Water Issues in Texas

South Texas County Judges and Commissioners Association
June 14, 2022

Ward Ling, Program Specialist
Texas A&M AgriLife, Texas Water Resources Institute

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Who We Are

- TWRI was established by Water Resources Research Act (1964) to address existing and emerging water issues

- Focus Areas
  - Restoring and Protecting
  - Sustaining and Enhancing
  - Engaging and Educating

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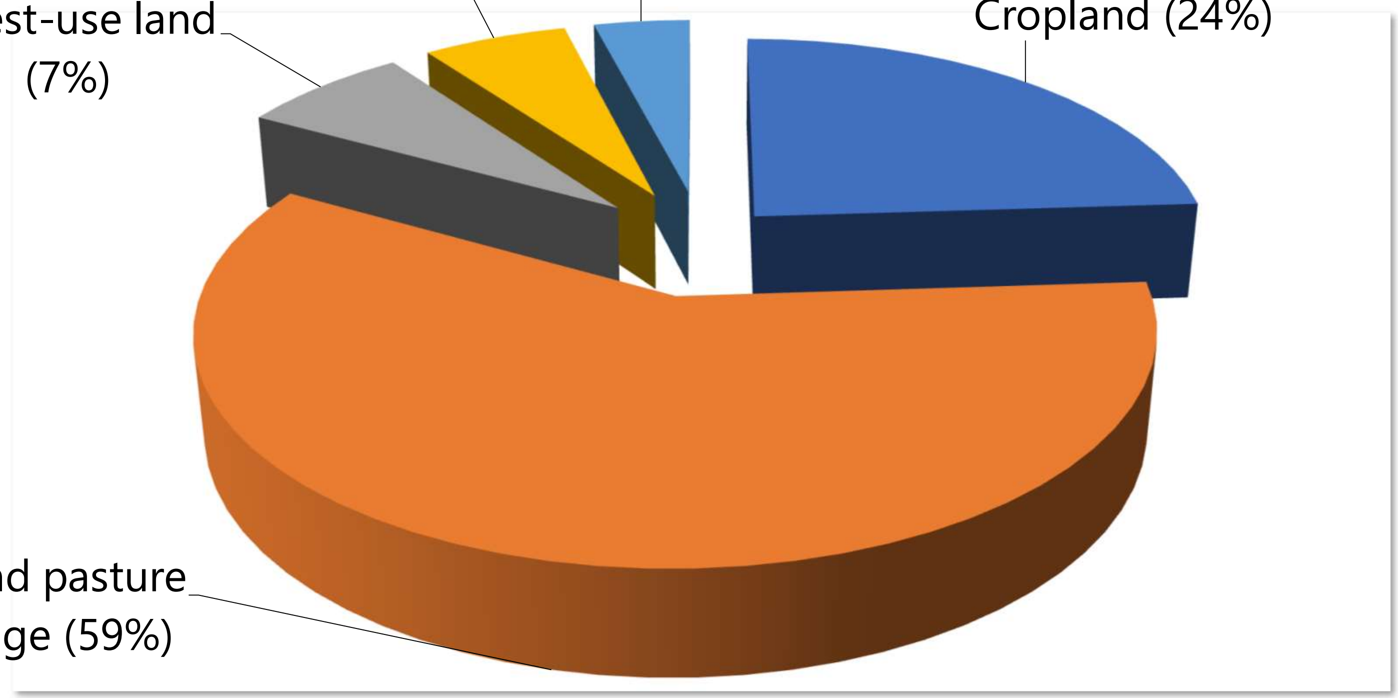
@TxWRI

Sign up for updates on State Water Issues

Outline

- Challenges
  - Water Quantity
  - Water Quality
  - How to Restore Quality

Land Use in Texas



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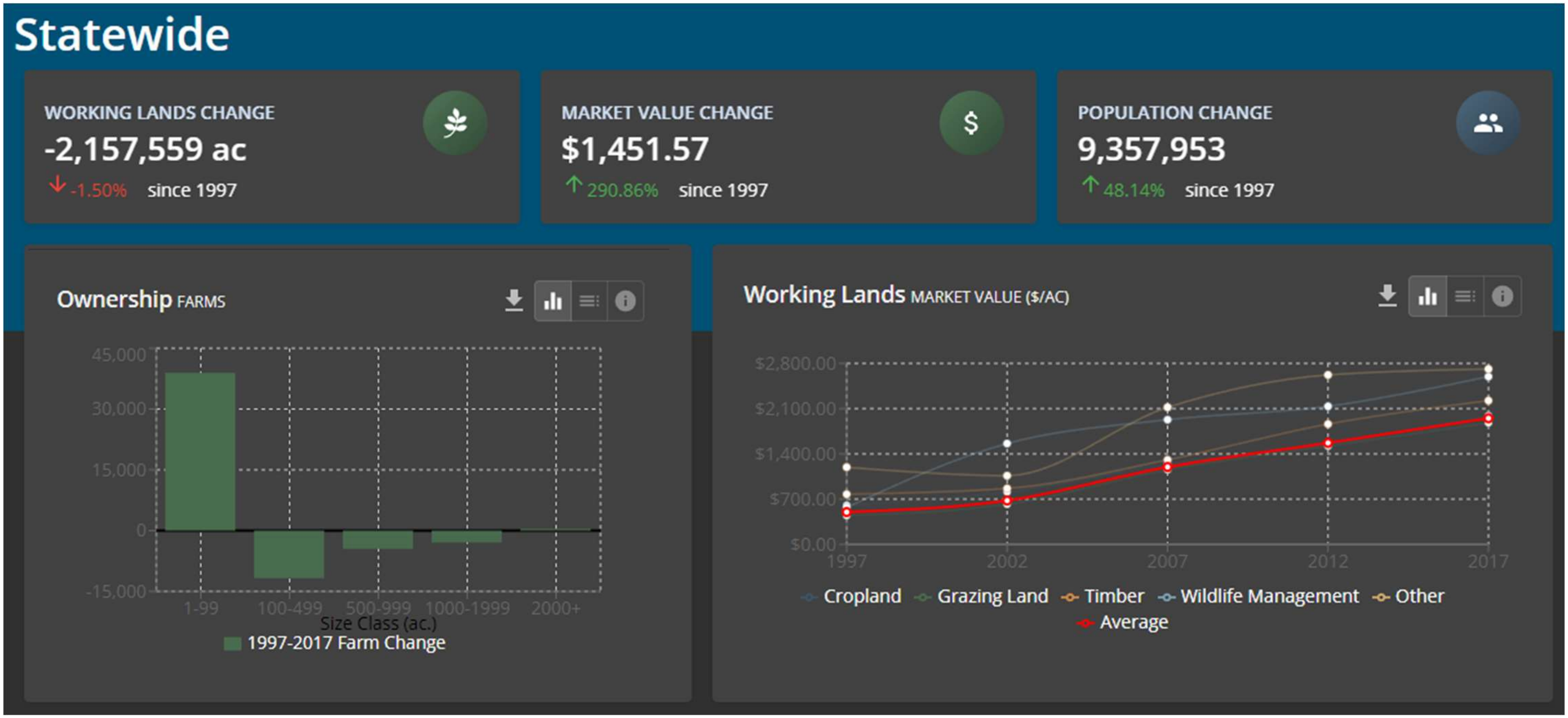
Land Fragmentation and Land Use Change



Source: TX Land Trends – https://data.txlandtrends.org

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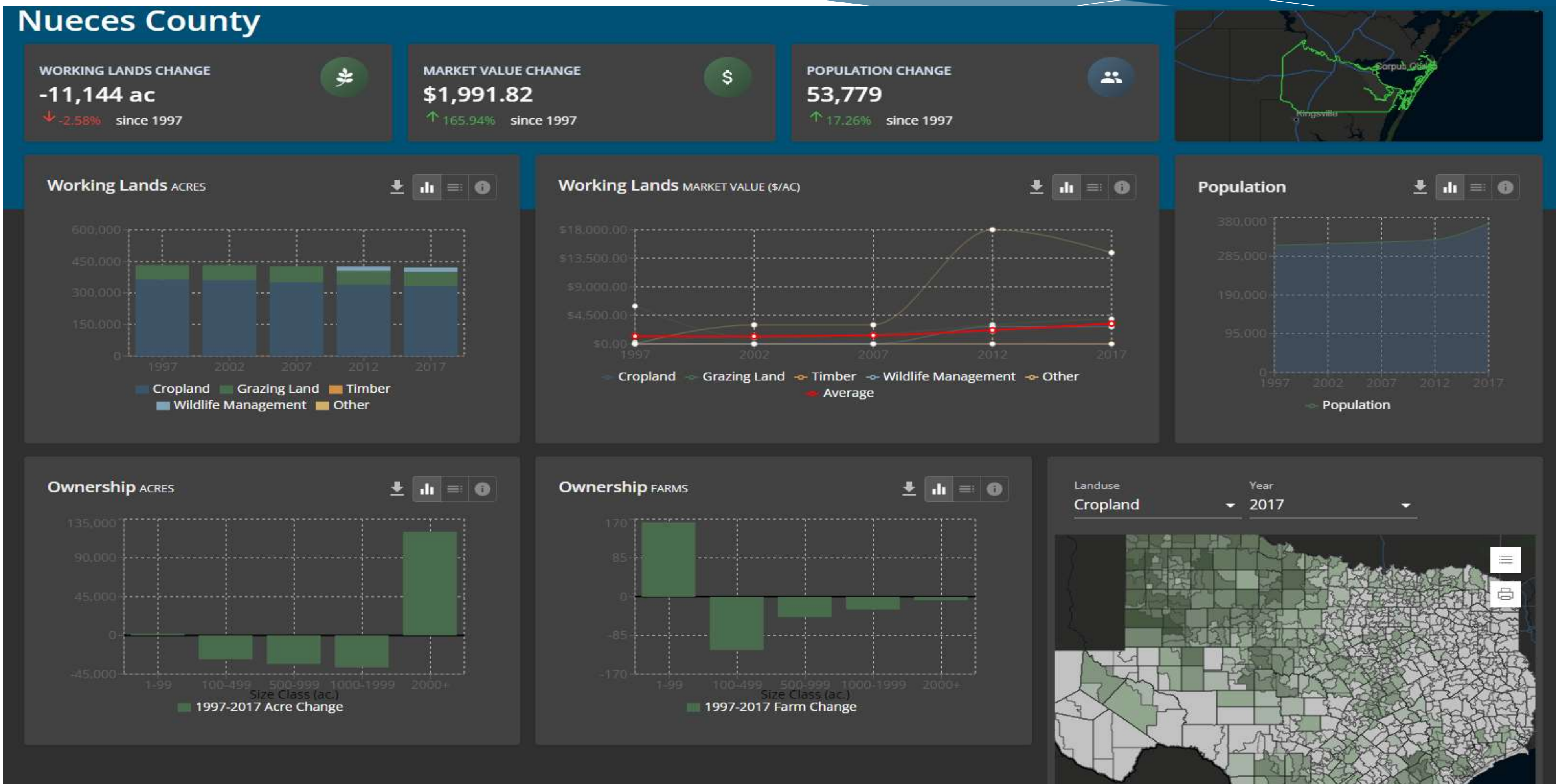

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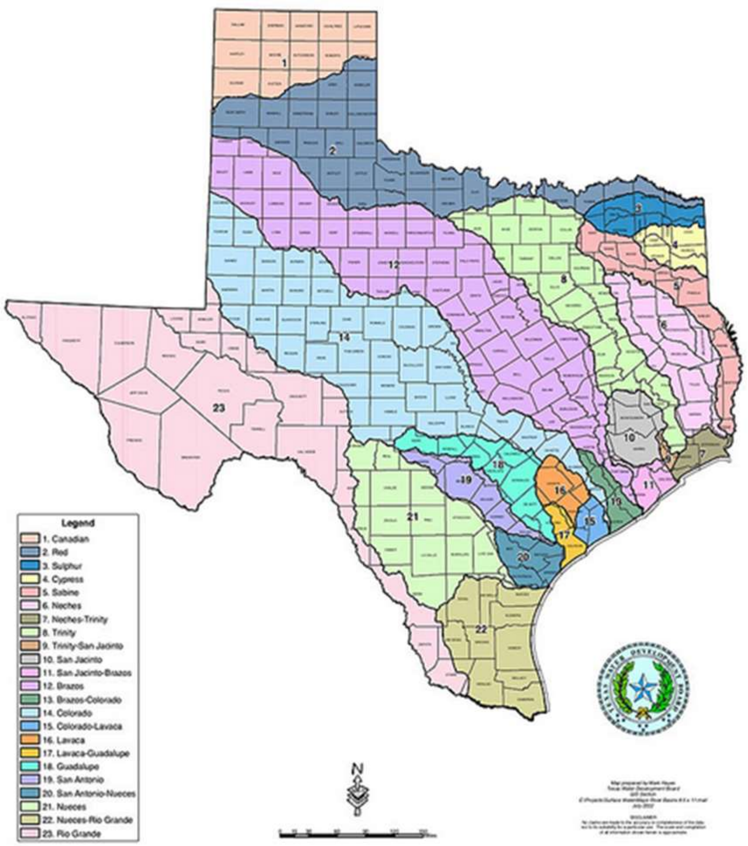
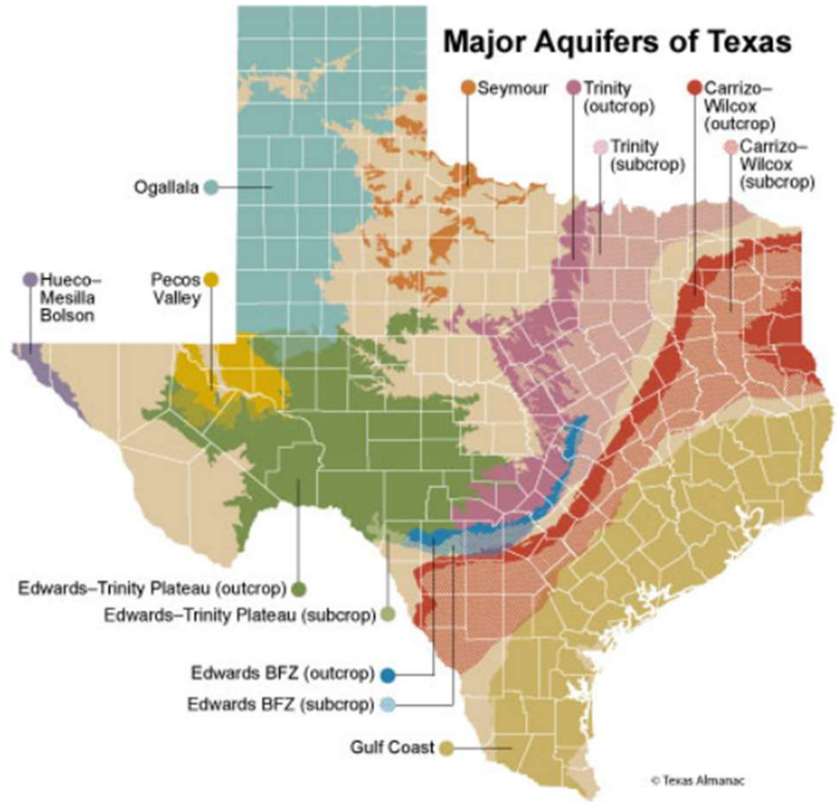
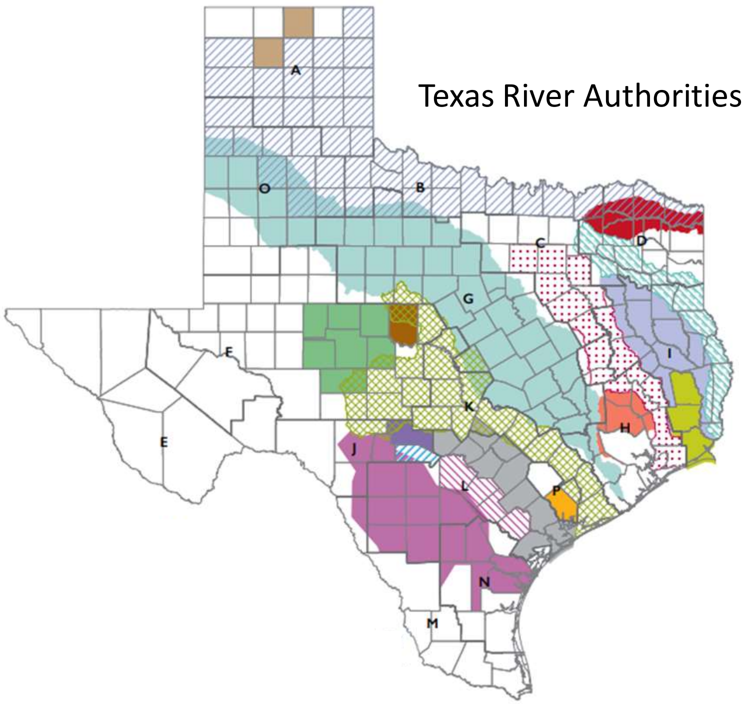
Texas Challenges – Physical Characteristics

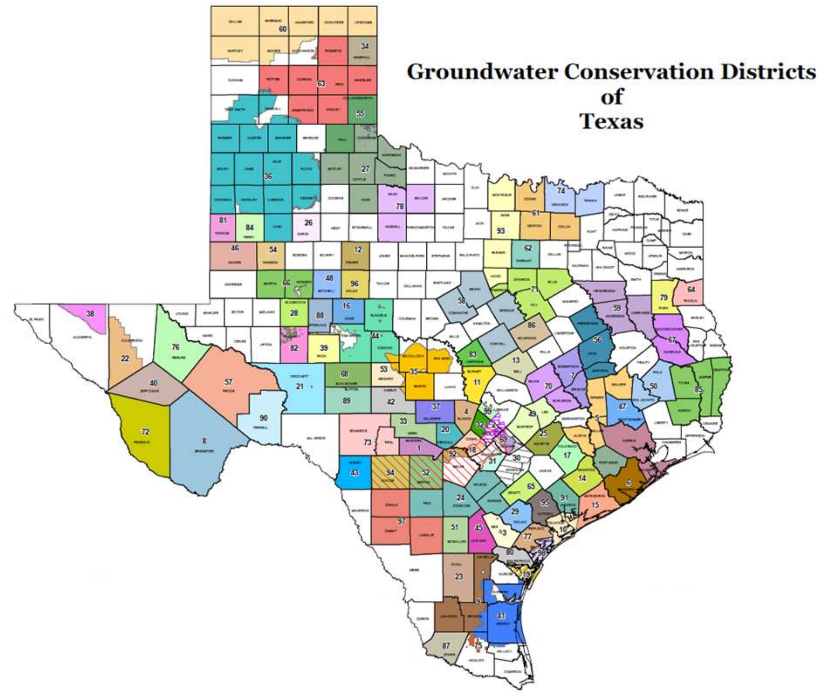




Texas Challenges – Political Boundaries

Texas Water Development Board





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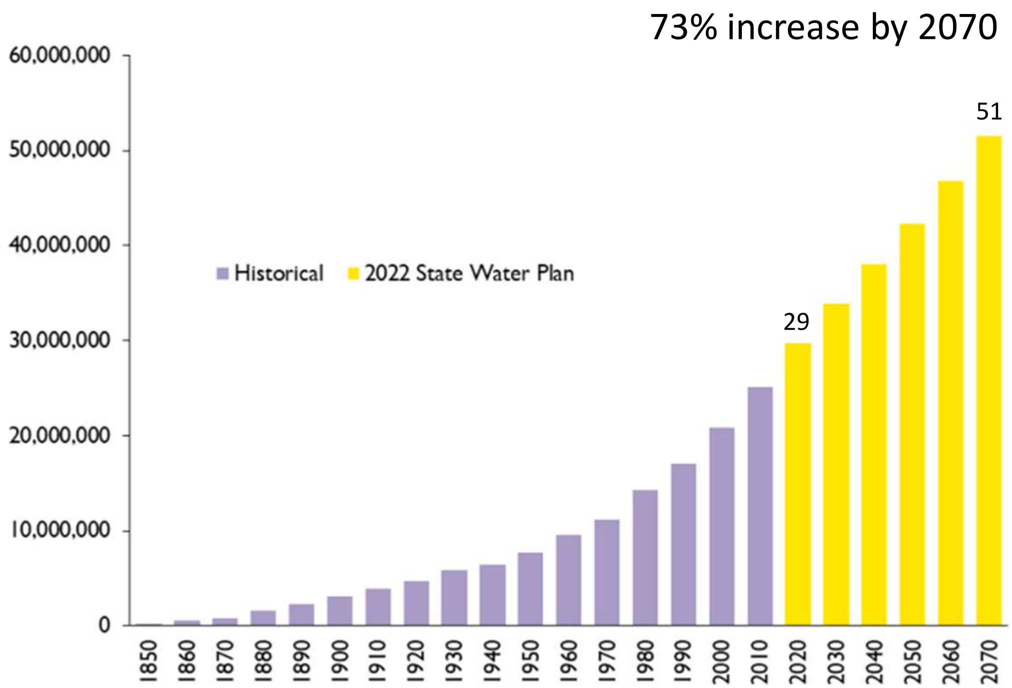
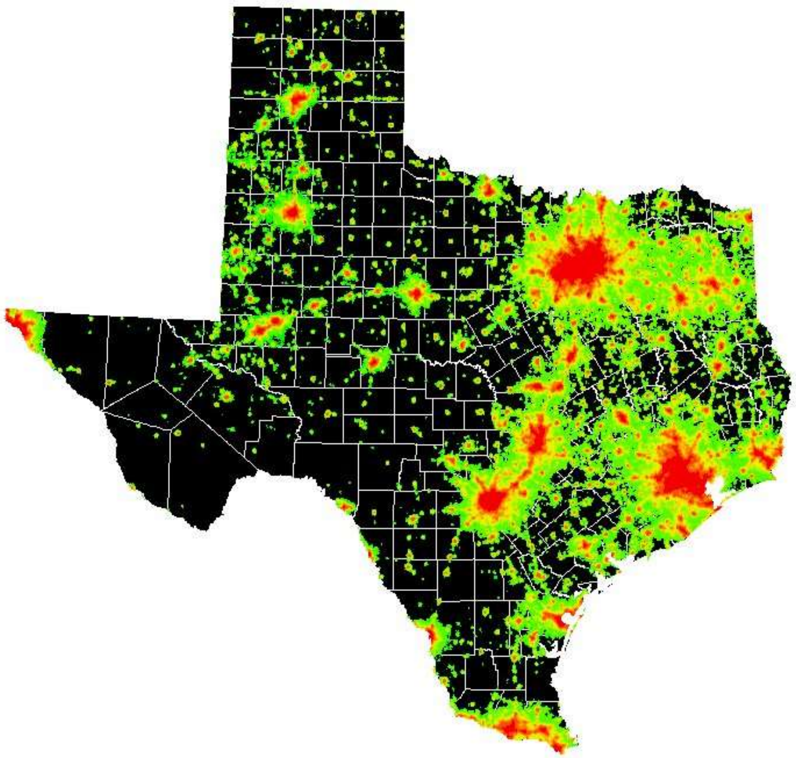
Texas Challenges – Population Growth and Demand



Source - TWDB Water For Texas, 2022 State Water Plan



Source – 2019, Texas Land Trends

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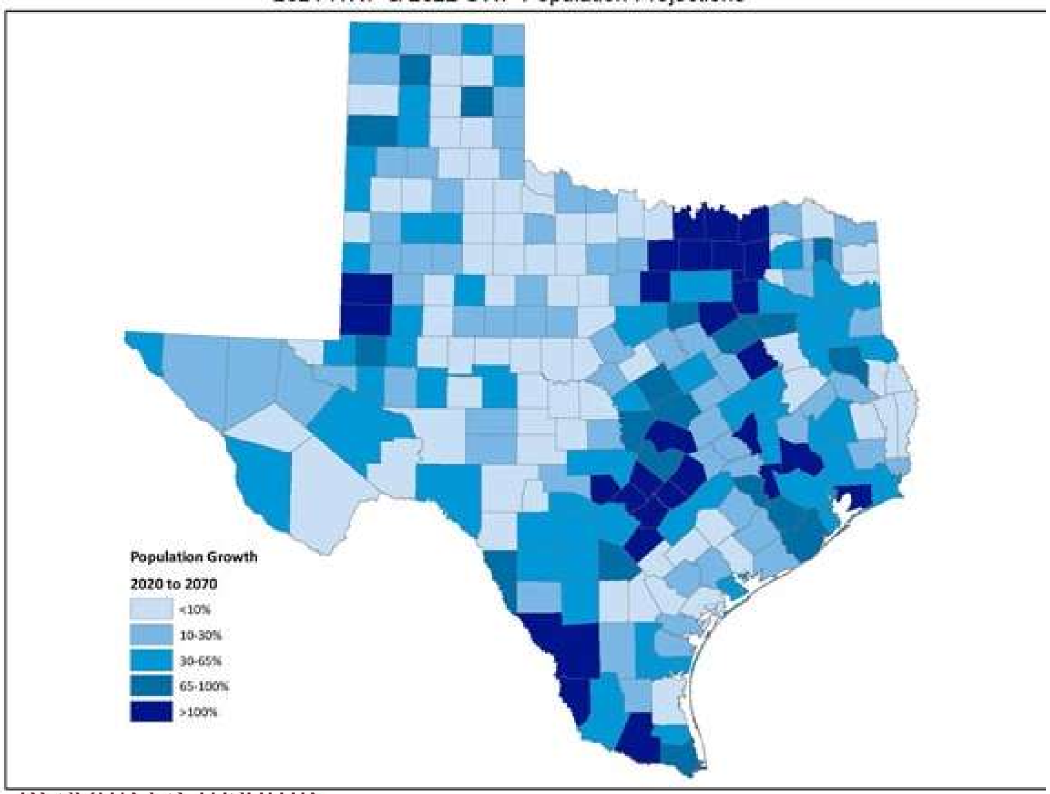
Texas Challenges – Population Growth and Demand

Projected Population Growth by County 2020-2070

2021 RWP & 2022 SWP Population Projections



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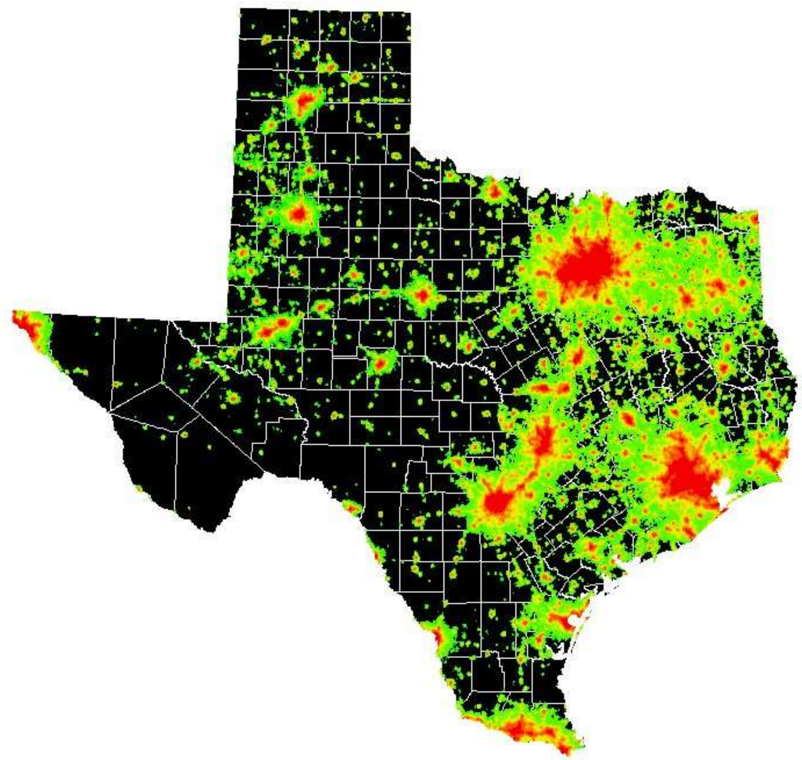

Source – 2019, Texas Land Trends

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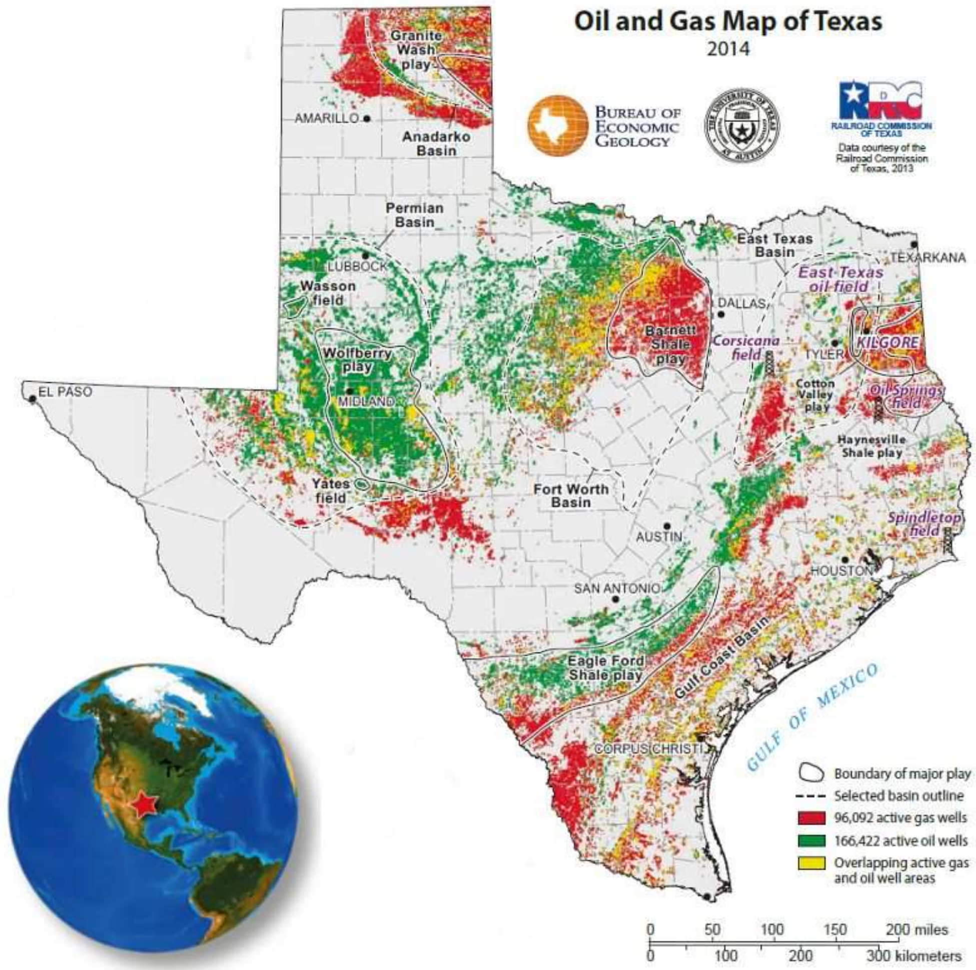
Texas Challenges – Energy Demand



Source: Geo ExPro website

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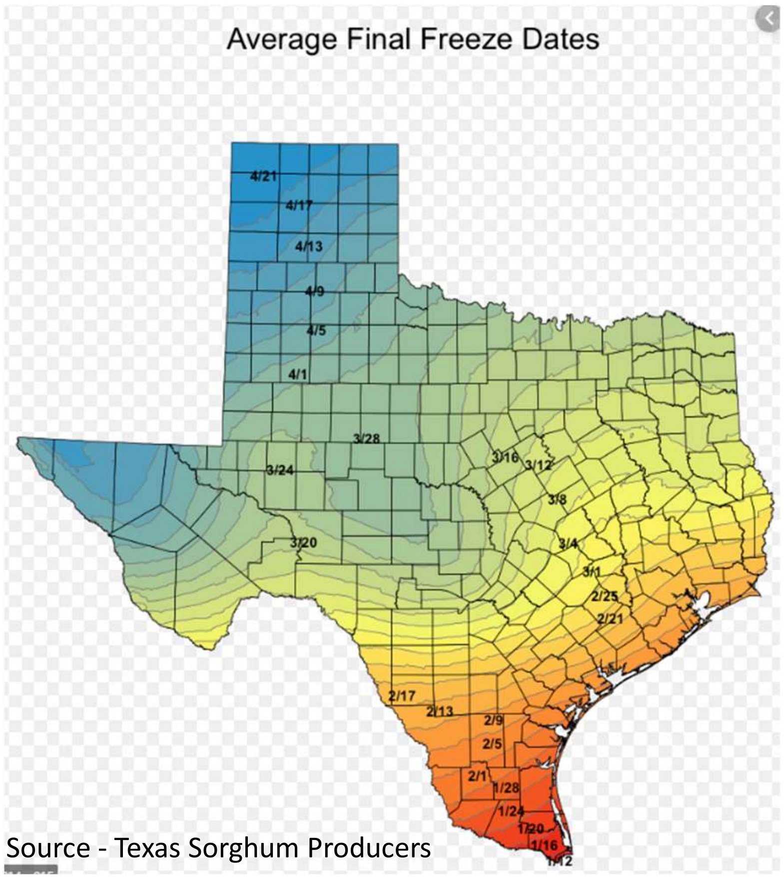
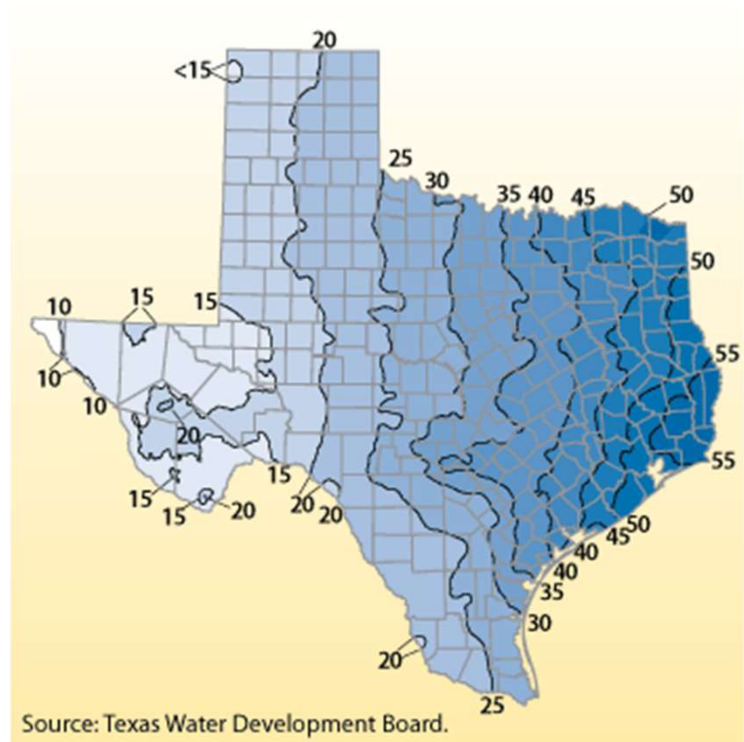
Texas Challenges – Average Climate

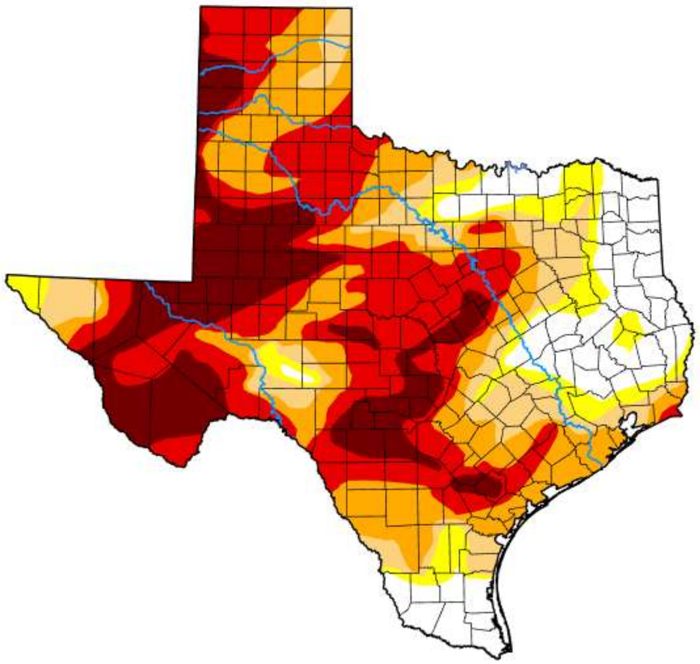


Source - Texas Sorghum Producers

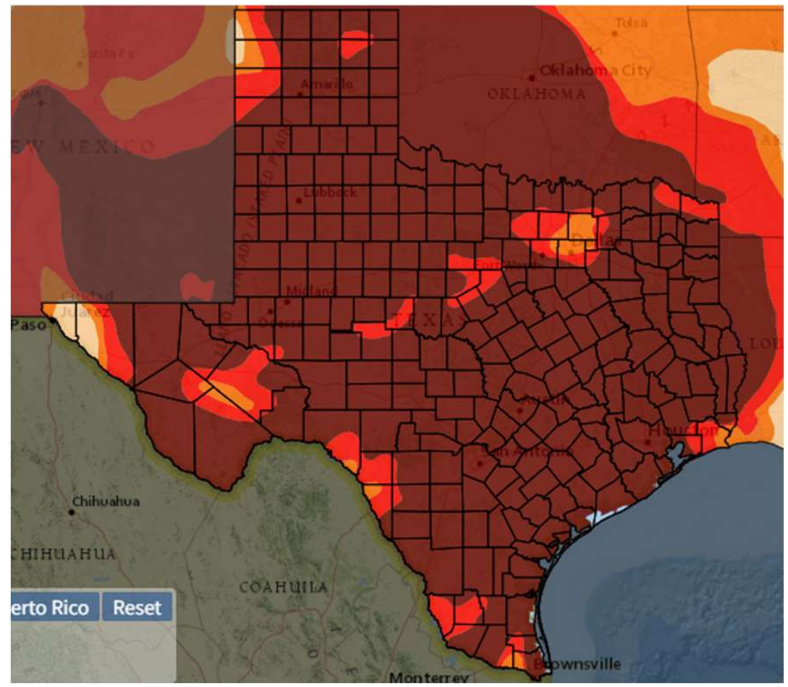


Source: Texas Water Development Board.

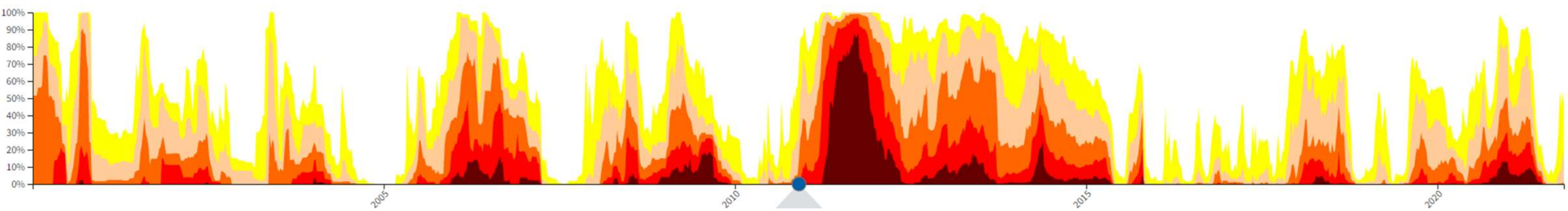
Texas Challenges– Climate



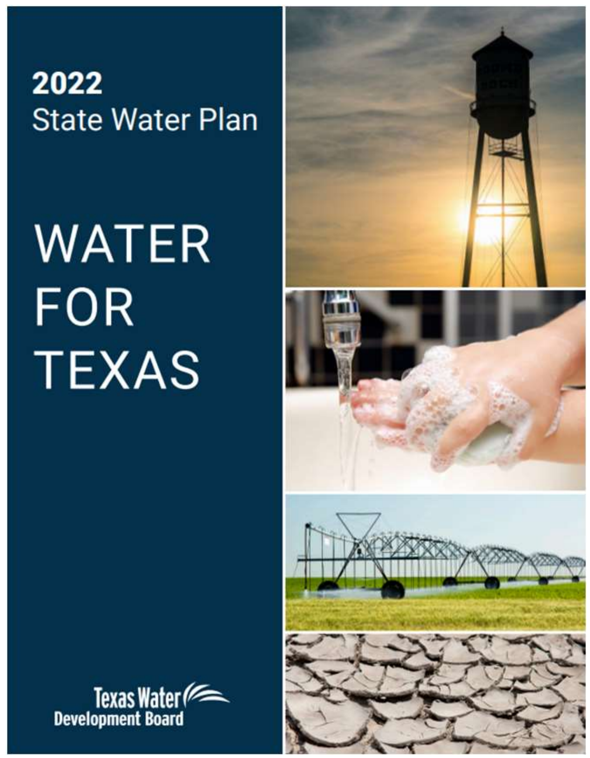
Source: Drought.gov– 6/02/22



November 2011



Water Quantity – Statewide Water and Flood Planning



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Water Quantity - State Water Planning

- Agriculture
- Environment
- Groundwater
- Public
- Counties
- Municipal
- Industry
- River Authorities
- Electric
- Small Business

*Over 5,800 projects costing $80 billion

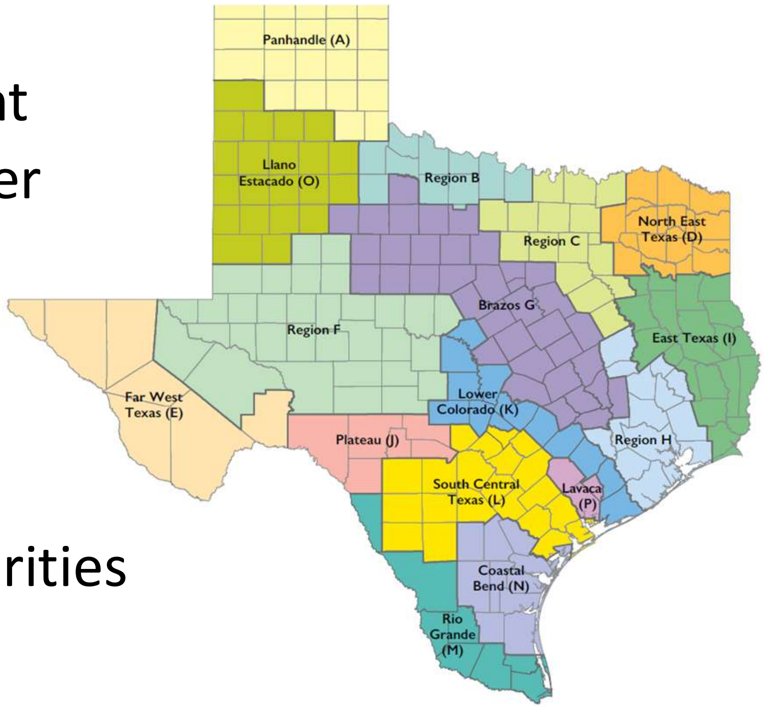
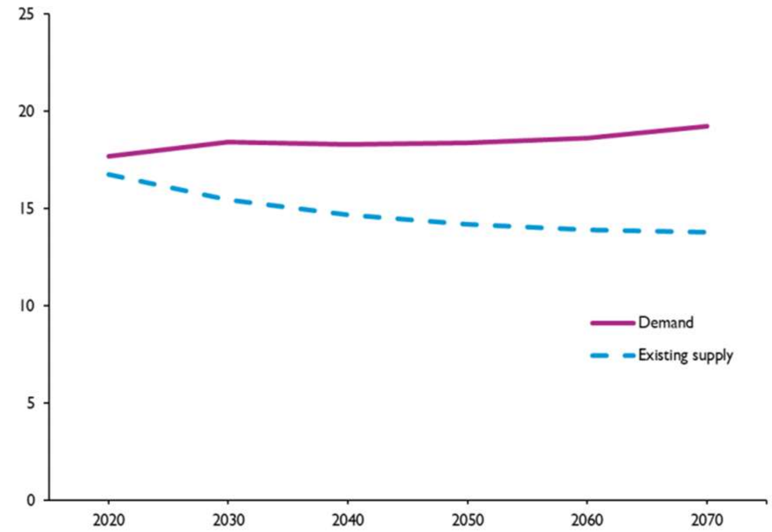


Figure ES-3. Projected total annual water demand and existing water supply for all sectors in Texas (millions of acre-feet)



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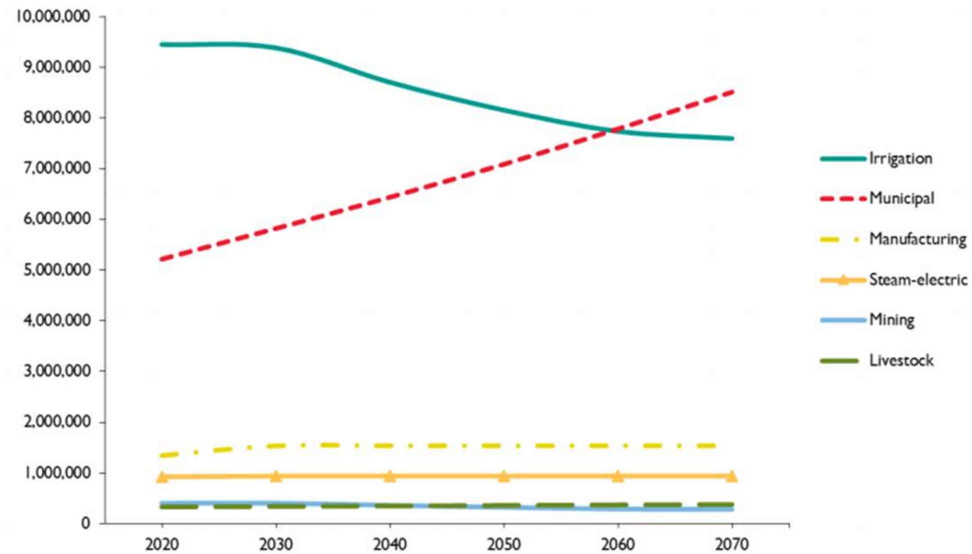
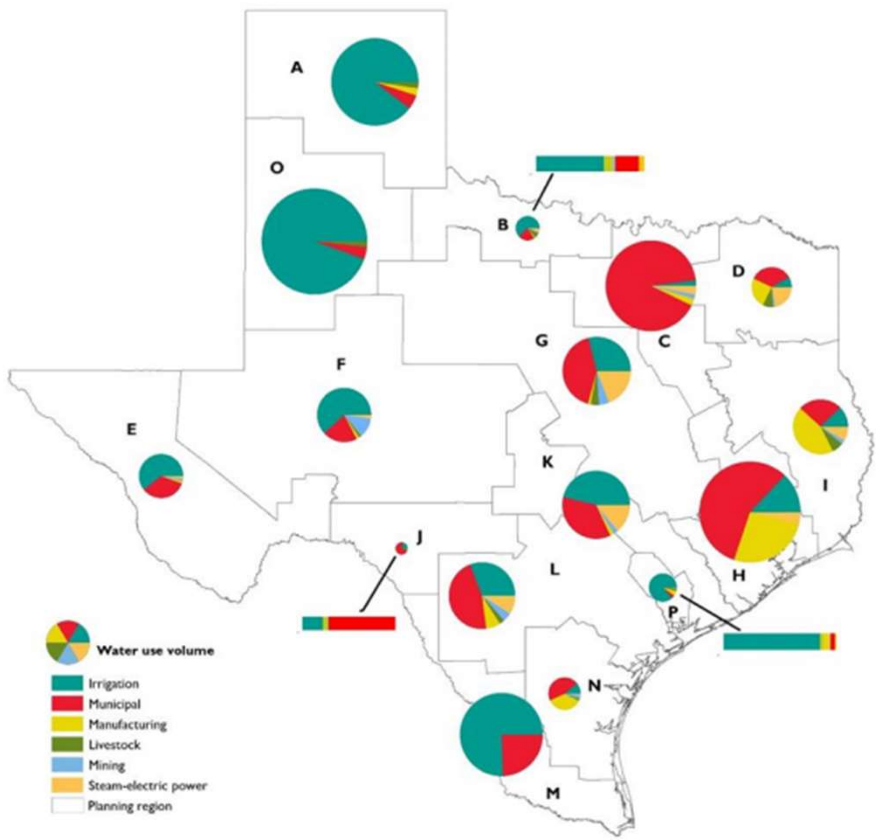
Water Quantity – Statewide and Regional Demand

Figure 4-5. Projected annual water demand by water use category (acre-feet)



Source – 2022 Texas State Water Plan

Figure 4-6. Projected annual water demand by region and category in 2040



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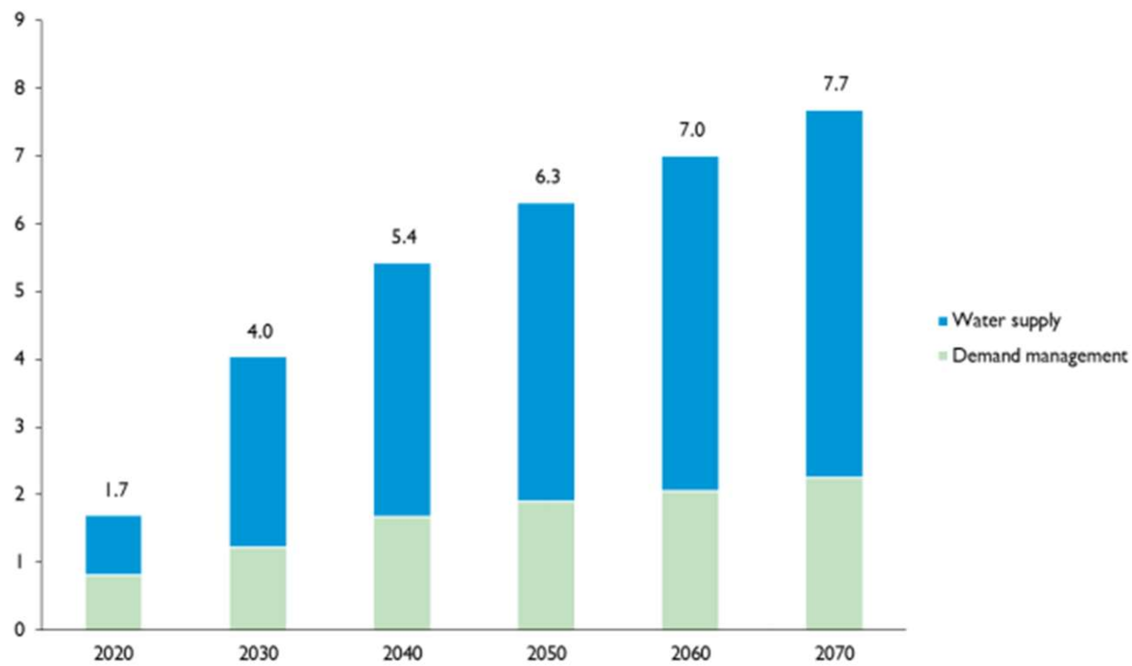
Water Quantity – Future Supply Sources (million acre-feet)

Figure ES-5. Annual volume of recommended water management strategies (millions of acre-feet)



Source – 2022 Texas State Water Plan

- Water Supply – Need new water supply (new reservoir, ASR, etc.)

- Demand Management – reduce the need for additional water (conservation, drought management, etc.)

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Statewide economic impact of doing nothing:

- Estimated $110 billion of lost income in 2020
- Estimated $153 billion of lost income in 2070

- Job losses of 615,000 in 2020
- Job losses of 1.4 million in 2070

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Source – 2022 Texas State Water Plan

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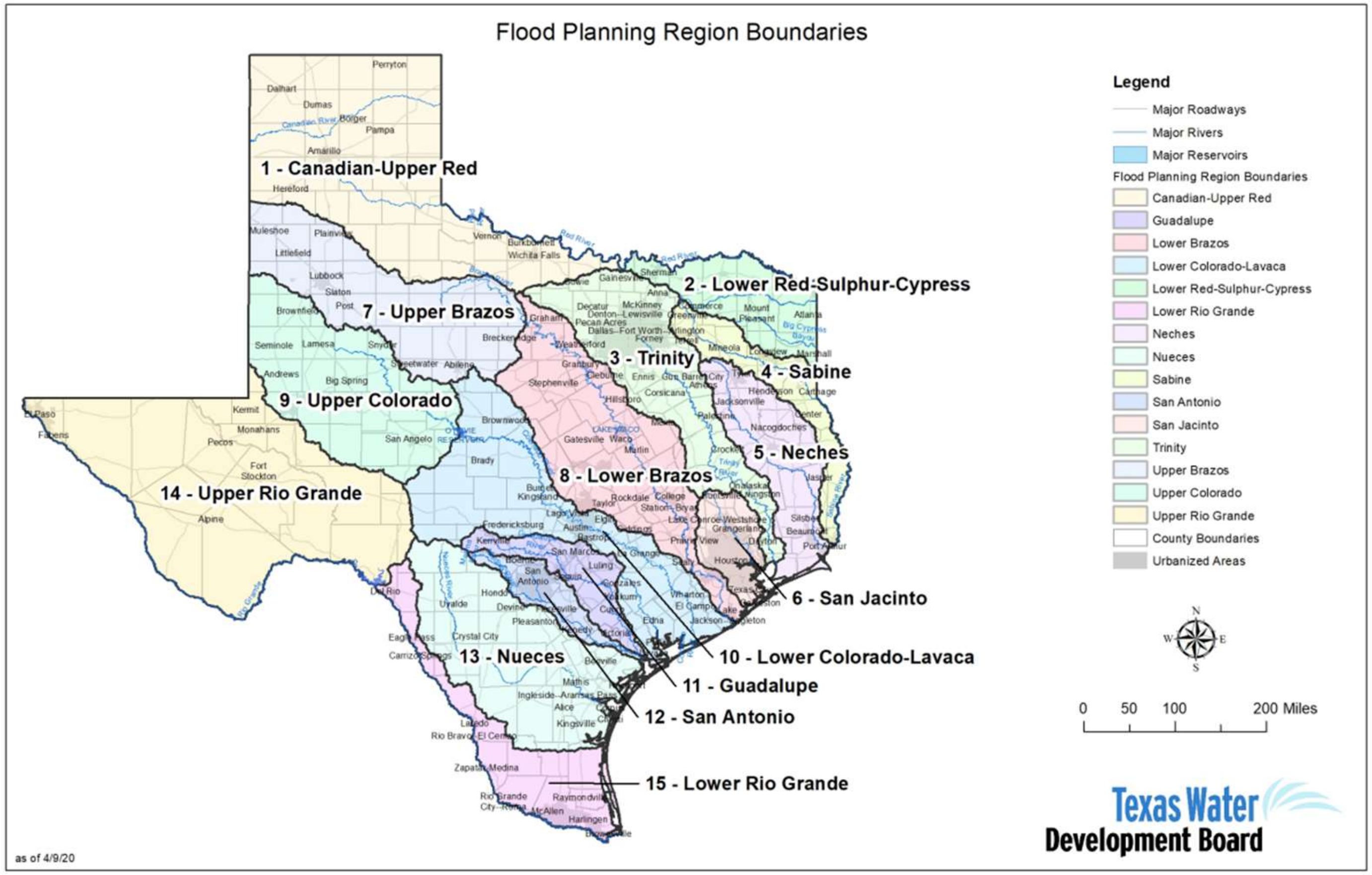
Statewide Flood Planning

- Began in 2020
- First regional plans due 2023
- First State plan due 2024

- Created Flood Infrastructure Fund



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Eligible Activities

Planning Phase Activities

- Preliminary engineering
- Project design
- Coordination of regional projects
- Obtaining regulatory approval
- Hydraulic and hydrologic studies

Other Activities

- Warning systems
- Stream gages
- Educational campaigns
- Crossing barriers

Construction/Rehab Phase

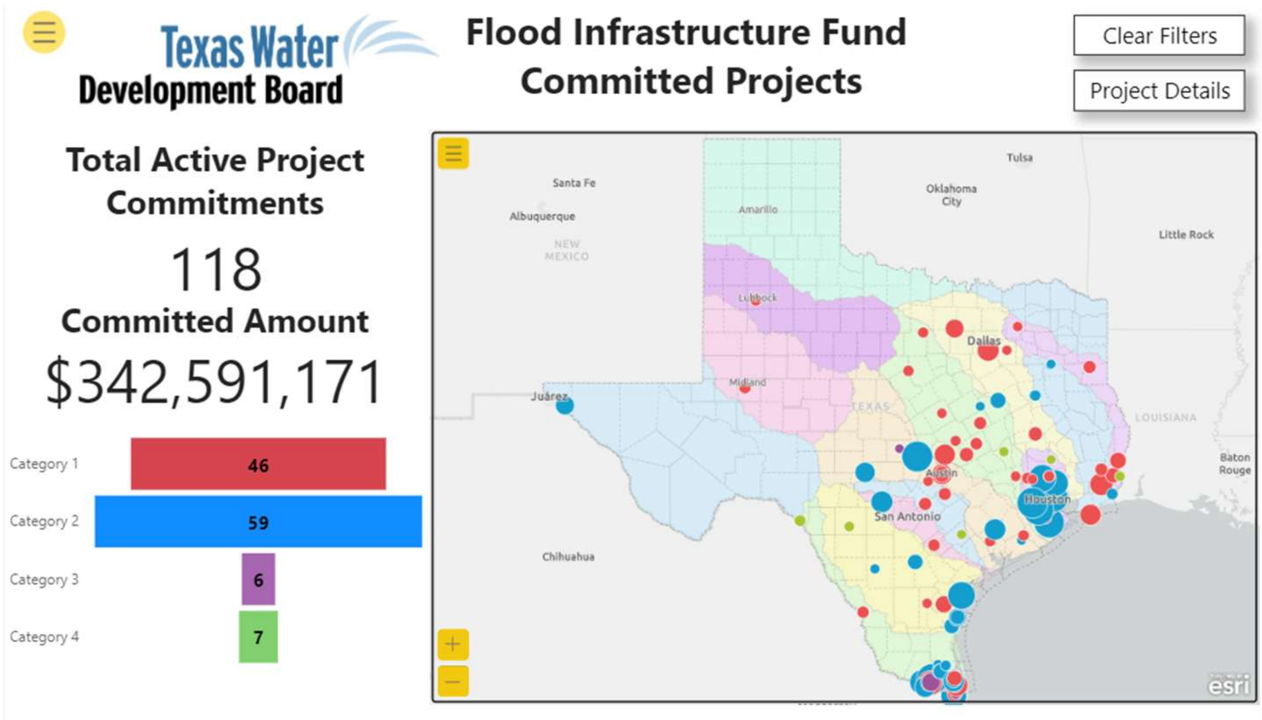
- Drainage infrastructure
- Flood control infrastructure
- Flood mitigation infrastructure
- Retention basins
- Detention ponds
- Nonstructural flood mitigation
- Permeable pavement
- Erosion control
- Levees
- Pump stations, etc.
- Restoration of riparian corridors
- Natural erosion and runoff control

Cat 1 – Flood Protection Planning for Watersheds

Cat 2 – Planning, Acquisition, Design, Construction, Rehabilitation

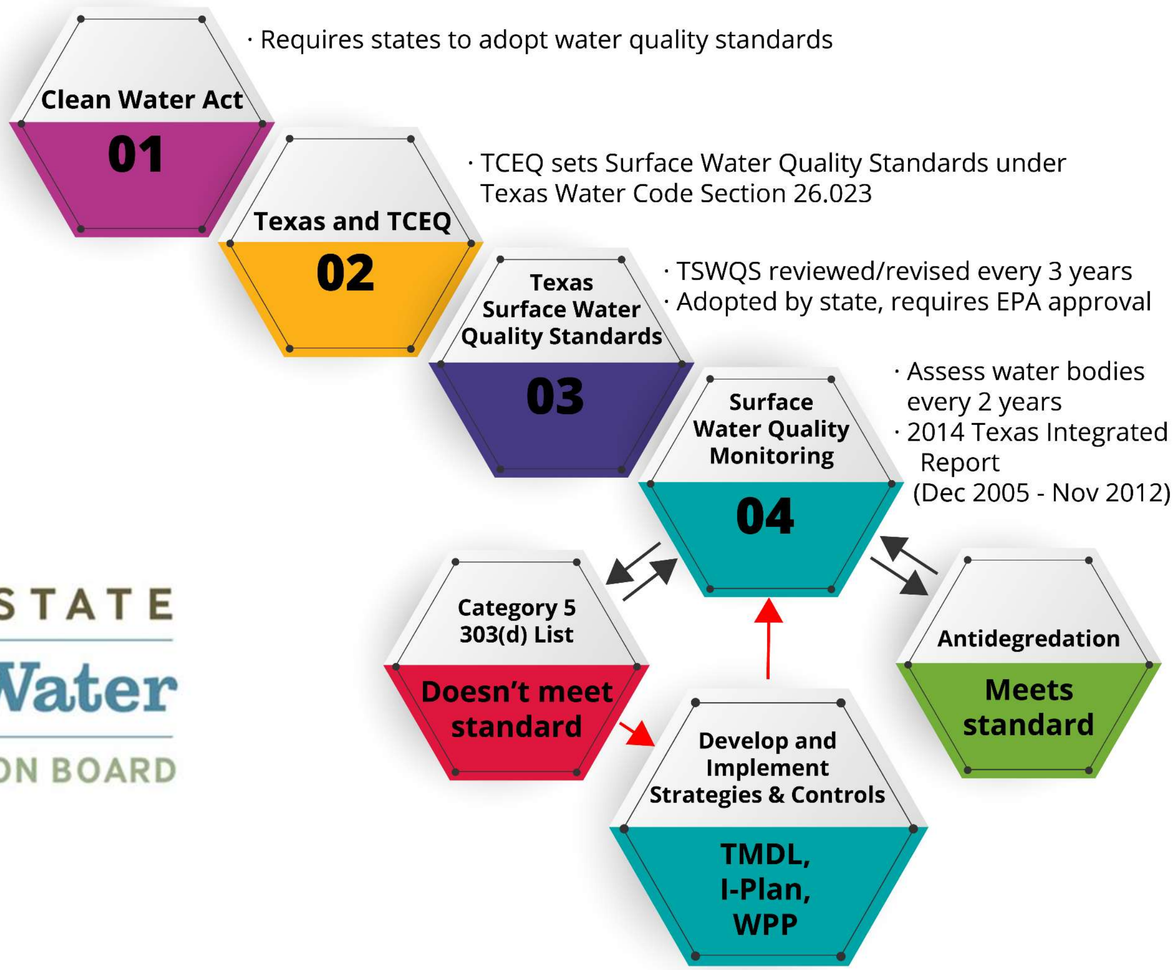
Cat 3 – Federal Award Matching Funds

Cat 4 – Measures Immediately Effective in Protecting Life and Property



Source - https://www.twdb.texas.gov/financial/programs/fif/dashboard.asp

Water Quality – Clean Water Act



TCEQ

TEXAS STATE Soil & Water CONSERVATION BOARD

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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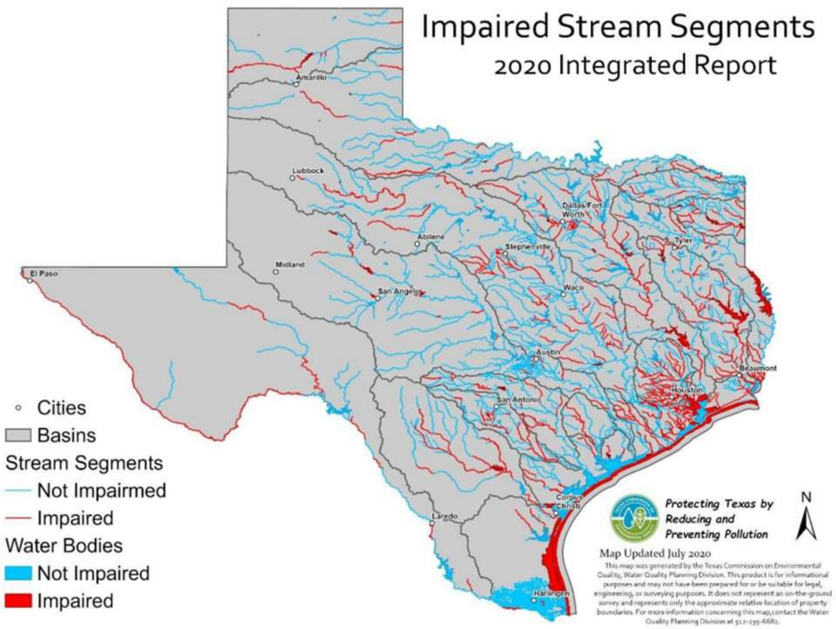
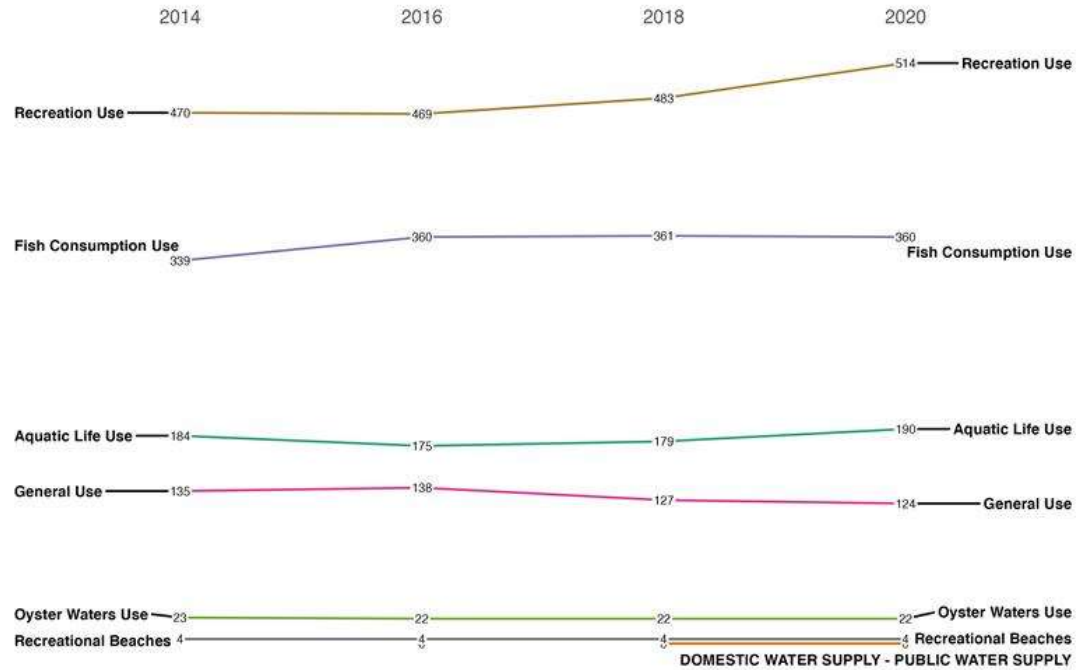
Water Quality – Impairments in Texas





[Surface Water Quality Viewer (arcgis.com)]

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Water Quality – Surface Water Quality Standards

Example Standards in Texas

Designated Use	Criteria	Parameter
Primary Contact Recreation	126 MPN/100 mL (FW) 35 MPN/100 mL (Marine)	*E. coli* Bacteria (FW) Enterococci (Marine)
Secondary Contact Recreation 1	630 MPN/100 mL (FW) 175 MPN/100 mL (Marine)	*E. coli* Bacteria (FW) Enterococci (Marine)
High Aquatic Life Use	5.0 mg/L Average 3.0 mg/L Minimum	Dissolved Oxygen
General Use	6.5 – 9.0	pH

Water Quality – Bacteria

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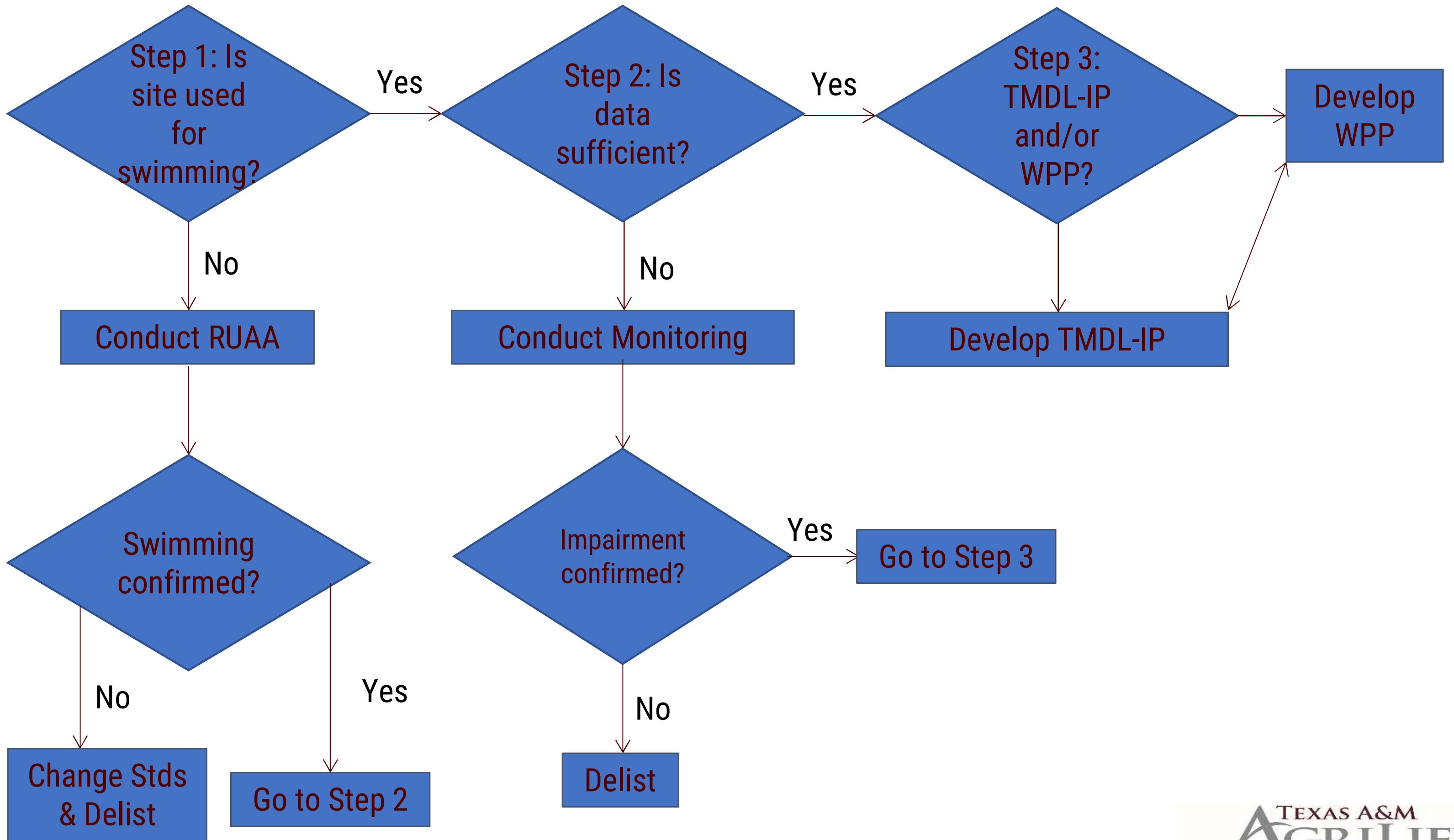
Water Quality – Addressing Impairments



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Why are watershed projects where they are?

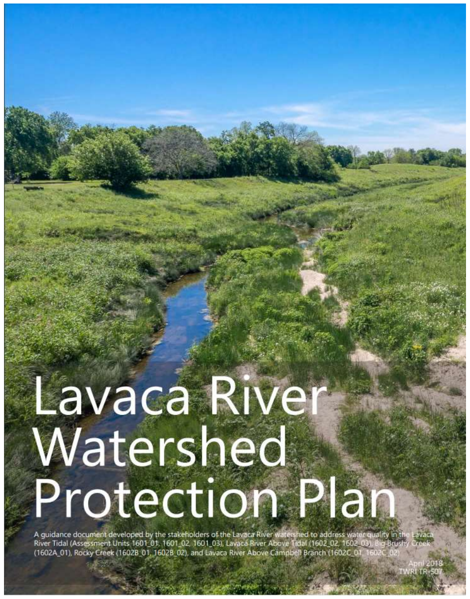
- Texas Nonpoint Source Management Program - [2022_ManagementProgram.pdf (texas.gov)]

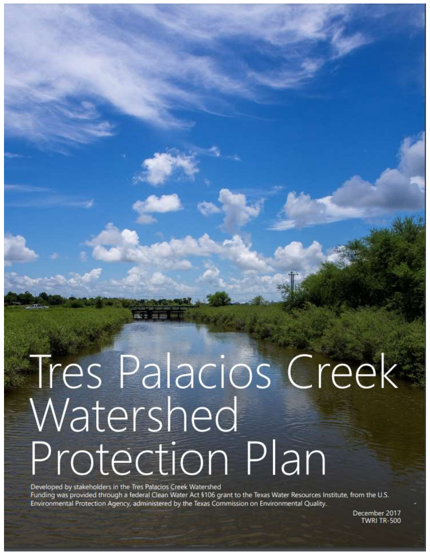
- Grant Program Priority Areas
  - Generally, from TSSWCB or TCEQ

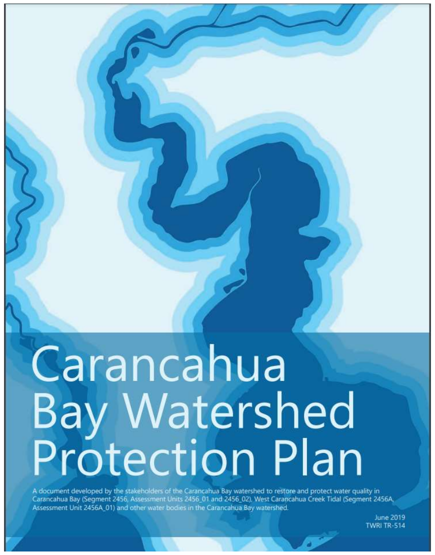
- Stakeholder Driven Needs
  - e.g. TRWD and NTMWD

The Response

- Develop a Watershed Protection Plan
  - Voluntary plan to restore
  - Educational programming
  - Local buy-in

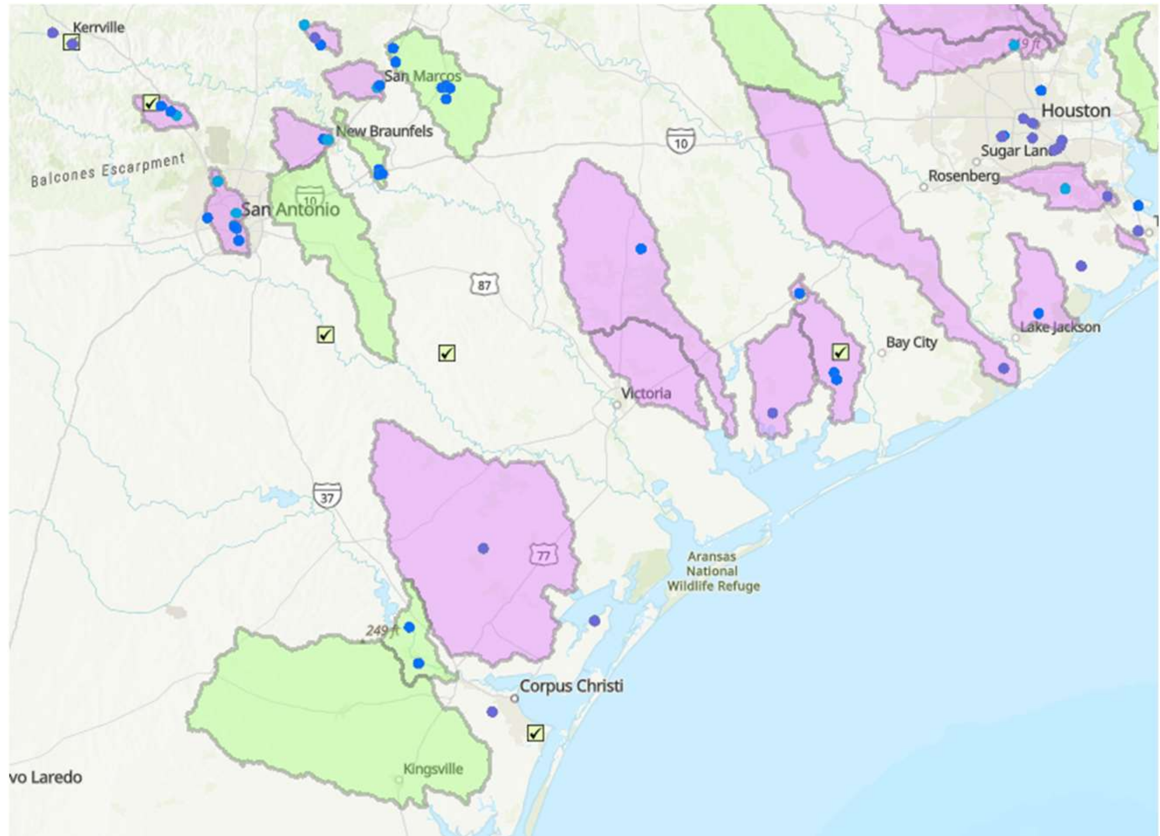






Ongoing Local Projects

- Stormwater Education
- Jackson Septic System Education
- Lavaca Implementation
- Tres Palacios Septic Replacement
- El Campo Pet Waste Stations
- Mission and Aransas Monitoring
- Matagorda SWCD Technician



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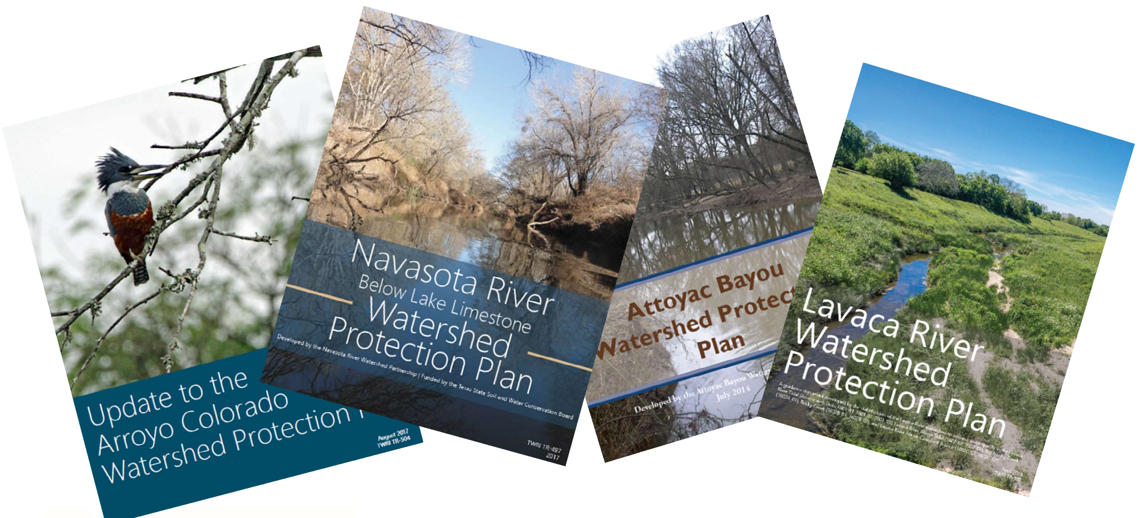
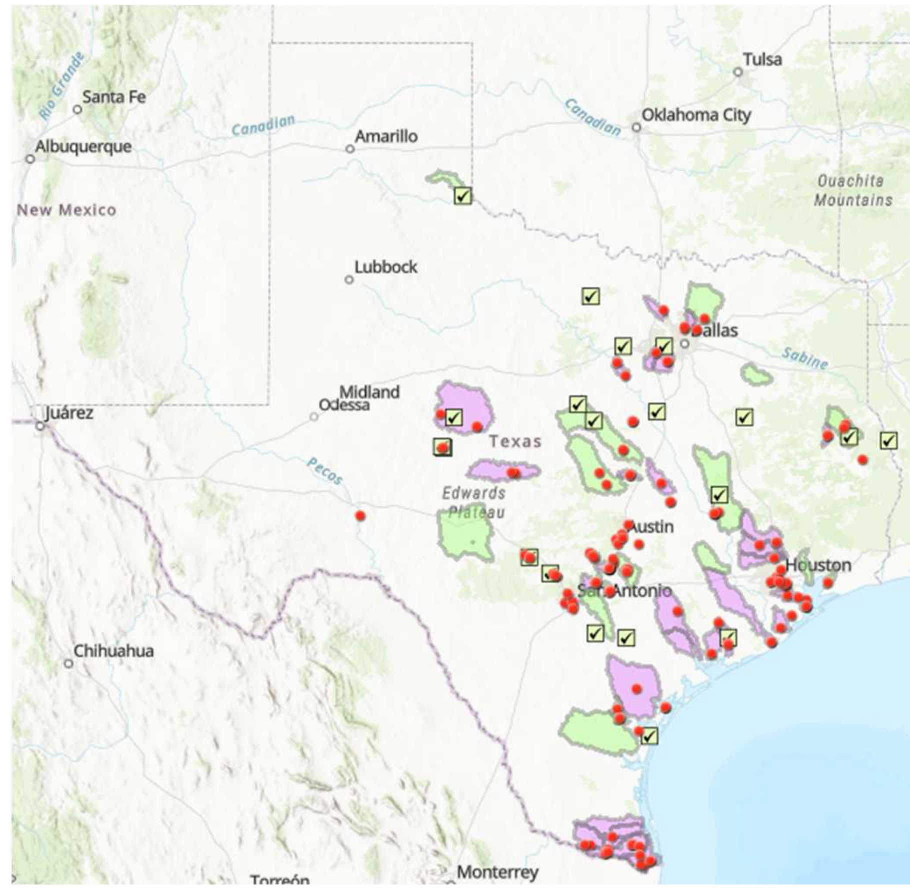
Watershed-Based Planning Process

3 Main Phases of Water Planning

- Characterization
- Planning
- Implementation





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https://tceq.maps.arcgis.com/apps/webappviewer/index.html?id=8a9549c92da0426e828b32deb7c7d4a

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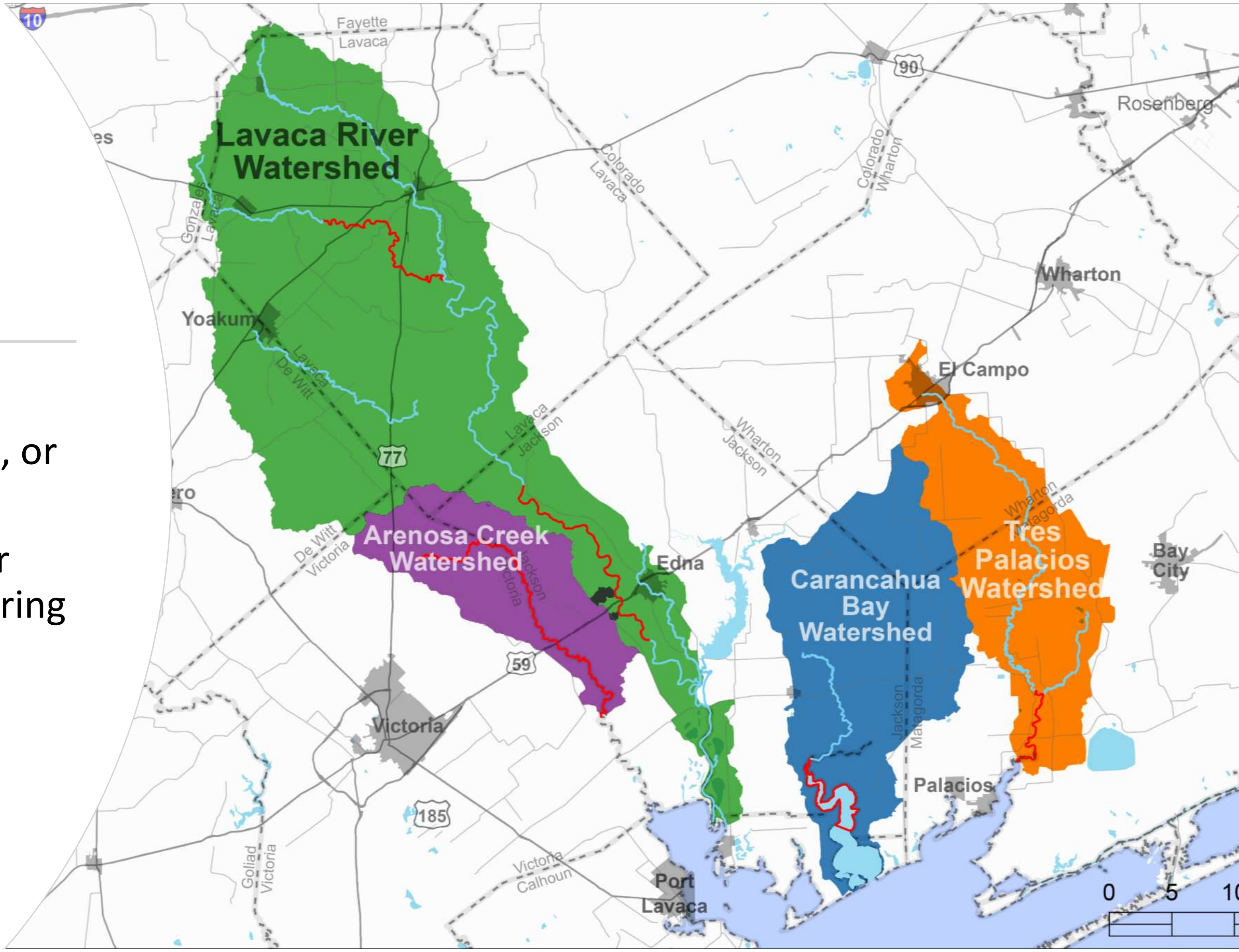
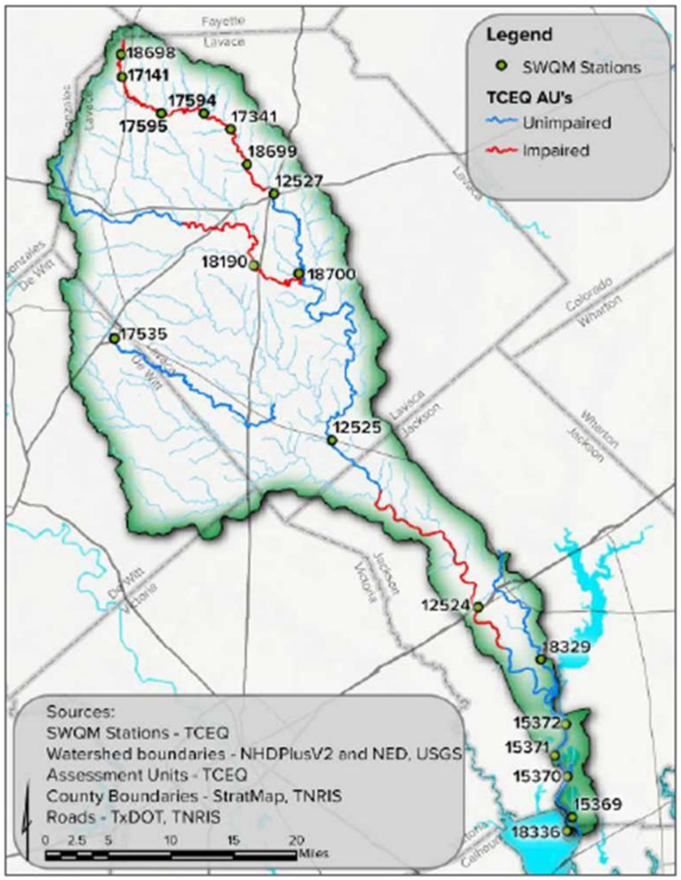
Area Watersheds

- Land that drains to a common river, creek, or bayou
- Carry pollutants over the land to water during rainfall events
- Resulted in water quality impairments



Water Quality – Example Watershed Based Plan



Lavaca River Watershed Protection Plan

- Impairments:
  - Excessive Bacteria
  - Low dissolved oxygen

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Water Quality – Example WPP

Chapter 1 – Introduction to Watershed Management

- Watersheds and Water Quality
- The Watershed Approach
- Watershed Protection Plan
- Adaptive Management
- Education and Outreach

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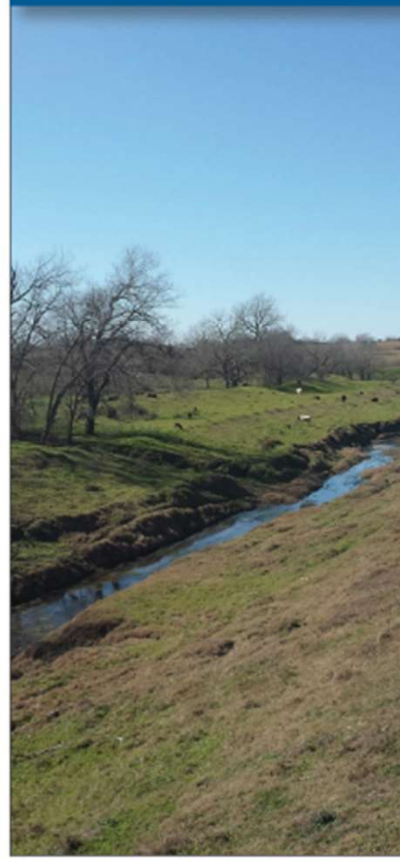
Chapter 1
Introduction to Watershed Management



A watershed is composed of an area of land that drains to a common body of water, such as a stream, river, wetland or ocean. All of the land surfaces that surround the water body where runoff drains are considered part of the watershed. Watersheds can be very small features that drain only a few square miles while larger watersheds can encompass numerous smaller watersheds and can drain large portions of states, such as the Colorado River watershed that includes 39,900 square miles of Texas and New Mexico.

The Lavaca River watershed is approximately 909 square miles and is composed of numerous smaller watersheds, such as Rocky Creek, Big Brushy Creek and Dry Creek (Figure 1). The Lavaca River watershed is then part of the larger Matagorda Bay watershed that includes the Navidad River, Tres Palacios River and a number of other creeks and rivers.

Watersheds and Water Quality

Natural processes and human activities can influence water quality and quantity within a watershed. For example, rain falling on the land area within a watershed might generate runoff that then flows across agricultural fields, lawns, roadways, industrial sites, grasslands or forests.

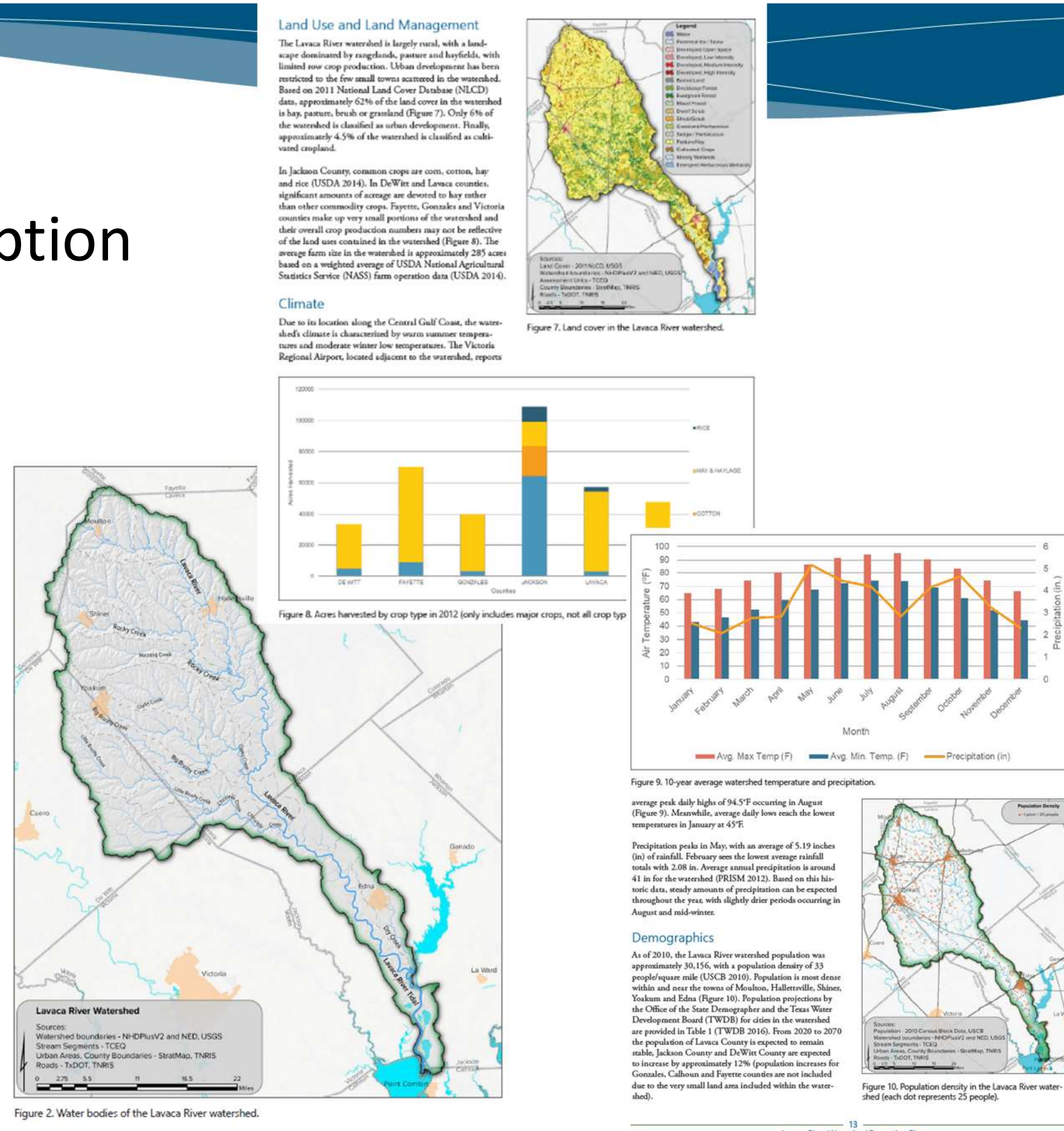
Point source pollution is categorized as being discharged from a defined point or location, such as a pipe or a drain, and can be traced back to a single point of origin. This type of pollution is typically discharged directly into a water body and subsequently contributes to the water body's flow. Point sources of pollution that are permitted to discharge their effluent within specific pollutant limits must hold a permit through the Texas Pollutant Discharge Elimination Systems (TPDES).

Pollution that comes from a source that does not have a single point of origin is defined as nonpoint source (NPS) pollution. This type of pollution is generally composed of pollutants that are picked up and carried by runoff in stormwater during rain events. Runoff that travels across land can

Water Quality – Example WPP

Chapter 2 – Watershed Description

- Watershed Description
- Soils and Topography
- Land Use and Management
- Climate
- Demographics



Land Use and Land Management

The Lavaca River watershed is largely rural, with a landscape dominated by rangelands, pasture and hayfields, with limited row crop production. Urban development has been restricted to the few small towns scattered in the watershed. Based on 2011 National Land Cover Database (NLCD) data, approximately 62% of the land cover in the watershed is hay, pasture, brush or grassland (Figure 7). Only 6% of the watershed is classified as urban development. Finally, approximately 4.5% of the watershed is classified as cultivated cropland.

In Jackson County, common crops are corn, cotton, hay and rice (USDA 2014). In DeWitt and Lavaca counties, significant amounts of acreage are devoted to hay rather than other commodity crops. Fayette, Gonzales and Victoria counties make up very small portions of the watershed and their overall crop production numbers may not be reflective of the land uses contained in the watershed (Figure 8). The average farm size in the watershed is approximately 285 acres based on a weighted average of USDA National Agricultural Statistics Service (NASS) farm operation data (USDA 2014).

Climate

Due to its location along the Central Gulf Coast, the watershed's climate is characterized by warm summer temperatures and moderate winter low temperatures. The Victoria Regional Airport, located adjacent to the watershed, reports average peak daily highs of 94.5°F occurring in August (Figure 9). Meanwhile, average daily lows reach the lowest temperatures in January at 45°F.

Precipitation peaks in May, with an average of 5.19 inches (in) of rainfall. February sees the lowest average rainfall totals with 2.08 in. Average annual precipitation is around 41 in for the watershed (PRISM 2012). Based on this historic data, steady amounts of precipitation can be expected throughout the year, with slightly drier periods occurring in August and mid-winter.

Demographics

As of 2010, the Lavaca River watershed population was approximately 30,156, with a population density of 33 people/square mile (USCB 2010). Population is most dense within and near the towns of Moulton, Hallettsville, Shiner, Yoakum and Edna (Figure 10). Population projections by the Office of the State Demographer and the Texas Water Development Board (TWDB) for cities in the watershed are provided in Table 1 (TWDB 2016). From 2020 to 2070 the population of Lavaca County is expected to remain stable, Jackson County and DeWitt County are expected to increase by approximately 12% (population increases for Gonzales, Calhoun and Fayette counties are not included due to the very small land area included within the watershed).

Figure 2. Water bodies of the Lavaca River watershed.

Figure 7. Land cover in the Lavaca River watershed.

Figure 8. Acres harvested by crop type in 2012 (only includes major crops, not all crop typ

Figure 9. 10-year average watershed temperature and precipitation.

Figure 10. Population density in the Lavaca River watershed (each dot represents 25 people).

13

Lavaca River Watershed Protection Plan

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Water Quality – Example WPP

Chapter 3 – Water Quality

- Bacteria
- RUAA
- Dissolved Oxygen
- UAA
- Nutrients
- Flow
- Potential Sources of Water Quality Issues
- Water Quality Summary

Table 4. *2014 Texas Integrated Report* Assessment Results for stream segments in the Lavaca River watershed currently monitored for bacteria (TCEQ 2016).

AU	Description	Current Standard	Geomean	Supporting/Not Supporting
1602_02	Lavaca River Above Tidal – From the confluence of Beard Branch upstream to the upper end of segment at the confluence of Campbell Branch in Hallettsville.	126 cfu/100 mL *E. coli*	114.65	Fully Supporting
1602_03	Lavaca River Above Tidal – Lower portion of segment from confluence with NHD RC 12100101002463 south of Edna upstream to confluence with Beard Branch.	126 cfu/100 mL *E. coli*	294.94	Not Supporting
1602B_01	Rocky Creek – From confluence of Lavaca River upstream to confluence of Ponton Creek	126 cfu/100 mL *E. coli*	222.16	Not Supporting

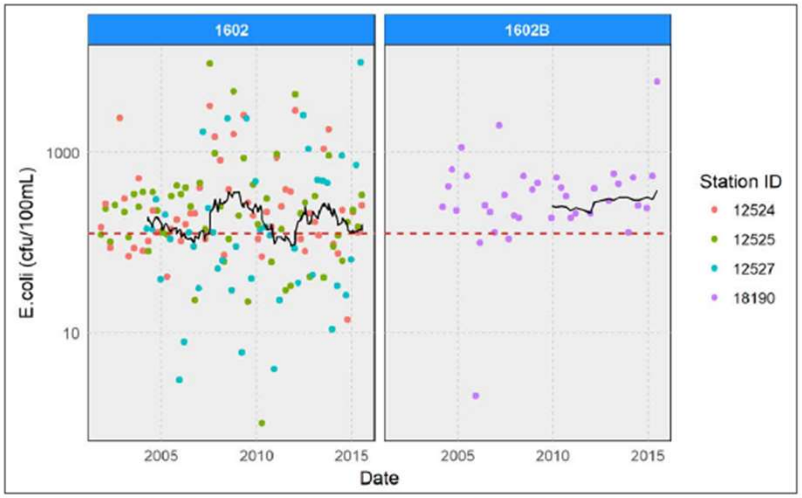

Figure 13. Historical *E. coli* concentrations at monitored segments with bacteria data. Dotted line indicates the 126cfu/100mL criterion and solid black line indicates the mean value of previous 20 measurements.

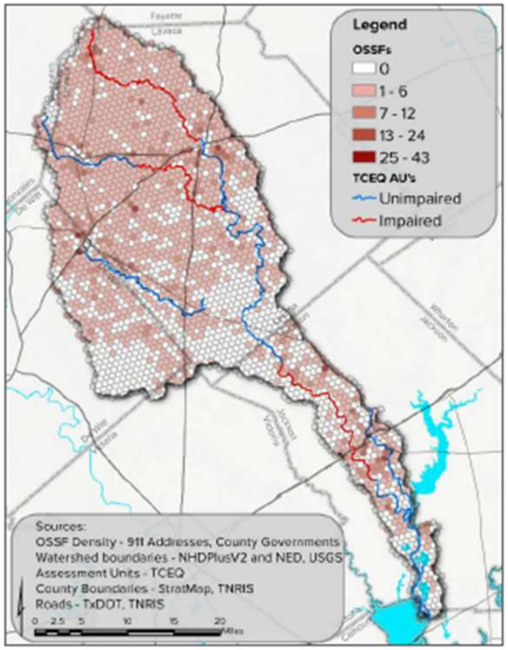

Figure 19. OSSF density.

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Water Quality – Example WPP

Chapter 4 – Pollutant Source Assessment

- Introduction
- Load Duration Curves
- Pollutant Source Load Estimates
- Load Reduction Summary

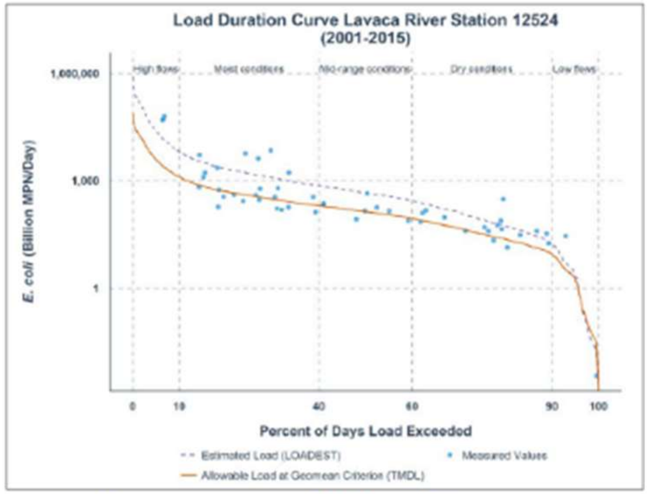

Figure 21. Load duration curve for Lavaca River SWQM Station 12524.

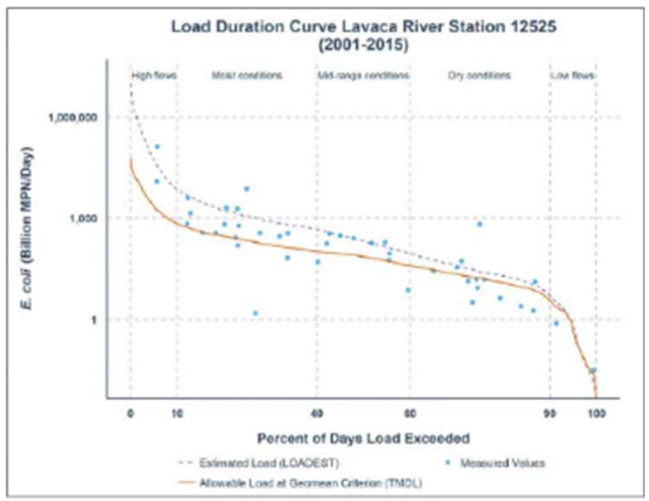

Figure 22. Load duration curve for Lavaca River SWQM Station 12525.

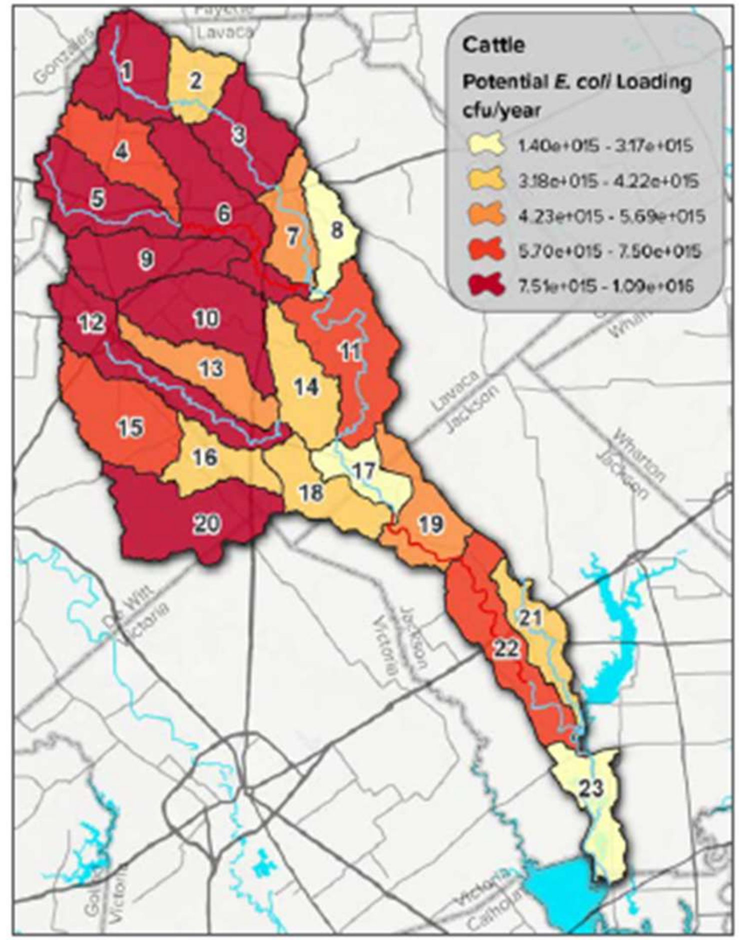

Figure 25. Potential annual bacteria loadings from cattle.

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Water Quality – Example WPP

Source: Cattle and Other Livestock			
Problem: Direct and indirect fecal bacteria loading due to livestock in streams, riparian degradation and overgrazing			
Objectives: • Work with producers to develop conservation plans and WQMPs that improve grazing practices and water quality. • Provide technical and financial support to producers. • Reduce fecal loadings attributed to livestock.			
Critical Areas: All properties with riparian habitat throughout the watershed and all properties in subwatersheds: 1, 3, 5, 6, 9, 10, 12 and 20			
Goal: Develop and implement conservation plans and WQMPs that minimize time spent by livestock in riparian areas and better use available grazing resource across the property.			
Description: Conservation plans and WQMPs will be developed with producers to implement BMPs that reduce water quality impacts from overgrazing, time spent by livestock in and near streams, and runoff from grazed lands. Practices will be identified and developed in consultation with NRCS, TSSWCB and local SWCDs as appropriate. Education programs and workshops will support and promote the adoption of these practices.			
Implementation Strategy			
Participation	**Recommendations**	**Period**	**Capital Costs**
TSSWCB, SWCDs	Develop funding to hire WQMP technician.	2019-2029	Estimated $75,000/yr
Producers, NRCS, TSSWCB, SWCDs	Develop, implement and provide financial assistance for 100 livestock conservation plans and WQMPs (including 30 in Rocky Creek subwatersheds).	2019-2029	$1,500,000 (est. $15,000/plan)
AgriLife Extension, TWRI	Deliver education and outreach programs and workshops (Lone Star Healthy Streams) to landowners.	2019, 2023, 2027	N/A
Estimated Load Reduction			
Prescribed management will reduce loadings associated with livestock by reducing runoff from pastures and rangeland as well as reducing direct deposition by livestock. Implementation of 100 WQMPs and conservation plans is estimated to reduce annual loads from livestock by 1.00×10^{15} cfu *E. coli*/yr in the Lavaca River. Of these 100 plans, at least 30 should be targeted toward the Rocky Creek watershed, which is estimated to reduce loads by 2.25×10^{14} cfu *E. coli*/yr.†			
Effectiveness	High – Decreasing the amount of time livestock spend in riparian areas and reducing runoff from pastures will directly reduce NPS contributions of bacteria in creeks.		
Certainty	Moderate – Landowners acknowledge the importance of good land stewardship practices and management plan objectives; however, financial incentives are often needed to promote the WQMP and conservation plan implementation.		
Commitment	Moderate – Landowners are willing to implement stewardship practices shown to improve productivity; however, because costs are often prohibitive, financial incentives are needed to increase implementation rates.		
Needs	High – Financial costs are a major barrier to implementation, education and outreach are also needed to demonstrate benefits to producers and their operations.		
Potential	Coastal Zone Management Program/Coastal Management Program (CZM program and CMP); EPA		

Practice	NRCS Code	Focus Area or Benefit
Brush management	314	Livestock, water quality, water quantity, wildlife
Fencing	382	Livestock, water quality
Filter strips	393	Livestock, water quality, wildlife
Grade stabilization structures	410	Water quality
Grazing land mechanical treatment	548	Livestock, water quality, wildlife
Heavy use area protection	562	Livestock, water quantity, water quality
Pond	378	Livestock, water quantity, water quality, wildlife
Prescribed burning	338	Livestock, water quality, wildlife
Prescribed grazing	528	Livestock, water quality, wildlife
Range/Pasture planting	550/512	Livestock, water quality, wildlife
Shade structure	N/A	Livestock, water quality, wildlife
Stream crossing	578	Livestock, water quality
Supplemental feed location	N/A	Livestock, water quality
Water well	642	Livestock, water quantity, wildlife
Watering facility	614	Livestock, water quantity

Chapter 5 – Watershed Protection Plan Implementation Strategies

- Management Measures

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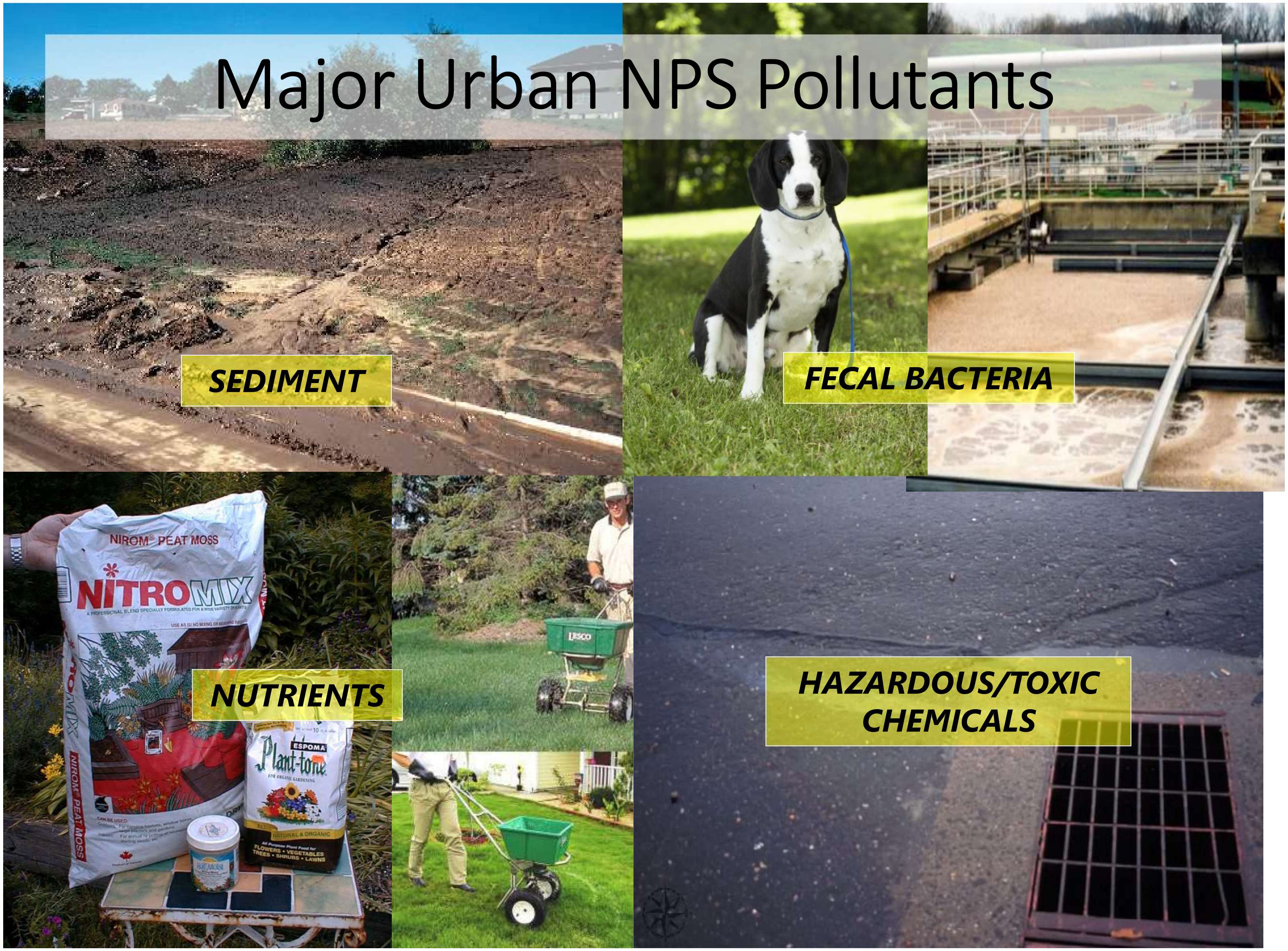
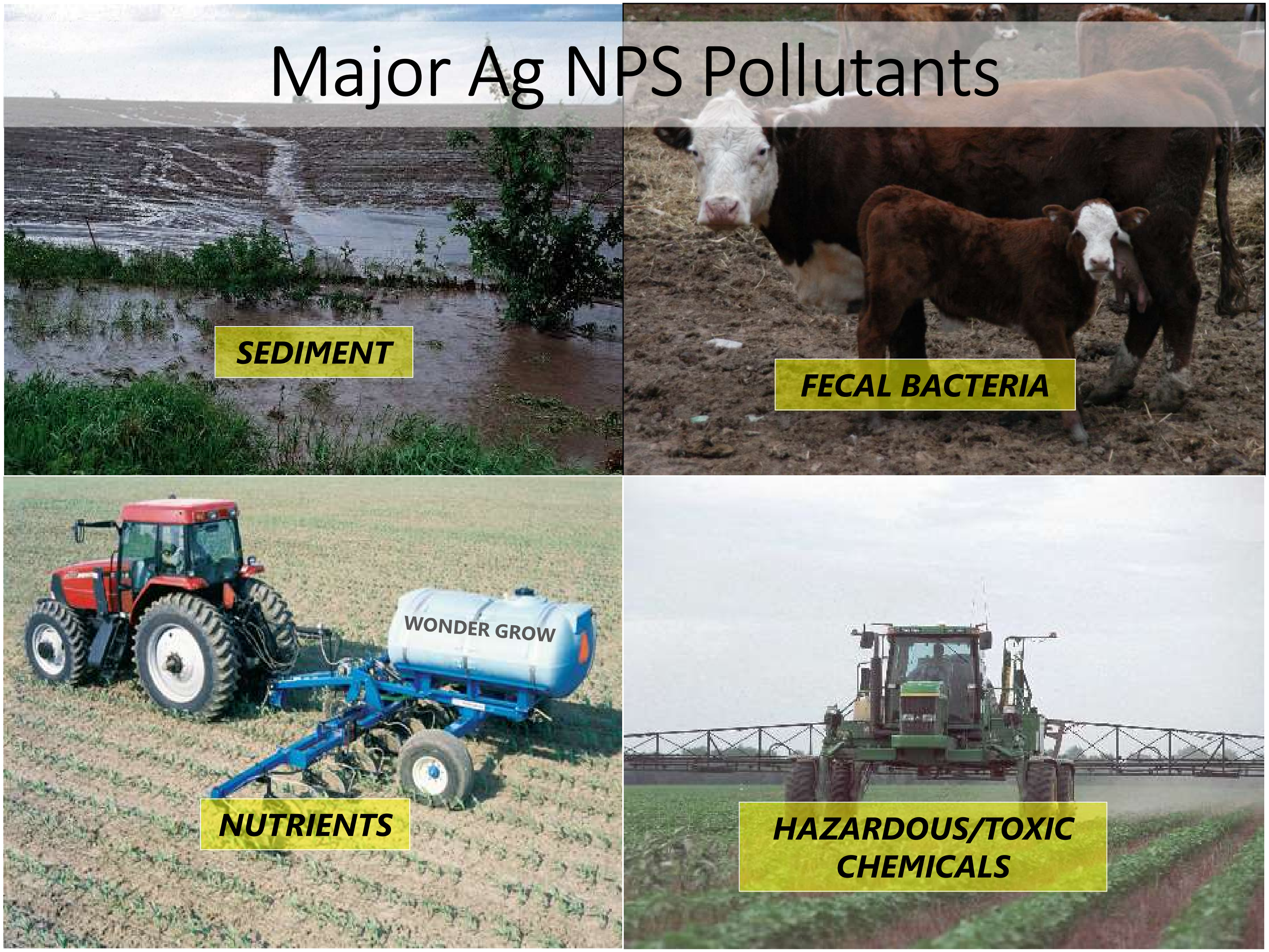
Major Urban NPS Pollutants



Major Ag NPS Pollutants



Water Quality – Example WPP

Chapter 6 – Education and Outreach

- Watershed Coordinator
- Public Meetings
- Future Stakeholder Engagement
- Education Programs (Extension programs)
- Public Meetings
- Newsletters and News Releases

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Septic Systems

- Inspect your septic system annually
- Pump out your septic system every 5 to 7 years
- Avoid or reduce the use of your garbage disposal
- Maintain a grass cover
- www.OSSF.TAMU.EDU

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Additives

- Additives are not necessary or beneficial
- 1 lb. of raw ground beef
- 1 bottle of red wine
- One half raw chicken
- Bag of cornmeal

Managing Your Well

- Find and record the locations of all wells on the property
- Inspect and maintain all wells (every 6-12 months)
- Properly plug abandoned wells
- Avoid activities around wellhead that may contaminate groundwater
- www.TWON.TAMU.EDU

Management of Feral Hogs

- Voluntarily construct fencing around deer feeders to prevent feral hog use
- Identify travel corridors and employ trapping and hunting
- Shoot hogs on sight
- Feral Hog Workshops
- Bounty Programs and Contests
- FeralHogs.tamu.edu

Water Quality – Example WPP

Chapter 7 – Resources to Implement the WPP

- Technical Assistance
- Financial Sources

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Chapter 8 – Measuring Success

- Water Quality Targets
- Additional Data Collection Needs
- Data Review
- Interim Measurable Milestones
- Adaptive Management

Water Quality – Example WPP

- Appendix A – Potential Load Reductions
- Appendix B – Load Reduction Calculations
- Appendix C – Elements of Successful Watershed Protection Plans (9 elements)

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Other Issues

- Endangered Species (76 in Victoria County alone)
- Environmental flows
- Invasive species – feral hogs, zebra mussels
- Waters of the US – WOTUS – Proposed rule change

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Any questions?

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