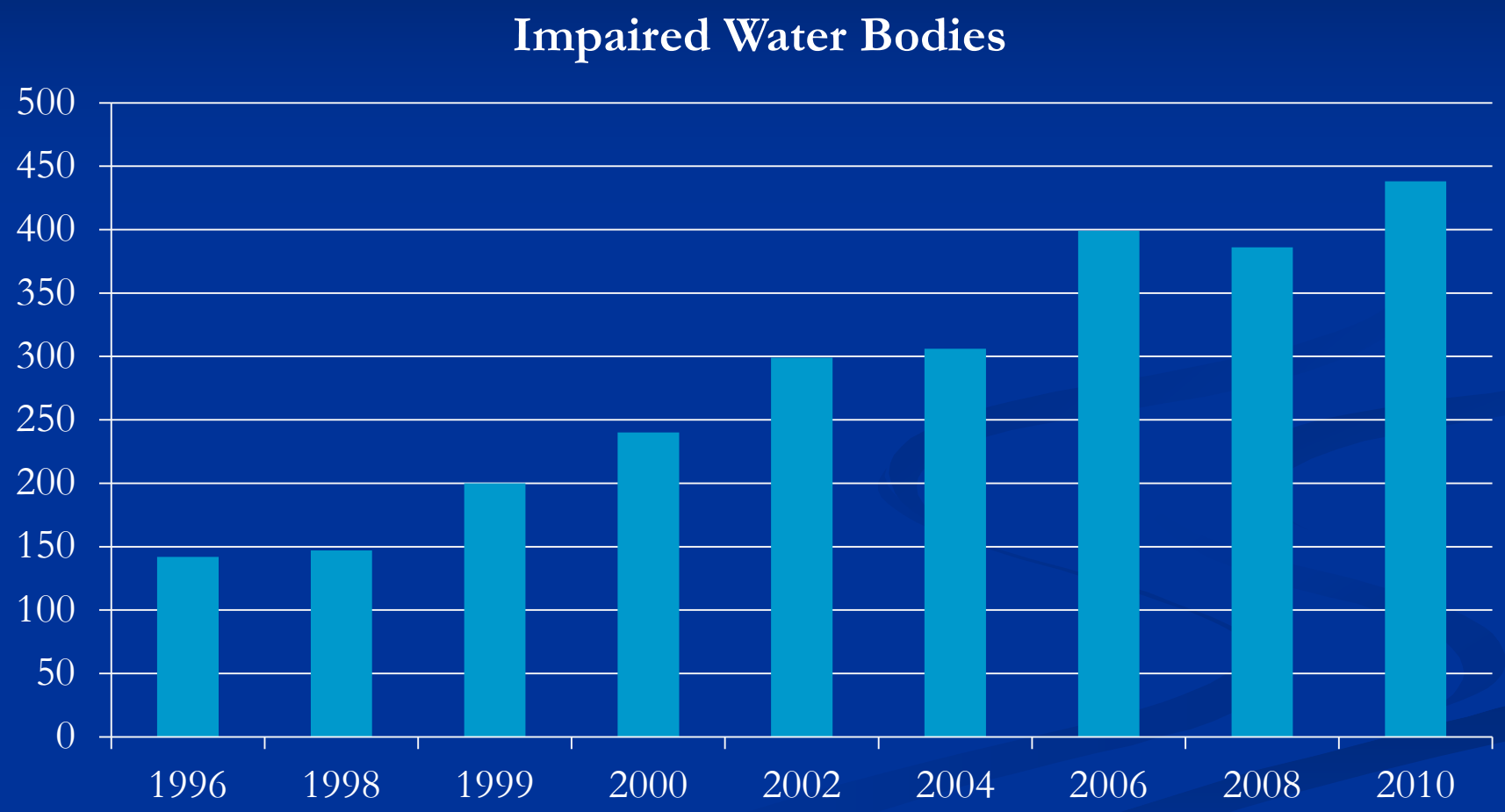
Resolved *A public water supply that has corrected production capacity deficiencies, or drought conditions for mandatory water use restrictions have alleviated.*
Watch - Voluntary *A public water supply that has reported problems with high water usage and production, but has not suffered a loss of distribution system pressure. Voluntary water use restrictions have been implemented.*
Watch - Mandatory *A public water supply that has reported problems with high water usage and production, but has not suffered a loss of distribution system pressure. Mandatory water use restrictions have been implemented.*

Texas Commission on Environmental Quality

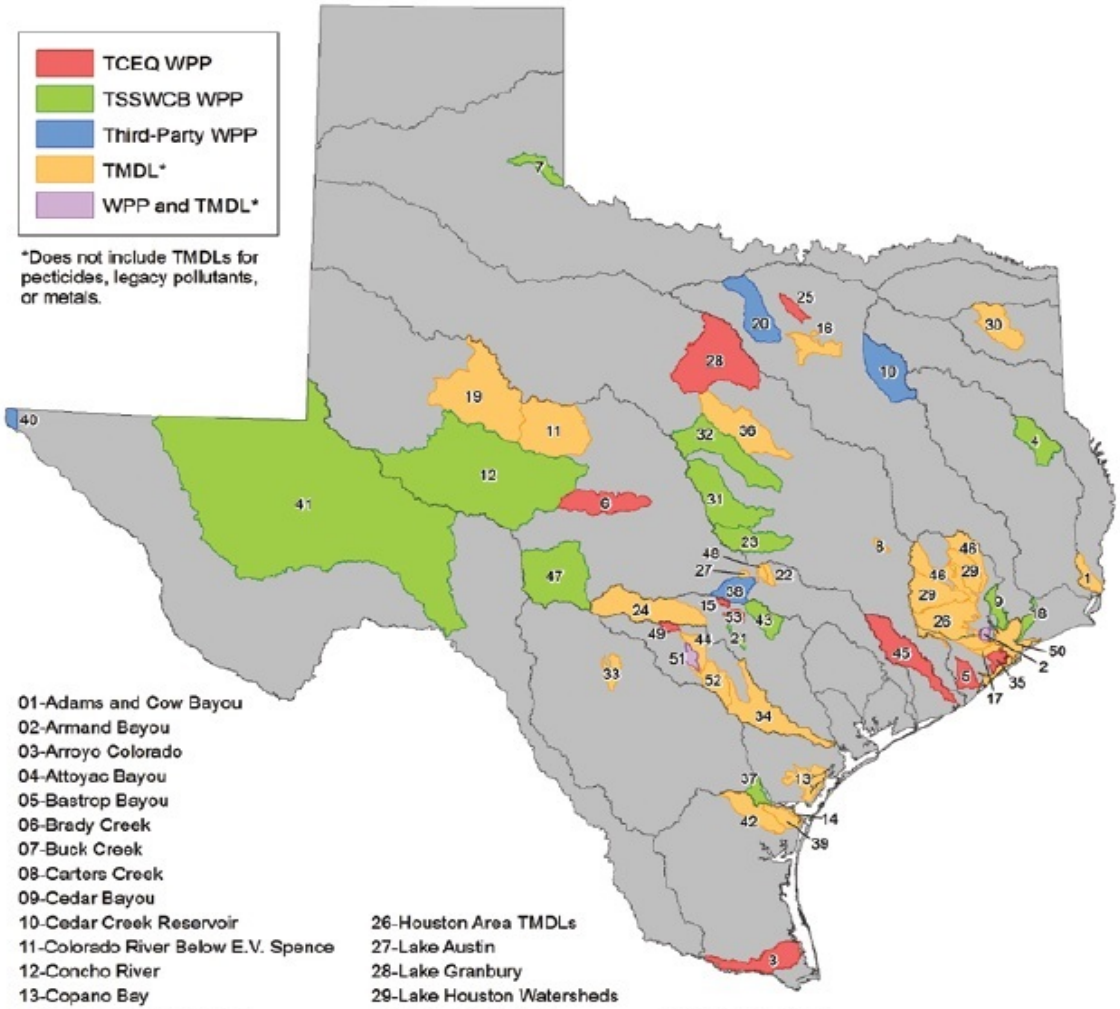
Surface Water Quality

- The 2012 303d List has **568** impaired water bodies on it.
- Many WPP and TMDL Implementation projects are ongoing across the state to improve WQ in watersheds.
- Bacteria is the cause for over 50% and low dissolved oxygen (nutrients) and organics in fish tissue at 15% each.

Surface Water Quality in Texas



Map of Watersheds With Watershed Protection Plans or TMDL I-Plans Being Developed or Implemented



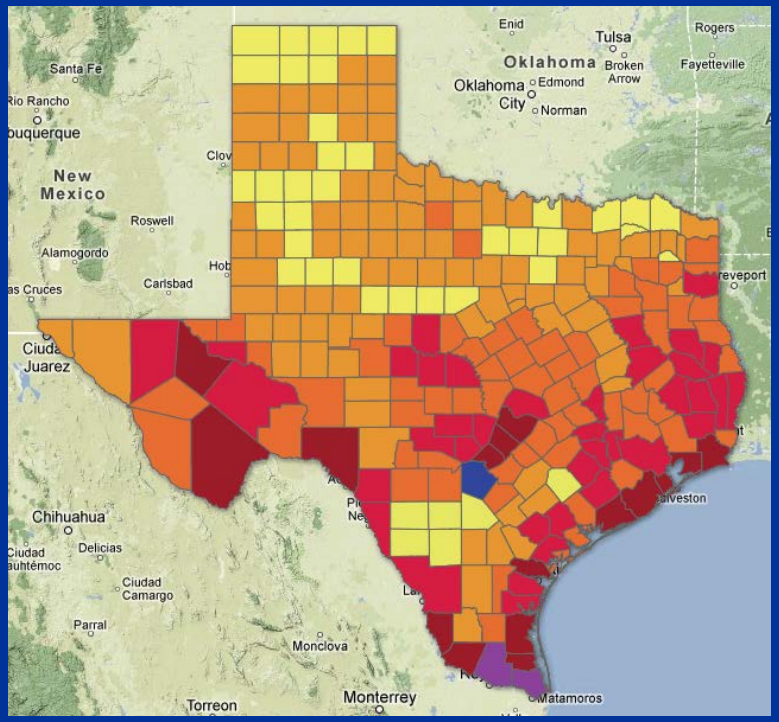
01-Adams and Cow Bayou
02-Armand Bayou
03-Arroyo Colorado
04-Attoyac Bayou
05-Bastrop Bayou
06-Brady Creek
07-Buck Creek
08-Carters Creek
09-Cedar Bayou
10-Cedar Creek Reservoir
11-Colorado River Below E.V. Spence
12-Concho River
13-Copano Bay
14-Corpus Christi Beaches
15-Cypress Creek
16-Greater Trinity TMDLs
17-Dickinson Bayou
18-Double Bayou
19-E.V. Spence Reservoir
20-Eagle Mountain Reservoir
21-Geronimo Creek
22-Gilleland Creek
23-Granger Lake
24-Guadalupe River Above Canyon Lake
25-Hickory Creek
26-Houston Area TMDLs
27-Lake Austin
28-Lake Granbury
29-Lake Houston Watersheds
30-Lake O' the Pines
31-Lampasas River
32-Leon River
33-Lower Sabinal River
34-Lower San Antonio River
35-Moses-Karankawa Bayous
36-North Bosque River
37-Lower Nueces River
38-Onion & Barton Springs
39-Oso Bay and Oso Creek
40-Paso del Norte
41-Pecos River
42-Petronila Creek
43-Plum Creek
44-Salado Creek
45-San Bernard
46-San Jacinto River
47-Upper Llano River
48-Spicewood Springs and Walnut Creek
49-Upper Cibolo Creek
50-Upper Coast Oyster Waters
51-Upper San Antonio River
52-Upper San Antonio River
53-Upper San Marcos

Upcoming Watershed Trainings in 2016

- Roundtable
- Getting in Step
- Stakeholder Facilitation
- Developing Water Quality Monitoring Plan

Texas - >100 Species under Status Review

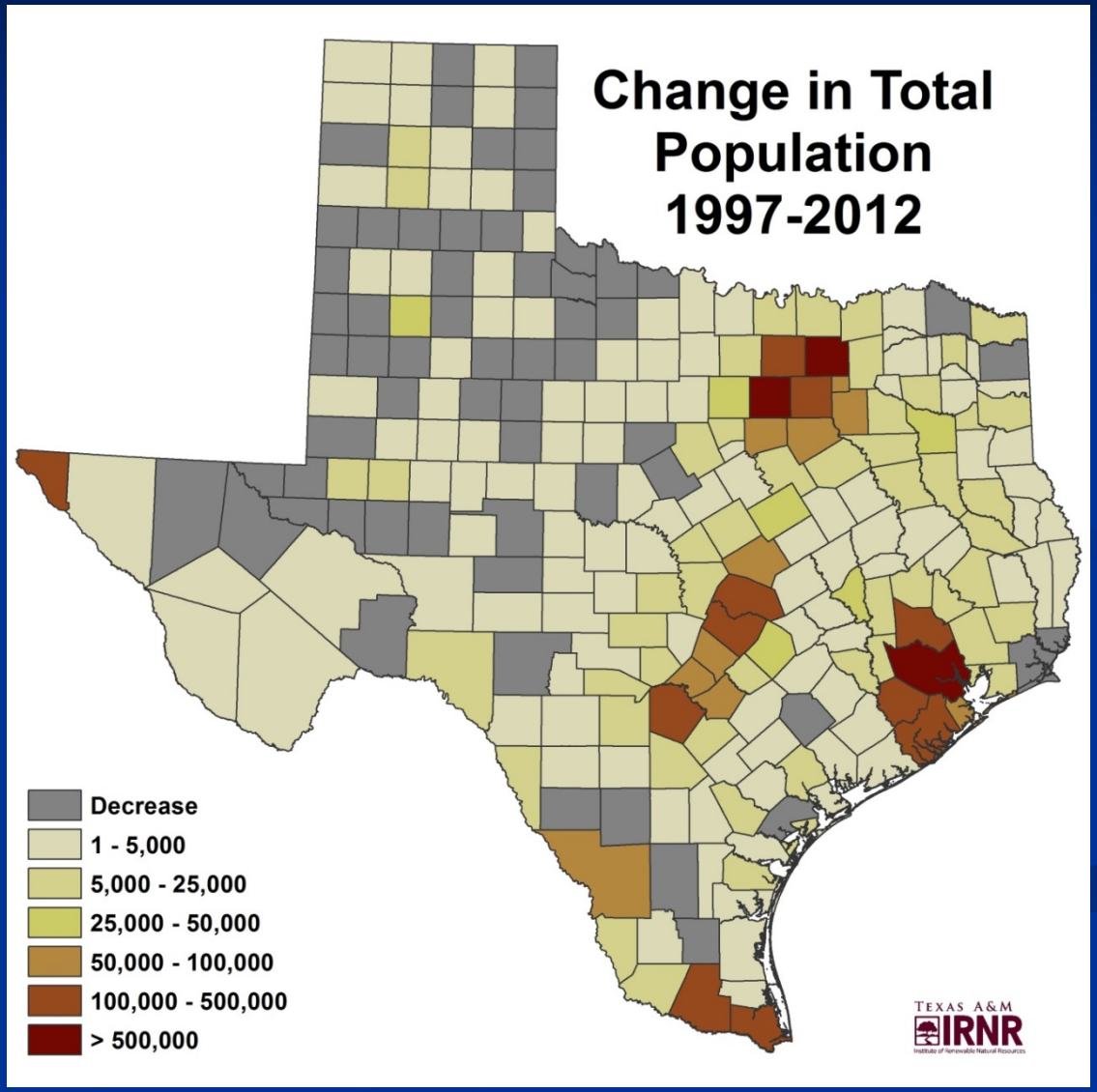
- 12 mussels
- 11 amphibians
- 20 fish
- 6 snail
- 1 Mammal
- 14 Insect
- 7 Arachnids
- 4 crustacean
- 11 bird
- 21 plants



IF all were listed, it would <u>DOUBLE</u> <u>Endangered Species</u> listed for Texas.

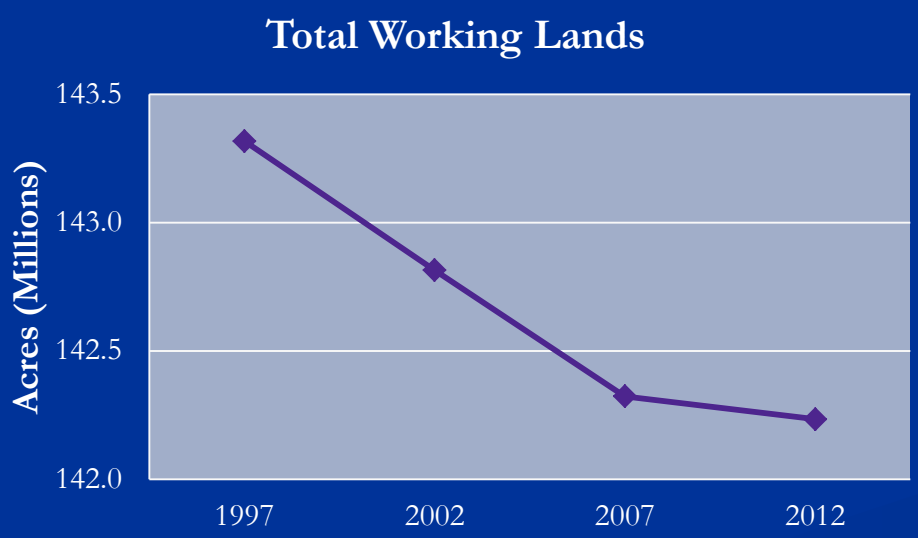
Texas Population

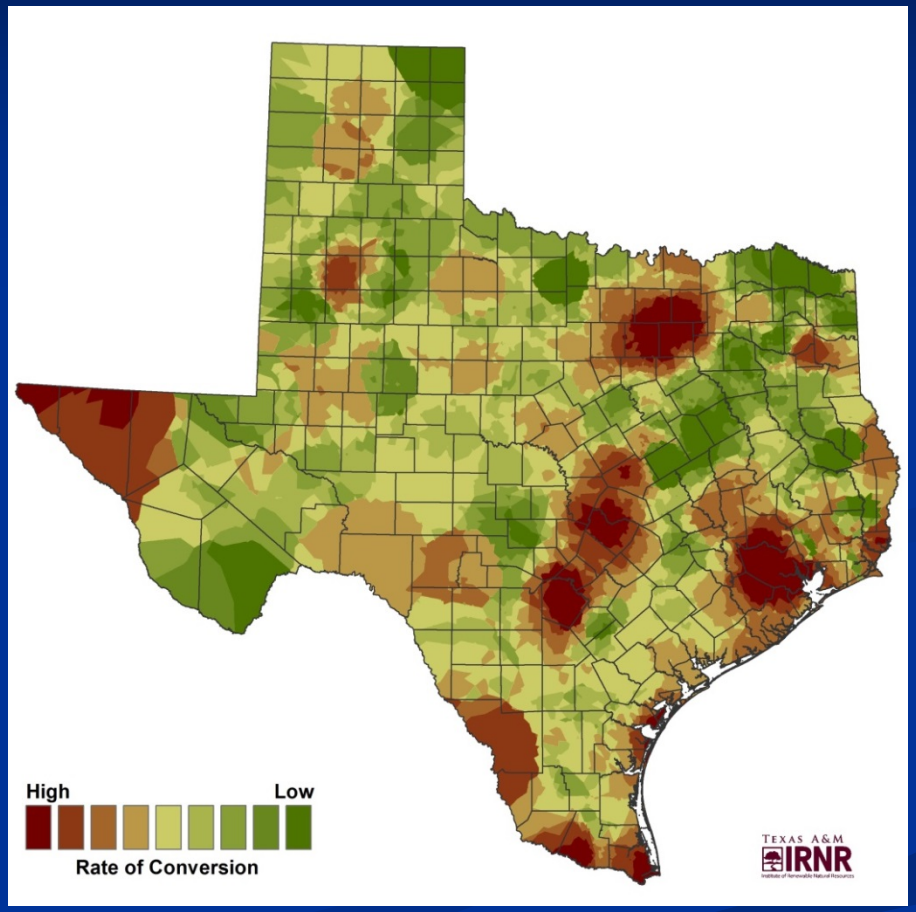
- 1997 – 19 Million
- 2012 – 26 Million
- 36% increase
- 500,000/year
- 65% of increase occurred within *Top Ten Highest Populated* Counties



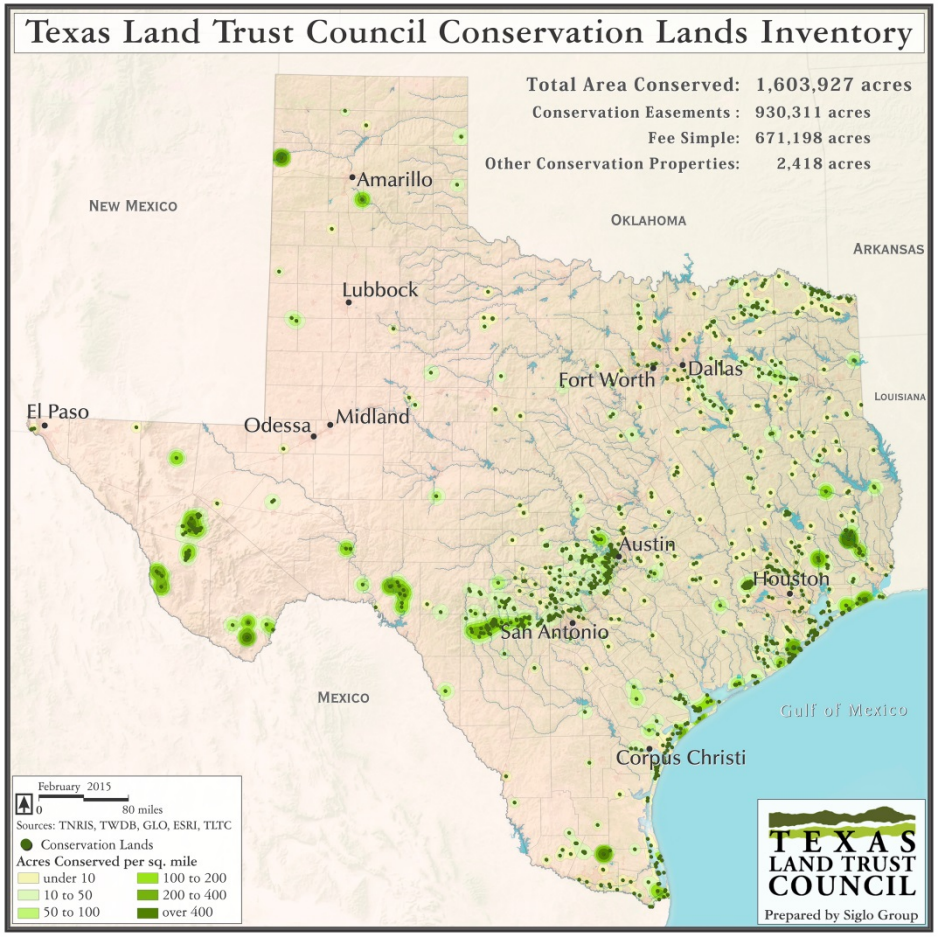
Loss of Working Lands

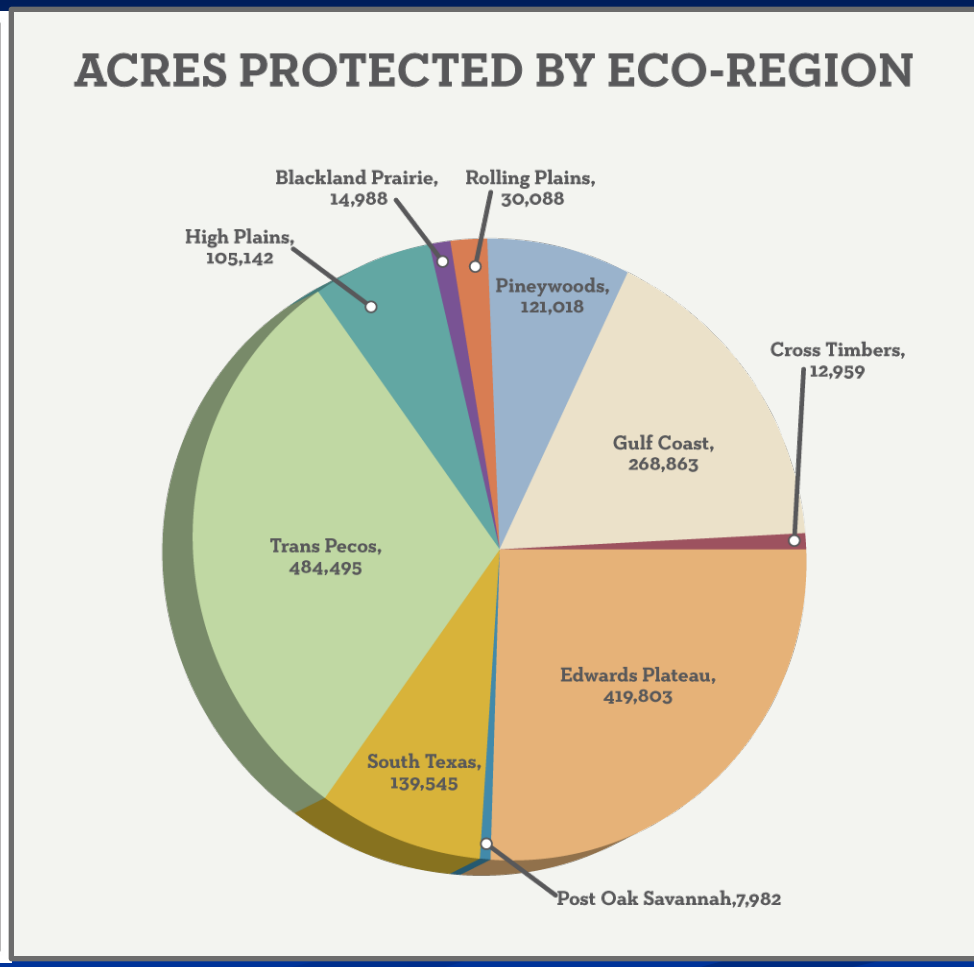
- 1997 – 143.4 Million acres
- 2012 – 142.3 Million acres
- Loss 1.1 Million acres



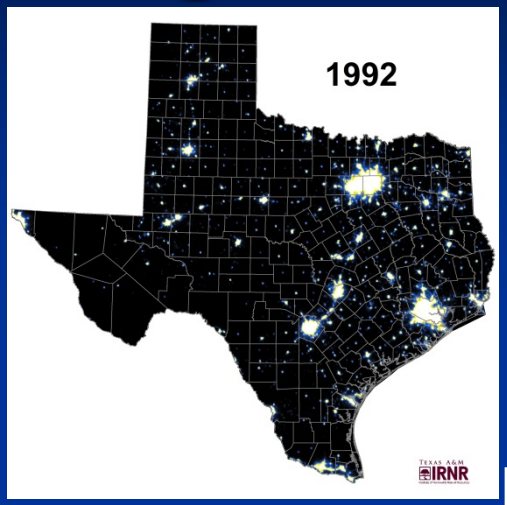


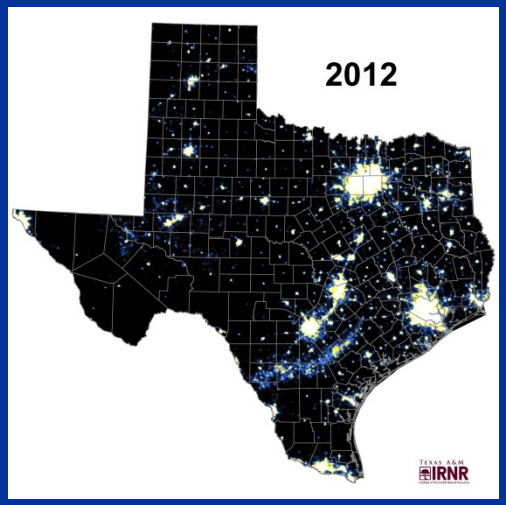
Texas Land Trust Council Conservation Lands Inventory

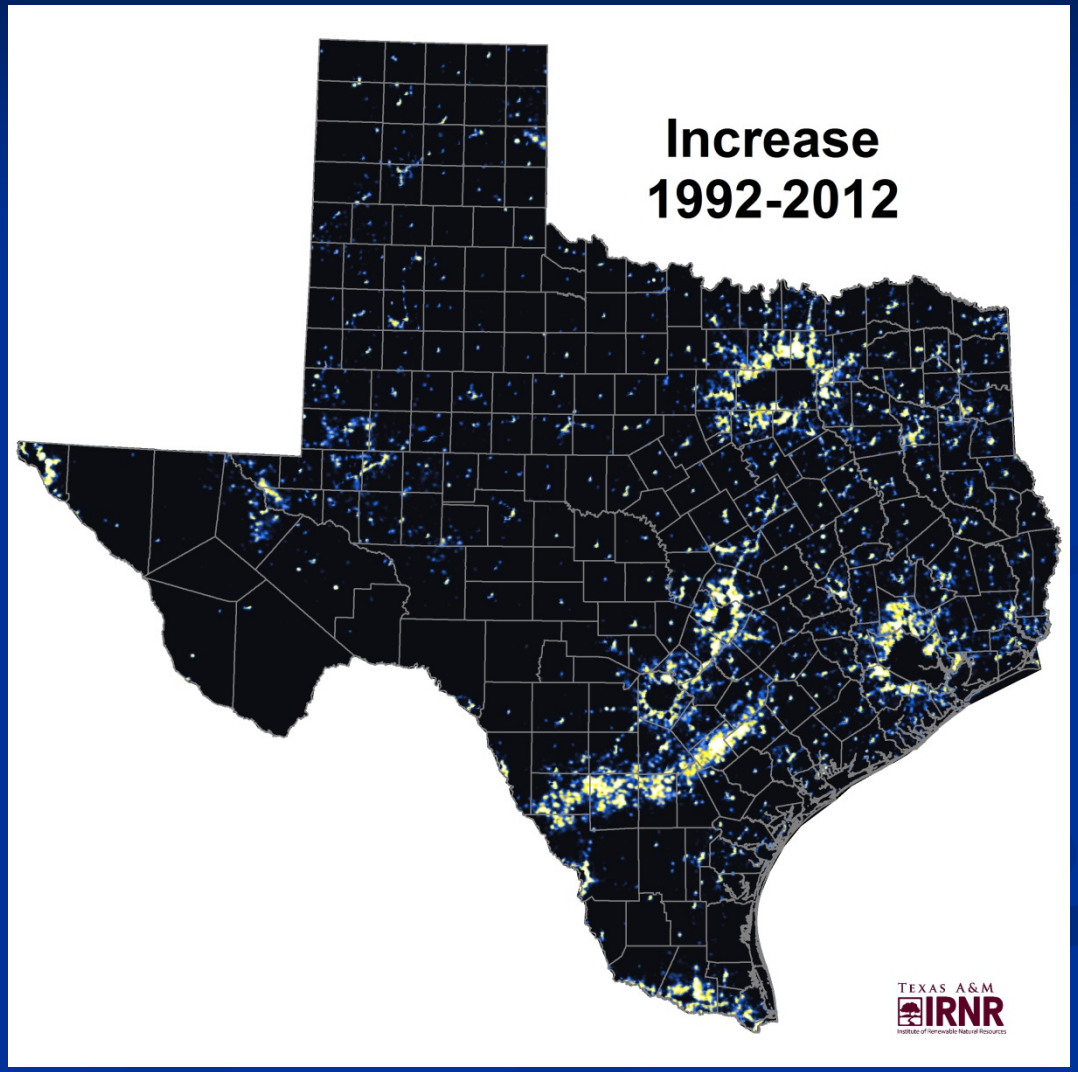




Night Time Illumination







Increase in Impervious Surface

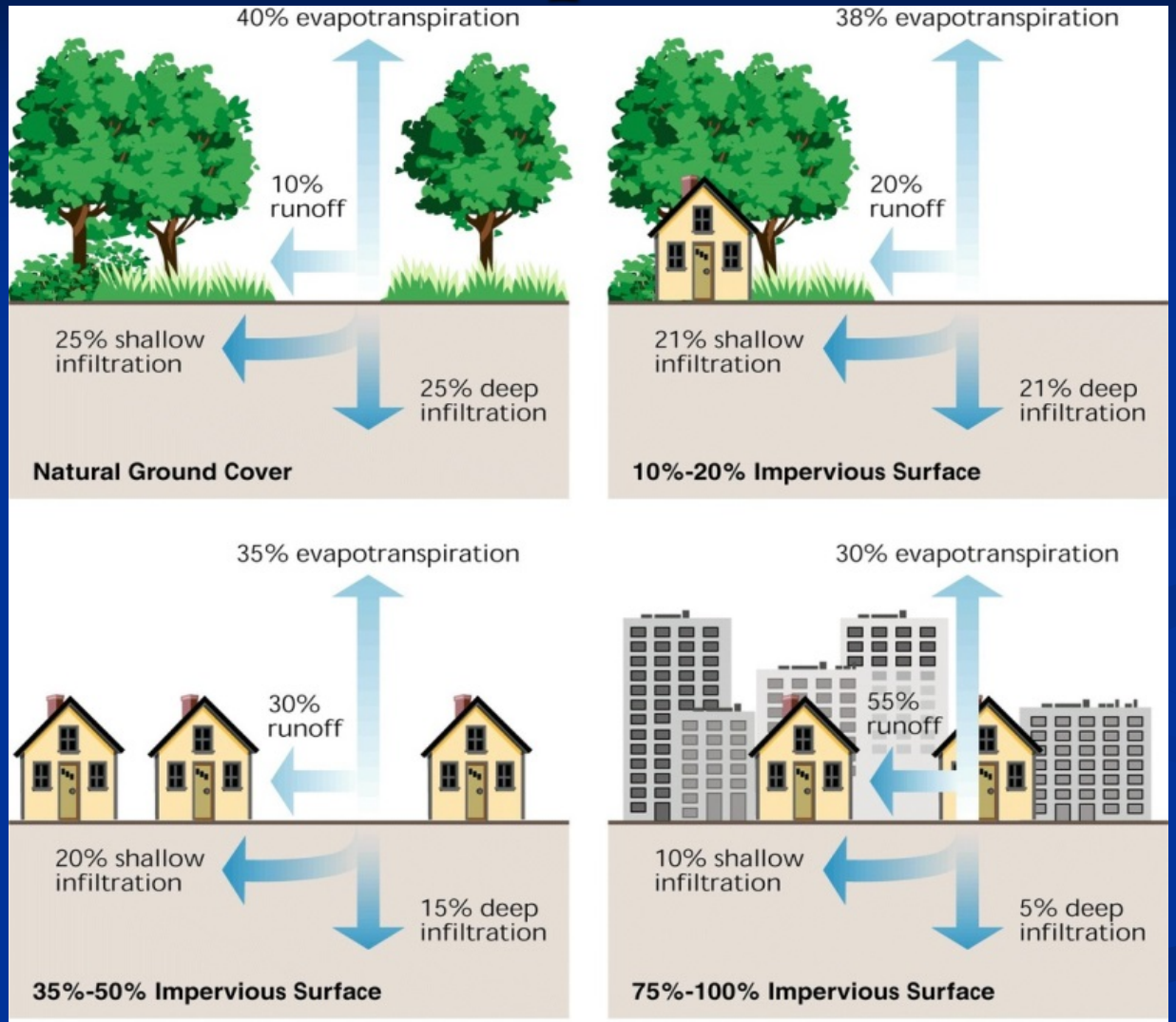
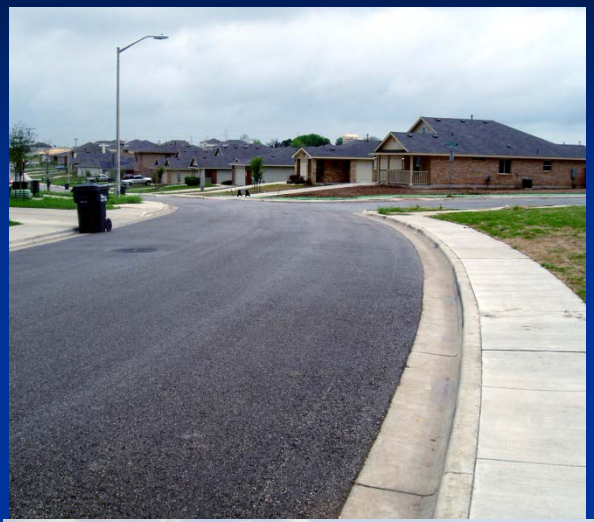
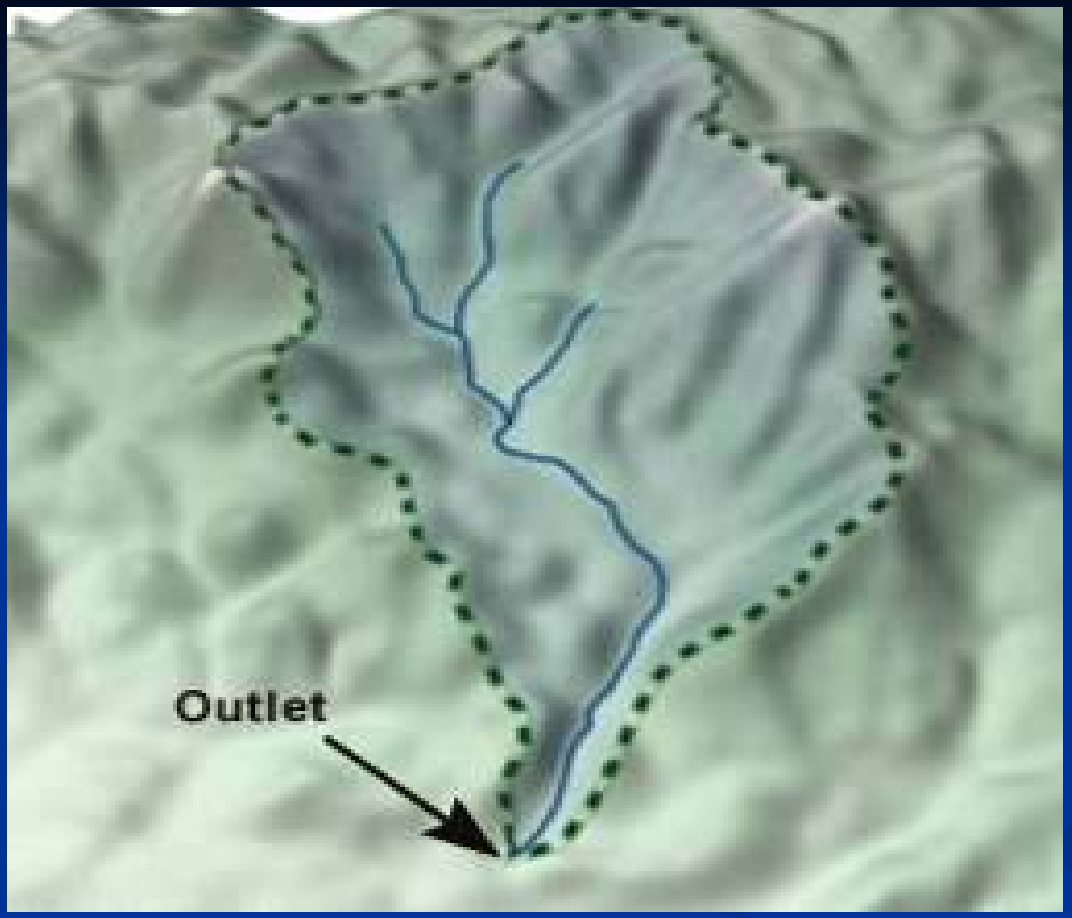


Fig. 3.21 -- Relationship between impervious cover and surface runoff. Impervious cover in a watershed results in increased surface runoff. As little as 10 percent impervious cover in a watershed can result in stream degradation.
In Stream Corridor Restoration: Principles, Processes, and Practices (10/98).
By the Federal Interagency Stream Restoration Working Group (FISRWG) (15 Federal agencies of the U.S.)

Land Uses: We Live and Work in a Watershed





Watershed
vs.
Catchment

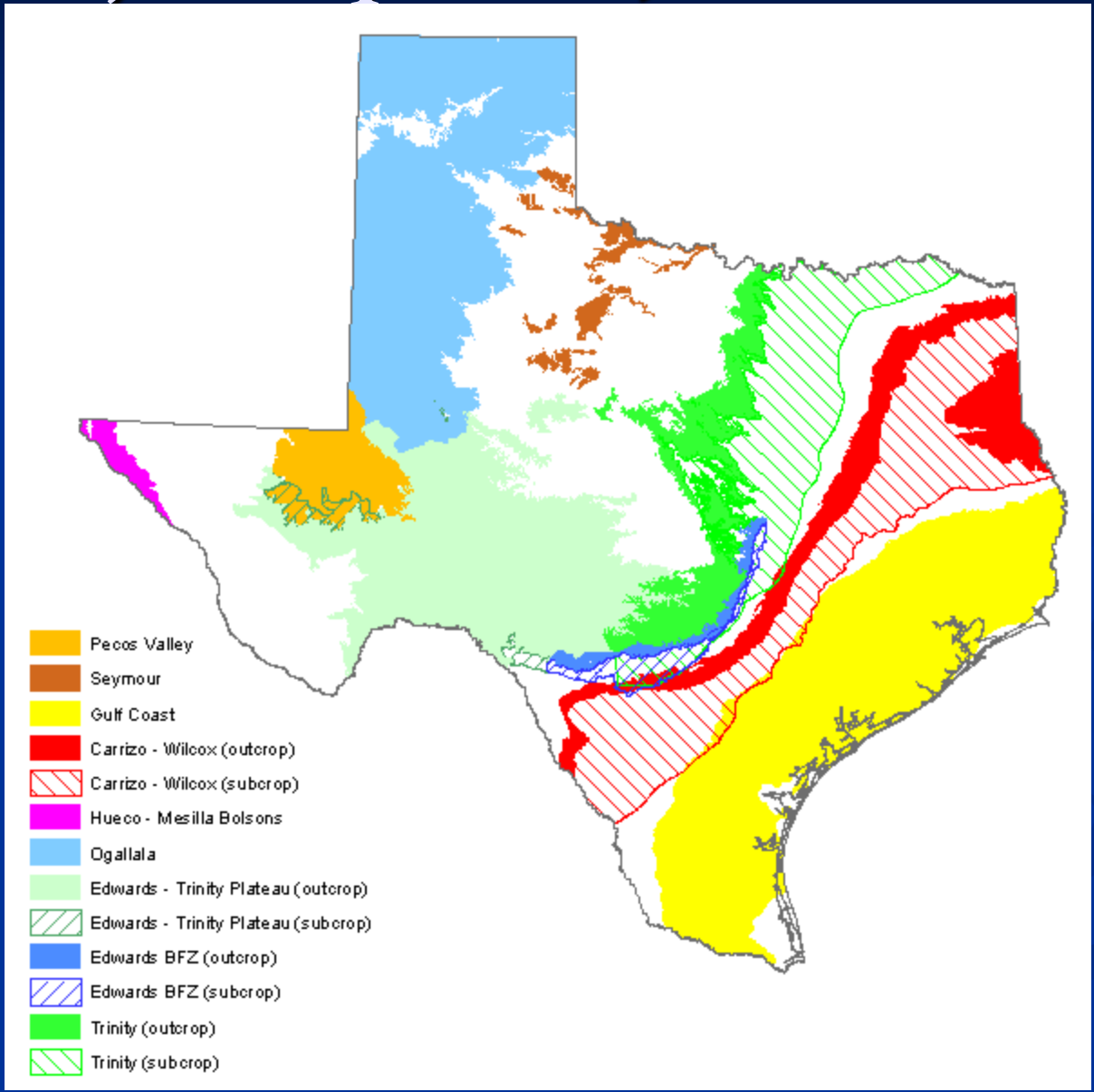
An Overlooked Opportunity

Catching the water

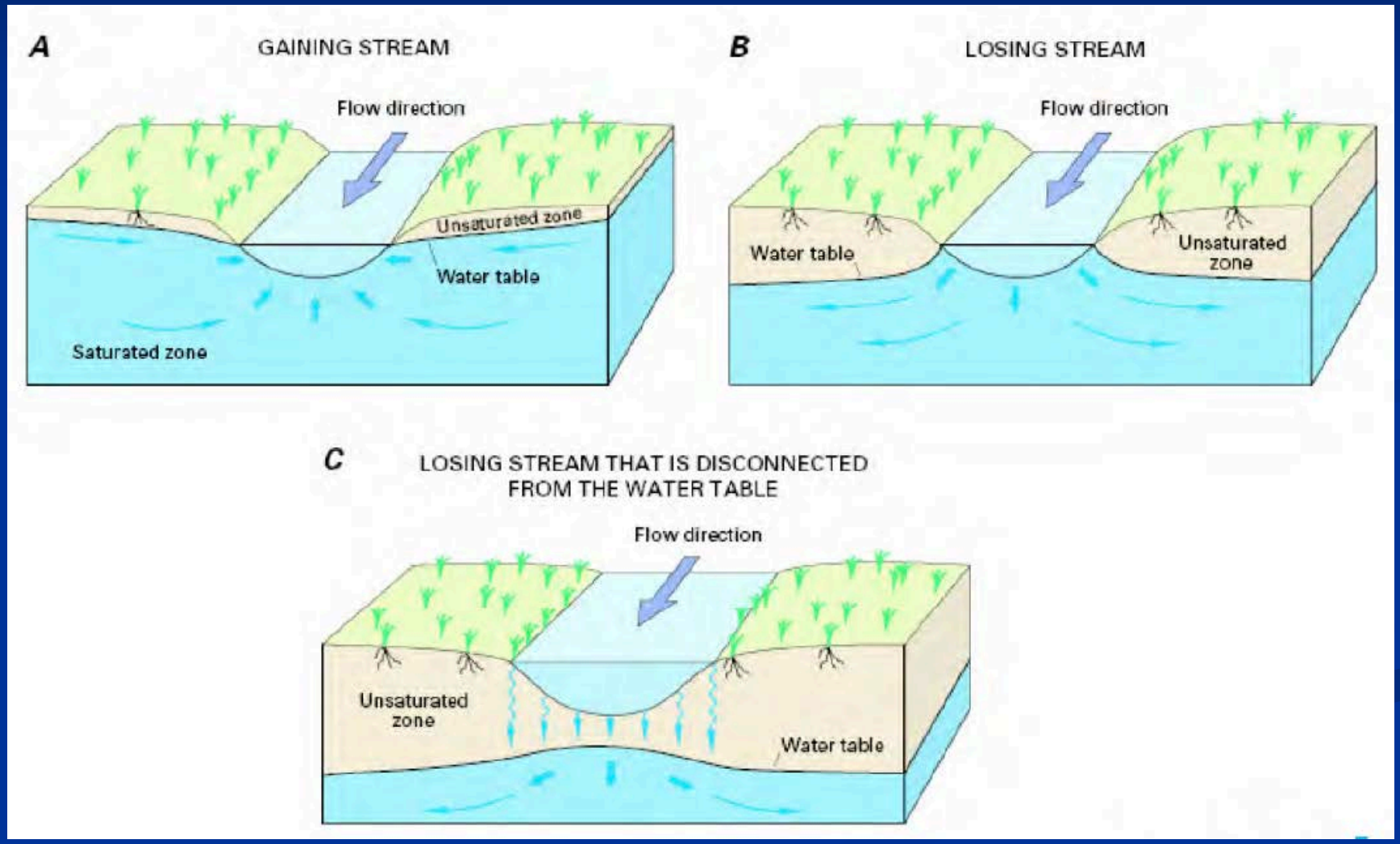
Storing the water in the land


Water Catchment
Water Shed

Major Aquifers, TWDB Map



Basic Types of Surface & Groundwater Interactions



Texas Riparian and Stream Ecosystem Education Program

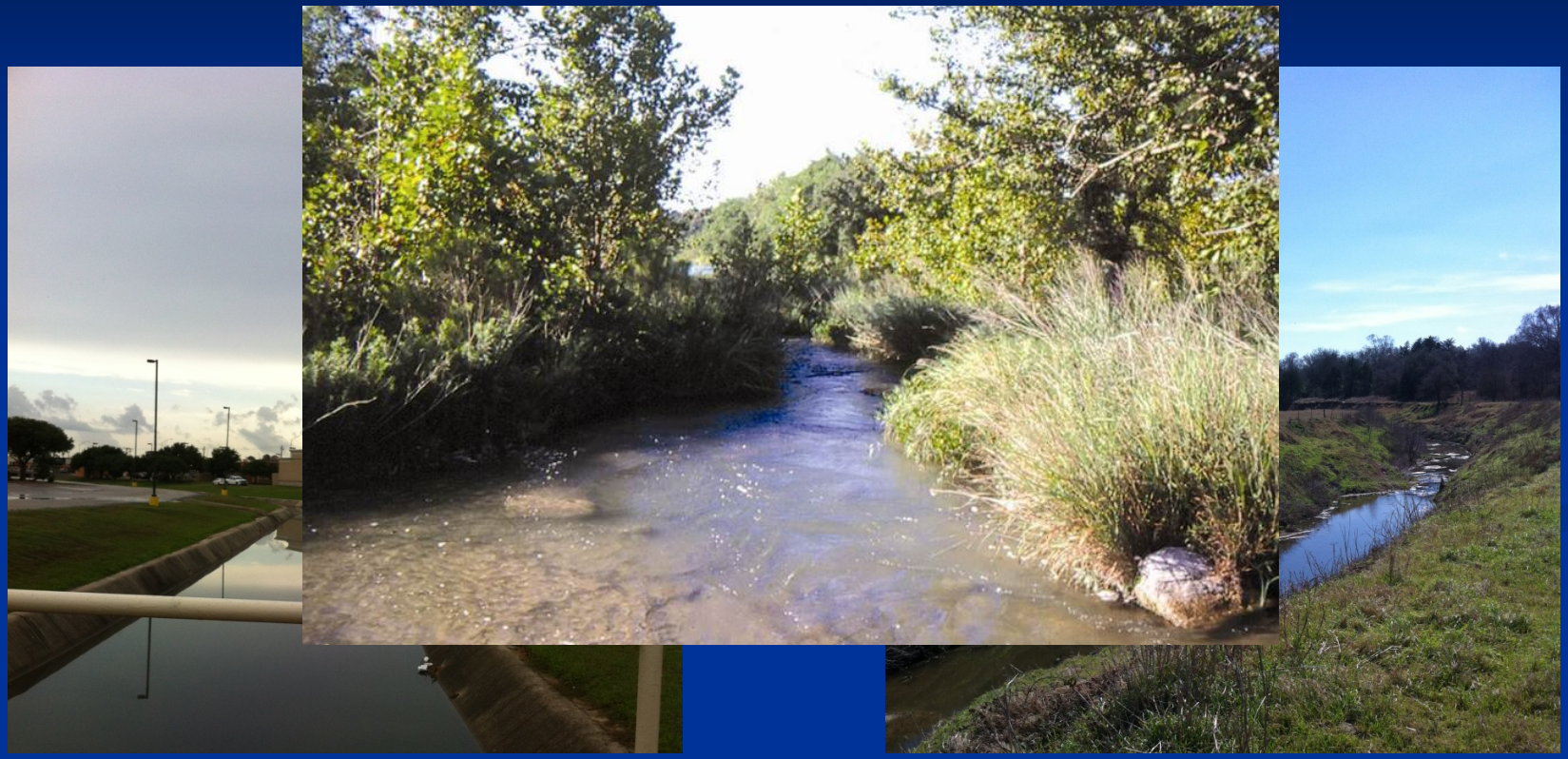
Nikki Dictson

Texas Water Resources Institute

http://texasriparian.org and
http://www.facebook.com/TexasRiparianAssociation

Funding is provided by the U.S. Environmental Protection Agency through the Texas State Soil and Water Conservation Board.

Creeks / Riparian Areas are special places that need preferential treatment.



To implement better management strategies we need to better understand these areas, the benefits, and what may be hindering their own natural restoration processes.

History of Riparian Workshops

- Workshops have been offered in the past by

  Texas A&M AgriLife Extension Service and Research, Texas Riparian Association, Universities, Stream Teams in North Central and Central Texas, Nueces River Authority, NRCS and Texas Parks and Wildlife Dept.

- These workshops have been very successful in the Nueces River Basin, Plum Creek and Lampasas River Watersheds attracting 30-120 participants.
- Unfortunately funding for many of these programs had ended except for TPWD and NRCS.

Texas Riparian & Stream Ecosystem Education

- Promote healthy watersheds and improve water quality through riparian and stream ecosystem education
- Increase citizen awareness and understanding of the nature and function of riparian zones, their benefits and management practices to protect them and minimize NPS pollution
- Enhance interactive learning opportunities for riparian education across the state and establish a larger, more informed citizen base working to improve and protect local riparian and stream ecosystems through online tools
- Connect landowners with local technical and financial resources to improve management and promote healthy watersheds and riparian areas



Education

- Deliver 24 riparian education programs to participants in prioritized watersheds, typically watersheds with watershed planning or total maximum daily load efforts due to impaired water quality
- Coordinate 2 statewide riparian conferences: SW Stream Restoration Conference in San Antonio June 1-3, 2016 and Riparian Symposium in February 2017.

Major Collaborators

Texas Water Resources Institute
make every drop count

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

TEXAS PARKS & WILDLIFE
Life's better outside.®
PROUD PARTNER

Soil Water
TSSWCB
Texas State Soil and Water Conservation Board

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TEXAS A&M FOREST SERVICE

TEXAS RIPARIAN ASSOCIATION

Nueces River Authority

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

LLANO RIVER FIELD STATION
Texas Tech University @ Junction

Dixon Water Foundation

Texas Riparian & Stream Ecosystem Workshop – Upcoming Training Locations

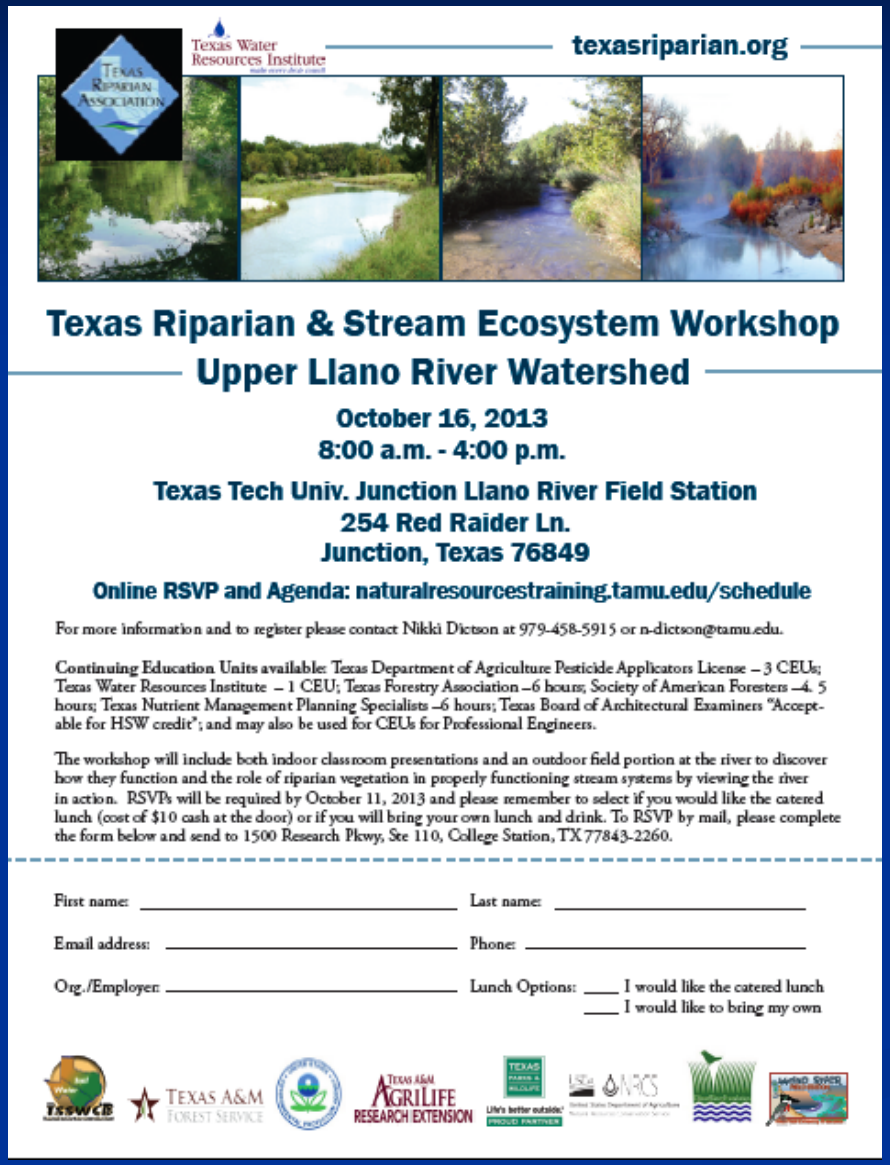
- Lampasas River –March 3, 2016
- Big Cypress Basin / Lake O' the Pines – April 26, 27,or 28,
- Village Creek/Lake Arlington – May 24, 2016
- Gilleland Creek – May 5, 2016
- Cost: Free for training but cost for catered lunch

- Theme: Advancing Stream Restoration in the Southwest
- **2016 CALL FOR ABSTRACTS**
- Submit abstracts by January 30, 2016 to southweststream@gmail.com

Completed Workshops

- Lockhart – Plum Creek Watershed, June 2013
- Temple/Moody – Leon River Watershed, September 2013
- Seguin – Geronimo and Alligator Creek , September 2013
- Junction – Upper Llano River Watershed, October 2013
- College Station – Graduate Course, October 2013
- Junction Pre-conference Workshop – November 2013
- College Station – Carters Creek Watershed – Nov. 21, 2013
- Hallettsville – Lavaca River Basin – February 25, 2014
- Wharton – San Bernard River – March 18, 2014
- Weslaco – Arroyo Colorado River – April 24, 2014
- Mont Belvieu – Cedar Bayou Watershed – May 8, 2014
- Kerrville – Upper Guadalupe River Basin – May 13, 2014
- Hankamer – Double Bayou Watershed – September 24, 2014
- Corpus Christi – Lower Nueces, Petronila Creek, & Oso Creek – Oct. 8, 2014
- Azle – Eagle Mountain Lake Watershed – October 14, 2014

Marketing



Texas Water Resources Institute

texasriparian.org

Texas Riparian & Stream Ecosystem Workshop

Upper Llano River Watershed

October 16, 2013
8:00 a.m. - 4:00 p.m.

Texas Tech Univ. Junction Llano River Field Station
254 Red Raider Ln.
Junction, Texas 76849

Online RSVP and Agenda: naturalresourcestraining.tamu.edu/schedule

For more information and to register please contact Nikki Dictson at 979-458-5915 or n-dictson@tamu.edu.

Continuing Education Units available: Texas Department of Agriculture Pesticide Applicators License – 3 CEUs; Texas Water Resources Institute – 1 CEU; Texas Forestry Association –6 hours; Society of American Foresters –4. 5 hours; Texas Nutrient Management Planning Specialists –6 hours; Texas Board of Architectural Examiners "Acceptable for HSW credit"; and may also be used for CEUs for Professional Engineers.

The workshop will include both indoor classroom presentations and an outdoor field portion at the river to discover how they function and the role of riparian vegetation in properly functioning stream systems by viewing the river in action. RSVPs will be required by October 11, 2013 and please remember to select if you would like the catered lunch (cost of $10 cash at the door) or if you will bring your own lunch and drink. To RSVP by mail, please complete the form below and send to 1500 Research Pkwy, Ste 110, College Station, TX 77843-2260.

First name: _____ Last name: _____

Email address: _____ Phone: _____

Org./Employer: _____ Lunch Options: ____ I would like the catered lunch
____ I would like to bring my own

- News Releases through AgriLife Today
- Listserv - TEXASRIPARIAN@LISTSERV.TAMU.EDU
- Website - http://texasriparian.org
- Facebook - http://www.facebook.com/TexasRiparianAssociation
- Online Registration – http://naturalresourcestraining.tamu.edu/schedule/

Texas Water Resources Institute

Riparian & Stream Ecosystems

Attoyac Bayou Watershed – Agenda
December 3, 2015

8:00 Meeting Registration

8:15 Welcome & Introductions
- Ricky Thompson, Texas AgriLife Extension Service, Nacogdoches County

8:30 Program Overview, Watershed & Riparian Management & Water Quality
- Nikki Dictson, Texas Water Resources Institute

9:15 How Creeks Function & Bear Creek Example
- Melissa Parker, Texas Parks and Wildlife Department

10:00 Break

10:15 Riparian Vegetation
- James Rogers, USDA Natural Resources Conservation Service (NRCS)

11:00 Management Practices, Local Resources and Photo Monitoring of Streams
- Nikki Dictson, Texas Water Resources Institute

11:45 Lunch

12:00 Attoyac Bayou Watershed Protection Plan
- Lucas Gregory, Texas Water Resources Institute
- Anthony Castilaw, Castilaw Environmental Services, LLC

12:15 The Role of Forests and Trees in Watershed Protection
- Todd Thomas, Texas A&M Forest Service

1:00 Lanes Balance Presentation

1:30 Trip to the Bayou (Split into 3 groups for 40-45 min stations)
- Bayou Walk
- Assistance for Improving the Health of Creeks – Kyle Wright, NRCS
- Feral Hogs – Mark Tyson, AgriLife Extension Service

4:00 Wrap Up Evaluation and Head for Home!

http://texasriparian.org/ and https://www.facebook.com/TexasRiparianAssociation

Texas A&M AgriLife Research Extension · Soil Water TSSWCB · Texas A&M Forest Service · Texas Parks & Wildlife Life's better outside. Proud Partner · Texas Riparian Association · USDA NRCS United States Department of Agriculture Natural Resources Conservation Service · United States Environmental Protection Agency · Attoyac Bayou Watershed Partnership

Online Resources and Tools

- Website: Texas Riparian Association http://texasriparian.org/ has had 31,229 views since it was moved and re-established in January 2013
- Website has 4,956 subscribers to blog posts
- Facebook page has 680 friends
- Listserv has 308 subscribers since May 2014.

Online Modules, Videos, and Resources

Home | About TRA | Riparian Program | Upcoming Training Locations | Southwest Stream Restoration Conference | Trainings | Past Meetings | Publication and Media | Resources | Riparian Photos | Listserv | Join Us | Partners

↑ Return to Riparian Program

Riparian Online Modules

(Edit Page)

The Riparian and Stream Ecosystem Education Workshop will include the following presentations for the indoor portion of the training:

You Tube Videos – Voice over PowerPoint Presentations

1. Riparian and Watershed Management: Steve Nelle, Retired USDA Natural Resources Conservation Service
2. Stream Processes and Hydrology: Ryan McGillicuddy, Texas Parks and Wildlife Department
3. Riparian Vegetation and hindrances to Healthy Riparian Areas: Steve Nelle, USDA NRCS
4. Management Practices and Local Resources: Nikki Dictson, Texas Water Resources Institute
5. Riparian Considerations for Land Operators: Lori Hazel, Texas A&M Forest Service

Riparian Mini-Modules

- Lesson 1: Debunking the Myths
  Nueces River Authority
- Lesson 2: Defining Riparian
  Nueces River Authority
- Lesson 3: Function Produces Values
  Nueces River Authority
- Lesson 4: How A River Works
  Nueces River Authority
- Lesson 5: The Impacts of Channel Degradation
  Nueces River Authority
- Lesson 6: The Importance of Riparian Vegetation
  Nueces River Authority
- Lesson 7: What Hinders Function and Recovery
  Nueces River Authority
- Lesson 8: Riparian Degradation and Recovery

Nueces River Authority

Understanding Lane's Balance for streams – A You Tube video with Steve Nelle explaining Lane's Balance.

Understanding Your Remarkable Riparian Area – A webinar on You Tube featuring Sky Jones-Lewey of the Nueces River Authority that was sponsored by Texas Wildlife Association and AgriLife Extension Service in 2012.

PowerPoint Presentations

Understanding Creek and Riparian Areas (powerpoint presentation)

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ndictson@gmail.com

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No recent Facebook posts to show
Admins only notice: Did you configure the plugin properly?
Find us on Facebook

Search | Search

Texas Riparian Association

Texas Rip...
680 likes
Liked

You and 15 other friends like this

Local Contacts: Technical and Financial Resources

- County Extension Agent/County
- Watershed Coordinator
- Soil and Water Conservation District
- NRCS
- TPWD
- Wildlife Management Association
- CEU Partners
- Web links to resources and BMP guides

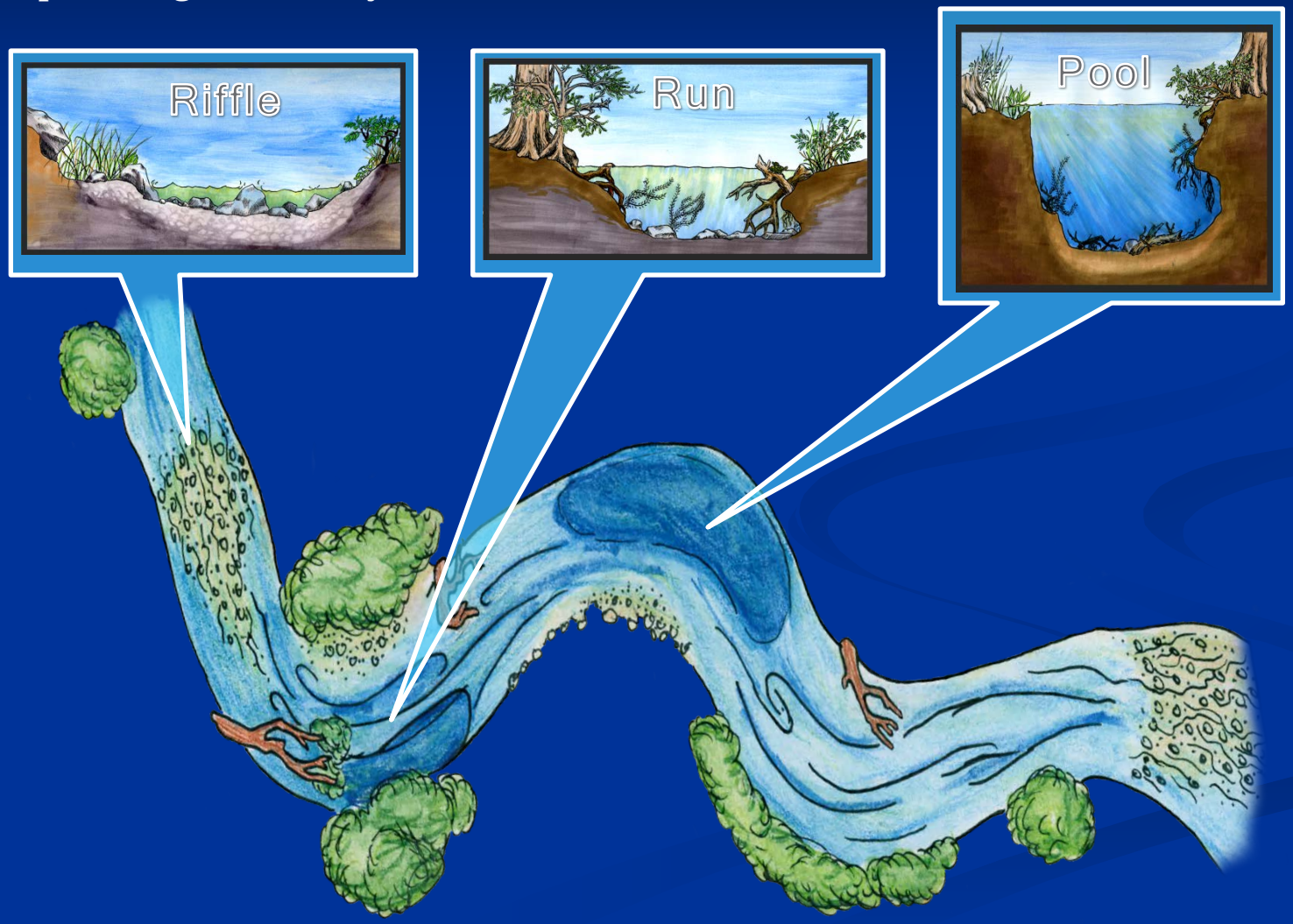
Continuing Education Units

- Texas Department of Agriculture Pesticide Applicators License - 3 CEUs
- Texas Water Resources Institute - 1 CEU
- Texas Nutrient Management Planning Specialists - 6 hours
- Texas Forestry Association - 6 hours
- Society of American Foresters - 5.5 hours
- Texas Board of Architectural Examiners "Acceptable for HSW credit"
- The program may also be used for CEUs for Professional Engineers.
- Advanced Hours for Texas Master Naturalist and Master Gardeners (Chapter Approval)

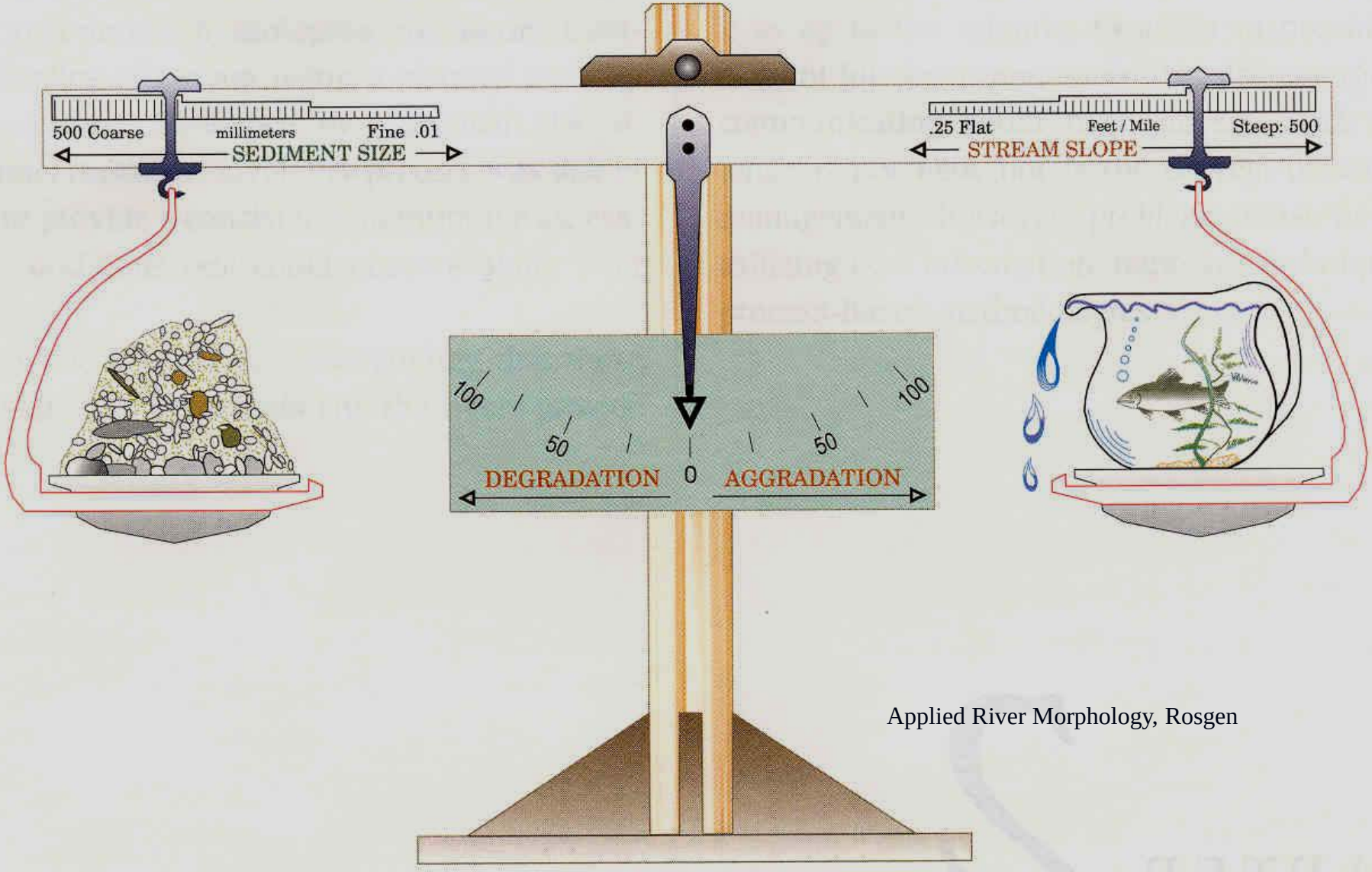
River, Floodplain and Riparian Areas are One

- Erosion Control
- Water Quality Improvement
- Wildlife Habitat
- Aquatic Habitat
- Recreation
- Water Storage
- Flood Protection

The patterns of rivers are naturally developed to dissipate the energy of the moving water and to transport sediment. The meander geometry and associated riffles and pools adjust to keep the system operating efficiently.



Lane's Relationship (1955)



Applied River Morphology, Rosgen

(Sediment LOAD) x (Sediment SIZE) $\propto$ (Stream SLOPE) x (Stream DISCHARGE)

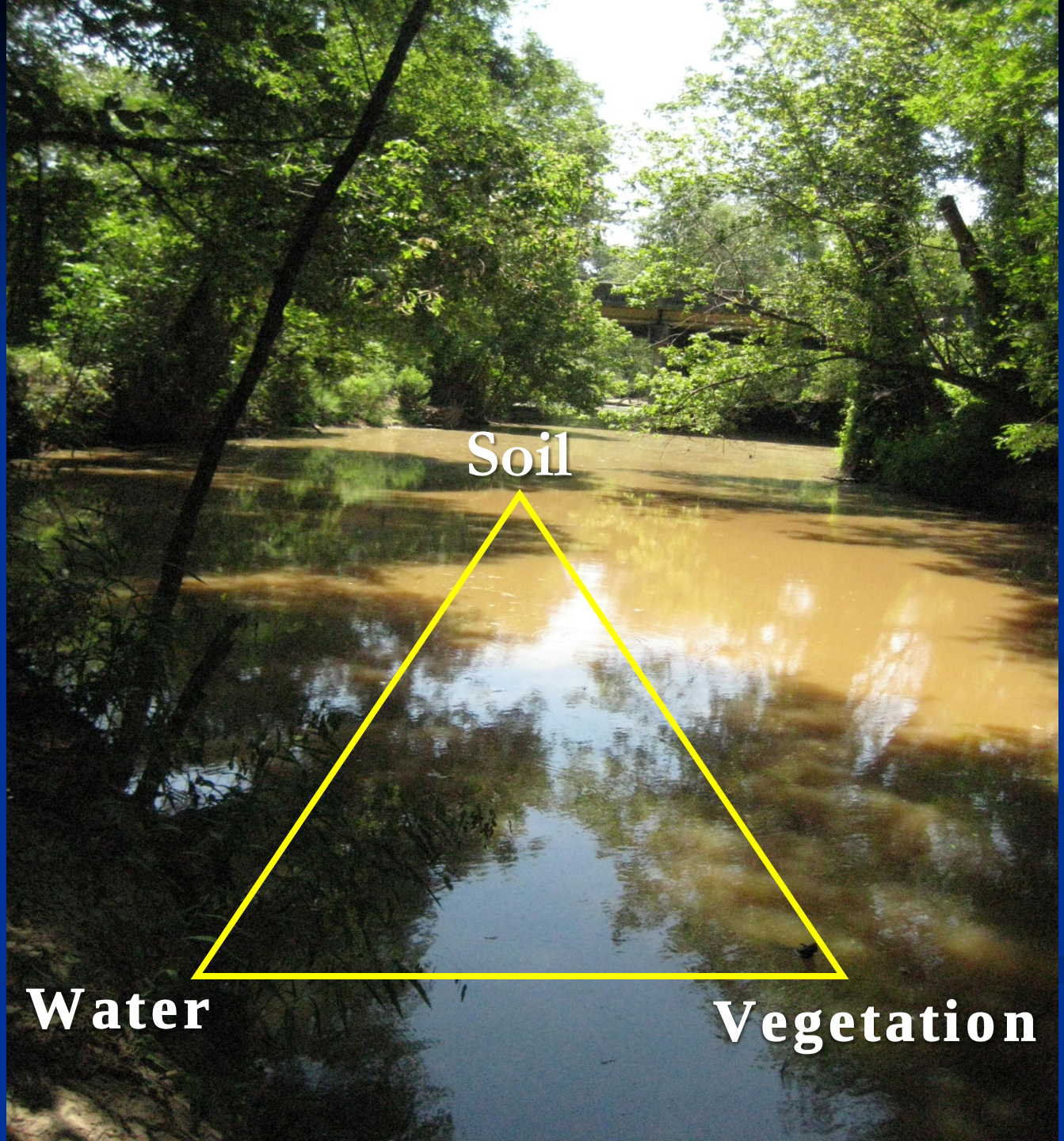
Properly Functioning Riparian Area

Adequate vegetation, landform or large woody material to:

- Dissipate stream energy
- Stabilize banks
- Reduce erosion
- Trap sediment
- Build / enlarge floodplain
- Store water
- Floodwater retention
- Groundwater recharge
- Sustain baseflow

- Water quality
- Water quantity
- Forage
- Aquatic habitat
- Wildlife habitat
- Recreational value
- Aesthetic beauty

Physical Function → **Values**


Soil
Water
Vegetation

The Role of Riparian Vegetation

Vegetation

Riparian Chain Reaction

Adequate Vegetation:

Protects banks from excess erosion

Dissipates energy and slows the velocity of floodwater

Sediment dropped

Sediment trapped and stabilized

Floodplain / riparian sponge is enlarged

Increased groundwater recharge

Base-flow is sustained over time

Stability Ratings of Riparian Plants Scale of 1 - 10

1 = Bare ground

10 = Anchored rock or large anchored logs

6/7 = Acceptable riparian stability *

Common Plants of Riparian Areas - Central Texas

With Wetland Indicator (WI) and Proposed Stability Rating (SR)
Compiled by Steve Nelle

Sedges / Grasses	WI	SR
Spikerushes (most)	OBL	6
Emory sedge	OBL	9
Sawgrass	OBL	9
Rice cutgrass	OBL	6
Southern wildrice	OBL	9
Water bentgrass	OBL	5
Cattail	OBL	9
Bulrushes (most)	OBL	9
Porcupine sedge	OBL	5
Knotgrass	FACW	6
Hairyseed paspalum	FACW	6
Bushy bluestem	FACW	5
Flatsedges (most)	FACW	5
White top sedge	FACW	5/6
Rushes (most) OBL or	FACW	6
Aparejograss	FACW	6
Barnyardgrass	FACW	4
Rabbitsfoot grass *	FACW	3
Switchgrass	FAC	9
Eastern gammagrass	FAC	9
Lindheimer muhly	FAC	7
Wildrye	FAC	5
White tridens	FAC	5
Vine-mesquite	FAC	6
Seep muhly	FAC	6
Broadleaf Uniola	FAC	6
Dallisgrass *	FAC	7
Vaseygrass *	FAC	5
Rustyseed paspalum	FAC	5
Giant reed (Arundo)*	FAC	7
St Augustine grass *	FAC	6
Indiangrass	FACU	7
Johnsongrass *	FACU	6
Bermudagrass *	FACU	6
Dichanthelium (most)	FACU	4
Southwestern bristle	UPL	5
King Ranch bluestem *	UPL	5

*Indicates Introduced Species

Forbs	WI	SR
Water willow	OBL	7
Water primrose	OBL	3
Watercress *	OBL	3
Scouring rush	OBL	6
Marsh fleabane	OBL	5
Smooth bidens	OBL	5
Water hyssop	OBL	3
Pennywort	OBL	3
Cardinalflower	FACW	5
Tall aster	FACW	5
Spiny aster	FACW	8
Large buttercup	FACW	6
Bog nettle	FACW	5
Dock (most)	FACW	
Mint *	FACW	3
Smallhead sneezeweed	FACW	3
Sesbania	FACW	3
Poison hemlock*	FACW	5
Frogfruit	FAC	4
Late boneset	FAC	5
Dogbane	FAC	7
Ironweed	FAC	5
Shield fern	FAC	6
Giant ragweed	FAC	3
Annual sumpweed	FAC	3
Brazilian verbena *	FAC	4
Cocklebur	FAC	3
Tall goldenrod	FACU	6
Common ragweed	FACU	2
Frostweed	FACU	6
Maximilian sunflower	FACU	6
Clammyweed	FACU	3
Castor bean *	FACU	3
Western ragweed	UPL	5
Turk's cap	UPL	5
Toothed goldeneye	UPL	5

Woody	WI	SR
Buttonbush	OBL	8
Bald Cypress	OBL	9
Indigobush amorpha	OBL	7
Black willow	FACW	7
Arroyo willow	FACW	7
Spiny aster	FACW	8
Box elder maple	FACW	6
Possum haw	FACW	6
Sycamore	FAC	6
Eastern cottonwood	FAC	7
Pecan	FAC	6
Little walnut	FAC	7
Roosevelt baccharis	FAC	6
American elder	FAC	6
Roughleaf dogwood	FAC	6
Sugar hackberry	FAC	5
American elm	FAC	6
Cedar elm	FAC	6
Bur oak	FAC	6
Chinquapin oak	FAC	6
Lindheimer indigo	FAC	5
Wafer ash (Ptelea)	FAC	6
Dewberry	FAC	4
Greenbriar	FAC	5
Poison ivy	FAC	5
Grape vine (most)	FAC	5
Japanese honeysuckle *	FAC	6
Live oak	FACU	6
Netleaf hackberry	FACU	5
Red mulberry	FACU	6
Mesquite	FACU	5
Huisache	FACU	5
Western soapberry	FACU	6
Bumelia	FACU	6
Black walnut	FACU	6
Desert willow	FACU	6
Carolina snailseed	FACU	4
Chinese tallow *	FACU	6
Gravelbar bricklebush	UPL	5
Slender bricklebush	UPL	5
Whitebrush	UPL	6
Juniper	UPL	5
Mexican persimmon	UPL	5
Vitex *	UPL	6
Ligustrum *	UPL	6
Chinaberry *	UPL	6

SR - Stability Ratings are on a scale of 1 – 10. The Stability Rating concept was developed by Al Winward, retired USFS Ecologist. Bare ground has a SR of 1. Anchored rock or logs have a SR of 10. A SR of 7 is considered the minimum for acceptable bank stability in the Hill Country. The ratings are subjective and based on experience and observation. Woody plants, when associated with stabilizing grasses and sedges provide a higher stability rating than if they occur alone.

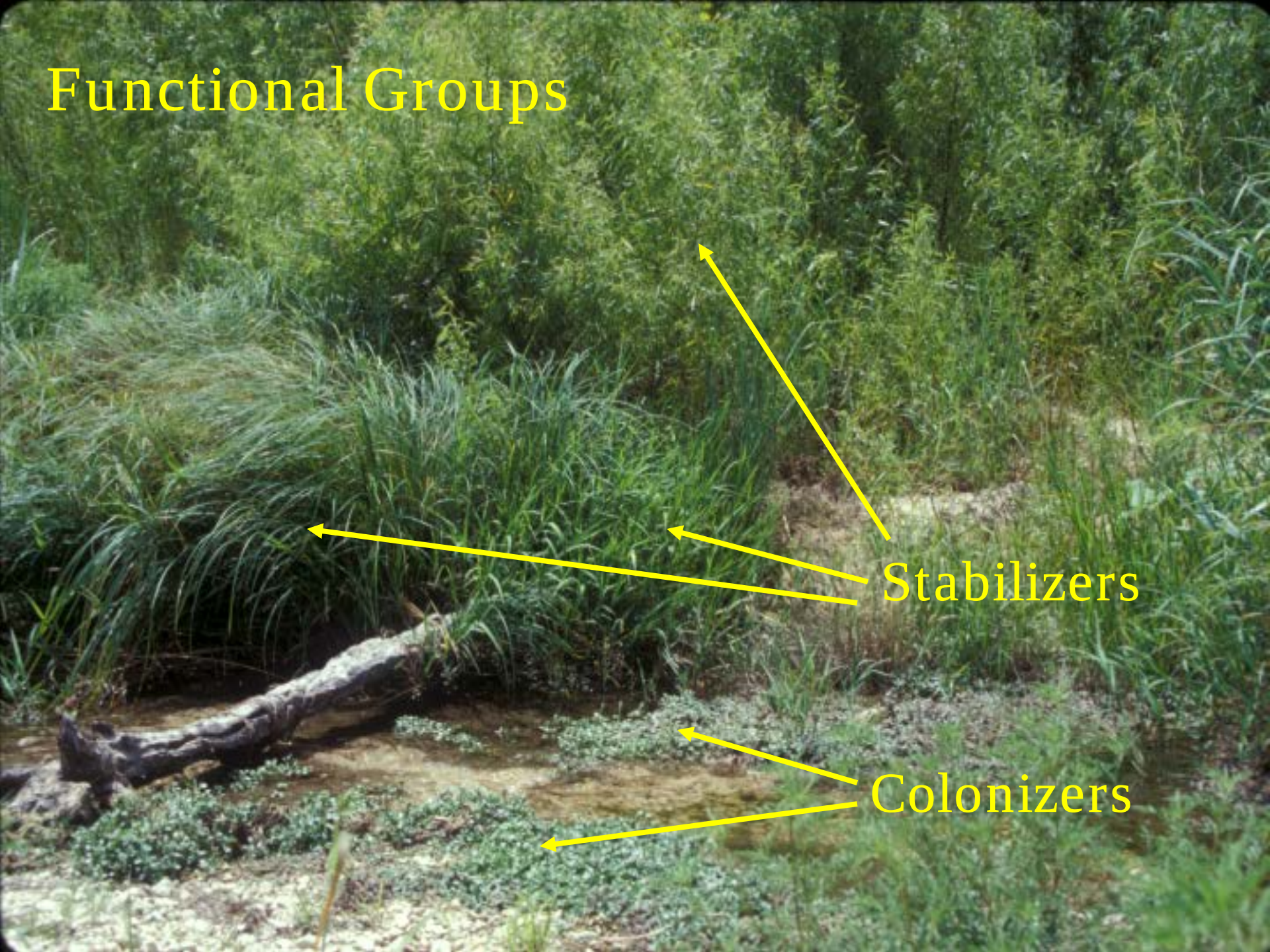
WI - Wetland Indicator Categories

OBL *Obligate Wetland* These plants are very indicative of wet soil conditions and/or a high water table.
FACW *Facultative Wetland* These plants usually grow in wet and seasonally moist areas
FAC *Facultative* These plants can tolerate wet conditions as well as periodically dry condions.
FACU *Facultative Upland* These plants do not tolerate very wet conditions and are indicative of dry locations.
UPL *Obligate Upland* Thse plants almost always occur in non wet areas

Revised January, 2012

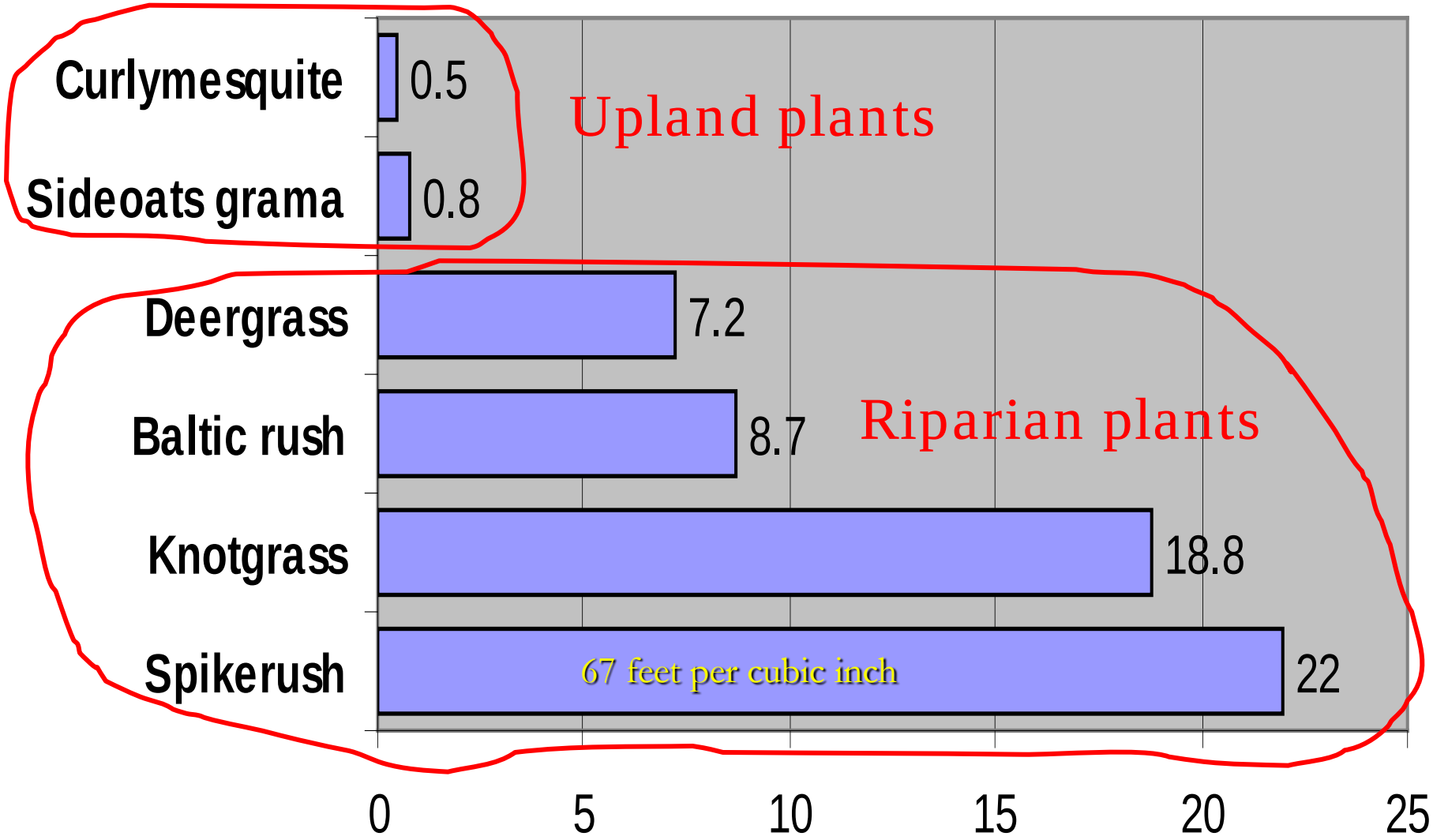
For comments, additions or corrections contact: nelleangelo@suddenlink.net

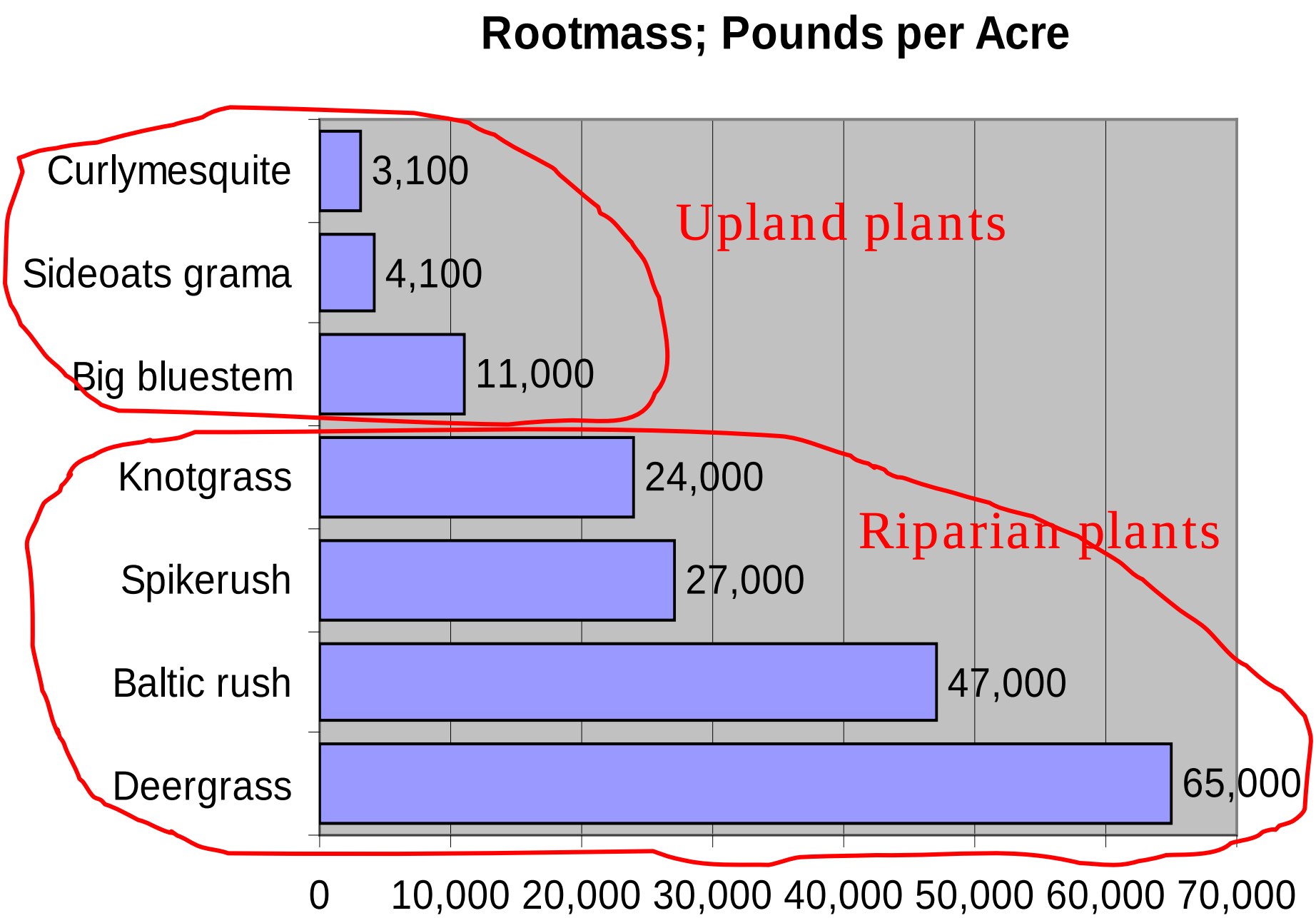
Functional Groups



Interpreting Riparian Vegetation

Root Length; Miles per Cubic Foot




Rootmass; Pounds per Acre
Curlymesquite
3,100
Sideoats grama
4,100
Big bluestem
11,000
Knotgrass
24,000
Spikerush
27,000
Baltic rush
47,000
Deergrass
65,000
Upland plants
Riparian plants
0
10,000
20,000
30,000
40,000
50,000
60,000
70,000

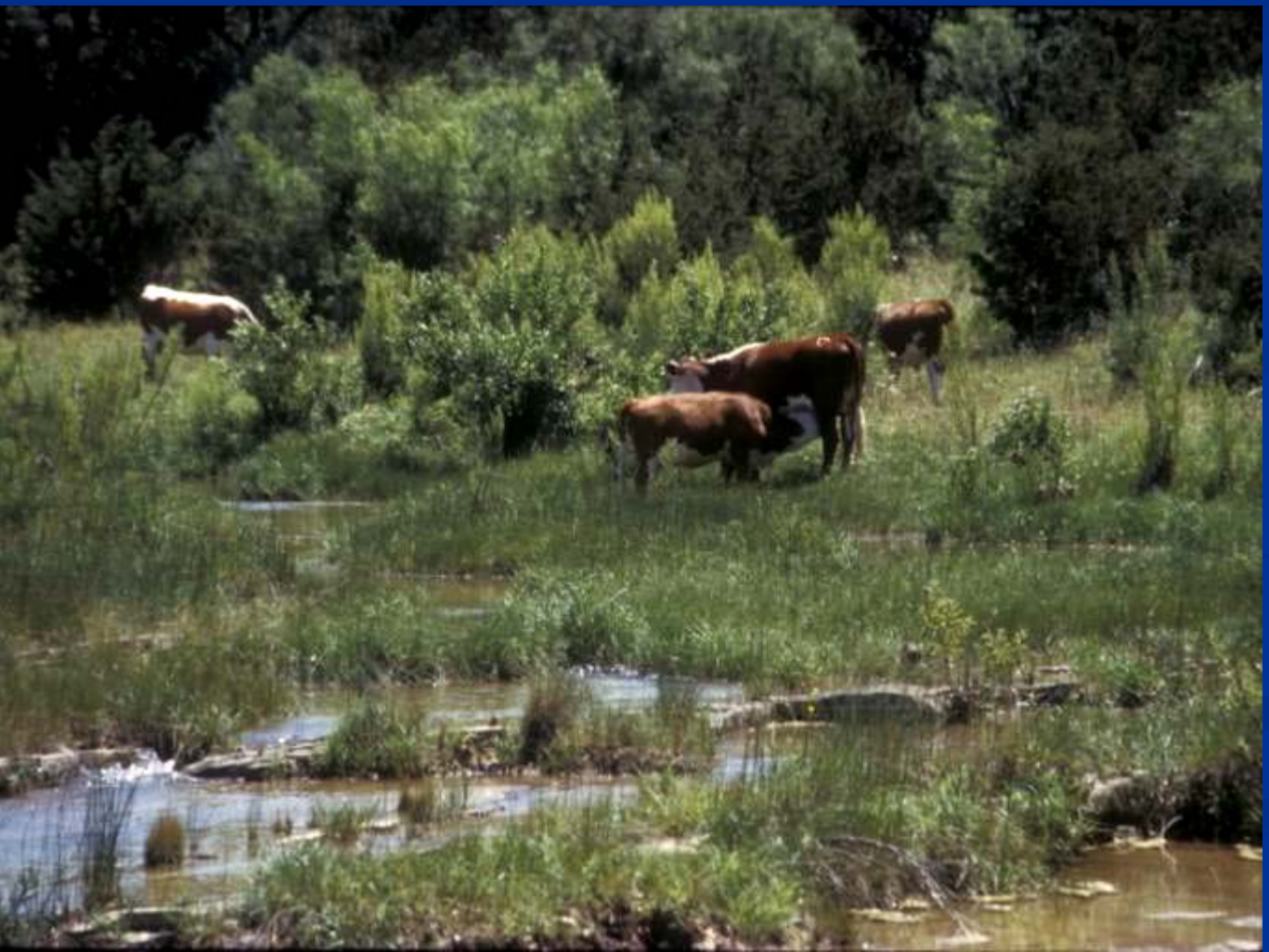
Plant Diversity

Plant Vigor-Leaves and Roots

Caring for the Green Zone, Riparian Areas and Grazing Management

Alberta Riparian Habitat Management Project, "Cows and Fish Project"

Vegetation Indicators:



Multiple age classes?

Plant diversity?

Plants indicative of wet conditions?

Stabilizing root mass?

Plant vigor?

Amount of plant cover?

Source of large wood?

Hindrances to Healthy / Functional Riparian Areas:

- Farming too close to the bank
- Mowing, spraying close to the creek
- Manicured landscapes next to the creek
- Chronic grazing concentrations in creek areas
- Excessive deer, exotics, hogs in creek
- Burning in riparian area
- Removal of large dead wood
- Artificial manipulation of banks / sediment
- Excessive vehicle traffic in creek area
- Poorly designed road crossings / bridges
- Excessive recreational foot traffic
- Excessive alluvial pumping or other withdrawals


12-2-07
10-2-08
5-2-09
-10-10
4-8-12
9-2-12
2012 04 08

Workshops typically have around 40 + attendees but have ranged from 30-93. Plum Creek Workshop had 120.

Value of the Program

- We developed evaluation tools with a pre/post-test component to try to evaluate knowledge gained during the program.
- The evaluation asks them demographic data on the pre-course evaluation.
- They are asked program satisfaction and willingness to adopt conservation practices on the post-course.

Riparian Evaluation of Program

1. Asked demographic data, program satisfaction, and willingness to adopt conservation practices.
2. -We had a 73.2% response rate (754/1030).
3. -The total combined acreage for all workshop participants is more than
4. 184,949 acres.
5. -83% had a bachelor's degree or higher
6. -19% increase between pre and post- test scores and knowledge gained overall (scores 77, 92)

Riparian Evaluation of Program

- -99.5% of respondents mostly or completely satisfied with the program
- -99.3% were mostly or completely satisfied with the course materials
- -99.2% were mostly or completely satisfied with the ease of understanding
- -Almost all respondents (99.7%) would recommend this course to others (1 no)
- -43.1%, believed they would benefit economically from this course in the future

Table showing Percent of Participants that plan to adopt each of the Conservation Practices

	% Plan to Adopt	% Undecided	% Will not Adopt
Riparian Herbaceous Buffers	85%	14%	0.7%
Riparian Forest Buffers	78%	19%	3%
Prescribed Grazing	72%	20%	8%
Rotational Grazing	76%	17%	7%
Manage Feral Hogs	82%	16%	3%
Rangeland Planting of Vegetative Cover	76%	21%	4%
Manage to Reduce Bare Ground	93%	7%	0.3%
Monitor Stream Sites through Photos	71%	24%	5%

Post workshop online evaluations

- -293 respondents out of the 938 or 31% rate of the total emails and 293 out of 395 that owned or managed land.
- -78% of respondents stated that they had adopted or planned still the BMPs discussed -30% estimated they have benefited over $1,000-$10,000+ and 30% estimated between $100-$500 of economic benefits
- -An additional 29% of attendees or 72 individuals have participated in a conservation program since the riparian training


Thanks!
TexasRiparian.org