BIG ELM CREEK WATERSHED PLANNING

Allen Berthold, Ed Rhodes - Texas Water Resources Institute
October 22, 2019

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Introductions

- Name
- Representation (Agency, Landowner, Etc.)

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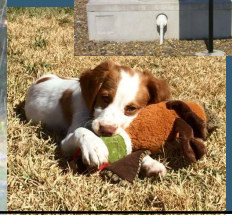
Texas Surface Water Quality Standards Review

Where do they come from?

Some Examples:

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

Sources of *E.coli* Bacteria?



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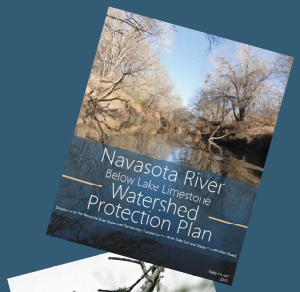
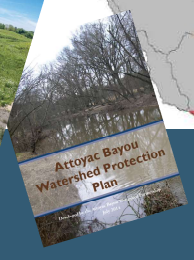
Watershed-Based Plans Across Texas





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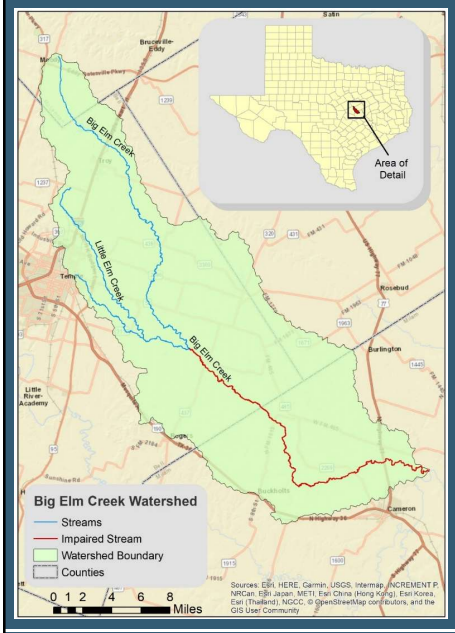
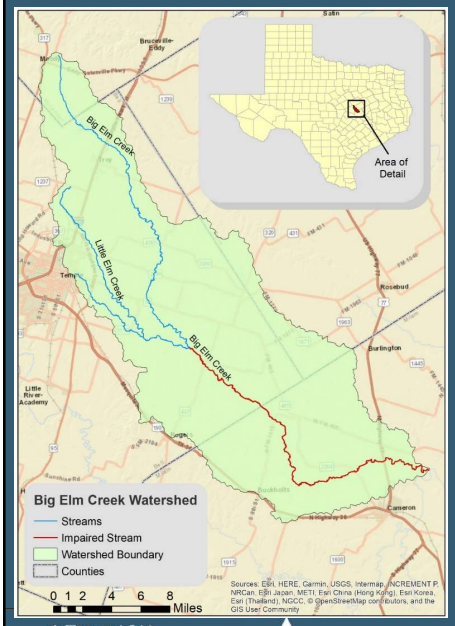


BIG ELM CREEK DRAFT WPP REVIEW



- Big Elm Creek
  - Issues:
    - Bacteria Over Threshold
    - Concern for Dissolved Oxygen

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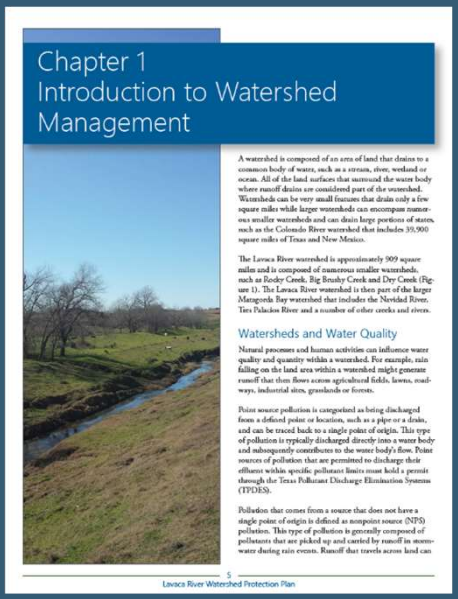
Chapter 1 – Introduction to Watershed Management

- Watersheds and Water Quality
- Types of Pollution
- The Watershed Approach
- Watershed Protection Plans
- Adaptive Management
- Education and Outreach



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 storm-water during rain events. Runoff that travels across land can

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Lavaca River Watershed Protection Plan

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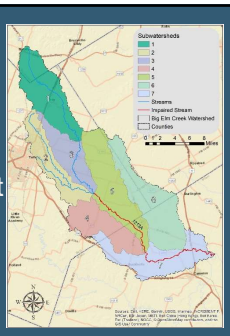
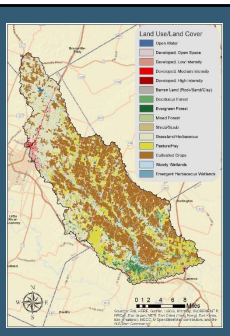
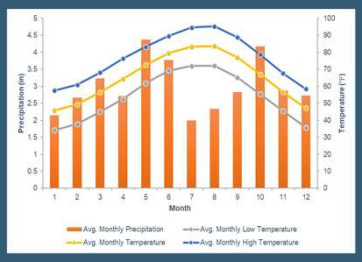
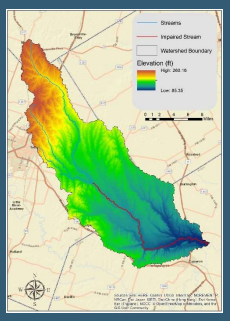
Chapter 2 – Watershed Characterization

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









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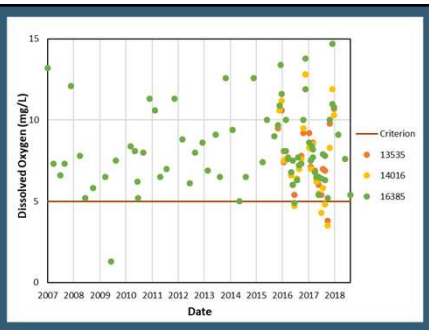
Chapter 3 – Water Quality

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

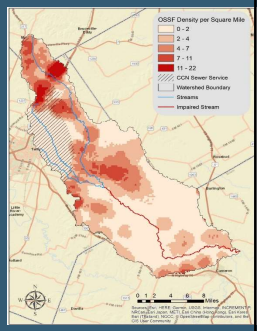


Facility Name	Receiving Stream	Flow (MGD) Permitted	Flow (MGD) Reported (3-year avg.)	Bacteria (cfu/100 mL) Permitted (Daily Average)	Bacteria (cfu/100 mL) Reported (3-year avg.)	Number of Quarters in Violation for Exceedance from 04/2015-3/2018
City of Troy	Kings Branch (1213A_02)	0.3090	0.1317	126	8.84	0
Doshier Farm	Unnamed tributary; Little Elm Creek (1213C_01)	7.50	1.69	126	3.01	0
Town of Buckholts	Lipan Creek (1213A_01)	0.1000	0.0295	126	1.08	4 (4 single grab *E. coli*)

Table 9. Permitted wastewater treatment facilities in the Big Elm Creek watershed

TPDES Permit No.	Facility	AU	Receiving Waters	Final Permitted Discharge (MGD)	Recent Discharge (MGD)
WQ0011263001	City of Troy WWTP	1213A_02	Kings Branch, Big Elm Creek, Little River	0.3090 (daily avg)	0.1215
WQ0010470002	Doshier Farm WWTP	1213C_01	Unnamed tributary; Little Elm Creek	7.50 (daily avg)	2.21
WQ0011875001	Town of Buckholts WWTF	1213A_01	Lipan Creek	0.1000 (daily avg)	0.0233

Table 10. Final permitted discharges and recent discharge of permitted wastewater treatment facilities in the Big Elm Creek watershed



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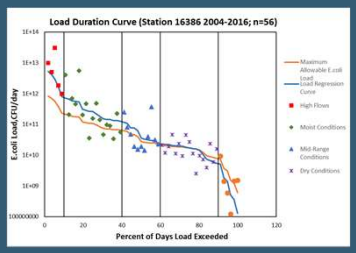
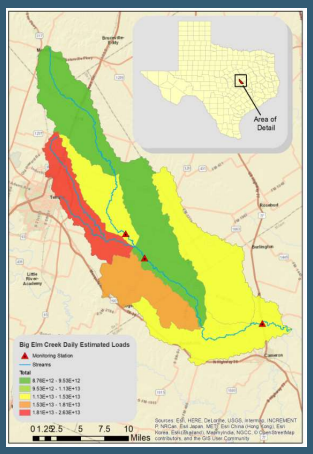
Chapter 4 – Pollutant Source Assessment

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



Pollutant Source	Pollutant Type	Potential Cause	Potential Impact
Livestock	Bacteria	• Runoff from pastures • Overgrazing • Manure transport to streams • Direct deposition into streams	Fecal material and bacteria directly deposited into stream or through runoff
Feral Hogs	Bacteria	Manure transport to streams • Direct deposition into streams • Riparian degradation	Fecal material and bacteria directly deposited into stream or through runoff
OSSFs	Bacteria	• System failure • Improper design	Insufficiently or untreated water runoff to streams
Domestic Pets	Bacteria	• Increased runoff from impervious surface • Improper disposal of pet waste	Increased velocity and volume of storm water quickly transport bacteria laden water to streams
Permitted discharges/SSOs	Bacteria	• Inflow and infiltration • Overloaded or aging infrastructure	Untreated waste enters water body

Table 12. Summary of potential bacteria sources contributing to Big Elm Creek watershed impairments



Pollutant Source: Feral Hogs			
Problem: Direct and indirect fecal loading, riparian habitat destruction, soil damage from rooting.			
Objectives: - Reduce fecal contaminant loading from feral hogs - Reduce hog population - Reduce food supply for hogs - Provide education and outreach to stakeholders			
Location: Entire Watershed			
Critical Areas: Riparian areas and travel corridors from cover to feeding areas			
Goal: Manage the feral hog population through available means in efforts to reduce the total number of hogs in the watershed by 15% (2188) and maintain them at this level			
Description: Voluntarily implement efforts to reduce feral hog populations throughout the watershed by reducing food supplies, removing hogs & educating landowners on hog removal techniques			
Implementation Strategy			
Participation	Recommendations	Period	Capital Costs
Landowners, Land Managers, & Lessees	• Voluntarily construct fencing around deer feeders to prevent feral hog use • Voluntarily identify travel corridors and employ trapping and hunting in these areas to reduce hog numbers • Voluntarily shoot hogs on sight; ensure that lessees shoot hogs on sight	2019-2029	$200 per feeder N/A N/A
Texas A&M AgriLife Extension Service	Deliver Feral Hog Education workshops	2019,2022, 2026	$7,500 ea
Estimated Load Reduction			
Removing feral hogs will reduce bacteria, nutrient and sediment loading in the watershed and direct deposition to waterbodies. This will primarily reduce direct deposition since hogs spend most of their time in riparian corridors. Sediment loading will be reduced through less landscape destruction. Feral hogs are estimated to contribute 5.07E+14 cfu of E. coli to the watershed daily. Reducing the population by 15% yields a maximum annual load reduction of 1.38E+15 cfu when a reasonable attenuation factor assumes that 25% of the fecal bacteria deposited by feral hogs occurs within the riparian corridor. Information is not available on nutrient or sediment contributions from feral hogs; however, it is assumed that a 15% reduction in hog population produces a significant pollutant reduction.			
Effectiveness	Moderate: Reduction in feral hog population will result in a direct decrease in bacteria and nutrient loading to the streams; however, removing enough hogs to decrease their overall population will be difficult		
Certainty	Low: Feral hogs are transient and adapt well to their environment. They move freely due to food and habitat availability, and hunting/trapping pressure. Removing 15% of the population each year will be difficult and is highly dependent upon the diligence of watershed landowners and lessees.		
Commitment	Moderate: Landowners are actively battling feral hog populations and will continue to do so as long as resources remain available. Hogs adversely affect their livelihood		
Needs	Moderate: Funds are needed to provide education and outreach to further inform landowners about feral hog management options, adverse economic impacts		

Table 13. Available pasture and rangeland practices to improve water quality.

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

- Introduction
- Management Measures

Chapter 6 – Resources to Implement the WPP

- Introduction
- Technical Assistance
- Financial Sources

Technical Assistance	
Management Measures	**Potential Sources**
MM1: Promote technical and direct operational assistance to landowners for feral hog control	AgriLife Extension, TPWD,NRCS, TSSWCB
MM2 : Promote and implement Water Quality Management Plans or Conservation Plans	AgriLife Extension, NRCS,TSSWCB, local SWCDs
MM3: Identify inspect and repair or replace failing on-site sewage systems	AgriLife Extension, McLennan County, Bell County, Milam County
MM4: Reduce the amount of pet waste mixing into waterbodies	Cities, Counties, HOAs AgriLife Extension
MM5: Implement and expand urban and impervious surface stormwater runoff management	City public works department , AgriLife Extension
MM6: Identify potential wastewater conveyance system failure and prioritize system repairs or replacement	WWTF operating entities, City public works department, contractors, consulting engineers
MM7: Reduce illicit dumping	AgriLife Extension; county law enforcement; TPWD game wardens
MM8: Conduct soil test for both agriculture and urban areas	AgriLife Extension, TWRI, Counties
MM9: Additional monitoring on the upstream and downstream close to landfill areas	AgriLife Extension, TWRI, Counties
MM10: Conduct old and new landowner education workshop program	AgriLife Extension, TWRI, Counties

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Chapter 7 – Education and Outreach

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

Education and Outreach Activity	Responsible Party	Number Implemented Time Frame (year) 1-3	4-6	7-10	Cost
General Resource Management Programming and Resources					
Texas Watershed Steward Trainings	Texas A&M AgriLife Extension	---	1	1	N/A*
Texas Well Owner Network Training		1	1	---	N/A*
Texas Riparian Ecosystem Trainings		1	1	---	N/A*
Watershed Newsletter	Watershed Coordinator	3	3	4	$5000
Cattle and Other Livestock					
Lone Star Healthy Streams Training	Texas A&M AgriLife Extension Service	1	1	1	N/A*
Forage Management Seminars (Nutrients, Pesticides, Water Quality)		3	3	4	N/A*
Management Practice Field Days	Texas A&M AgriLife Extension Service/Watershed Coordinator/NRCS	2	2	3	N/A*
Feral Hog Education and Outreach Programming					
Feral Hog Management Workshops	Texas A&M AgriLife Extension Service/TPWD	3	3	4	$7,500
OSSF Management Programming					
OSSF Owner Education and Outreach	Texas A&M AgriLife Extension Service/ Counties /TWRI	3	3	4	$30,000
OSSF Installer & Maintenance Provider Training		2	2	2	$18,000

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Chapter 8 – Measuring Success

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

Management Measure	Responsible Party	Unit Cost	Implementation Goals (years after implementation begins)* 1 2 3 4 5 6 7 8 9 10	Total Cost
Livestock				
Develop 30 WQMPs/ conservation plans.	TSSWCB, SWCDs,NRCS	$15,000 per plan	6 12 18 24 30	$450,000
Lone Star Healthy Streams Programs	Texas A&M AgriLife Extension Service	N/A	Once every year	N/A
Feral Hogs				
Install feral hog enclosures.	Landowners	$200 per feeder	As many as possible	N/A
Feral Hog Removal	Landowners	N/A	15% reduction or 2,188 hogs/year	N/A
Feral hog removal workshop	Texas A&M Extension Service	$7,500 each	3	$22,500
OSSFs				
Develop OSSF repair/replacement program.	Watershed Coordinator, counties, AgriLife Extension	N/A	1	N/A
Identify and inspect failing OSSFs	Homeowner, county DR or contractor	$7,500 per system	6 12 18 24 30	$225, 000
Pet Waste				
Install and maintain pet waste stations. est 25 stations	Cities, Counties, HOAs	~ $85/year/station	5 5 5 5 5	$2,125
Develop educational and outreach materials.	Cities, AgriLife Extension, Watershed Coordinator	N/A	Develop and deliver annually	N/A
Urban Stormwater				
Identify and install potential stormwater BMP projects.	Cities, property owners, contractors	$4000 to $45,000/acre treated	As many as possible	N/A
Centralized Wastewater				
WWTF conveyance system testing to ID inflow and infiltration problem areas	WWTF Operating Entities	$3000-$10000/site	As many as possible	N/A
Repair or replace WWTF conveyance infrastructure	WWTF Operating Entities	N/A	As many as possible	$~26.9Million
Illicit Dumping				

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Appendix A – Potential Load Reductions

Appendix B – Load Reduction Calculations

Appendix C – Elements of Successful Watershed Protection Plans (9 elements)

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- Next Steps….
  - Comments/Questions
  - Submit to TCEQ

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Texas Riparian and Stream Ecosystem Workshop

- November 13
  - TWRI
  - AgriLife Extension
  - Texas A&M Forest Service
  - TPWD
  - NRCS
- Oscar Store outside of Temple
- Indoor/Outdoor
- CEU's available
- Free to Attend
  - Lunch $15, or bring your own
- RSVP by Nov 7th
- Contact Clare Entwistle
  - clare.entwistle@ag.tamu.edu
  - https://twri.tamu.edu/our-events/2019/november/texas-riparian-stream-ecosystem-training-big-elm-creek-watershed/