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.

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

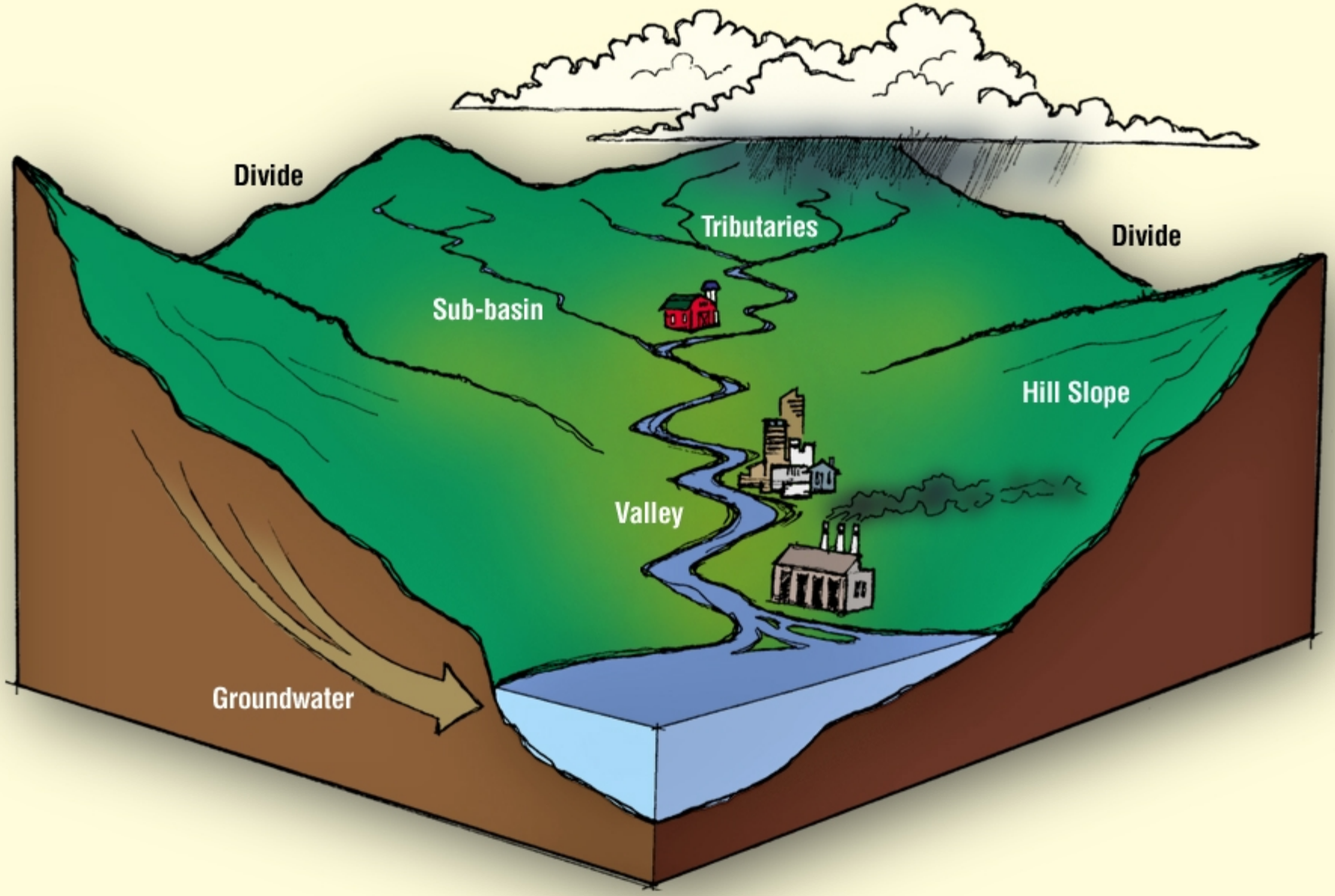

Education

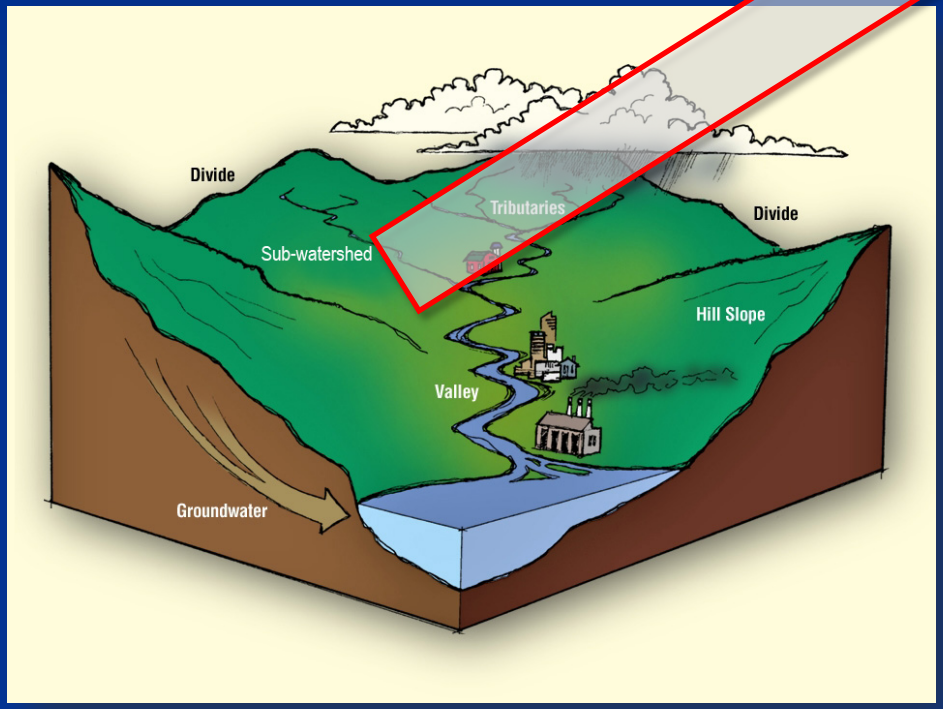
- Deliver a minimum of 25 riparian education programs to participants in prioritized watersheds, typically watersheds with watershed planning or total maximum daily load efforts due to impaired water quality
- Coordinate 3 Modified Proper Functioning Condition/Stream Visual Assessment trainings to agency personnel and water professionals
- Coordinate 2 statewide riparian conferences

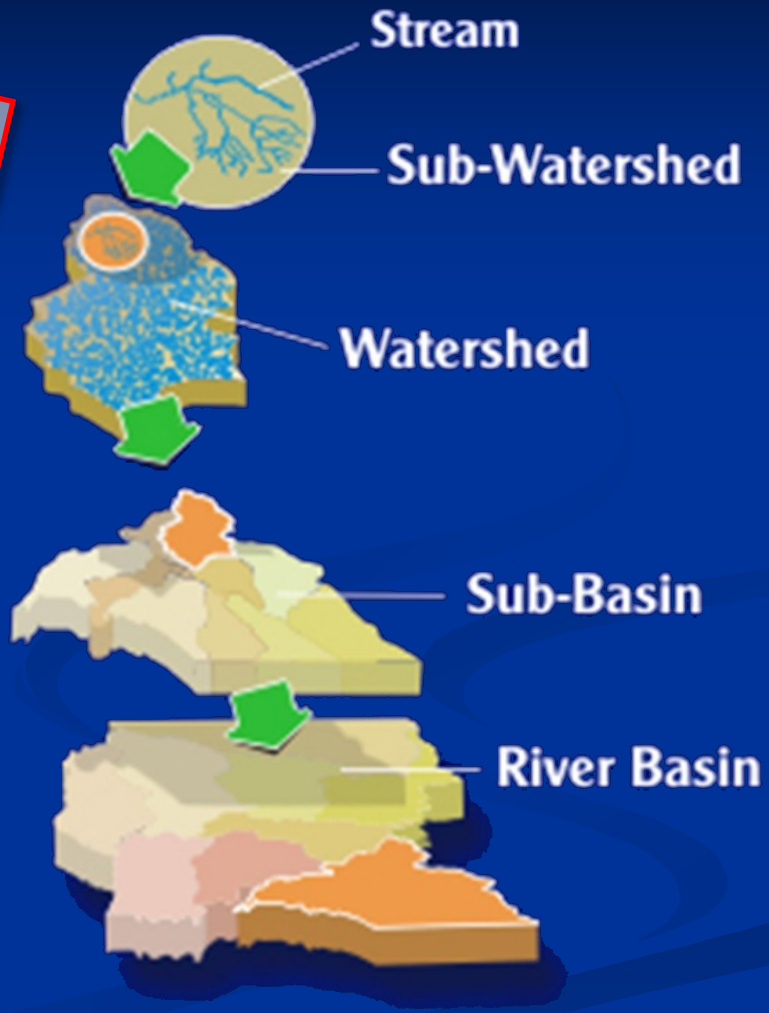
Collaborators

- Texas Water Resources Institute
- Texas State Soil and Water Conservation Board
- Texas Riparian Association
- Texas A&M Forest Service
- Texas Parks and Wildlife Department
- USDA Natural Resources Conservation Service
- Nueces River Authority
- Texas A&M AgriLife Research, Ecosystem Science and Management Department
- Texas Tech University Llano River Field Station

What is a WATERSHED?




Divide
Tributaries
Divide
Sub-watershed
Hill Slope
Valley
Groundwater


Stream
Sub-Watershed
Watershed
Sub-Basin
River Basin

WATERSHED

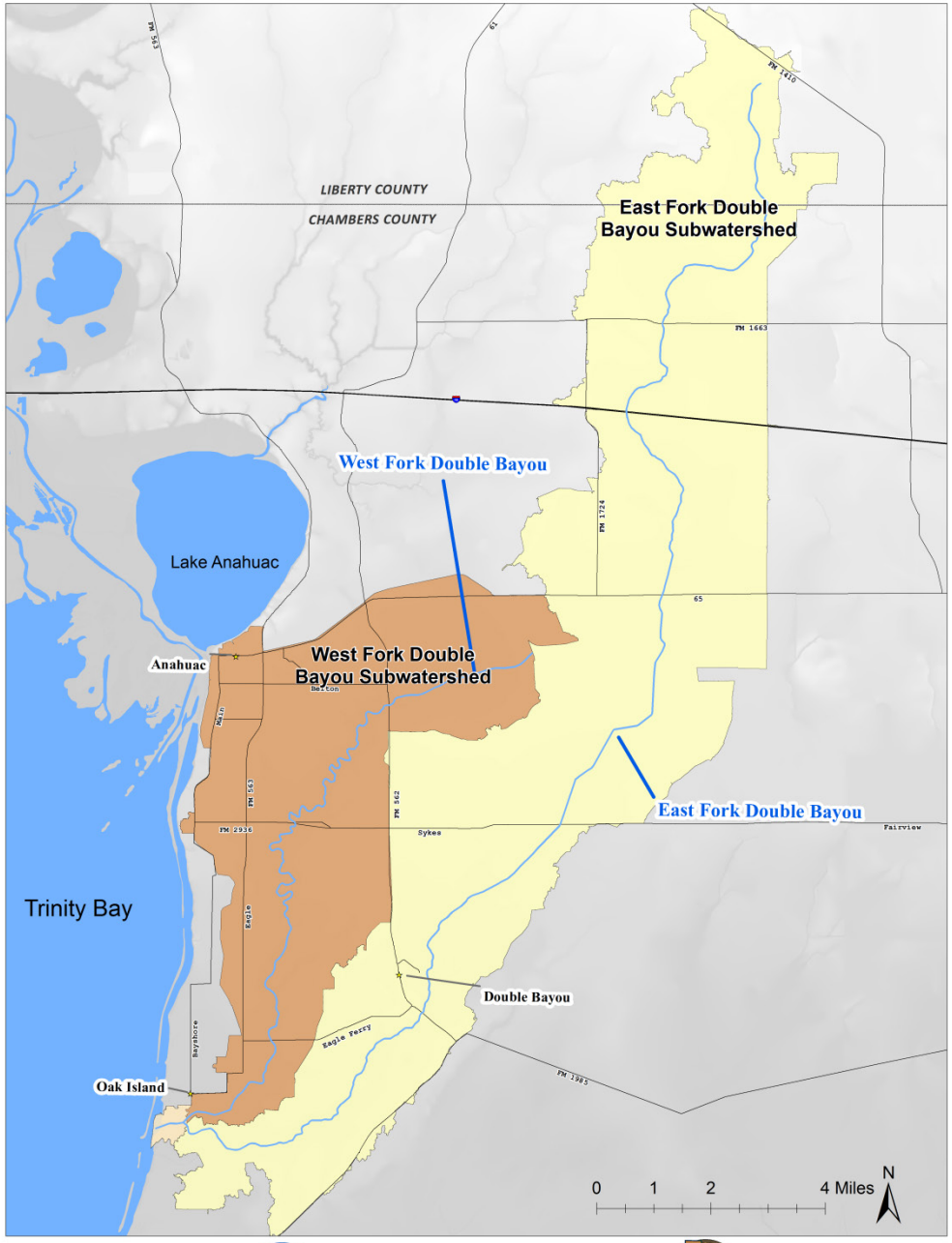
Texas Rivers

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 Antonio-Nueces
21. Nueces
22. Nueces-Rio Grande
23. Rio Grande

Source: Texas Water Development Board

Double Bayou Watershed



HARC

Shead Conservation Solutions

TSSWCB

USGS science for a changing world

Tidal River Segments

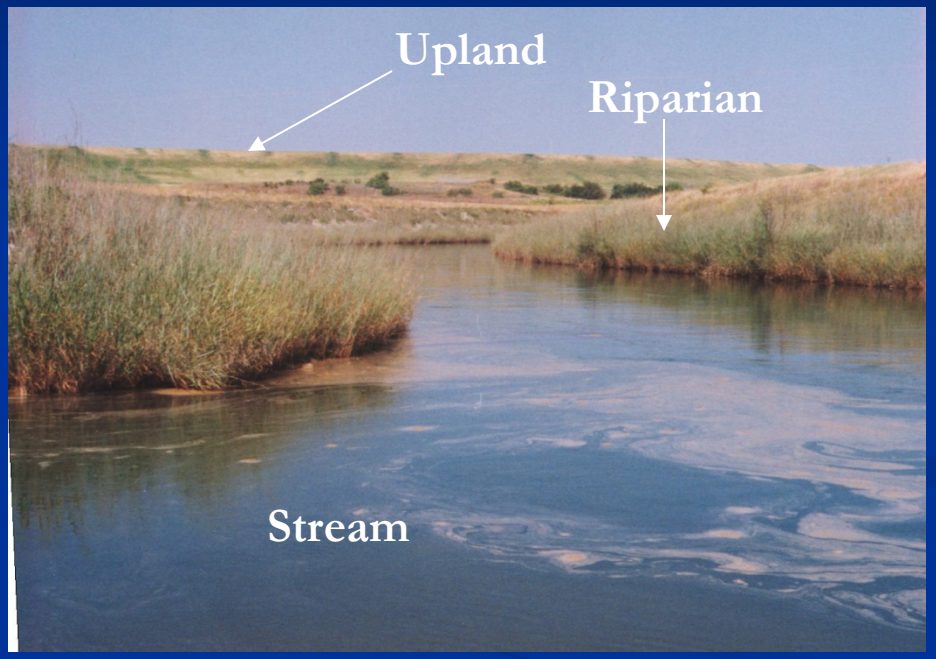
- The regular rise and fall of the ocean's waters are known as tides. Along coasts, the water slowly rises up over the shore and then slowly falls back again.
- When the water has risen to its highest level, covering much of the shore, it is at high tide.
- When the water falls to its lowest level, it is at low tide.
- Some lakes and rivers can also have tides.

Double Bayou

Watershed

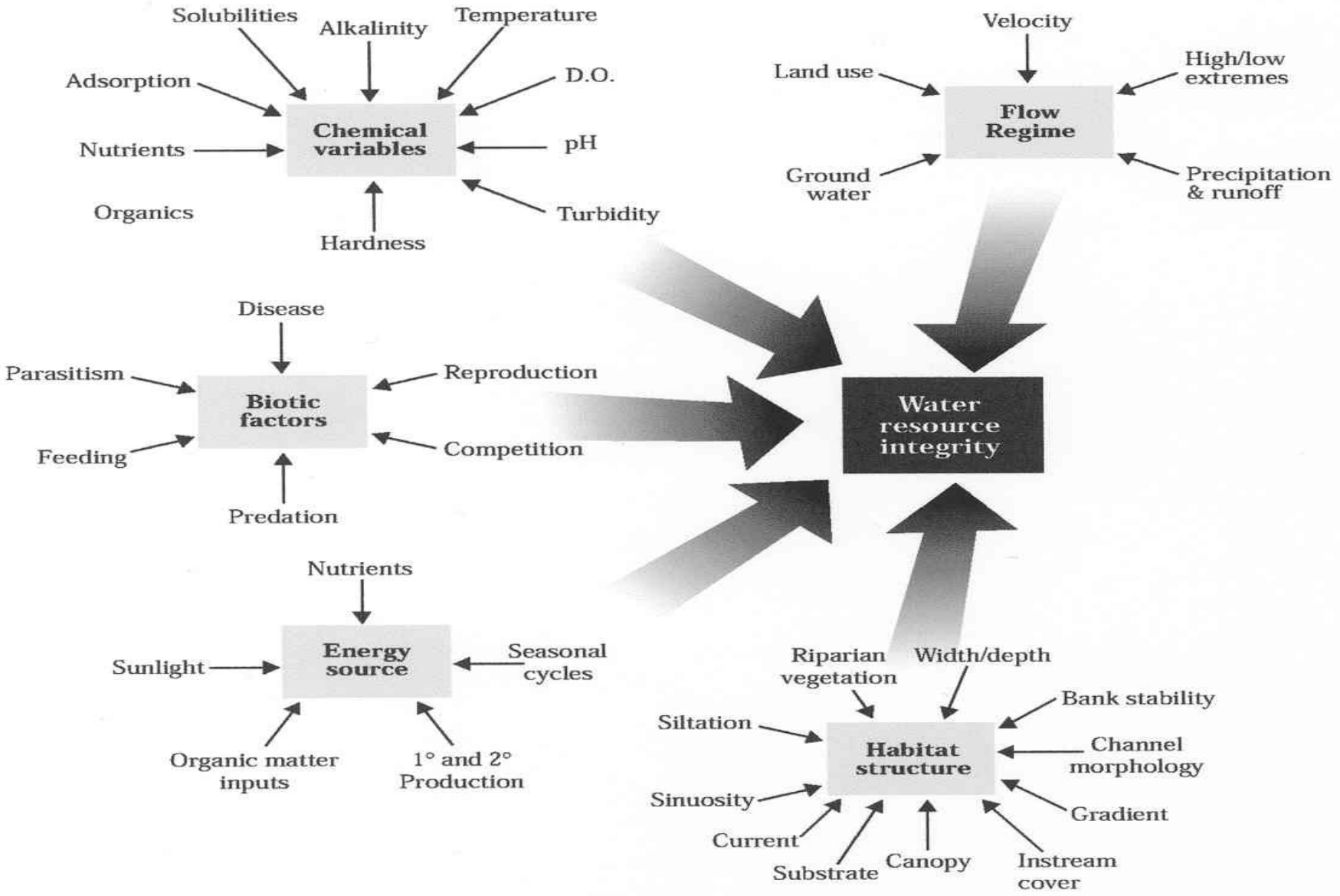
A Watershed can be characterized as consisting of:

- 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.

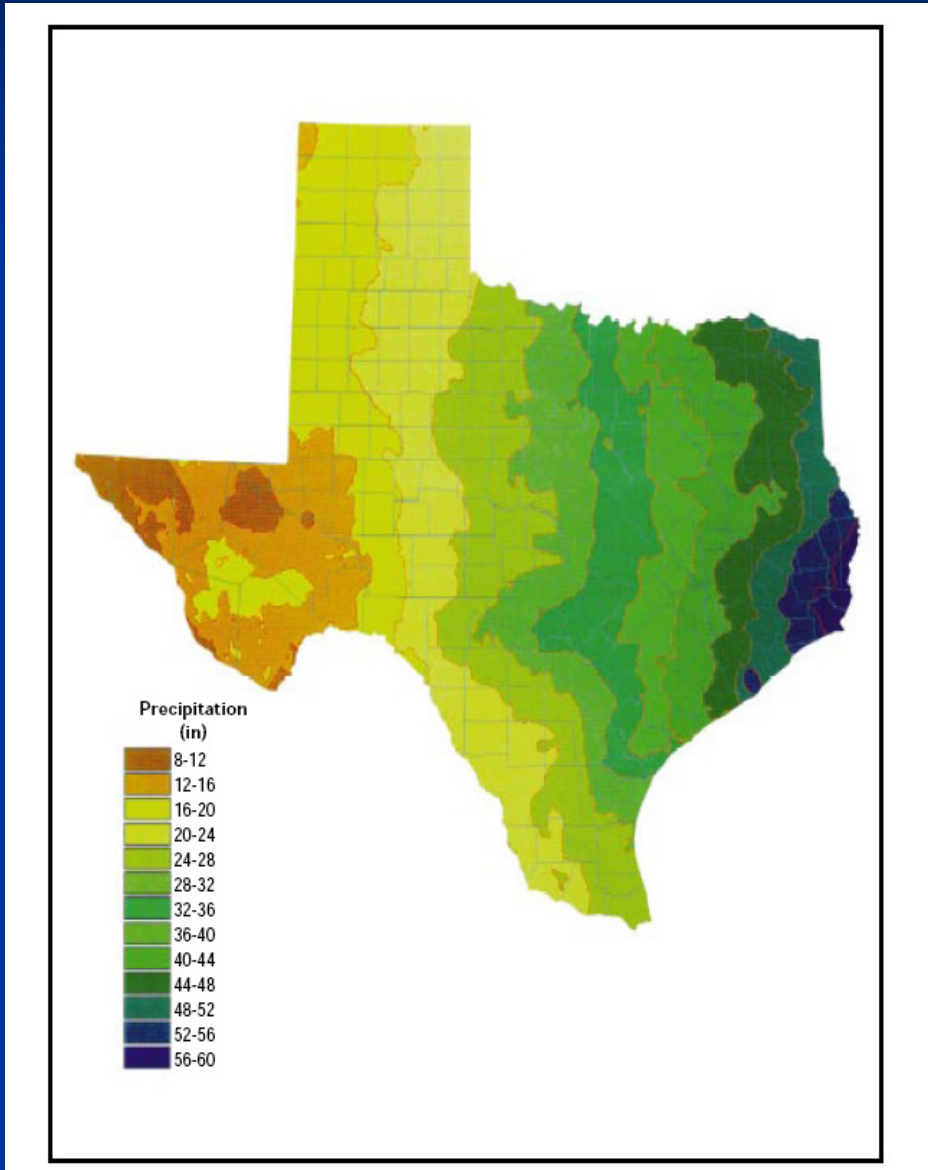
Watersheds are Complex Systems



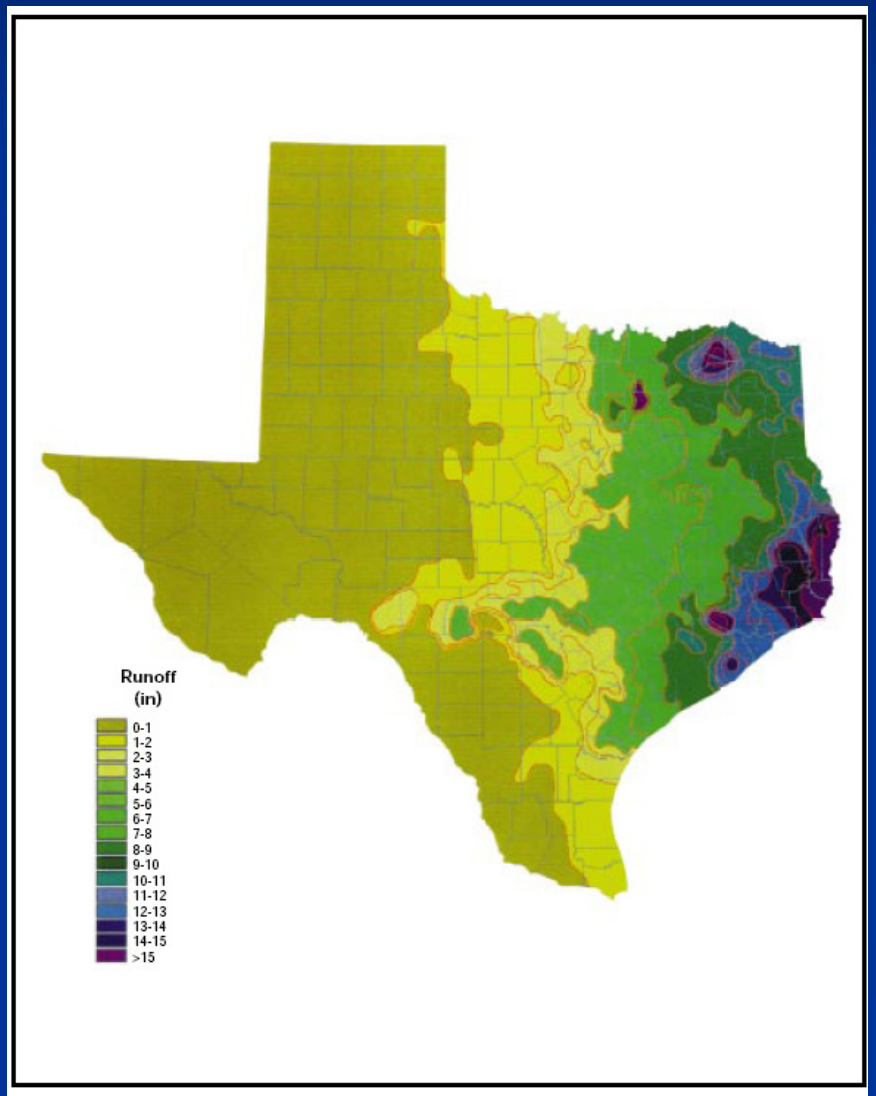
Watershed form is influenced by:

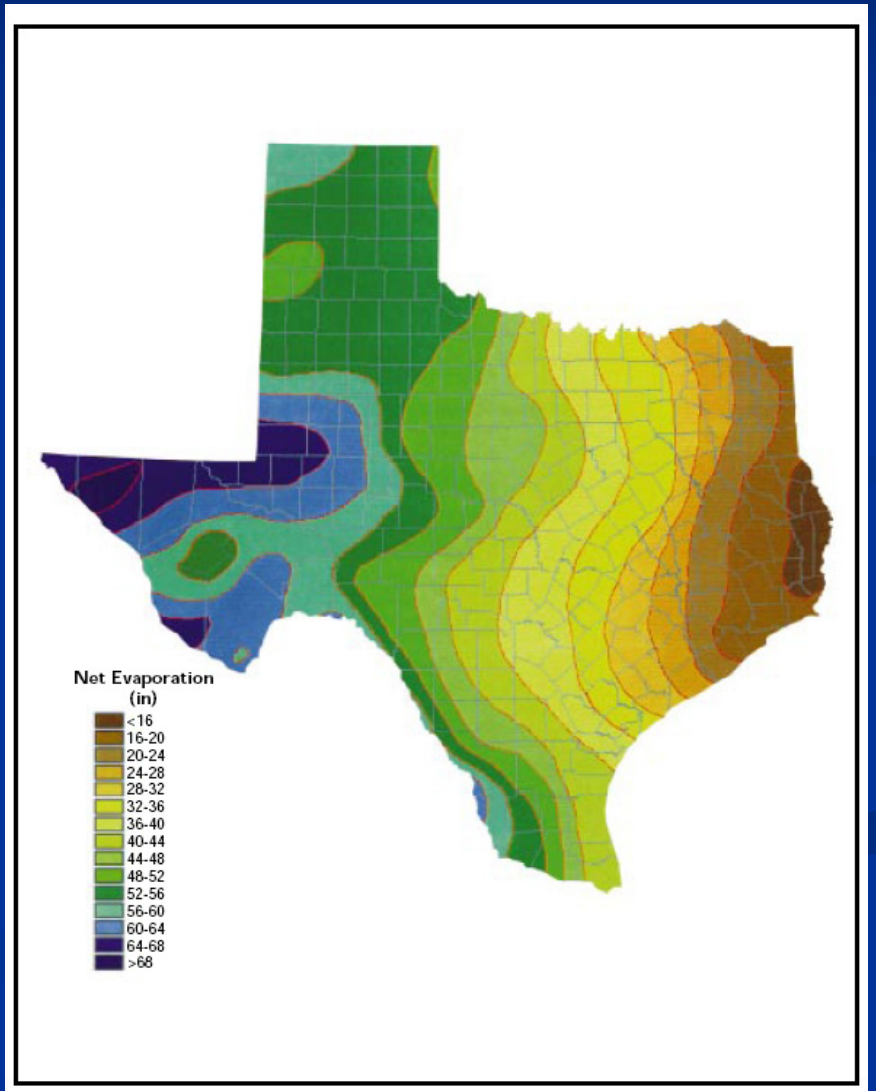
1. Climate
2. Geology & Soils
3. Topography
4. Vegetation
5. Land Uses

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



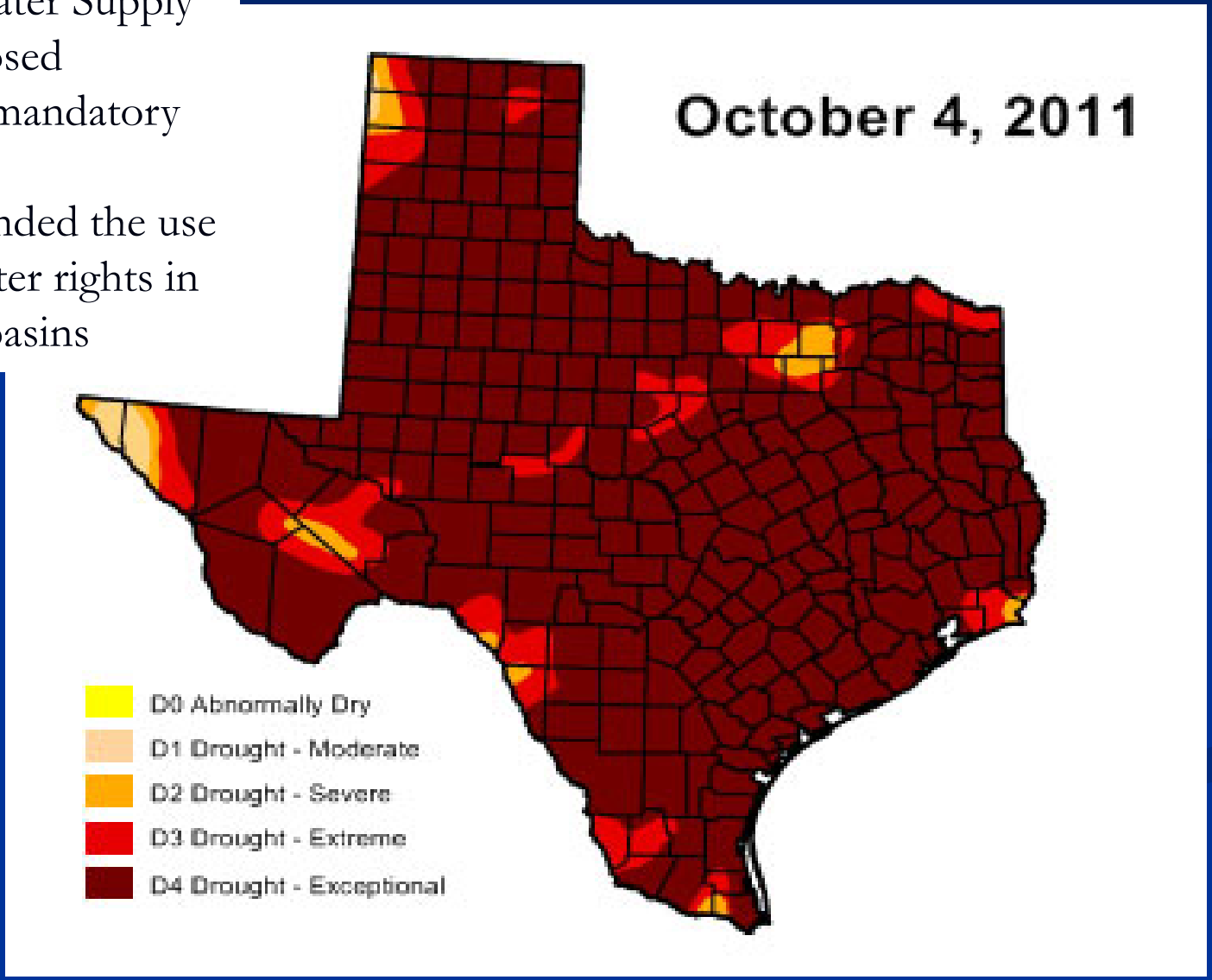
Average Annual Runoff and Evaporation Rates 1961-1997 (TWDB 1997)



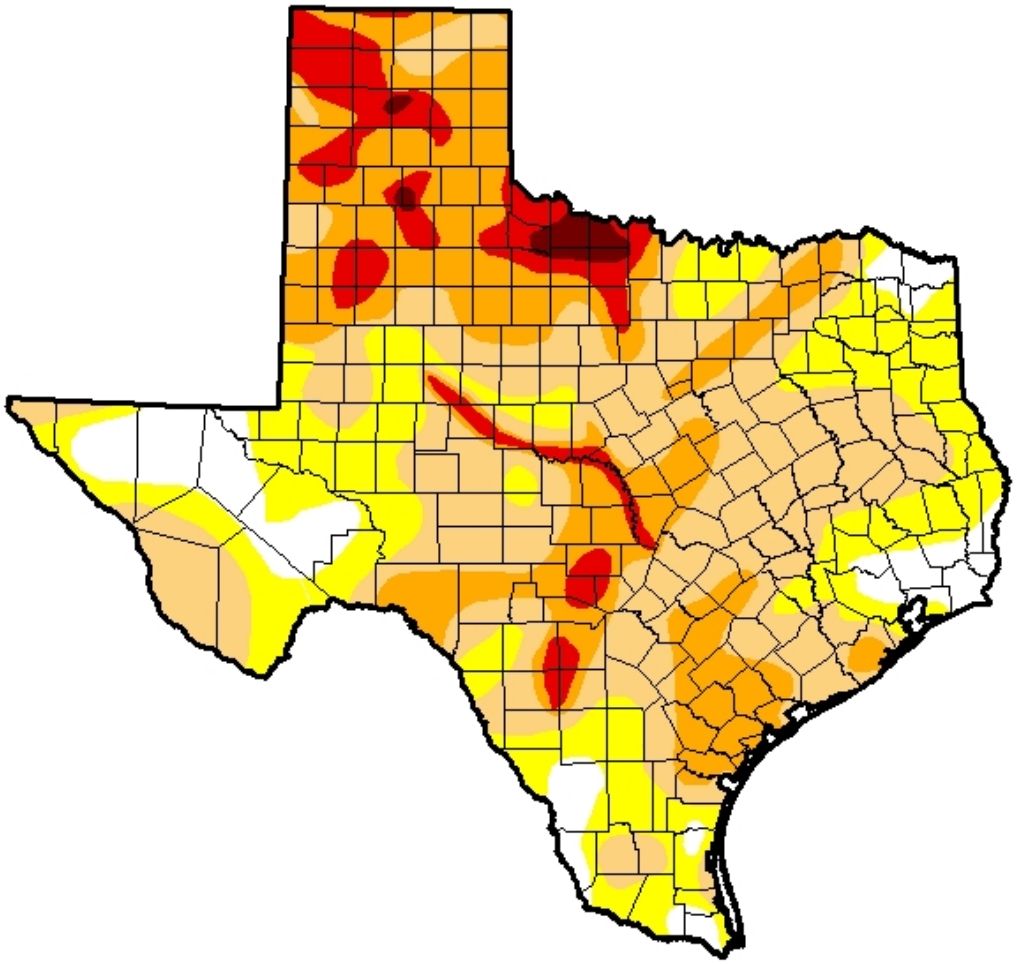


The Drought

- 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



March 4, 2014

(Released Thursday, Mar. 6, 2014)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	8.95	91.05	67.15	31.38	8.52	1.07
Last Week 2/25/2014	7.38	92.62	67.88	33.55	9.45	0.93
3 Months Ago 12/3/2013	24.58	75.42	47.39	21.29	5.84	0.96
Start of Calendar Year 12/31/2013	28.48	71.52	43.84	21.15	5.82	0.79
Start of Water Year 10/1/2013	6.62	93.38	70.95	25.08	4.01	0.12
One Year Ago 3/5/2013	11.15	88.85	76.29	55.62	23.86	7.41

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:
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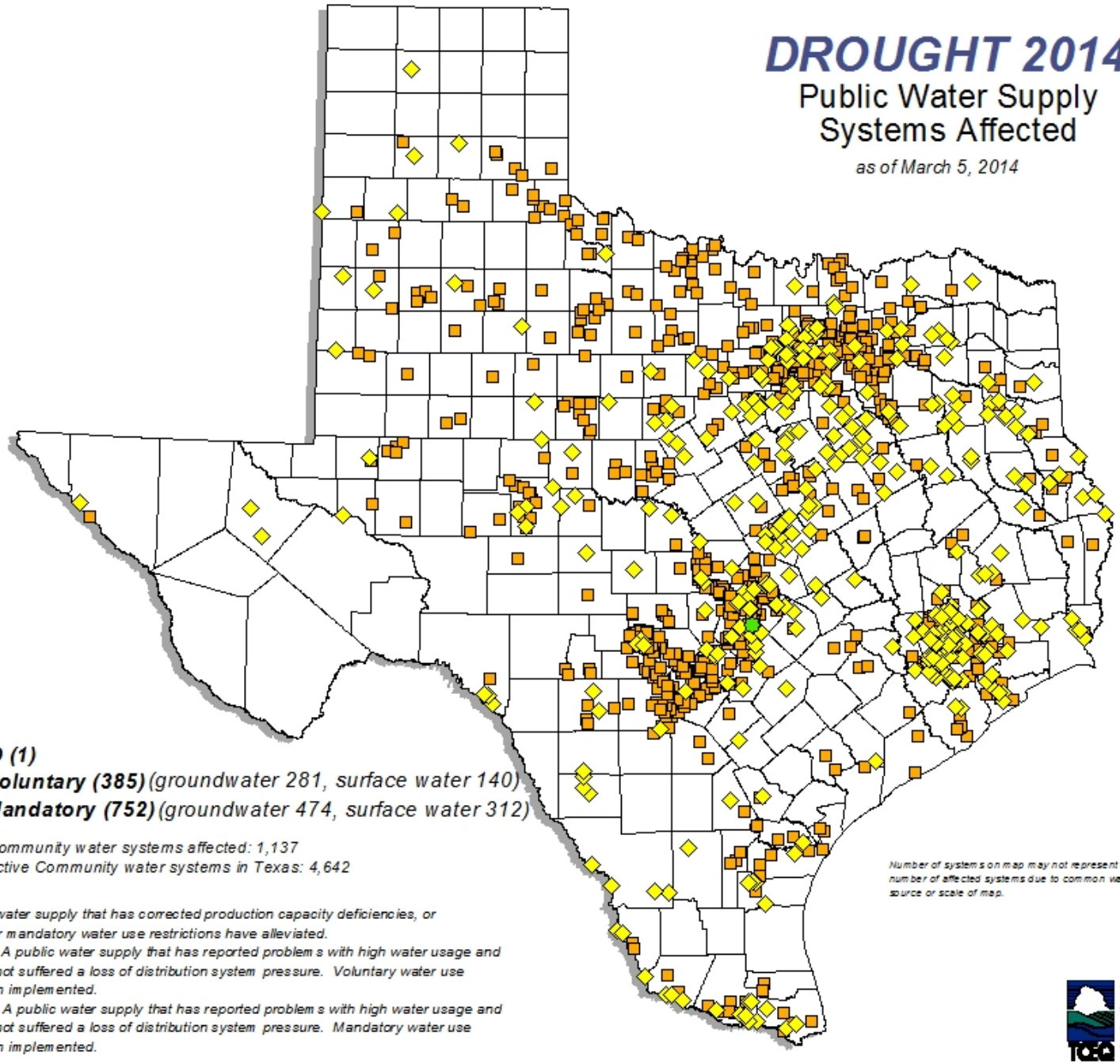
U.S. Department of Agriculture

http://droughtmonitor.unl.edu/

DROUGHT 2014

Public Water Supply Systems Affected

as of March 5, 2014



- **RESOLVED (1)**
- **WATCH - Voluntary (385)** (groundwater 281, surface water 140)
- **WATCH - Mandatory (752)** (groundwater 474, surface water 312)

Total number of Community water systems affected: 1,137
Total number of active Community water systems in Texas: 4,642

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

Geology and Soil Types

Increase in Impervious Surface

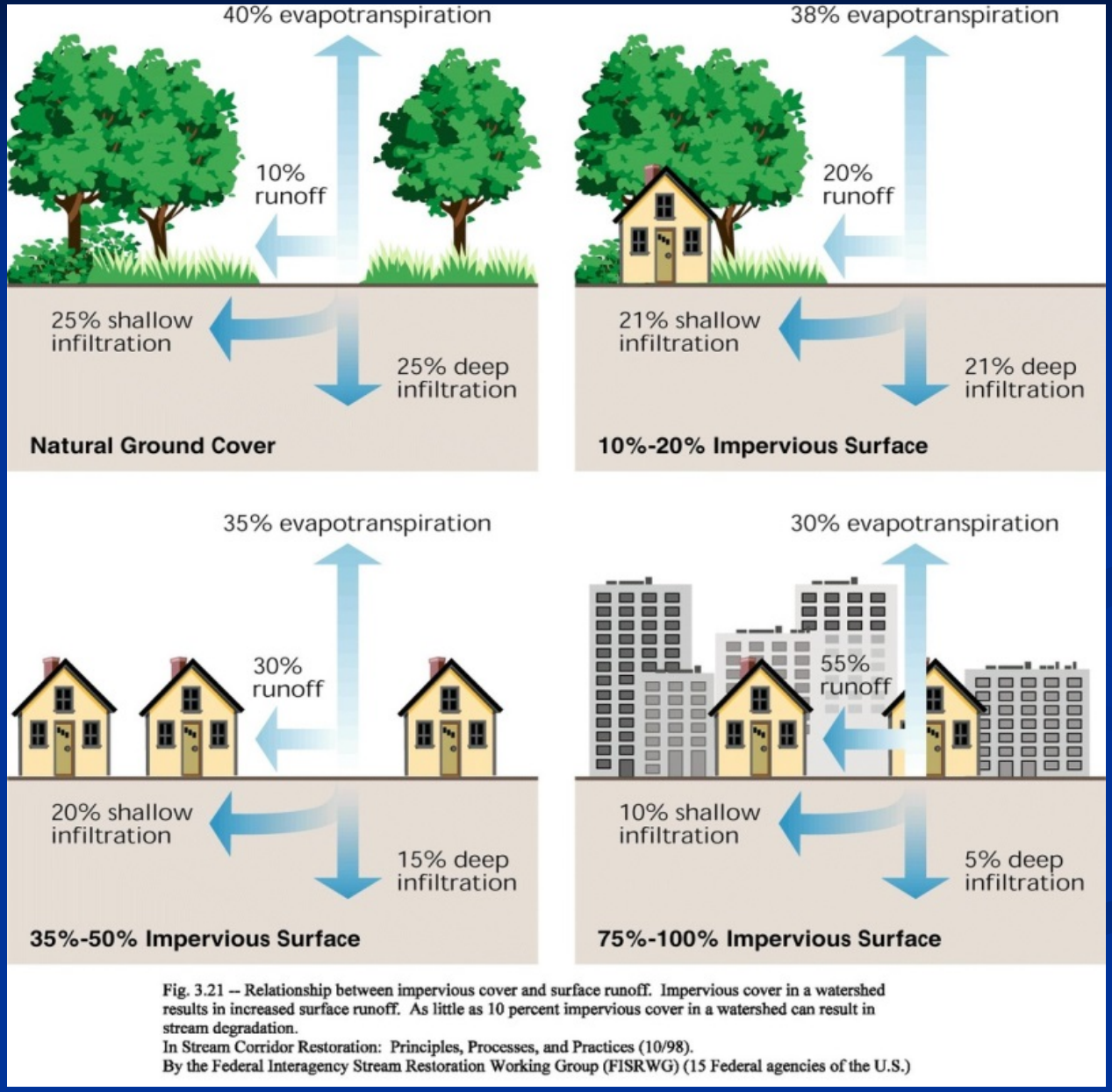
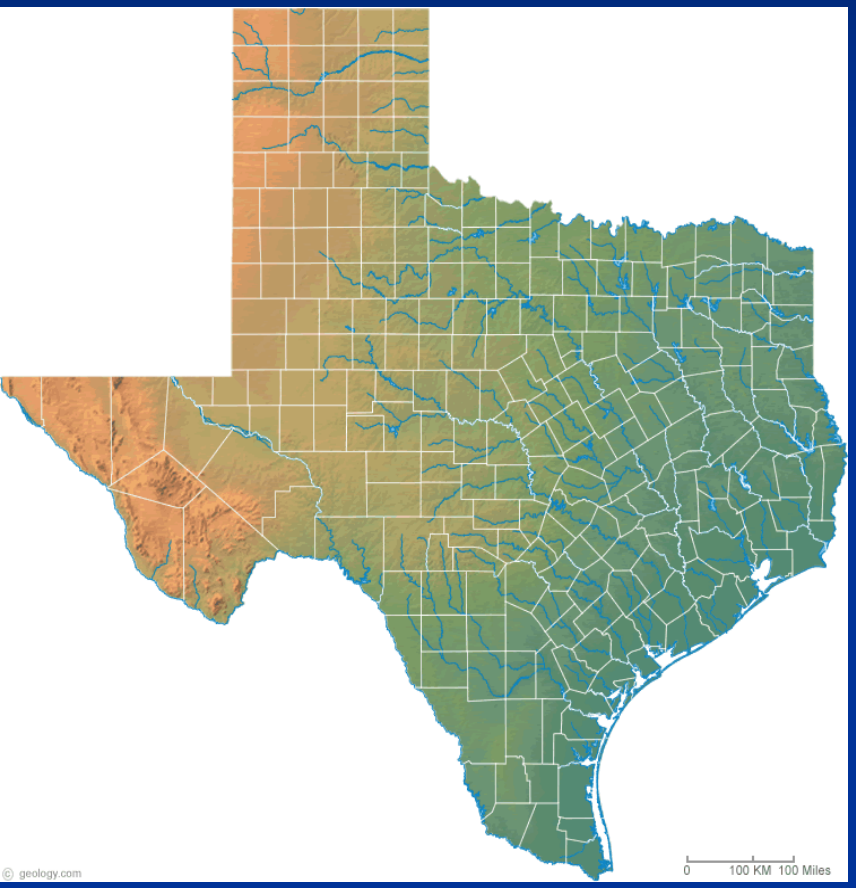


Fig. 3.21 -- Relationship between impervious cover and surface runoff. Impervious cover in a watershed results in increased surface runoff. As little as 10 percent impervious cover in a watershed can result in stream degradation.
In Stream Corridor Restoration: Principles, Processes, and Practices (10/98).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

Topography



- Derives slopes of stream segments and watershed areas to identify unstable areas and to characterize segments or subwatersheds to model
- Evaluate altitude changes
- Topo Maps - http://topomaps.usgs.gov http://www.tnris.org/

Vegetation

Land Uses

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.

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?

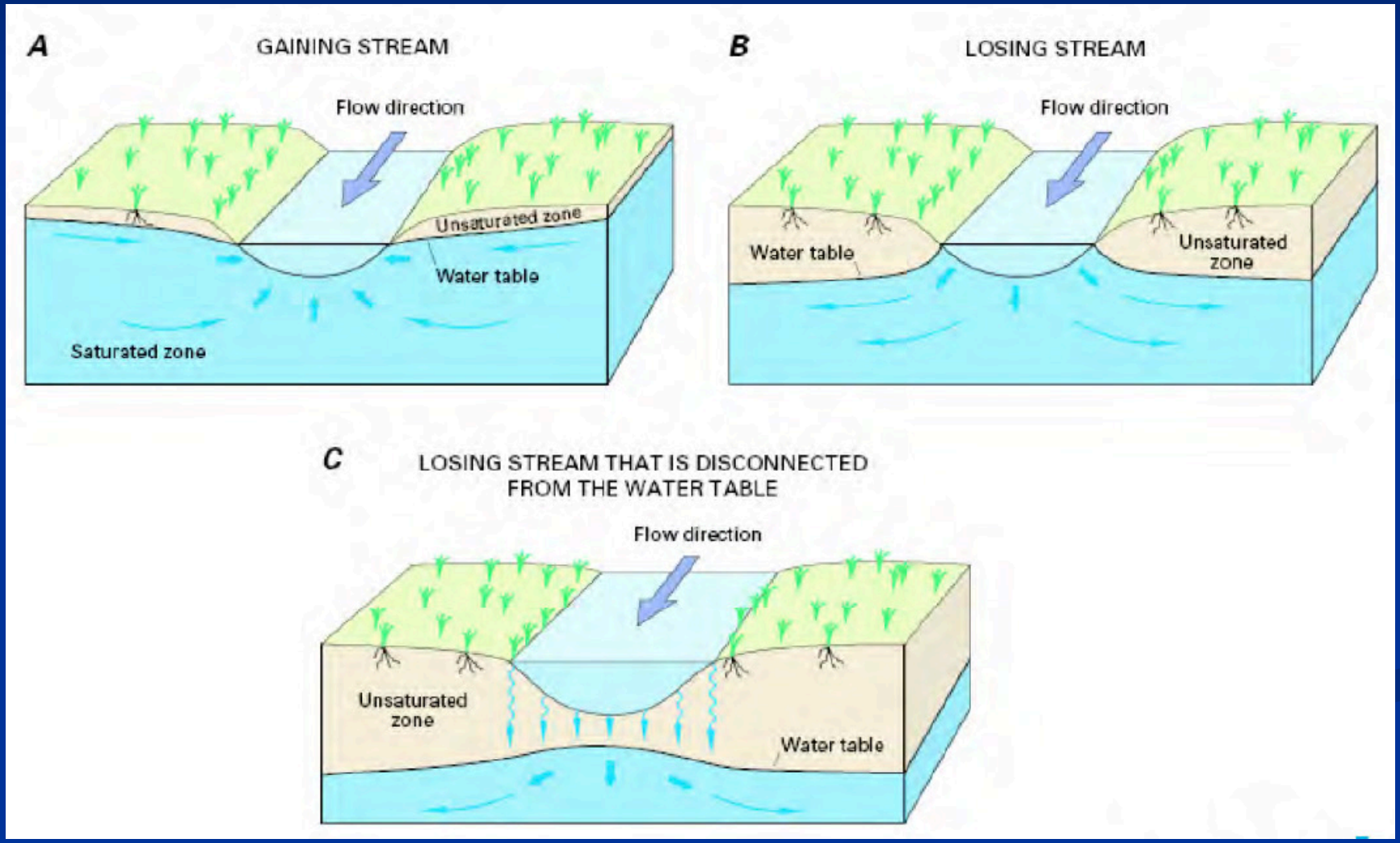
Most streams and rivers in Texas have been adversely affected by past natural and human activities resulting in:

- 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

Stream Flow

- **Perennial** – Flow 90% of the time during a normal year; may pool or dry up during drought; and well defined channels
- **Intermittent** – Flow 30-90% of time during a normal year; may pool or dry up during summer; may or may not have well-defined channels
- **Ephemeral** – Flow less than 30% of the time during a normal year usually immediately after rain events; may or may not have well-defined channels

Basic Types of Surface & Groundwater Interactions



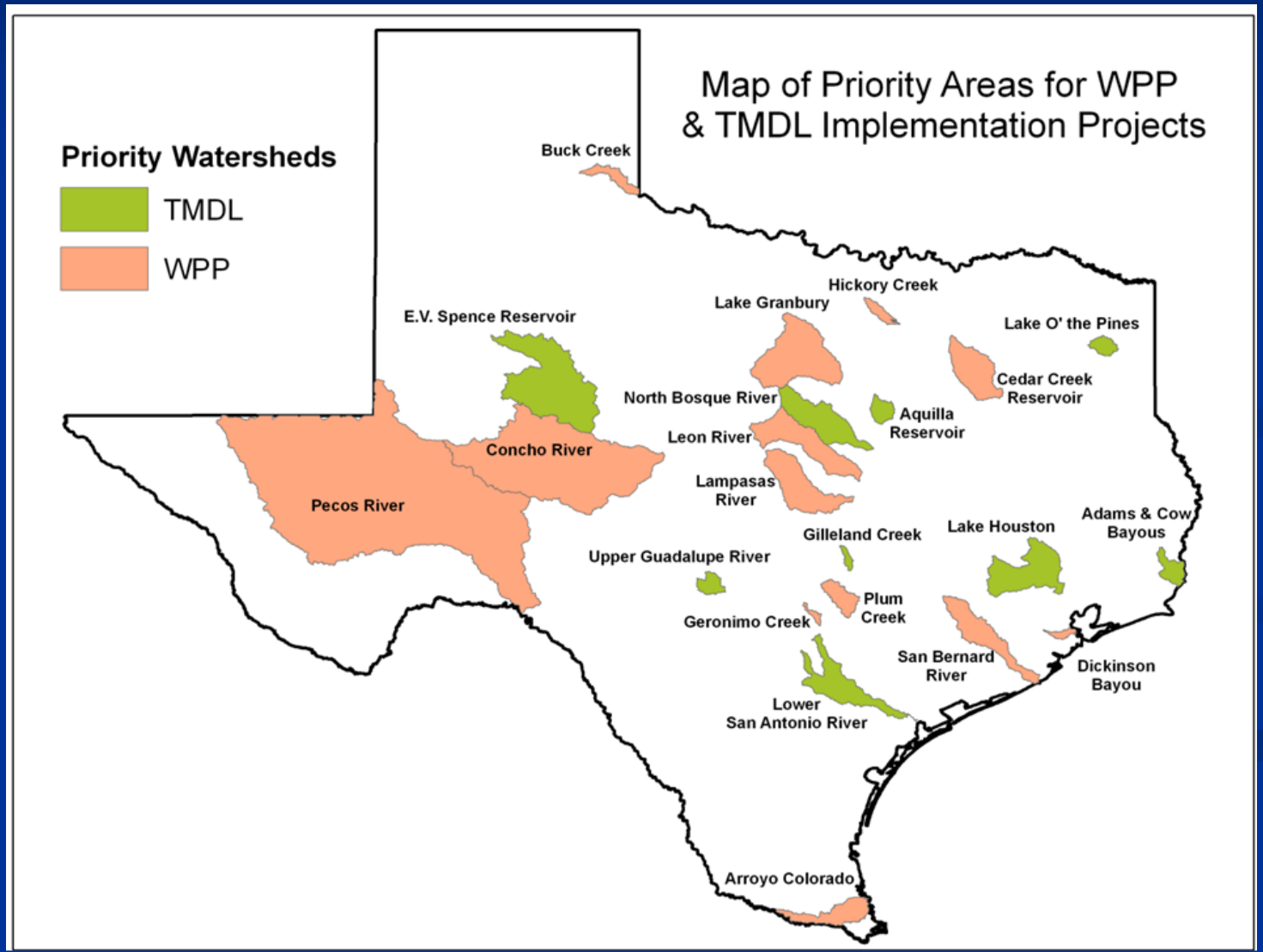
Why should we be concerned about the health of the stream and riparian areas?

- **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 pipeline.**
- **They are one of the most important resources found on private and public lands in Texas.**

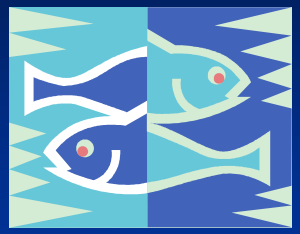
Creeks and Riparian Areas are Important

- Texas has more than 200,000 miles of rivers and streams with riparian zones and floodplains that comprise corridors of great economic, social, cultural, and environmental value.
- 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.
- Creeks / Riparian Areas are special places that need preferential treatment.
- To manage or restore creeks you must understand them and then address the issues that are inhibiting natural restoration.

Map of Watershed Protection Plans and Total Maximum Daily Loads Implementation Projects



Designated Uses



Aquatic Life

- Protect aquatic species
- Dissolved Oxygen, Toxic Chemicals, Total Dissolved Solids

Recreation

- Estimates the relative risk of swimming and other water recreation activities
- Bacteria

Drinking Water

- Indicates if water is suitable as a source of drinking water
- Metals, Pesticides, Toxic Chemicals, Total Dissolved Solids, Nitrates

Fish Consumption

- Protect public from consuming fish that may be contaminated
- Metals, Pesticides, Other Toxic Chemicals

Surface Water Quality

Numeric

- High Aquatic Life Use
  - Dissolved Oxygen – 5.0 mg/L

  (4-5 stressed <3 mortality)
  - pH – Optimum Range 6.5-9.0
  - Temperature – 90 F (32.2 C) common range 68-86 F
  - Total Dissolved Solids – *400 mg/L
  - Sulfate – *50 mg/L
  - Chloride - *100 mg/L

* Specific criteria for mainstem Guadalupe River

Screening Criteria

- Nitrite and Nitrate Nitrogen – 1.95 mg/L
- Phosphorus – 0.69 mg/L
- Ammonia
- Chlorophyll *a* (algae) 14.1

Numeric Criteria of bacteria for designated uses of water bodies.

Parameter (indicator organism)	Use	Numeric Criteria (geometric mean)[a b]	Numeric Criteria (single sample max)[a]
E. coli (Freshwater)	Primary Contact Recreation	126	N/A
	Secondary Contact Recreation I	630	N/A
	Secondary Contact Recreation II	1,030	N/A
	Noncontact Recreation	2,060	N/A
Enterococci (Marine Waters)	Primary Contact Recreation	35	89
	Secondary Contact Recreation I	175	N/A
	Noncontact Recreation	350	N/A
Fecal Coliform (Highly Saline Waters)[c]	Contact Recreation	200	400
	Secondary Contact Recreation I & II	1,000	N/A
	Noncontact Recreation	2,000	N/A
Fecal Coliform	Oyster Harvesting Waters	14[b]	N/A

[a]All values are in colony forming units per 100 ml
[b]The standard for Fecal Coliform in Oyster Harvesting Waters is based on the median sample number, not the geometric mean
[c]Fecal Coliform is no longer used for contact recreation except in high salinity waters

Point Source Pollutant Sources

- Point Source
  - Permitted Discharges
    - Wastewater Treatment Plants
    - Industrial Facilities
    - Confined Animal Feeding Operation
- Stormwater Permit

Nonpoint Sources

- Urban
- Wildlife
- Feral Hogs
- Livestock
- Crops
- Onsite Septic Facilities