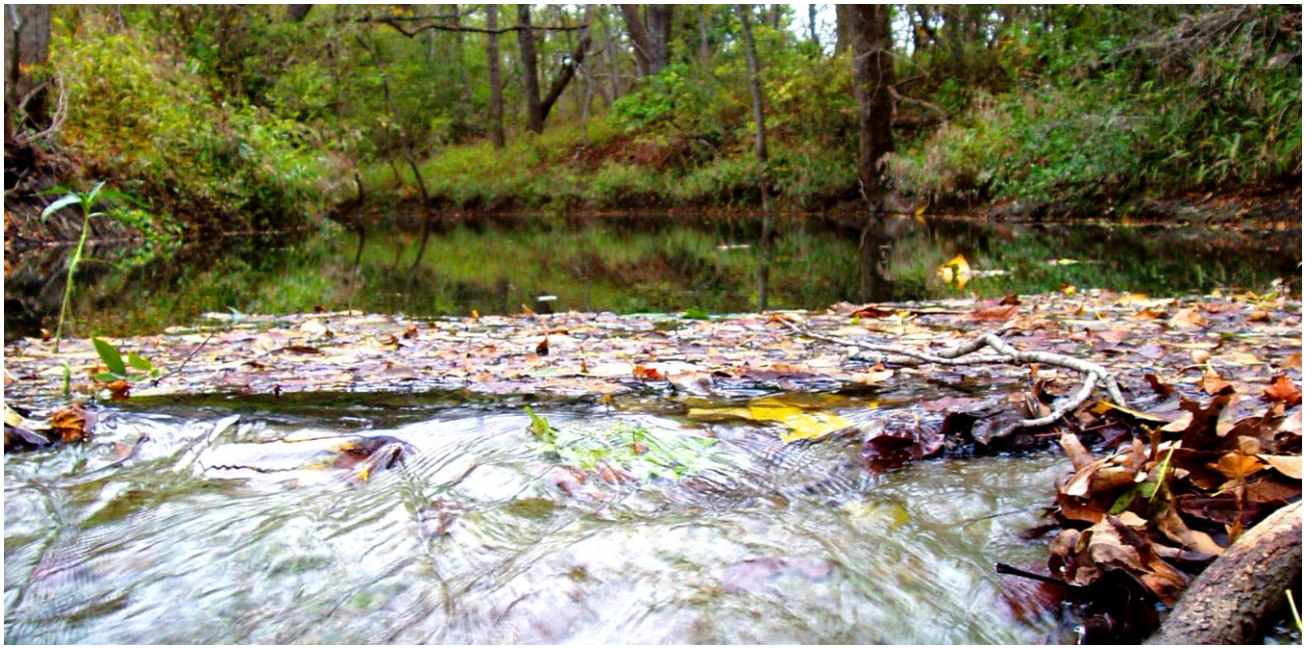
Plum Creek Watershed Protection Plan Final Report

DEVELOPED BY

THE PLUM CREEK WATERSHED PARTNERSHIP

October 2012



Plum Creek Watershed Partnership

2012 Plum Creek Watershed Protection Plan

Final Report (Project # 08-07)

Prepared for the
Plum Creek Watershed Partnership
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Overview

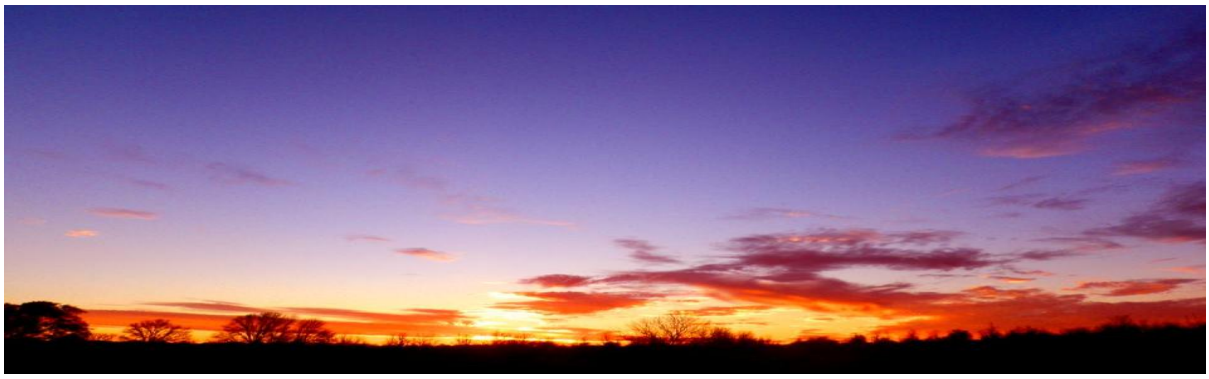
The Plum Creek Watershed Partnership completed and began implementation of the Plum Creek Watershed Protection Plan in February 2008 in an effort to guide the restoration and protection of water quality in Plum Creek and its tributaries. Since that time, significant changes have taken place in the Plum Creek watershed. The region has endured the most severe drought on record, resulting in all but those areas immediately below springs or effluent discharges running dry. Dry conditions in the Plum Creek watershed throughout most of 2007-2011 dramatically impacted the landscape and substantially affected pollutant loading characteristics throughout the watershed. In addition, large swaths of the watershed have been transformed by the continued construction of State Highway 130. New commercial and residential development has followed this work and also has continued in the area around Kyle and the Interstate 35 corridor. These changes have altered land use and management in many areas, affecting the implementation of some strategies.

Acknowledging and understanding these shifts in the watershed are key to adaptive management, as the most appropriate actions for some areas likely will change over time as a result. Combined with continued intensive water quality monitoring of the watershed, necessary adjustments can be made in response to these shifts to enable continued progress toward the water quality goals established in the plan.

Successful watershed management is neither a simple, predetermined series of steps nor a “quick fix” that guarantees watershed improvement. Rather, it is a long-term commitment to stewardship of water and other ecological resources. To maintain the greatest likelihood of success, consistent re-evaluation and adaptive management based on new data and observed trends in the watershed is critical.

This document functions as:

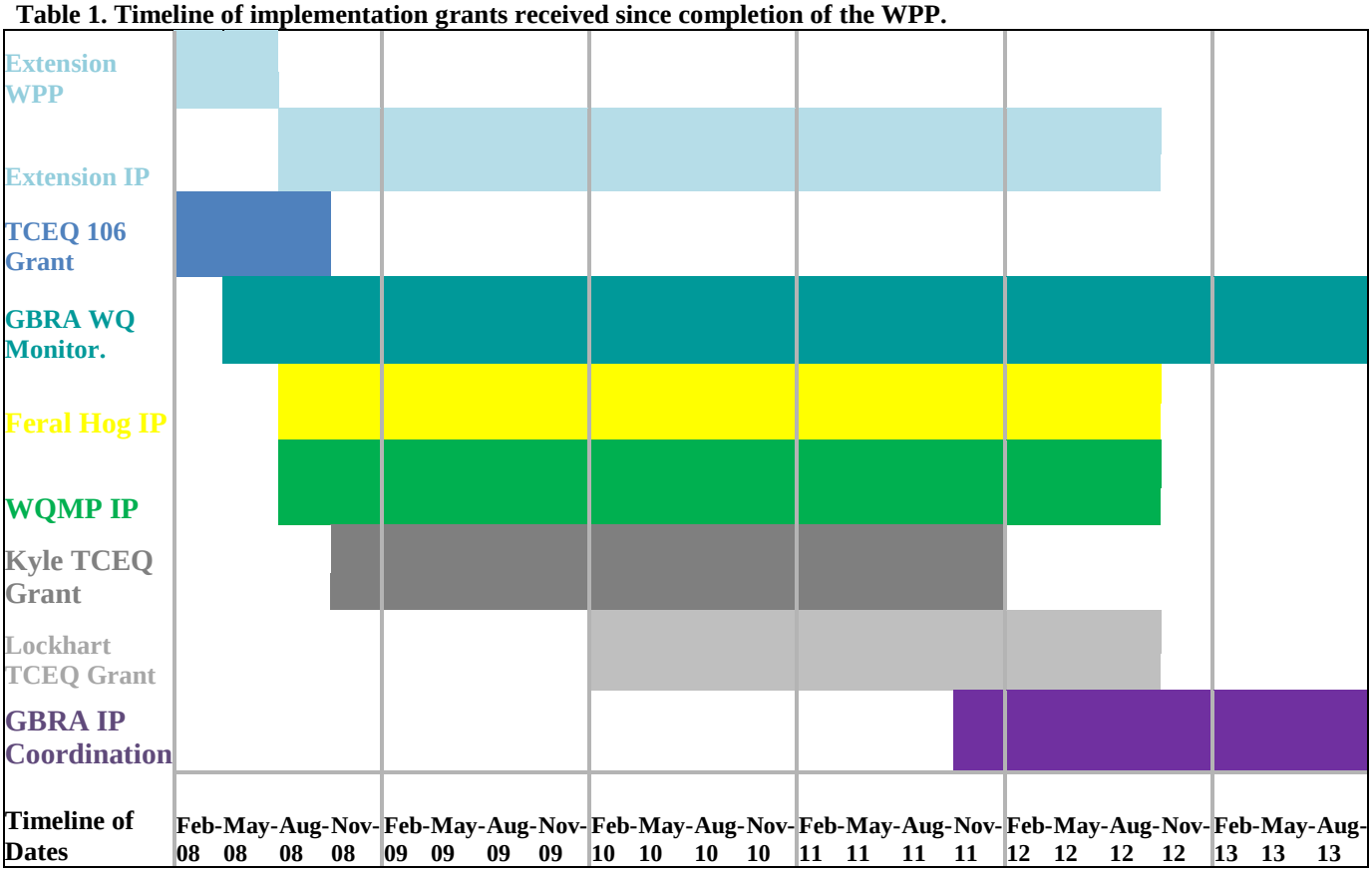
- a final report on efforts implemented in Plum Creek since the initial release of the Plum Creek WPP in February 2008 through October 2012
- a modification to the goals and strategies indentified in the WPP, the implementation schedule, interim milestones, and supporting documentation
- an analysis of collected water quality data to ascertain interim progress in achieving water quality restoration



Progress Toward Implementation Milestones

The Plum Creek Watershed Protection Plan was designed by the local steering committee and partnership to identify strategies, management measures, outreach and education within the watershed to reduce pollutants and improve water quality in the Plum Creek Watershed. Since the completion of the WPP the Partnership has accomplished many of these measures, which are outlined in this update. Table 1 shows the timeline of grants received during implementation. An analysis of water quality data is also included in this update. Figure 1 identifies subwatersheds within each monitoring region as established in the WPP. These subwatersheds were used to prioritize areas for implementation.

Table 1. Timeline of implementation grants received since completion of the WPP.



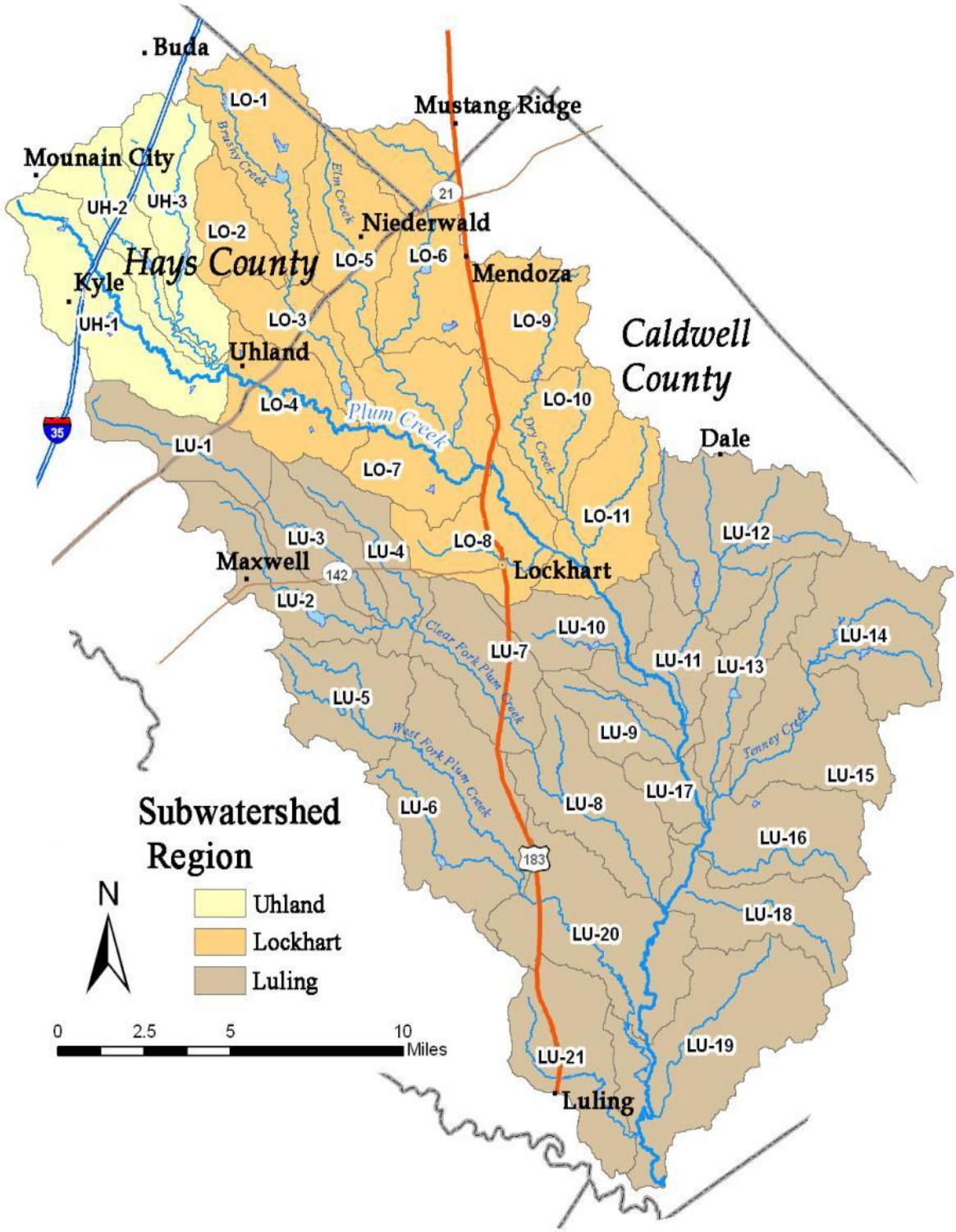


Figure 1. Subwatersheds identified for Plum Creek.

Urban Stormwater Management

Urban development continues to be an increasingly critical issue in the watershed, and implementation of management measures in these areas will be extremely important. The Partnership has engaged Kyle, Lockhart, Luling, and Buda to implement strategies in the WPP and identify additional strategies that meet city needs and supplement water quality improvement efforts. The I-35 Corridor has seen a huge increase in development and growth between Austin and San Antonio. A large swath of the watershed has been transformed by the continued construction of State Highway 130. New commercial and residential development have followed this work and will most likely continue in the area around this new corridor that extends from Austin to Seguin (Figure 2).

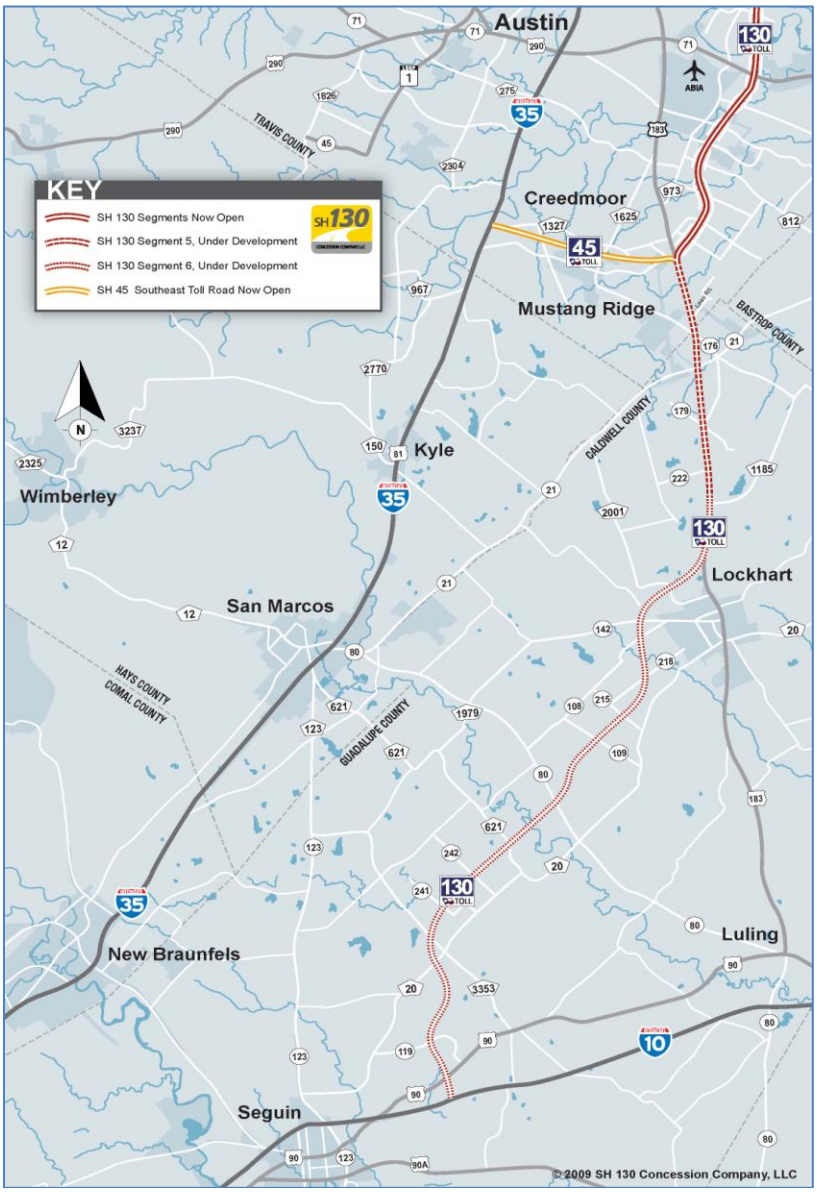


Figure 2. Maps showing locations of SH 130 Segments 5 & 6 through Plum Creek Watershed.

The City of Buda is included as part of the Urbanized Area of the City of Austin as defined by the 2000 Census (Figure 3), and thus falls under Phase II MS4 requirements. The City of Kyle has seen tremendous growth over the last several years and has a current population of 28,016 (2010 Census). Kyle has not yet reached the total population threshold to be under Phase II MS4 requirements based on the 2010 Census (Tables 2 and 3). The urbanized area maps based on the 2010 Census have not been released. Implementation thus far primarily has focused on voluntary efforts to meet the requirements of the MS4 program in cities throughout the watershed.

Table 2. Updated Table 2.2 showing the population of incorporated cities completely or partially within the watershed based on the 2000 and 2010 Census. Source: Texas State Data Center and Office of the State Demographer.

City	2000 Census Population	2010 Census Population	Percent Change
Buda	2,404	7,295	203
Kyle	5,314	28,016	427
Lockhart	11,615	12,698	9
Luling	5,080	5,411	7
Martindale	953	1,116	17
Mountain City	671	648	3
Mustang Ridge	785	861	1
Niederwald	584	565	-3
Uhland	386	1,014	163

Table 3. Updated Table 2.3 showing the population of counties partially within the Plum Creek Watershed based on the 2000 and 2010 Census. Source: Texas State Data Center and Office of the State Demographer.

County	2000 Census Population	2010 Census Population	Percent Change
Caldwell	32,194	38,066	18
Hays	97,589	157,107	61
Travis	812,280	1,024,266	26

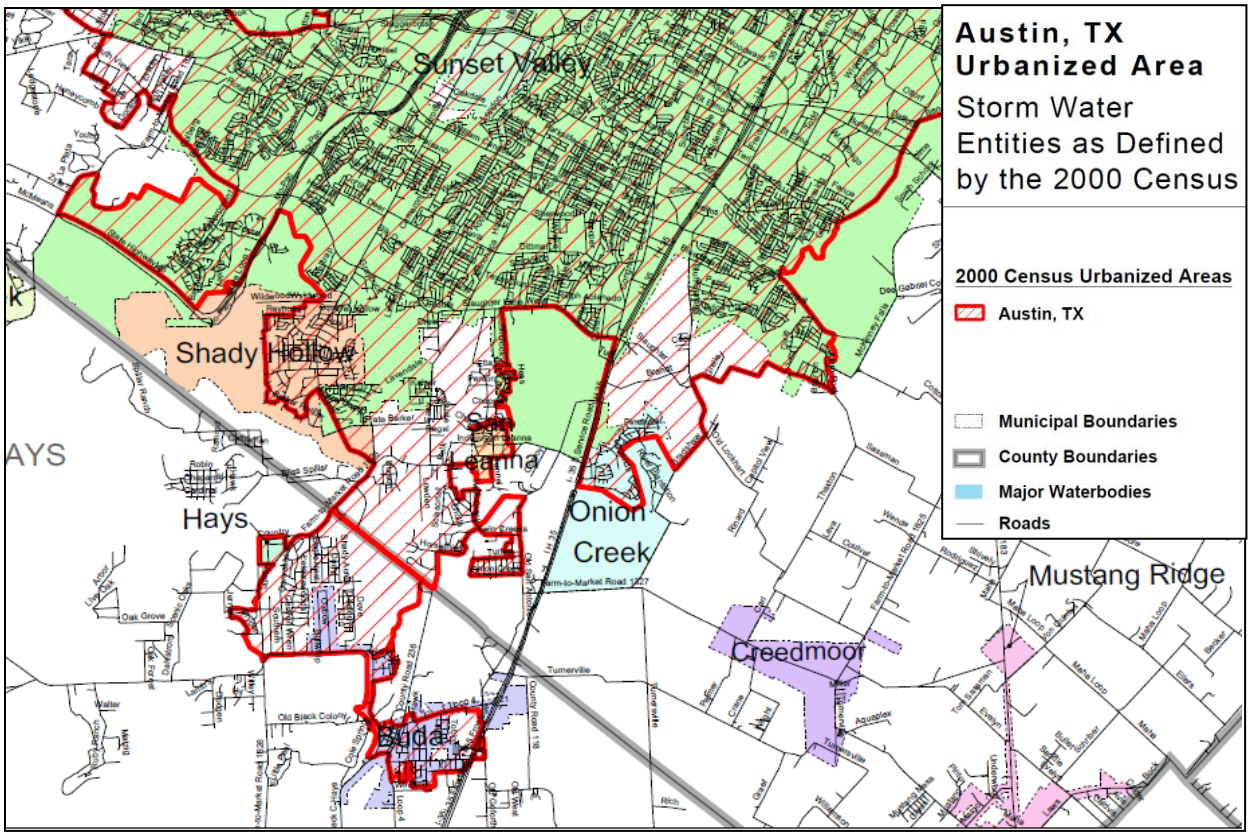


Figure 3. Lower portion of Austin urbanized area map of stormwater entities as defined by the 2000 Census; includes the City of Buda.

As an integral part of the urban stormwater management effort in Plum Creek, the Partnership worked to assist the cities of Lockhart and Luling with development of project proposals which were submitted to TCEQ for CWA §319(h) funding. The City of Lockhart accepted and signed their grant and the grant was executed in August 2010. The City of Luling determined it was unable to accept the urban implementation grant due to changes in economic conditions during the interim period from proposal submission to contract delivery, largely due to the inability to meet matching requirements within the new and compressed project timeframe.

Grant programs are important for nonpoint source management efforts in the urban sector. However, consideration must be given to the fiscal limitations of small cities and the extent to which short-term fluctuations in revenue can impact activities and programs. With worsening economic conditions, cities and particularly smaller cities have become less financially capable of undertaking reimbursable grant projects that require significant matching funds. Unfortunately, it is often these smaller communities that have the greatest need for this financial support to implement or enhance their nonpoint source management efforts. Application review should be streamlined to the greatest extent possible to facilitate timely review/approval and project implementation. In addition, mechanisms for providing assistance to cities for proposal development, including identification of creative and functional matching strategies, should be developed. The Partnership will continue to work with TCEQ and the cities, to achieve urban stormwater management milestones identified in the WPP.

URBAN STORMWATER MANAGEMENT

Street Sweeping

The Cities of Lockhart and Luling already had implemented street sweeping programs with city funds prior to the WPP. The Cities of Buda and Kyle each purchased street sweepers with city funds and initiated sweeping programs in priority areas starting at the end of 2008. Kyle has swept 8,854 miles of roadways from October 2008-May 2011 with a new vacuum sweeper pictured below in Figure 4. Lockhart is currently sweeping an average of 50-60 miles per month or about 660 miles/year. Buda has 35 miles of streets that are swept multiple times annually. Luling city maintenance crews plan to maintain an existing program in which all city streets are swept at least monthly. Sweeping efforts will continue to be adjusted to account for new development, with expansion of frequency and coverage as necessary and possible.

Figure 4. New street sweeper purchased by the City of Kyle.

Urban Stormwater Assessments and Mapping

To identify the most effective locations for the installation of structural stormwater controls, the Cities of Kyle and Lockhart incorporated comprehensive urban stormwater assessments into their TCEQ CWA §319(h) grants. The City of Kyle has mapped their entire system of 1,843 storm drain inlets, 261 storm drain outlets, and 750 stormwater manholes using GIS. These analyses have enabled evaluation of current stormwater flows and conveyance systems, identified needs, and supported optimal placement of additional controls.

Lockhart is in the process of mapping their stormwater system including over 288 inlets. The initial data were used to identify needed locations in the downtown area for markers and inlet filters. Mapping the stormwater system is also a key step for planning and conducting an illicit discharge survey. The mapping and assessment will be used to identify needs and determine need for and optimal placement of additional controls.

Urban Stormwater Markers, Inlet Protection Filter Devices, and No Dumping Campaigns

The City of Kyle has installed “no dumping” markers on all storm drain inlets throughout the city limits (Figure 5), and developed and distributed over 250 copies of a fact sheet on storm drain dumping at various meetings and events including the Kyle Cleanup Event. The fact sheets are available at City Hall and online.

Figure 5. No dumping markers on storm drains in Kyle and Lockhart.

The City of Lockhart's TCEQ CWA §319(h) project included funds to purchase and install 262 stormwater inlet tiles throughout town and storm inlet protection filter devices are now in place at 80 locations in downtown. These devices reduce NPS pollution in the form of grass clippings, leaves and debris (Figures 5 and 6).

Figure 6. Lockhart storm drain inlet protection and storm drain marker.

Retention Retrofits

As part of the TCEQ CWA §319(h) project in the City of Kyle (subwatershed UH-1), two runoff control structures that receive stormwater from a number of nearby subdivisions have undergone a retrofitting process to facilitate water quality treatment in addition to providing flood control. Retrofit #1 at the Lower Plum Creek located at Steeplechase Park detention facility to reduce

pollution and improve water quality as it moves through this facility was completed in September 2011 at a cost of $54,938 (Figure 7). Retrofit #2 on Upper Plum Creek is located at Spring Branch Subdivision in an area where the stormwater flow from multiple subdivisions come together in a drainage swale or channel that is being retrofitted to improve water treatment of storm water for a cost of $52,146 (Figure 8). Total Engineering costs for these two projects have totaled $49,007.

Luling Stormwater Structure

Rehabilitation of the retention structure near the City of Luling has not moved forward and is unlikely to do so in the near future. The structure on Salt Branch (incorrectly identified as Cottonwood Creek in the WPP) is located on private property. While the City of Luling expressed some interest in the project, the landowner has not been receptive.

Ordinance to Include the Use of Mulch Tubes

The City of Kyle developed and approved (November 1, 2011) an ordinance to require the use of mulch tubing in areas of high runoff or environmental sensitivity. Consistent with the new ordinance, the city plans to install mulch tubing along a retrofit project in Steeplechase Park.

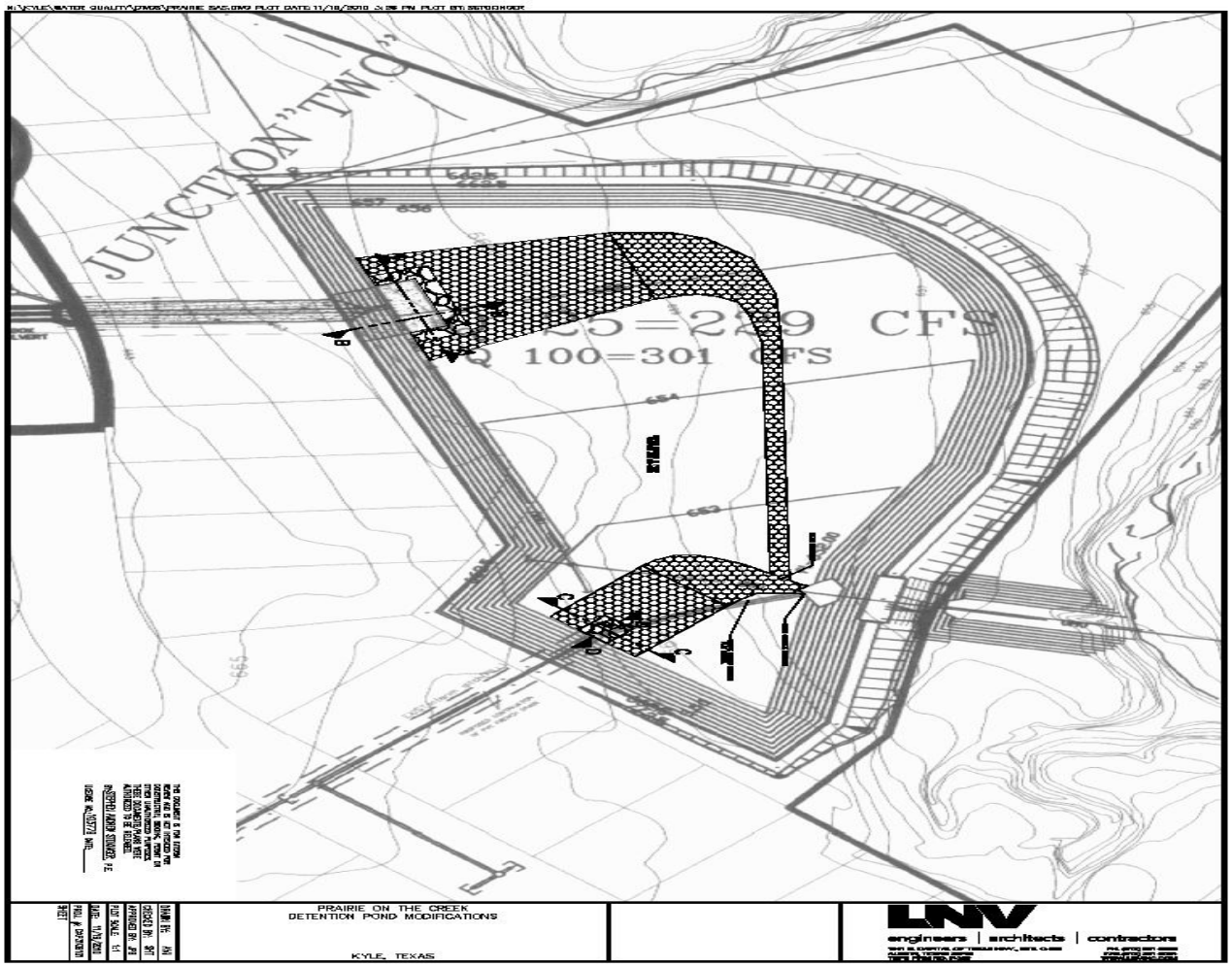


Figure 7. Retrofit Design #1 for Lower Plum Creek at the Steeplechase Park Detention Facility.

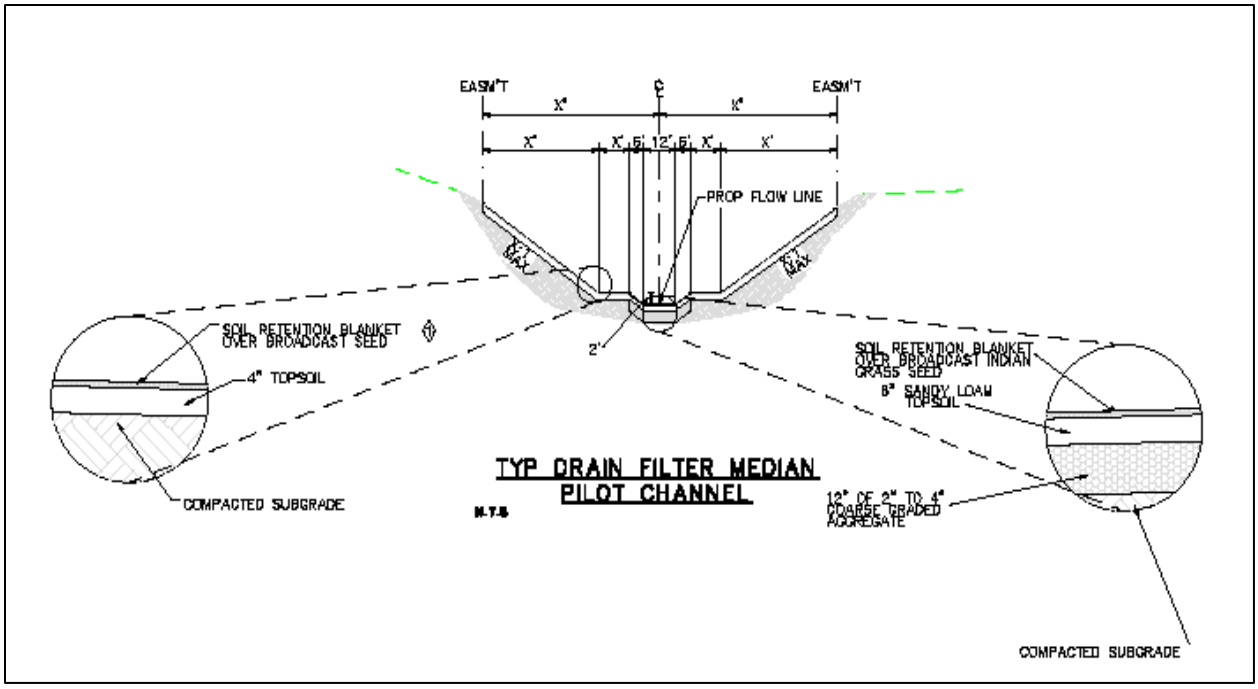


Figure 8. Retrofit #2 Design of Upper Plum Creek drainage swale at Spring Branch Subdivision.

Stormwater Management and Illicit Discharge Survey

The City of Lockhart's TCEQ CWA §319(h) project includes funds for an illicit discharge survey. In addition to the stormwater mapping and control plan, and installation of stormwater inlet tiles and inlet protection filter devices, city staff will conduct an illicit discharge survey of the stormwater system to assess the nature of dry weather flows and determine the need for further action. The QAPP is under development.

Urban Waterfowl Management

The City of Lockhart identified a large domestic waterfowl population in City Park as a potential bacteria source. In 2008, resident ducks from the City Park pond were reduced by 60% as they were relocated to a pond on a large landowner's property outside of the City of Lockhart. The other 40% of the duck population remained within the large pond in the park. The City notes that, under normal conditions, the pond does not discharge to Town Creek or Plum Creek. Based on comments received from citizens regarding the aesthetic value of the ducks in the park, the City has decided to no longer manage the duck population within the park and to not remove the remaining 40%.

Dog Waste Management

As the local human population continues to grow, it is likely that the pet population will keep pace. Initial dog population estimates utilized in the planning process were based on household data from the 2000 Census. Current numbers for both are undoubtedly higher as shown by increasing population numbers in the 2010 Census data (Table 2). To address this component of urban stormwater, the Cities of Kyle, Buda and Lockhart each have enacted pet waste ordinances requiring proper disposal in parks and public areas. More recently, the City of Luling is evaluating the potential of an addendum to include a pet waste ordinance to their existing pet ordinance. Pet waste stations with bag dispensers and waste receptacles and signage encouraging

their use have been installed throughout the City of Lockhart's park system and in Kyle's Steeplechase and Gregg-Clark Parks (Figure 9). Six of these stations were supported by CWA TCEQ §319(h) funds in Kyle and by city funds in Lockhart. The City of Buda utilized city funds to purchase 4 pet waste stations to place in city parks in the middle of 2011.

Each spring in Kyle, a community clean-up event is conducted in Steeplechase Park, which is bisected by Plum Creek. In 2009, approximately 550 dog droppings in the park were marked for removal prior to installation of 13 pet waste stations in conjunction with the event, including several in Steeplechase Park. On the day of the clean-up event in 2010 and 2011, only 128 and 175 dog droppings were present representing 76% and 68% reductions.

Figure 9. Pet waste stations installed in City Parks in Lockhart and Kyle.

Enforcement of existing ordinances and education of pet owners remain priorities. Public education campaigns are in place in Kyle and Lockhart to promote proper pet waste management and will be supplemented through the CWA TCEQ §319(h) projects in these cities.

TSSWCB utilized CWA §319(h) grant funding for the purchase of 37 new pet waste stations in August 2011, including pet waste stations for Kyle (3), Buda (18), Lockhart (10), and Luling (6). The cities will install and maintain these stations into the future. The installation of these stations approaches the goal for pet waste stations established in the WPP.

Hays County Development Regulations

In July 2011, Hays County adopted regulations to provide a framework for the orderly and efficient development of rural and suburban areas outside of incorporated cities. The purpose of these regulations is to implement the powers and duties of the County authorized under the Texas Water Code, the Texas Health and Safety Code, the Texas Local Government Code and other laws, to establish the policies of the Commissioners Court and to set forth procedures to be followed in County proceedings in regulating certain activities associated with development in Hays County. The regulations are designed to simplify procedures, avoid delays, save expense, and facilitate the administration and enforcement of laws and regulations by the County. The regulations are consistent with the WPP goals of improving water quality from stormwater, construction sites, and wastewater from new development and were supported by the PCWP.

Wastewater Management

Compared with work to address other potential sources, efforts to secure funding to enhance wastewater management for both centralized treatment facilities and private septic systems have not been as successful. Permit renewal and the inherent difficulties of making substantial voluntary capital investments during unfavorable economic conditions have combined to prevent significant progress to date toward treatment improvements for centralized systems. Likewise, improved management of septic systems continues to be hampered by limited inspection/ enforcement, as well as by inadequate resources to assist economically limited homeowners. However, some accomplishments as described below have provided water quality benefits and will help guide future progress. In the WPP, the Partnership identified several common goals and strategies for wastewater treatment facilities. Based on the East Hays County Wastewater Compact and in order to reduce nutrient loading to Plum Creek, the Partnership strongly recommended that wastewater treatment facilities strive to achieve 5-5-2-1 treatment levels. The Partnership recommended that existing facilities voluntarily work towards this increased treatment and that new facilities apply for TPDES permits with these requirements. The Steering Committee now clarifies that zero discharge, land application of wastewater effluent would result in greater pollutant loading reductions. The Partnership recommends that new wastewater treatment facilities consider Texas Land Application Permits (TLAP) as an alternative to dispose of treated effluent.

WASTEWATER MANAGEMENT

Regional Water and Wastewater Planning Studies

In addition to the previous Regional Wastewater Facility Planning Study for Eastern Hays County completed prior to WPP development, Hays County and Caldwell County have both conducted a Water and Wastewater planning study with funding from TWDB. The Caldwell County study was sponsored by the county and GBRA in August 2009 and focused on water supply planning for future development and current availability and viability of proposed regional water projects. However, water supply strategies investigated in this study were limited to those already listed in TWDB planning documents. The study also addressed future wastewater management needs for both septic systems and centralized treatment, with recommendations closely aligning with those in the WPP to reduce the potential for pollutant loading. The recommended regional wastewater treatment facilities are based on a regionalization concept that will ultimately provide four regional wastewater facilities in the county (Figure 10). These facilities will be sized and phased to accommodate growth and enable reuse of reclaimed water.

Hays County commissioned a Water-Wastewater Facilities Plan to assess current conditions and water and wastewater service demand and supplies, make alternative forecasts of future growth and associated service needs and define current and future unmet needs. Also included was an assessment of alternative management strategies for addressing unmet needs and identification of preliminary recommendations of water management actions needed in the next 50 years. The study focuses primarily on the area west of the IH-35 corridor cities. The study was sponsored by the Hays County Commissioners Court with funding support from the Texas Water Development Board and ten regional and local government entities and utilities with jurisdiction over portions of the planning area.

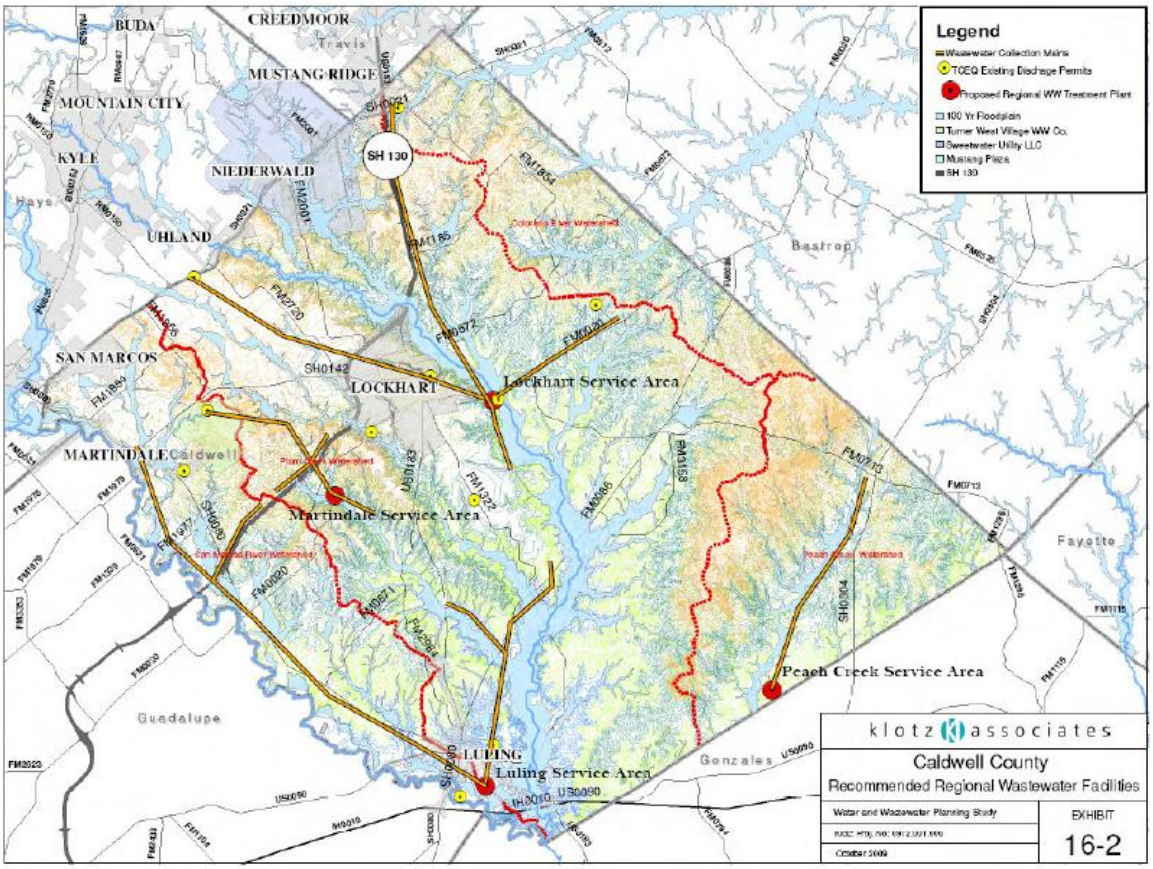


Figure 10. Recommended regional wastewater facilities in Caldwell County.

Kyle Water Reuse Feasibility Study

The City of Kyle is conducting a study of the feasibility of implementing the Region L water supply strategy of using reclaimed water from WWTF effluent by identifying potential users and costs of expanding an existing single user system. The one year study is 100% grant funded through 50% by TWDB and 50% from Bureau of Reclamation. Study objectives include: identifying viable means of implementing the regional objective of conserving the Barton Springs/Edwards Aquifer groundwater resources and Guadalupe River surface water resources through water recycling and reuse; reduce the annual discharge of nutrients to Plum Creek; Provide sustainable water sources for the continued growth of Kyle, Meet the increasing recreation service expectations of a growing community. Plum Creek Watershed Partnership is represented on the Technical Advisory Group and attended the kickoff meeting on September 28, 2011. The project will be completed in November 2012.

Buda Water Reuse Projects

The City of Buda has almost completed its Wastewater Treatment Plant (WWTP) Expansion from 0.95 MGD to 1.5 MGD. As part of this expansion project, the city has installed reuse pipe from the WWTP to the City Park property on the south side of the WWTP. The city is in the process of obtaining a Chapter 210 permit modification from TCEQ to allow the distribution of reuse water to additional locations that were not included in the original permit authorization. A bulk reuse station is being designed for construction immediately south of the Public Works

Department that will allow contractors to utilize reuse water instead of potable water for construction projects. This project will be online later this year.

Several years ago Buda installed purple pipe along most of Main Street from Old San Antonio Road through Stagecoach Park to Public Works, and along Cabela's Drive from Main Street to Old San Antonio Road. These lines were recently tested and are ready to provide reuse water to customers pending final TCEQ approval of the Chapter 210 permit modification. These lines will provide irrigation to the main street medians, City Park, and the sportsplex. In addition, there is potential for use of this water for irrigation by Cabela's, the new Microtel Hotel, the new Noah's Ark Self Storage, the proposed multi-family development at the southwest corner of the Cabela's tract, Creekside Villas, Texas Lehigh Cement, and by Nighthawk Foods for reuse water to replenish their cooling towers.

Regional Wastewater Compact

Both Regional Water and Wastewater Planning Studies resulted in the development of draft compacts between local municipalities and counties. Neither compact has been signed by all parties. The Eastern Hays County Wastewater Compact was a goal of the Partnership, but there were no further agreements beyond the initial signatories of the City of Niederwald, Hays County, and GBRA. The Caldwell County Wastewater Compact was drafted following the same recommendations. Through the WPP process the ideas in the compact were discussed again with the current city councils and commissioner courts and included in the WPP as wastewater measures. The recommendations of the compact were included and approved as recommendations in the WPP that was signed by the Steering Committee including members representing all of the cities and counties, covering the entire watershed. Most wastewater treatment facilities renewed their permits during 2008-2010 (see Table 4), so new permit requirements will not be considered until 2013-2015. More Stringent limits to improve effluent remains a high priority in the watershed, despite facing significant financial hurdles associated with improved treatment process costs.

Sewer Pipe Replacement and New Sewer Service

The cities of Kyle, Lockhart, and Luling have budgeted city funds to replace aging wastewater conveyance infrastructure. In some areas, sewer lines consist of outdated clay pipes that are easily damaged and typically are beyond their original design life. These cities continue to move forward with replacement of critical areas within city limits. The Cities have made varied progress in replacing sanitary sewer pipes since the WPP was published. The City of Lockhart has replaced approximately 4,000 linear feet of existing sewer pipes. The City of Kyle has replaced approximately 4,660 linear feet of sewer main and extended new service lines to approximately 50 homes at a cost of about $432,000. The City of Luling extended first-time sewer service to about 50 homes and businesses located within the San Marcos Watershed with 16,672 linear feet of sewer main and service lines for a cost of $1,746,620. The City of Buda installed 2,652 linear feet of new wastewater pipe which replaced 1,500 linear feet of degraded sewer lines for a cost of about $216,000; the City of Buda is in the process of replacing 8,523 linear feet of pipe over the next three years (2012-2014) at a projected cost of $1,467,000.

Table 4. Revised Table 7.3 in WPP. TPDES wastewater discharge permits in Plum Creek Watershed.

FACILITY NAME	Type of Disinfection	MAX PERMITTED FLOW (MGD)	PERMIT NUMBER	EFFECTIVE DATE	EXPIRATION DATE	*E. coli* effluent limit in permit?	*E. coli* effluent monitoring in permit?
KYLE	Chlorine	3/4.5	WQ0011041-002	02/04/2010	02/01/2015	no limit in either phase[1]	no monitoring requirement in either phase[1]
LOCKHART NO. 2 (FM 20 Plant)	UV	1.5	WQ0010210-002	02/04/2010	02/01/2015	126 cfu/100mL daily avg[2]; 394 cfu/100mL daily max	once per day
BUDA	Chlorine	0.6/0.95/1.5	WQ0011060-001	02/16/2010	02/01/2015	no limit in either phase[1]	no monitoring requirement in either phase[1]
LOCKHART NO. 1 (Larremore Street Plant)	Chlorine	1.1	WQ0010210-001	03/04/2010	02/01/2015	126 cfu/100mL daily avg[2]; 394 cfu/100mL daily max	once per week
LULING-NORTH	Chlorine	0.9	WQ0010582-002	05/28/2009	02/01/2014	no limit[1]	no monitoring requirement[1]
RANCH AT CLEAR FORK	Chlorine	0.33/0.7	WQ0014439-001	04/28/2008	02/01/2013	no limit in either phase[1]	no monitoring requirement in either phase[1]
NIEDERWALD (SWEETWATER)	Chlorine	0.075/0.122/0.25	WQ0014672-001	09/21/2010	03/01/2015	126 cfu/100mL daily avg[2]; 394 cfu/100mL daily max	once per quarter
RAILYARDS-PARKLAND	UV	0.35	WQ0014165-001	07/28/2005	02/01/2010	n/a – permit expired	n/a – permit expired
RAILYARDS-VILLAGE HOMES	Chlorine	0.075/0.12375	WQ0014060-001	05/11/2010	02/01/2015	126 cfu/100mL daily avg[2]; 394 cfu/100mL daily max	once per quarter
GOFORTH	Chlorine	0.0424	WQ0013293-001	04/13/2010	02/01/2015	126 cfu/100mL daily avg[2]; 394 cfu/100mL daily max	once per week
SUNFIELD	Chlorine	0.25/0.5/0.99	WQ0014377-001	08/06/2009	02/01/2014	no limit in either phase[1]	no monitoring requirement in either phase[1]
SHADOW CREEK (formerly CASTLETOP)	Chlorine	0.162/0.486	WQ0014431-001	02/22/2010	02/01/2015	no limit in either phase[1]	no monitoring requirement in either phase[1]

[1] Language in "Other Requirements" – The permittee is hereby placed on notice that the Executive Director of the TCEQ will be initiating rulemaking and/or changes to procedural documents that may result in bacteria effluent limits and monitoring requirements for this facility.

[2] Language in "Definitions" defines *daily avg* as the arithmetic average of all effluent samples as required by the permit within a period of one calendar month consisting of at least four separate measurements.

New Discharge Permit in the Plum Creek Watershed

EB Windy Hill, L.P. has applied to the TCEQ for a new permit to authorize the discharge of treated domestic wastewater at a daily average flow not to exceed 0.20 million gallons per day in the interim phase and a daily average flow not to exceed 0.40 million gallons per day in the final phase. The plant will be located south of the end of Mockingbird Lane and approximately 2 miles east of the intersection of Interstate Highway 35 and County Road 122 (Bebee Road) in Hays County. The treated effluent will be discharged to Porter Creek which flows into Soil Conservation Service (SCS) Site 6 Reservoir, to Porter Creek, to Bunton Branch and finally into Plum Creek. The unclassified receiving water has a high aquatic life designated use for the Porter Creek and SCS Site 6 Reservoir portions. The SCS Site 6 Reservoir is designated as a high hazard dam, meaning dam failure may cause loss of life or serious damage to infrastructure; design work for rehabilitation of the Site 6 dam has been approved, but there is currently no funding for construction (see *Other Developments* section for further discussion of high hazard flood control dams). The effluent limitations in the interim and final phases of the draft permit, based on a 30-day average, are 5 mg/l $CBOD_5$, 5 mg/l TSS, 2 mg/l NH3-N, 1 mg/l phosphorus, 126 CFU or MPN of E. coli per 100 ml and 5.0 mg/l minimum dissolved oxygen (DO). The effluent must contain a chlorine residual of at least 1.0 mg/l and must not exceed a chlorine residual of 4.0 mg/l after a detention time of at least 20 minutes based on peak flow.

Voluntary Effluent Monitoring by WWTF

The Buda, Lockhart, Shadow Creek, and Sunfield wastewater treatment facilities in the Plum Creek watershed have voluntarily initiated monthly *E. coli* and even some phosphorus monitoring with their own financial resources. If these parameters are not included in their permit limits, then they are conducting voluntary monitoring and the resulting data are not required to be sent to TCEQ. This monitoring is conducted by each WWTF and is separate from the TSSWCB CWA §319(h) grant for targeted sampling in the Plum Creek watershed that includes monitoring of WWTF effluent.

The Lockhart facilities voluntarily have collected phosphorus data on a periodic basis using their own financial resources. Results of the targeted water quality monitoring program indicate this should be a priority at all facilities to improve understanding of the role of point sources in nutrient enrichment, which appears to be significant. Removing phosphorus remains a high priority in the watershed, despite facing significant financial hurdles associated with improved effluent treatment.

The Partnership also participated in numerous discussions with TCEQ in pursuit of unannounced inspections to provide additional information on loading from point sources. However, no unannounced inspection program has been implemented by TCEQ in the watershed.

New E. coli Effluent Limits and Monitoring Requirements for Permitted WWTFs

As of December 31, 2009, TCEQ, through the Texas Pollutant Discharge Elimination System (TPDES), requires bacteria effluent limits and monitoring requirements in all WWTF permits. These new requirements will be a part of permit language for all TPDES permits for which a Notice of Application and Preliminary Decision is published on or after January 1, 2010. These new requirements will call for periodic *E. coli* monitoring of all facilities, which will provide additional information on the long-term loading potential of point sources in the watershed. Most

facilities in the watershed renewed their permits during 2008-2010, but six of the twelve permits were renewed without the *E. coli* limits and one permit expired. TCEQ responded that these permits may have been in the approval process prior to the rule change to include *E. coli* limits. The new monitoring requirements for *E. coli* limits for the remaining 7 WWTFs will not be considered until 2013-2015 when the next round of permit renewals are scheduled. Table 4 identifies WWTFs in the watershed, their bacteria discharge limits, and those to which TCEQ has applied the new bacteria effluent limits and monitoring requirements.

Phosphorus Removal

Many facilities currently do not have phosphorus limits. As a result, phosphorus concentrations in effluent frequently are significantly greater than the screening criteria, particularly in the effluent and downstream of those facilities without phosphorus limits. The Partnership believes it is imperative that point sources be worked with more closely by the regulatory authorities to reduce these substantial and clearly defined nutrient contributions by changes in the TPDES permit or other innovative methods. Load Duration Curves (LDCs) for nutrients using the State's screening criteria's as the target water quality load were developed at each of the three routine stations. Load reductions for total phosphorus based on the LDCs in the WPP resulted in a need for a 27% reduction at the Uhland Station 17406, 5.4% reduction at the Lockhart Station 12647, and no reduction at the Luling Station 12640.

In a proactive effort, the City of Lockhart agreed to support an effort by GBRA to investigate flow-triggered phosphorus removal from the city's wastewater treatment facility, which is operated by GBRA. This approach was proposed to TCEQ in anticipation of a new phosphorus limit in the facility's TPDES permit. However, TCEQ is still working on new statewide water quality standards for nutrients for freshwater streams and thus did not accommodate the change in monitoring protocol. Consequently, the study was not funded, and the Partnership believes that a valuable opportunity to pilot this method to reduce phosphorus loading to Plum Creek during the most critical flows and to obtain data on this innovate strategy was missed. To the greatest extent possible, agency personnel should strive to support proactive and innovative efforts on the part of watershed stakeholders.

Recommended Facility Upgrades and SCADA

To assist in determining upgrades and expansion efforts necessary to achieve the goals outlined in the East Hays County Wastewater Compact, wastewater engineer Martin Rumbaugh volunteered time to visit wastewater treatment facilities in Kyle, Lockhart, and Luling. Following informal inspections of infrastructure, general recommendations and cost estimates for increased levels of treatment were provided to operators of each facility. While these improvements have been encouraged, they largely have not been undertaken due to the need for increased financial investment.

A recommendation for all of the systems was to obtain funding to put lift stations and WWTFs on SCADA systems. After the recent wastewater spill in Kyle of over a million gallons into the Plum Creek and subsequent fish kill, Kyle and AquaSource, Inc. installed a SCADA system at the Kyle plant in November 2011. The City can receive data that indicate effluent depth at the wastewater lift station, helps monitor the WWTF for a possible overflow, and allows the City to contact the operators of the plant if there are any concerns.

AgriLife Extension worked with the City of Luling to develop an application for the 2009 TWDB Clean Water State Revolving Fund (CWSRF) assistance program, which received additional American Recovery and Reinvestment Act funds, to upgrade components of the wastewater collection system and install critical components at the wastewater treatment facility. However, this project was not prioritized high enough to be included in the 2009 Intended Use Plan for CWSRF funding. The City of Luling and other watershed municipalities are hesitant to take on debt to implement treatment upgrades that are not part of current TPDES permit requirements, particularly given current economic conditions. This is a critical issue voiced frequently by facility operators and managers. Unfortunately, funding opportunities other than loans are severely limited.

Serious knowledge gaps remain with regard to regrowth of *E. coli in the environment relative to the completeness of disinfection*. In most cases, effluent sampling conducted by GBRA indicates very low levels, often < 10 cfu/100mL. However, downstream concentrations are often much higher, with no known inflows or significant concentrations of potential sources nearby. Understanding the dynamics of regrowth and reactivation of bacteria after the disinfection process of WWTFs is of vital importance to wastewater management and to watershed stewardship as a whole.

Plum Creek Community Installs Wet Well with Bar Screens to Reduce Suspended Solids in Effluent for Reuse

Construction of a new wet well with bar screens began in November 2011 to reduce suspended solids in effluent from the Kyle wastewater treatment plant to be used for irrigation at the Plum Creek Community Golf Course. The bar screens will collect suspended solids, algae, and plastics that have caused pump clogging in the past so they can be sent to a grinder and then pumped back to the front of the WWTP System for retreating.

Septic System Connection to Sewer

The Partnership continues to work with Hays County and the City of Buda on a potential project to connect a 264-home subdivision (Hillside Terrace) located in Plum Creek subwatershed UH-3 to central sewer service. This project is located in Hays County and is in the Buda ETJ. This subdivision has been identified by local citizens and city and county staff as a site of chronically failing septic systems on small lots and is located in a critical subwatershed identified in the watershed planning process as having a high likelihood of impacting water quality. An unnamed tributary of Andrews Branch passes through and drains much of this neighborhood before it flows into Andrews Branch and Porter Creek that meets with Bunton Branch just before entering Plum Creek upstream of the Uhland water quality monitoring site. Pre-application meetings were held with the TWDB Economically Distressed Areas Program. This program provides funding for water and wastewater projects in economically distressed and disadvantaged areas. However, the program requires adoption and use of model subdivision regulations by both the City and County. Through an extended assessment process, it was determined that Hays County had several areas where recently approved and adopted revisions to county development regulations were not sufficient to meet TWDB program requirements. As a consequence, no funding could be obtained through this program.

Subsequently, AgriLife Extension worked with Hays County and the City of Buda to conduct a socioeconomic survey of Hillside Terrace residents and develop an application for the TWDB CWSRF Intended Use Plan for 2012.The survey indicated an annual median household income of $25,500, and qualified the project area as a disadvantaged community with potential to receive up to 70% loan forgiveness. The project is categorized as a nonpoint source project which also places it in a separate ranking category of NPS projects. The Hillside Terrace project for $5,600,000 ranked third in the NPS projects category with a score of a 71, but the small amount of loan forgiveness money was all utilized by the first project. The project was invited to apply for a loan in the full amount of the project, but the City and County declined the loan for this round and will apply again next year if they potentially can receive some of the loan forgiveness funding. Another potential future funding option for wastewater and water issues in the watershed that will be explored is Texas Department of Agriculture's Community Development Block Grant funds.

Wastewater in the Counties

One significant obstacle to addressing septic system contributions to water quality impairment is the general lack of septic system maintenance and inspection requirements. While authorized agents for septic systems in Hays and Caldwell Counties and City of Uhland require newer aerobic systems to have quarterly maintenance contracts and reporting by licensed professionals, conventional systems do not have the same requirements. As a result, maintenance of such systems is frequently neglected, and problematic systems often are reported only when a complaint is filed by a neighbor or other individual. If problems are severe enough to cause surfacing of wastewater, it is very likely that system failure has been occurring underground for an extended period of time. These situations can only be prevented if all systems are required to undergo regular inspection and maintenance. The counties are notified of these generally by complaints turned in by neighbors due to standing water and smell.

Hays County has been tracking their complaints and violations in a database which shows that since 2008, over 208 systems have been in inspected and were in violation and have completed the necessary measures to be back in compliance, by repairs, pumping, disconnecting additional structures or installing new systems.

Due to staff turnover in Caldwell County the history of complaints, violations, and compliance could only be determined from January 2011. Information was available on 37 violations investigated by the County Sanitarian of suspected septic system violations. There have been 21 cases that have been resolved and have their systems back in compliance, nine cases still pending, 7 cases in Justice of the Peace Court. The Caldwell County District Attorney conducted a raid that resulted in 17 cases of septic system violations. Five of the 17 cases have installed new systems, 7 have moved their mobile homes from the area, and the remaining 4 cases are pending.

Caldwell County has a Certified Sanitarian working on OSSF inspections and permitting and an enforcement officer that follows up on violations. There were only a total of 83 new permits requested in 2011 between January 1 and November 30, 2011. Numbers of new OSSF permits did not increase in 2011 as speculated, which would have created the need and revenue for additional staff.

Agricultural Nonpoint Source Management

The Caldwell-Travis SWCD in cooperation with the Hays County SWCD received a TSSWCB CWA §319(h) nonpoint source grant in October 2008 to provide technical assistance for development of TSSWCB-certified Water Quality Management Plans (WQMPs). The grant also provides financial incentives to implement certain BMPs prescribed in the WQMPs. The Caldwell-Travis SWCD hired a technician in May 2009 to provide the technical assistance and implement the program in the Plum Creek watershed within Caldwell and Hays Counties. Initial landowner interest in the program was very low. Most producers have not been in a position to assume new financial obligations during the difficult economic times and in the midst of the extreme drought. Overall, livestock numbers and crop production activities in the watershed have been much lower than in previous years.

These recent weather patterns have substantially affected pollutant loading characteristics in the primary agricultural subwatersheds. Decreased plant cover likely resulted in greater loss of soil and associated nutrients in many areas when rainfall occurred. Although fewer numbers of livestock may have reduced overall bacteria loading during this period, remaining animals may have concentrated near riparian areas with perennial water sources that often provided the only source of forage. Producers are keenly aware of the need to replace lost vegetative cover and continue to seek options for rehabilitating their properties.

AgriLife Extension and the SWCD Technician have promoted interaction between the Steering Committee and the U.S. Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS) Local Work Groups to blend the goals of the Plum Creek WPP with the resource concerns and conservation priorities for the Environmental Quality Incentives Program (EQIP). Recommendations from the Local Work Groups assist USDA-NRCS in allocating EQIP county base funds and with resource concerns for other USDA Farm Bill programs.

The Caldwell-Travis SWCD and TSSWCB continue to investigate and adjust the suite of approved management practices for the program as requests from landowners are received and evaluated. While the maximum reimbursement rate for financial incentives (funded through the 319(h) grant) are set at 60%, the Caldwell-Travis SWCD will continue to adjust the average price of practices to remain competitive with current market rates.

However, policies of participating agencies have in some cases made adjustment of approaches and tailoring programs to local needs difficult. For example, scientific research has shown that alternate shade structures can reduce nutrient and sediment loading to streams related to livestock management. Unfortunately, there is not an NRCS-approved Practice Standard for Texas which sets forth the criteria necessary to ensure the practice achieves its intended purposes. Without a practice standard, financial incentives cannot be provided through either TSSWCB or NRCS. The TSSWCB and Texas A&M University are working to provide the NRCS with the necessary scientific basis to develop a practice standard for shade structures in Texas. An ongoing study at Texas A&M (funded by the TSSWCB) indicates that shade structures may reduce the percent of time cattle spend in riparian areas by 11-31% and thus are expected to result in similar reductions in direct deposition of manure and associated bacteria and nutrients into these areas. It is hoped that this study, which will conclude in May 2012, will result

in the needed policy change. Federal and State agencies provided technical assistance and financial incentives to agricultural producers should seek modifications to existing programs as soon as possible to enable inclusion of new and innovative practices that have been documented to be effective by scientific research.

Adjustments to the program have included an increase from $10,000 to $15,000 maximum per farm for financial incentives. Additional practices with BMP codes for the field office technical guide have been added to the approved list including the well pumping plant (533) and critical area planting (342). The issue of cross fencing along streams/water ways for stream exclusion was resolved in March 2011 by addition of a provision for "fences installed to protect stream health."

The current list of approved practices for funding through the 319(h) grant includes the following:

- Prescribed Grazing (528): Manages the controlled harvest of vegetation with grazing animals to improve or maintain the desired species composition and vigor of plant communities, which improves surface and subsurface water quality and quantity.
- Riparian Herbaceous Buffers (390): Establishes an area of grasses, grass-like plants, and forbs along water courses to improve and protect water quality by reducing the amount of sediment and other pollutants in runoff as well as nutrients and chemicals in shallow groundwater.
- Grassed Waterways (412): Natural or constructed channel shaped or graded and established with suitable vegetation to protect and improve water quality.
- Riparian Forest Buffers(391): Established an area predominated by trees and shrubs located adjacent to and up-gradient from watercourses to reduce excess amounts of sediment, organic material, nutrients, and pesticides in surface runoff and excess nutrients and other chemicals in shallow groundwater flow.
- Watering Facilities (614): Places a device (tank, trough, or other watertight container) for providing animal access to water and protects streams, ponds, and water supplies from contamination by providing alternative access to water.
- Field Borders (386): Establishes a strip of permanent vegetation at the edge or around the perimeter of a field to protect soil and water quality.
- Filter Strips (393): Establishes a strip or area of herbaceous vegetation between agricultural lands and environmentally sensitive areas to reduce pollutant loading in runoff.
- Nutrient Management (590): Manages the amount, source, placement, form, and timing of the application of plant nutrients and soil amendments to minimize agricultural nonpoint source pollution of surface and groundwater resources.
- Conservation Cover (327): Establishes permanent vegetative cover to protect soil and water resources.
- Stream Crossings (578): Creates a stabilized area or structure constructed across a stream to provide a travel way for people, livestock, equipment, or vehicles, improving water quality by reducing sediment, nutrient, organic, and inorganic loading of the stream.
- Cross-Fencing (382): Facilitates the implementation of a rotational grazing system by creating multiple fields for forage utilization by livestock. This practices improves forage and stream health by excluding livestock from areas for a given period of time.

- Pipelines (516): Facilitates the transportation of water source to a watering facility for livestock.
- Water Well (642): Provides groundwater that will be transported and used by livestock.
- Pasture and Hayland Planting (512): Establishes a permanent vegetative cover of improved grasses, either seeded or vegetative, to be utilized by livestock for forage.
- Rangeland Planting (550): Establishes a permanent vegetative cover of native grasses to be utilized by livestock for forage.

Through dedicated efforts of the local SWCD Technician, participation has begun to increase, with eight plans certified and an additional five in development since being hired over 2 years ago. The SWCD Technician has developed a program brochure, publications, and three press releases. The current listing of certified plans and plans in development for each subwatershed may be found in Table 5 (livestock operations) and Table 6 (cropland operations). Continued emphasis will be placed on outreach to the agricultural community to increase program participation.

The WQMP goals of the WPP have been more difficult to reach due to the low initial interest in the program, difficult economic situation, drought cycles, and the loss of time in the hiring and training of the technician. Changes in the goal totals may need to be shifted to the remaining years in order to reflect the current status of the program.

Table 5. Recommended number of management plans for livestock operations by subwatershed.

Region	Subwatershed	Animal Units	Farms	Conservation Plans Needed	Certified Plans	Plans in Development
Uhland	UH-1	493	10	6	0	0
	UH-2	403	8	5	0	0
	UH-3	731	15	10	0	0
	Region Total	1628	33	21	0	0
Lockhart	LO-1	1024	20	3	0	0
	LO-2	327	7	1	0	0
	LO-3	717	14	2	0	0
	LO-4	852	17	3	0	0
	LO-5	882	18	3	0	0
	LO-6	1751	35	5	0	0
	LO-7	2019	40	6	0	0
	LO-8	506	10	2	0	0
	LO-9	828	17	2	0	0
	LO-10	1117	22	3	0	0
	LO-11	1308	26	4	0	0
	Region Total	11329	227	34	0	0
Luling	LU-1	168	3	1	0	0
	LU-2	748	15	6	1	0
	LU-3	498	10	4	0	0
	LU-4	322	6	3	0	0
	LU-5	1257	25	10	1	0
	LU-6	1879	38	15	1	0
	LU-7	694	14	6	0	0
	LU-8	1027	21	8	0	2
	LU-9	542	11	4	0	1
	LU-10	600	12	5	1	0
	LU-11	1020	20	8	0	0
	LU-12	1787	36	15	0	0
	LU-13	999	20	8	0	0
	LU-14	1662	33	14	1	0
	LU-15	1173	23	10	2	0
	LU-16	1124	22	9	1	0
	LU-17	344	7	3	0	0
	LU-18	986	20	8	0	0
	LU-19	2348	47	19	0	1
	LU-20	1981	40	16	0	0
	LU-21	989	20	8	0	0
	Region Total	22147	443	182	8	4
Total		35101	702	237	8	4

Table 6. Recommended number of management plans for cropland operations by subwatershed.

Region	Subwatershed	Cropland Acres	Farms	Conservation Plans Needed	Certified Plans	Plans in Development
Uhland	UH-1	1374	6	2	0	0
	UH-2	930	4	1	0	0
	UH-3	569	2	1	0	0
	Region Total	2873	12	4	0	0
Lockhart	LO-1	1138	5	2	0	0
	LO-2	149	1	0	0	0
	LO-3	433	2	1	0	0
	LO-4	1163	5	2	0	0
	LO-5	1374	6	3	0	0
	LO-6	742	3	2	0	0
	LO-7	1117	5	2	0	0
	LO-8	1890	8	4	0	0
	LO-9	742	3	2	0	0
	LO-10	222	1	0	0	0
	LO-11	1117	5	2	0	0
	Region Total	10087	44	20	0	0
Luling	LU-1	4059	18	0	0	0
	LU-2	2171	9	0	0	0
	LU-3	2623	11	0	0	1
	LU-4	3143	14	0	0	0
	LU-5	148	1	0	0	0
	LU-6	72	1	0	0	0
	LU-7	1106	5	0	0	0
	LU-8	1890	8	0	0	0
	LU-9	742	3	0	0	0
	LU-10	88	1	0	0	0
	LU-11	500	2	0	0	0
	LU-12	240	1	0	0	0
	LU-13	289	1	0	0	0
	LU-14	88	1	0	0	0
	LU-15	506	2	0	0	0
	LU-16	24	1	0	0	0
	LU-17	70	1	0	0	0
	LU-18	351	2	0	0	0
	LU-19	72	1	0	0	0
	LU-20	30	1	0	0	0
	LU-21	351	2	0	0	0
	Region Total	18563	86	0	0	0
Total		31523	142	24	0	1

Wildlife and Non-Domestic Animal Management

Feral hogs have established themselves across much of the southern United States, and their range continues to expand rapidly into neighboring regions across the country. These animals have caused such concern at the national level that they have received specific attention from the Office of the President. Executive Order 13112 was issued in 1999 to all federal agencies. This Presidential Document calls upon agencies "whose actions may affect the status of invasive species" to (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner" through "eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of invasive species from areas where they are present." *Only four* terrestrial vertebrate species were classified by the USDA National Invasive Species Information Center as invasive species. One of these is the feral hog, *Sus scrofa*. In addition to Executive Order 13112, the USEPA Office of Wetlands, Oceans, and Watersheds (OWOW) have a *Strategic Action Plan for Invasive Species*, addressing certain strategic goals:

- control invasive species, both aquatic and terrestrial, affecting aquatic ecosystems,
- create education and outreach opportunities, and including certain priority actions:
- encourage the inclusion of invasive species in existing monitoring programs,
- control the spread of invasive species and promote public understanding using education and outreach tools,
- review all uses of OWOW funding to explore using OWOW assistance agreements to target invasive species problems impacting aquatic systems, and,
- estimate the economic impacts of invasive species affecting the aquatic environment.

In the State of Texas, feral hogs cause a variety of problems including agricultural damage, predation of livestock, pets, and wildlife, transmission of disease and parasites, and extensive environmental damage. An estimated $51.7 million in agriculture damage is caused by feral hogs annually. Effects of their activities on water resources include increased sediment, bacteria and nutrient loads, algae blooms, oxygen depletion, and bank erosion. In areas where high numbers of hogs are present or where animals spend a significant portion of their time in and near streams, they can be a major contributor of bacteria and nutrients. Because of the problems posed by feral hogs it was proposed in a component of a TSSWCB CWA §319(h) grant proposal to hire a Texas Wildlife Services position for direct control. Texas Wildlife Services (TWS), a unit of Texas AgriLife Extension Service, is the primary State agency charged with responsibility for controlling feral hog populations in Texas (Chapter 825 of the Texas Health and Safety Code). TWS accomplishes this through direct control efforts in cooperation with individual landowners, private entities, counties, and state and federal agencies. Through a cooperative agreement with USDA-Animal and Plant Health Inspection Service (APHIS), TWS carries out federal mandates for wildlife damage management in Texas on behalf of USDA-APHIS. Though this agency has worked with other dangerous or invasive species in the past, much of their current effort is focused on controlling feral hog populations across Texas.

However, due to concerns over feasibility and public perception, a component of a TSSWCB CWA §319(h) grant proposal to hire a Texas Wildlife Services position for direct control of feral hogs was not funded by the EPA. However, in light of the importance of managing feral hogs for environmental benefits, the grant was reconfigured to support an AgriLife Extension Assistant to

provide one-on-one feral hog management education and offer technical assistance to landowners as they sought to control feral hog damage on their properties. More information on these outreach efforts can be found in the outreach and education Chapter below. The Plum Creek Watershed Partnership will continue to work with those State agencies that have responsibilities associated with feral hogs in order to advance the discussion with EPA regarding the alignment of established federal priorities for invasive species control (Executive Order 13112 and EPA OWOW Action Plan) with available grant programs (i.e., 319(h)).

Feral Hog Control

In addition to the management education supported through TSSWCB CWA §319(h) funds, the Partnership was able to secure cooperation from Texas Wildlife Services with financial support from the Texas Department of Agriculture to conduct aerial control of feral hogs (Table 7). Through flights conducted in January, February, and March 2010, a total of 372 hogs were removed from approximately 40,000 acres in 22 subwatersheds identified in Table 7. The Extension Assistant worked with Texas Wildlife Services staff and local officials to identify area landowners and solicit participation. Prior to the effort, landowners in the control area completed a cooperative agreement permitting aerial control. This project was very popular among participating landowners and served to strengthen interest in cooperative management. Follow-up has occurred with these landowners through letters, phone calls, and site visits. It is hoped that similar efforts will continue in the future, but funding will need to be acquired.

To increase effectiveness, future efforts should be directed toward achieving participation of a high percentage of area landowners to increase controlled acreage and manage contiguous properties. Due to the high mobility and large range of feral hogs, these animals can quickly move in from unmanaged properties to repopulate those that have undergone hog control. This may be minimized by participation of contiguous properties as feasible in the management area to eliminate potential refuge areas. Additionally, the full burden of controlling feral hogs realistically cannot be placed solely on land-owners. Continued assistance from state and federal agencies will be necessary to address this challenge. Here again, innovative strategies are urgently needed to promote progress and success in spite of traditional program limitations. In Alabama, USDA-NRCS is piloting the use of federal Farm Bill financial assistance funds to combat feral hogs (http://www.al.nrcs.usda.gov/programs/whip/feral_hog.html). The Plum Creek Watershed Partnership will work with USDA-NRCS to explore the feasibility of this effort in Texas.

In 2009, AgriLife Extension identified significant initial interest from the Texas Hunters for the Hungry Program and the Texas Department of Criminal Justice regarding the incorporation of harvested feral hogs into the food supply for community groups, low-income families, and inmates. A proposal for TSSWCB §319(h) CWA funds was developed to support an environmental and economic analysis of feral hog damage and harvest. However, a number of concerns regarding logistics and marketability stalled the proposal. In July 2011, the Texas Department of Agriculture solicited proposals for a pilot program for harvesting feral hogs and distributing pork products to feed food-insecure Texans.

Table 7. Recommended number of feral hogs to be removed and number of hogs that have been removed by subwatershed. The ♦ denotes subwatersheds flown during aerial control that removed 372 hogs.

Region	Subwatershed	Total Hogs	Reduction Goals for Hogs	Online Reporting of Hogs Removed	Locations of 2010 Aerial Control
Uhland	UH-1	127	83	1	♦
	UH-2	89	58	0	♦
	UH-3	192	125	0	♦
	Region Total	408	266	1	--
Lockhart	LO-1	167	25	0	0
	LO-2	67	10	0	0
	LO-3	122	18	0	0
	LO-4	90	14	0	♦
	LO-5	96	14	0	0
	LO-6	184	28	0	0
	LO-7	207	31	0	♦
	LO-8	53	8	6	♦
	LO-9	114	17	0	0
	LO-10	159	24	0	0
	LO-11	177	27	0	0
	Region Total	1436	216	6	--
Luling	LU-1	98	40	0	♦
	LU-2	111	46	0	♦
	LU-3	87	36	0	♦
	LU-4	119	49	0	♦
	LU-5	146	60	1	♦
	LU-6	316	130	1	♦
	LU-7	130	53	21	♦
	LU-8	146	60	0	♦
	LU-9	90	37	0	♦
	LU-10	93	38	19	0
	LU-11	173	71	0	♦
	LU-12	280	115	0	0
	LU-13	131	54	0	♦
	LU-14	177	73	0	0
	LU-15	206	84	0	0
	LU-16	220	90	0	♦
	LU-17	40	16	0	♦
	LU-18	139	57	0	♦
	LU-19	239	98	14	♦
	LU-20	194	80	171	♦
	LU-21	160	66	36	0
	Region Total	3295	1353	263	--
				270	**372**
Total		5139	1835	**642**	

Wildlife Surveys

The role of wildlife in the deposition of *E. coli* is not well understood. Although water quality studies incorporate wildlife data, the data often lack a clear connection between wildlife density and *E. coli* deposition. Minimal understanding of species-specific fecal pollution and the role of species density on water quality complicates attempts by natural resource managers to adjust wildlife populations to improve water quality. While some research has been conducted to establish animal densities and bacteria loading potentials in other watersheds, no new wildlife surveys have been conducted in the Plum Creek watershed beyond the use of the online feral hog reporting system (described in Outreach and Education).

A project funded by TSSWCB with 319(h) grant funds was conducted on Cedar Creek in Brazos County with the goal to determine the impact of free-ranging mammals (in general and species-specific) on *E. coli* loads in the floodplain. The objectives were to determine the density of important free-ranging wildlife in the study area, investigate fecal deposition rates, and determine fecal *E. coli* loads for each species. Mark-recapture and mark-resight surveys were conducted for population density estimates (2008–2009) for meso- and large mammals in the study areas. Fecal samples were collected from study species for *E. coli* analysis. Transects were walked to determine spatial distribution of fecal material. The study combined the highest and lowest seasonal density estimates with conservative estimates of fecal deposition rates and found that white-tailed deer, raccoons, and feral hogs deposited the most fecal material into the watershed. Using the fecal samples, project collaborators at Texas A&M University found that raccoons and Virginia opossums had the highest mean CFU/gram of fecal material of sampled species. Overall, it was estimated that raccoons potentially deposited the most *E. coli* per square kilometer, followed by feral hogs, Virginia opossums, and white-tailed deer. Raccoons were larger potential contributors than mammals like feral hogs and white-tailed deer likely because they stay near water and are known to defecate in water sources. White-tailed deer defecated frequently and in relatively large amounts; however, they had relatively low *E. coli* concentration in their fecal material (Parker 2010).

There is a broadly recognized concern that direct deposition of fecal material from bird and bat species inhabiting bridges spanning waterways can contain bacteria concentrations multiple orders-of-magnitude higher than relevant water quality criteria. This concern of higher pollutant levels is especially pertinent regarding bacteria sampling where collection of water samples is from a bridge or in proximity to a bridge. To address this issue TSSWCB is funding a project entitled *Instream Bacteria Influences from Bird and Bat Habitations of Bridges* to test the hypothesis that bridges containing significant numbers of roosting and nesting birds and bats increase ambient bacteria concentrations of streams under low flow conditions as compared to the situation where roosting and nesting is absent. The results of this project have the potential to prove or disprove sampling bias for bacteria collected from bridge locations under certain environmental conditions. Further, the results of the project have the potential to inform the selection of stream sampling locations in future projects to minimize potential biases in bacteria results and aid in the identification and quantification of other sources contributing fecal pollution to waterbodies. While this project is not being conducted in the Plum Creek watershed, results will be presented to the Partnership and incorporated in the WPP through adaptive management.

Outreach and Education Strategy

PUBLIC OUTREACH

Education of citizens in the watershed to increase awareness and involvement continues to be of tremendous significance in the push to reduce nonpoint source pollution and will be a key focus of the Partnership's efforts throughout implementation. A major success for the Partnership was the acquisition of TCEQ CWA §106 funds to support the *Taking Charge of Water Quality in the Plum Creek Watershed* project to conduct a significant portion of the educational activities outlined in the WPP. Many of the resources developed through this project have been adapted and utilized in other watersheds across the state, and the effort has received multiple awards for its creativity and effectiveness. In coordination with this project and other Partnership efforts, AgriLife Extension, GBRA, and TSSWCB have produced numerous publications, press releases, and newsletters directed toward watershed stakeholders. In addition, multiple websites and educational modules have been developed as information and education resources for the public in Plum Creek and across the state.

Plum Creek Watershed Protection Plan

The Plum Creek WPP is a 176 color document that can be found electronically at the Plum Creek Website at http://plumcreek.tamu.edu/WPP. Over 750 copies have been printed and distributed throughout the watershed at Partnership Meetings, city council and county commissioner court meetings, field days, workshops, and other events.

Watershed Protection Campaign Brochure

AgriLife Extension developed a brochure entitled *The Plum Creek Watershed: Your Water, Your Home* (Figure 11) which summarizes Partnership efforts and provides basic management practice recommendations. Hardcopies of the brochure are available at all Partnership sponsored and supported meetings and approximately 7,200 copies have been distributed to counties, cities, homeowner associations, schools, and other organizations to engage a broader audience in the local watershed effort. The brochure also is available on the Partnership website.

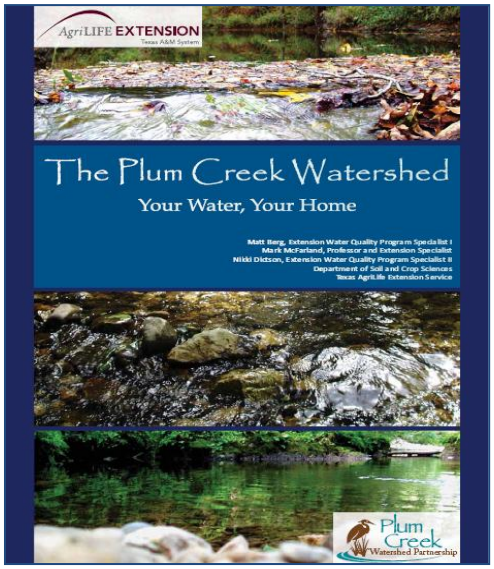


Figure 11. Brochure produced for the Plum Creek WPP.

Partnership Website

The Plum Creek Watershed Partnership website (http://plumcreek.tamu.edu) continues to be maintained by AgriLife Extension and hosted by the Texas Water Resources Institute. The website has undergone significant redesign since the release of the WPP, with regular addition of new sections and updated information. The site includes information about the Plum Creek watershed, background on the Partnership, links to updated water quality data, information on feral hog control, the WPP, descriptions of outreach efforts, a list of upcoming events, a library of resources developed for the Partnership, and links to project partners and related sites. Since creation, the site has had over 10, 319 unique visitors. The GBRA hosts a separate website with the water quality monitoring data and the four online training modules; since this site was initiated in February 2009 it has had a total of 34,072 page views.

News Releases

Extension continues to work with TSSWCB to develop regional press releases describing important events and key developments in the watershed to further encourage involvement in the implementation process. Twenty-eight press releases have directly detailed Plum Creek efforts (21 since the completion of the WPP). All of the press releases are available on the Partnership website library page http://plumcreek.tamu.edu/library/. Articles are released by AgriLife Communications to over 100 media outlets and to their online distribution list, directly distributed to the Plum Creek Watershed Partnership through email and Facebook, and publicized through TSSWCB Conservation News, Texas Riparian Association listserv, and other electronic outlets as appropriate.

Newsletter

AgriLife Extension developed a watershed-specific newsletter, "*The Plum Creek Current,"* to report important project developments, provide updates on watershed events, and spotlight seasonally-pertinent best management practices (Figure 12). Newsletters are developed as appropriate based on project activities and progress, emailed to the Partnership, and made available to the general public on the Partnership website.

The Plum Creek Current

A Newsletter of the Plum Creek Watershed Partnership

April 2010 Volume 2 Issue 2

Plum Creek Watershed Clean-Up in Kyle

Residents of Kyle came together on February 27 to play an active role in keeping their watershed clean. More than 400 volunteers pitched in to remove debris from fields and streams in the area. Coordinated by the City of Kyle, GBRA, Hays CISD schools, and the Plum Creek Watershed Partnership, the event resulted in the removal of 1,740 pounds of recyclable material and 1,720 pounds of trash from Steeplechase Park and the new Plum Creek Preserve and Nature Trail still under development. In all, more than 3.5 miles of streams and ponds in city parks were cleaned up. City of Kyle Director of Parks and Recreation Kerry Urbanowicz proclaimed, "Steeplechase park is clean! We still have a long way to go on Lake Kyle, but we made a big start." Another part of the event featured the flagging of existing dog droppings to demonstrate their potential to contaminate Plum Creek with bacteria and nutrients. After 550 dog droppings were marked in 2009, only 128 were found at this year's event. After being flagged, pet waste was removed from Steeplechase Park. The city has installed pet waste stations in the park with bags for easy clean-up, and park staff encourage visitors to help reduce pollution from pets even further.

Volunteers remove trash from the banks of Lake Kyle in the new Plum Creek Preserve.

Feral Hog Management Workshop and Control Efforts

Wintry precipitation fell on February 23, but that did not prevent nearly 300 people from attending the annual feral hog management workshop in Luling. The workshop was made possible by a Clean Water Act grant from the EPA and the Texas State Soil and Water Conservation Board. Attendees were treated to a free lunch and listened to presentations on feral hog biology, current research, and control methods by speakers from several state and federal agencies.

Extension Assistant Chancey Lewis, who provides local support for Plum Creek Watershed landowners, described the link between growing feral hog numbers and water quality problems. Since feral hogs spend much of their time near water to drink and wallow especially in warmer months, high concentrations of fecal material can be deposited directly in streams, degrading water quality.

In a related effort, USDA-Texas Wildlife Services recently conducted multiple aerial missions to reduce feral hog numbers in portions of the watershed. Between January and March, three rounds of flights were conducted over participating properties that had granted permission for aerial control. In all, local populations were reduced by 372 hogs. Since a single feral hog can produce up to 4.5 billion *E. coli* bacteria each day, this represents a significant reduction in the potential feral hog bacteria load reaching Plum Creek. In order to get a better handle on feral hogs, landowners are encouraged to report sightings of animals or damage at http://plumcreek.tamu.edu/feral-hogs and begin control efforts on their own properties.

Helicopter used in aerial control of feral hogs by USDA-Texas Wildlife Services. Three rounds of flights were conducted in the watershed

Luling Foundation Field Day May 20

The 83rd Annual Luling Foundation Field Day will be held on Thursday, May 20. Registration begins at 7:30 AM at 523 S Mulberry St in Luling, and participants will board trailers for farm tours beginning at 8:30 AM. This year's topics include sustainable gardening, managing small acreages, watershed management, water issues, and current events in land management. A free BBQ lunch will be provided. This is a great opportunity to learn about new developments in agriculture and integrate profitable ideas into your operation, regardless of its size. Don't miss out! For more information, call (830) 875-2438.

The Luling Foundation

Established in 1927 by Edgar B. Davis, The Luling Foundation teaches agricultural diversity and strives to improve the lives of rural families in Caldwell, Gonzales, and Guadalupe Counties through practical education and example.

BMP Spotlight: Pick Up After Your Pet

Spring is a great season to spend time outdoors with the family pet, and many people choose to take their dogs or other pets out for some exercise in the local park or simply along neighborhood streets. When these animals do their business, the resulting pet waste can hurt water quality and represents a health risk to both animals and people in the form of bacteria, viruses, and parasites. Pet waste left in a park or on a lawn, street, or sidewalk is washed to the nearest stream in storm runoff, and these problems can become serious if pet waste is not picked up and properly managed. Water samples from Bull Creek in Austin show that bacteria levels in that stream are much greater in the off-leash area of the local park than in other portions of the stream. The highest bacteria levels occur on weekends and days when more people visit the park with their pets.

By making wise decisions, pet owners can both reduce the risk of disease and protect water quality. Where available, always use pet waste stations when away from home. If these are not present, use a disposable pet waste bag or glove (available at pet stores and some veterinary clinics) to pick up dog droppings before throwing them away in the nearest trash receptacle.

Even leaving pet waste in your own yard can cause significant disease risk. When at home, flush pet waste down the toilet, throw it in the trash, or bury it away from water and food gardens. There are a number of commercially available products that can also be used to treat pet waste. Most people would not be comfortable with dumping their own waste on the ground outdoors, but that is just what happens with pet waste. It can really add up! With so many pets in the Plum Creek Watershed, it is important that each pet owner properly dispose of the waste from his or her animals.

ALL PETS MUST BE ON A LEASH

PLEASE CLEAN UP AFTER YOUR PET

PET WASTE TRANSMITS DISEASE

Use available pet waste stations when walking your pet.

Next Partnership Meeting

6-9 PM on May 6, 2010
Lockhart State Park Recreation Hall
Snacks will be provided before the meeting.

Lockhart State Park is located at 4179 State Park Road/FM 20 west of U.S. Highway 183 in Lockhart.

PCWP on Facebook

Find the Plum Creek Watershed Partnership on Facebook, the online social networking website, to follow along with watershed news and events.

The Plum Creek Watershed Partnership
http://plumcreek.tamu.edu
Matt Berg, Watershed Coordinator
(979) 845-2862

This publication was developed with funding support from the U.S. Environmental Protection Agency through a Clean Water Act §319(h) Nonpoint Source grant administered by the Texas State Soil and Water Conservation Board

Figure 12. The Plum Creek Current.

Texas Watershed Steward Workshops

In addition to the pilot session of the Texas Watershed Steward Program in Kyle in December 2007, a second workshop was conducted in August 2008 in Luling. AgriLife Extension coordinated the effort with the Partnership. Texas Watershed Steward is a science-based watershed training program that helps citizens identify and take action to address local water quality impairments. The Texas Watershed Steward Program is funded through Clean Water Act §319(h) nonpoint source grants from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency. A total of 128 participants attended the two workshops. Six-month follow-up evaluations indicated that as a result of the training events:

- 95% of participants were better equipped to be stewards of their watershed.
- 93% now more closely monitor individual actions that can impair water quality.
- 72% indicated an intention to participate in community cleanup activities.
- 57% indicated an intention to get involved in local planning/zoning decisions.
- 74% indicated an intention to communicate water issues to elected officials.
- 60% indicated an intention to help develop a plan for their watershed (WPP).
- 55% indicated an intention to help form or become a member of a local watershed group.
- 85% indicated an intention to adopt new BMPs to help protect their watershed.

Volunteer Monitoring

Texas Stream Team is an environmental education and monitoring program administered by Texas State University-San Marcos funded through a 319 grant from TCEQ. Texas Stream Team is a network of trained volunteers collecting water quality data on lakes, rivers, streams, wetlands, and estuaries across the state. Stream Team held a volunteer monitor training in 2010 in Kyle for 25 participants in addition to their trainings regularly held in San Marcos. Stream Team volunteers monitor 17 locations in the Plum Creek watershed (see Figure 13).

Stream Team has also conducted educational booths at events in the watershed including:

- April 17, 2010 – Used the NPS model in presentations to 57 people at the Earth Day Share Fair at City Square Park in Kyle.
- September 25, 2010 – Attended the Lockhart Town Branch Clean-Up at City Park in Lockhart. There were 47 participants aged 5-12. The booth included information about bacteria levels in Town Branch, data reports, and other publications provided at all outreach events.
- November 3, 2010 – Provided a NPS Environmental Education Presentation using the watershed model to 2 classes (31 students, 2 teachers) at Kyle Elementary in Plum Creek watershed (in coordination with GBRA).
- November 8, 2010 – Provided a NPS Environmental Education Presentation using the watershed model to 4 classes (74 students, 2 teachers) at Bluebonnet Elementary (Lockhart) in Plum Creek watershed (in coordination with GBRA).
- February 26, 2011 – Provided NPS and monitoring education and information to 150 people at the City of Kyle's Plum Creek clean-up event.
- April 16, 2011 – Provided an NPS outreach presentation to over 31 attendees at the City of Kyle Earth Day Share-Fair. Children were led through a hypothetical fish kill scenario wherein they learned about NPS pollution. A booth was conducted by staff on NPS pollution in the Plum Creek watershed and they distributed relevant publications.

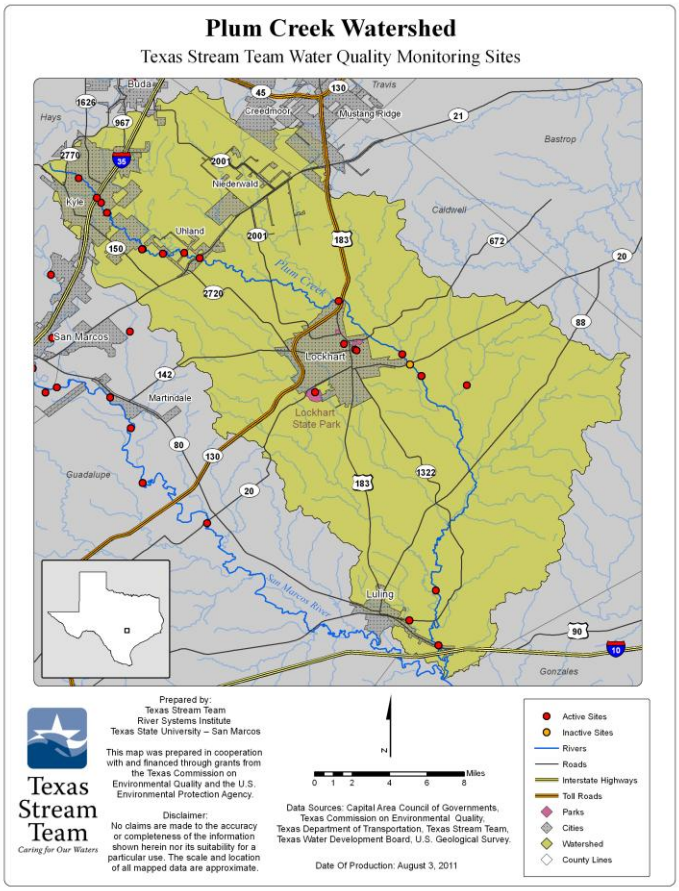


Figure 13. Map of volunteer monitoring locations in Plum Creek Watershed.

GBRA's Plum Creek School Water Quality Project

To promote youth education and involvement in the Plum Creek Watershed Partnership, a water quality monitoring program was initiated in the 2006-2007 school year and is being conducted annually. Over 4,000 students and approximately 80 teachers from 13 Hays ISD, Lockhart ISD, and Luling ISD schools have participated in classroom instruction and hands-on investigation of water quality in Plum Creek since 2006. The program was initiated and is led by GBRA. The program for the 2011-2012 school year will happen in the spring semester since the drought has dried up most of the creek sampling locations that the schools were utilizing for the program. GBRA and the science teachers hope that the rains will return and there will be water in the creeks near the schools to sample and conduct the program. Science teachers at each school are trained in basic water quality monitoring techniques. Water monitoring test kits, supplies, poster-sized watershed maps, and student workbooks are donated to the schools by GBRA. In addition, packets of educational information about the watershed and water quality issues are sent home with the students that include *The Plum Creek Watershed: Your Water, Your Home* publication.

As a part of this program in 2008 and in concert with a Service Learning Grant, a group of students at Luling High School developed an interest in collecting data on local waterbodies. The students and teachers created the Luling River Pals who were trained by GBRA and Texas Stream Team as volunteer water quality monitors. The Luling River Pals monitored local creeks through 2010 and worked with the elementary school students in Luling as part of their project.

Plum Creek Watershed Kiosks in Kyle, Lockhart and Luling

Three new Plum Creek Watershed kiosks were set up in Kyle, Lockhart, and Luling during 2011for the public to learn more about the watershed, water treatment and watersheds in general. These new interactive kiosks display educational modules by touch screen enabling the user to participate in mini-lessons on water subjects including watersheds and nonpoint source pollution, the wastewater treatment process, and the operation and maintenance of aerobic and conventional septic systems. They also include links to real-time data for Plum Creek, which means that users are able to look at the current temperature, pH, dissolved oxygen, conductivity, turbidity, and flow at sites along the stream. Additional links are available for historical data including the Texas Commission on Environmental Quality Clean Rivers Program, GBRA, the Plum Creek Watershed Partnership, and the city's website. Three kiosks were designed by by GBRA, and funded by the Texas State Soil and Water Conservation Board through an EPA Clean Water Act Section 319 (h) Nonpoint Point Source Pollution Grant Program.

Tributary and Watershed Roadway Signage

The Partnership contacted the Texas Department of Transportation (TxDOT) to request permission to install roadway signage marking Plum Creek tributaries and entrance points to the watershed. However, the request was denied by TxDOT, who opposed any nonessential signage that does not provide directions to motorists. Sign installation has been approved in other watersheds, including the Arroyo Colorado watershed and Lake Houston watershed in the state, and it is unclear why there is variation among TxDOT offices and policies. Nevertheless, the Partnership will continue to pursue this outreach strategy as a highly visible means of boosting awareness of the Plum Creek watershed among local stakeholders and watershed users. TSSWCB CWA §319(h) funds were originally dedicated for purchasing and installing signs as part of this effort.

The use of highway billboards to promote Partnership efforts and general watershed stewardship also has been investigated, but some members of the Steering Committee prefer less intrusive means of promotion and advertising so the Partnership is no longer working towards this task and voted to remove it from the implementation goals.

Outreach at Local Events

The Partnership participates actively in several local annual events that have a strong environmental stewardship component. These include the City of Kyle's Plum Creek Watershed Clean-Up, the City of Lockhart's Town Branch Clean-Up, and the Luling Foundation Field Day. Since 2006, approximately 3,907 individuals have been reached with information on Partnership efforts in the watershed through these events. In addition, thousands more have been reached through educational programming and meetings with various entities within the watershed.

Rainwater Harvesting Education

AgriLife Extension conducted three workshops in July and August 2008 in Hays County on the benefits of rainwater harvesting and procedures for system installation and management. Over 300 individuals participated. Hays County Extension conducted a rainwater harvesting workshop in September 2011 in San Marcos with 28 participants. In addition, a number of permanent rainwater harvesting displays have been installed at venues in and around the Plum Creek watershed, including the Hays County Extension office and the Luling Foundation Farm.

URBAN OUTREACH

NEMO workshops
TCEQ CWA §106 funds were used to conduct two Nonpoint Education for Municipal Officials (NEMO) workshops targeting city and county employees and elected officials, with coordination by AgriLife Extension, Sea Grant, and GBRA. The events were titled *Managing Urban Growth: Quality of Life and Environmental Issues* and included topics such as smart growth, low impact development, stormwater management, and reducing impervious surfaces. Individual workshops were tailored to the northern (February 2008 – 48 attendees) and southern portions of the watershed (May 2008 – 43 attendees) and included municipal officials from across the watershed and surrounding counties.

Online Stormwater Management Module
TCEQ CWA §106 funds also enabled GBRA to develop an online educational module for municipal operations employees outlining the processes and best practices for urban stormwater management. The module has been promoted among watershed cities and is available on the Partnership and GBRA websites at http://www.gbra.org/stormwater/default.aspx. A total of 1,343 unique visits to the website since it was developed in September 2009.

Stormwater Management Demonstrations
No additional stormwater management demonstrations have taken place in the watershed since the events in June and July 2007 prior to the release of the WPP. The event in June in downtown Kyle had 28 in attendance and 19 attended the event at the business park in Lockhart in July. Upon completion of the municipal stormwater assessments and review of the associated recommendations, additional demonstrations may be warranted as cities formulate decisions for the selection and placement of additional controls. The City of Kyle adopted an ordinance in November 2011 that includes the use of stormwater mulch tube filters at environmentally sensitive construction sites.

Site Assessment Visits
As a component of the TCEQ CWA §106 funds received to conduct watershed outreach, TCEQ personnel conducted nine non-regulatory site assessments of water supply facilities, wastewater treatment facilities, private companies, and municipal operations facilities. These visits are voluntary and provide confidential recommendations for pollution prevention strategies to the operators at each site.

Urban Sector Turf and Landscape Management
The Partnership worked with AgriLife Extension's Sports and Athletic Field Education (SAFE) program to conduct a 6-hour training event in March 2009 for 49 personnel from area parks departments and school athletics departments. The workshop provided education tailored to management of golf courses and other sports and athletic fields, with topics including fertilizer and pesticide selection and use, irrigation management, aerification of soils, and cultural practices such as mowing height and frequency. Attendees received classroom training at the Hays County Extension Office and then participated in a hands-on irrigation audit demonstration at a local San Marcos Sports Complex.

Household Hazardous Waste Collection Events

A TCEQ CWA §319(h) grant awarded to the City of Lockhart includes provisions for hosting an annual hazardous and electronic waste collection day. Lockhart held two events on Saturdays in April during 2010 and 2011 (Table 8). The City of Lockhart's project also provided for expansion of services at the city recycling center to include disposal of kitchen fats, oils, and grease in addition to existing oil, oil filter, and antifreeze disposal services. A collection tank for grease and cooking oils was placed at the Lockhart Recycling Center so the material can be removed and recycled into products such as animal feeds and ingredients used in consumer and industrial products like soaps, cosmetics, rubber and plastics.

Table 8. Lockhart hazardous waste collection events results during 2010 and 2011.

Lockhart Hazardous Waste Collection Events					
Year	Total # Households	HHW collected in lbs	Hazardous Paint in lbs	Lead Acid Batteries in lbs	Cost of Hazardous Materials contractor Services
2010	250	5,661	13,287	225	$13,428
2011	288	3,651	11,561	20	$11,366
Total	538	9,312	24,848	245	$24,794

SEPTIC SYSTEM OUTREACH

Online Septic System Module

TCEQ CWA §106 funding also supported GBRA and AgriLife Extension efforts to develop an online module to address the proper function and maintenance of septic systems. Illustrating both conventional and aerobic systems, the module was developed for septic system owners, professional installers, maintenance providers, and inspectors. The module is available in both English (http://www.gbra.org/septic.swf) and Spanish (http://www.gbra.org/septic-spanish.swf) and can be found on both the Partnership and GBRA websites. These websites have received 5,776 unique visitors for the English version and 340 unique visitors for the Spanish version during January 2009-November 2011. While initial efforts focused on local municipal officials, school teachers, and residents in the Plum Creek watershed, this module has been promoted across the state and has been utilized in several other watershed efforts.

Septic System Workshops

AgriLife Extension conducted a total of seven septic system operation and maintenance workshops in Caldwell and Hays Counties with support through TCEQ CWA §106 funds during 2008-2009. Four events were tailored to homeowners (two each addressing conventional and aerobic systems), and two events targeted practitioners. An additional train-the-trainer course was aimed at developing capacity for local designated representatives to deliver maintenance courses to homeowners. Overall, 118 practitioners and 74 homeowners participated in the workshops (Table 9). In addition, AgriLife Extension provided watershed maps and technical assistance to designated representatives in the watershed to aid in addressing local septic system issues. To complement septic system outreach efforts, over 50,000 copies of several different septic system management factsheets were delivered to cities and counties for distribution throughout the watershed.

Table 9. Onsite wastewater trainings in Plum Creek.

Onsite Wastewater Trainings	Date	Participants	Hours	Contact Hours
OSSF Practitioners	8/26/2008	60	8	480
OSSF Homeowners	8/29/2008	19	6	114
Aerobic Treatment Training San Marcos	5/27/2009	37	8	296
OSSF Practitioners	5/28/2009	49	8	392
OSSF Training San Marcos	6/23/2009	10	8	80
Aerobic Treatment Training Lockhart	6/24/2009	10	6.5	65
Aerobic Treatment System Train the Trainer	7/28/2009	11	17	187
Total		196	61.5	1,614

MUNICIPAL WASTEWATER OUTREACH

Online Wastewater Treatment Facility Module

TCEQ CWA §106 funds were used by GBRA to develop an online informational wastewater treatment module that addresses treatment methods and processes and explains the importance of proper wastewater management to protect the quality of receiving waters. In addition to being distributed to public officials and watershed residents by email and over 760 post cards, this module was sent to wastewater facility operators for use in educating the public. The module is available on both the Partnership and GBRA (http://www.gbra.org/wastewater-treatment.swf) websites and has received 15,228 unique visitors since January 2009 through November 2011. The educational module was selected by the Water Environment Association of Texas for the 2008 Presidential Award for Outstanding Effort Toward Public Outreach and Communication (Figure 14).

Figure 14. 2008 Presidential Award for Outstanding Effort Toward Public Outreach and Communication for the wastewater module.

Online Fats, Oils, and Grease Module

TCEQ CWA §106 funds supported the development of an online training module to outline management practices for handling fats, oils, grease. The module also addresses proper use and disposal of household hazardous chemicals and is geared toward both businesses and homeowners. The module is available on the GBRA and Partnership websites http://www.gbra.org/fog.swf) and http://plumcreek.tamu.edu between January 2009 and November 2011 recorded 510 unique visitors.

Fats, Oils, and Grease Workshops
TCEQ CWA §106 funds designated for conducting outreach in the watershed expired before TCEQ could host workshops for restaurants and apartments on proper management and disposal of fats, oils, and grease. Also, the TCEQ Small Business Assistance Program no longer conducts these workshops. The GBRA online fats, oils, and grease module will continue to be promoted and the City of Lockhart currently has a FOG educational program and recycling program.

AGRICULTURAL OUTREACH

Soil and Water Testing Campaigns
Annual county-based soil and water testing campaigns have been conducted by AgriLife Extension in Hays and Caldwell Counties during 2009 and 2010. Landowners submitted 148 samples for the 2009 campaign and 164 samples for the 2010 campaign. Agricultural operations were represented by 280 of the 312 samples for 10,298 acres. Projected fertilizer savings based on soil tests for agricultural operations were an estimated 202,075 pounds of nitrogen and 320,250 pounds of phosphate compared to rates proposed before testing. This management practice provided not only environmental benefits by reducing nutrient loading to the soil and potentially to water resources, but also created the opportunity for an economic impact estimated at $302,948 in cost savings. Over 80% of lawn and landscape samples received a recommendation for no application of P fertilizer due to high soil test levels. These programs are supported by TSSWCB §319(h) funds that help defray costs for watershed residents.

Nutrient, Crop, and Livestock Grazing Management Education
Routine programming for Caldwell County has included multiple events on nutrient, crop, and livestock grazing management each year. Personnel turnover in both the Caldwell and Hays Counties have resulted in periods where both have been without Agricultural and Natural Resource Extension Agents in place to coordinate educational activities. The following activities were conducted in Caldwell County through May 2011.

- 2010 Beef Cattle Nutrition Class Series – Sept. 2, 7, 14 – 18 attendees
- Luling Foundation Water Field Day – Oct. 29, 2010 – 162 attendees
- Row Crop Conference – Feb. 14, 2011 – 35 attendees
- Luling Foundation Forage Field Day – March 31, 2011 – 42 attendees
- Beef Cattle Short Course – April 8, 2011 – 23 attendees

The Lone Star Healthy Streams Program – Grazing Cattle Component (LSHS) is a coordinated and comprehensive education program designed to increase awareness of the water quality issues associated with livestock, expand the overall knowledge of how to improve the management of grazing lands by landowners, and encourage voluntary implementation of BMPs to reduce the runoff of pollutants from grazing livestock operations. LSHS builds on recent research and demonstration projects, conducted and funded by a variety of entities, which evaluated the effectiveness of BMPs to improve water quality impacted by grazing cattle. LSHS will be delivered via local workshops in priority watersheds across the state and computer-based trainings. Implementation of LSHS is designed to increase the utilization of technical assistance and financial incentives available to landowners to voluntarily implement BMPs targeted to

manage the impact of livestock. While the curriculum is still being developed, the Program has been piloted in several watersheds, including Plum Creek. LSHS is implemented through a partnership between the Texas AgriLife Extension Service, the Texas Water Resources Institute, and the TSSWCB. The Program is supported through CWA §319(h) grants from TSSWCB and USEPA. More information on the Lone Star Healthy Streams Program is available at http://lshs.tamu.edu/.

To date, the following LSHS programs have been delivered in the watershed:

- October 29, 2010 – Luling Foundation Water Field Day – 162 individuals
- March 3, 2011 – Caldwell County – 31 individuals
- August 26, 2011 – Caldwell County Expo presentation – 85 individuals

Agricultural Waste Pesticide Collection Events

No additional agricultural waste pesticide collection events have been conducted in the watershed since the June 2007 event prior to the release of the WPP. Since these efforts primarily are coordinated between TCEQ and the Texas Department of Agriculture, they have been rotated to other locations throughout the state. As collection events have occurred in nearby counties, they have been promoted by the Partnership. In 2011, TCEQ terminated this program due to lack of funding.

FERAL HOG MANAGEMENT OUTREACH

Feral Hog Control

A total of 642 feral hogs have been reported as removed from the watershed, including both producer activity and project-related control programs (Table 7). This has been accomplished through a combination of efforts including workshop training events, direct technical assistance and publications, websites, newsletters, news releases, and related resources.

Feral Hog Management Workshops

To complement direct landowner outreach on feral hog management, AgriLife Extension has coordinated feral hog management workshops in Luling in February of each year. Attendance has been 185, 130, 350, 279, and 260, respectively, for 2007 through 2011. Attendees are not limited to residents of Plum Creek watershed, and some travel considerable distances to attend. Significant focus is placed on the potential for hogs to harm the environment and degrade water quality, and attendees receive presentations on a variety of management options from various agencies including Texas AgriLife Extension Service, Texas Parks and Wildlife Department, Texas Department of Agriculture, USDA Wildlife Services, and Texas Animal Health Commission. These events are a key avenue for relaying information to landowners in the Plum Creek watershed and beyond. TSSWCB CWA §319(h) funds have been used to cover workshop expenses so that the events are available at no cost to attendees.

Technical Assistance

The AgriLife Extension Wildlife and Fisheries Assistant stationed in the watershed has provided technical assistance to landowners on feral hog management through 60 site visits and 25 community presentations to over 3,307 attendees. A total of 3528 individuals have obtained direct assistance with approximately 2490 contact hours recorded through November 2011.

Feral Hog Reporting System

AgriLife Extension developed an online feral hog reporting system to track sightings and damage caused by the animals. The system is used by project personnel to target areas for focused management assistance. In addition, the system has been useful in validating the SELECT analysis performed during plan development. A total of 42 public reports have been made, with some from areas not in the watershed. In addition, 16 landowners have reported a total of 270 feral hogs removed from the watershed (see Table 7). The reporting system is located in the feral hog section of the Partnership website. The reporting website has been a beneficial tool in tracking the removal of feral hogs from the watershed. Continued use of this system is suggested with some upgrades: a map visual for identification of hog removal locations, an automated e-mail requesting monthly reports, and a section to better identify the location of the property from which feral hogs have been removed.

Feral Hog Management FactSheets

A significant project accomplishment has been the production of a series of factsheets addressing feral hog management. Developed by AgriLife Extension with TSSWCB CWA §319(h) funds, the following publications (Figure 15) are available on the Partnership website, some with Spanish translations:

- *Feral Hogs, Plum Creek, and You*
- *Recognizing Feral Hog Sign* (Spanish)
- *Box Traps for Capturing Feral Hogs* (Spanish)
- *Corral Traps for Capturing Feral Hogs* (Spanish)
- *Snaring Feral Hogs* (Spanish)
- *Building a Feral Hog Snare* (Spanish)
- *Placing and Baiting Feral Hog Traps* (Spanish)
- *Door Modifications for Feral Hog Traps* (Spanish)
- *Feral Hogs Impact Ground-nesting Birds*
- *Feral Hog Laws and Regulations in Texas*
- *Feral Hogs and Disease Concerns*
- *Feral Hogs and Water Quality in Plum Creek*
- *Feral Hog Transportation Regulations*
- *Using Fences to Exclude Feral Hogs from Wildlife Feeding Stations*

Over 5,000 of the publications have been distributed throughout the watershed and are available on the project website. These publications have been very popular, and a review of website traffic indicates they have been downloaded over 11,430 times from scribd.com, 432 times from the Texas AgriLife bookstore, and 321 times from the Plum Creek Watershed Partnership website. In addition, they have been viewed by visitors from 48 states plus the District of Columbia. Feral hog management has become a significant issue across the Nation, and efforts in the Plum Creek watershed have provided resources that will have a far-reaching impact.

In addition, 10 hardcopy and internet news releases were created with AgriLife Communications. There have been over 20 feral hog blogs posted to the AgriLife Extension Service Wildlife and Fisheries Sciences Department wild wonderings blog at http://wild-wonderings.blogspot.com/.

There are 10 feral hog videos on the Wildlife and Fisheries Department YouTube site that have been viewed over 71,000 times. On the Plum Creek Watershed Partnership website, two voice-over power-point presentations are available for viewing. Two radio interviews were conducted with Texas Farm Bureau Radio, which reaches 89 counties in Texas.

AgriLIFE EXTENSION
Texas A&M System

L-5623
11-10

Recognizing Feral Hog Sign

Chancey Lewis, Matt Berg, Nikki Dictson, Jim Gallagher, Mark McFarland, and James C. Cathey*

Feral hog populations are expanding in Texas, impairing water quality, damaging native plant and animal communities, wrecking landscapes and gardens, and reducing agricultural production in many areas of the state. To develop management strategies for feral hogs, a landowner or manager needs to understand their behaviors and recognize their signs.

Feral hogs leave evidence, or sign, of their passing. The most noticeable sign is the damage caused by their destructive rooting behavior. However, during a drought, rooting is minimal, and other signs are more common, such as hog wallows, rubs, tracks, trails, droppings, and beds.

Hogs are very mobile and routinely travel from one field that offers cover to another field that provides food. To increase trapping success, look for signs to determine their key travel corridors, which include creeks, sloughs, ponds, and other water sources.

Rooting damage

As feral hogs feed, they may severely damage native plant and animal communities as well as agricultural crops. If the hogs' rooting in an area disturbs vegetation and soil extensively, the type and abundance of plants there can shift. Rooting damages lawns, gardens, hay pastures, and native range (Fig. 1). It can also reduce the number of plant species in an area.

Feral hog diets differ throughout the year, depending on the availability of a wide variety of food items. During drought, they compete with native wildlife species for acorns, pecans, and other food.

Crop damage

Field crops commonly damaged by feral hogs include rice, sorghum, wheat, corn, soybeans, peanuts, potatoes, watermelon, and cantaloupe. Hogs not only consume planted seed, emerging

Figure 1

Feral hogs can cause damage to rural pastures and urban landscapes alike.

*Former Extension Assistant, Extension Program Specialist, Extension Program Specialist II, Assistant Extension Wildlife Specialist, Professor and Extension Soil Fertility Specialist, and Associate Professor and Extension Wildlife Specialist All of The Texas A&M University System

RECOGNIZING FERAL HOG SIGN | 1

AgriLIFE EXTENSION
Texas A&M System

L-5624
11-10

Corral Traps for Feral Hogs

Chancey Lewis, Matt Berg, Nikki Dictson, Jim Gallagher, Mark McFarland, and James C. Cathey*

Expanding populations of feral hogs in Texas are damaging water quality, landscapes, gardens, native plant and animal communities, and agricultural production in many areas of the state. To reduce the harm caused by feral hogs, landowners and managers will need to adopt an integrated management approach using multiple techniques.

Most management efforts should include the use of large corral traps, which can be effective for reducing hog numbers quickly. Feral hogs typically travel in family groups called sounders, and a large corral trap can capture an entire group.

Advantages

- Corral traps are effective for capturing large groups of hogs.
- If a deer is captured, the open trap allows it to escape.
- The traps can be placed in key areas that hogs will return to in the future.

Disadvantages

- The materials can be expensive and the construction time-consuming.
- Corral traps are not easily disassembled and moved. They are not portable as a unit.
- Pre-baiting can be expensive and time-consuming.

Trap designs

Most corral traps are made of 20- by 5-foot sheep/goat panels with 4- by 4-inch square mesh and steel T-posts. This type of panel prevents smaller pigs from escaping.

Figure 1

A

B

A large, teardrop shaped corral trap can capture many hogs (A). Traps vary in size and shape, and occasionally a smaller round shape is preferred (B). (Photo A source: Billy Hightobham)

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CORRAL TRAPS FOR FERAL HOGS | 1

Figure 15. Two examples of feral hog management factsheets developed for the watershed.

Stream and Riparian Workshops

The Partnership coordinated with the Texas Parks and Wildlife Department, USDA Natural Resources Conservation Service - State Riparian Service Team, and the Nueces River Authority to conduct stream and riparian workshops in the watershed. The first workshop was held in Lockhart in October 2010 with 54 participants. A second workshop was coordinated in conjunction with the San Marcos River Foundation and held in San Marcos in May 2011 with over 130 attendees. The workshops targeted landowners with property adjacent to Plum Creek and its tributaries, and focused on management practices to restore and maintain riparian health in these critical areas.

Illegal Dumping/Litter Prevention Campaign

GBRA partnered with Caldwell and Hays Counties to remove trash and debris and discourage littering of streams throughout the Plum Creek watershed. Using TCEQ CWA §106 funds, initial efforts primarily focused on removing trash from sites identified through a stream crossing inventory. Upon completion of debris removal, signs were installed on county roads by the county personnel at 16 sites to discourage dumping. To complement this work and establish an ongoing presence to address illegal dumping, the Partnership cooperated with Caldwell County to secure funding from the Capital Area Council of Governments to support personnel and purchase trash removal equipment. Through the combined efforts of GBRA and Caldwell County, in 2008 a total of 14,320 pounds of refuse were disposed of at the landfill and 3 batteries and 62 tires were properly disposed. A total of 237 man hours were committed to the effort. Through additional collaborations between GBRA and Caldwell County a second round of

cleanups at 9 stream crossings, 4 sites that had been targeted by the original survey project and 5 new locations, were conducted in February 2009. An estimated 8,500 pounds of refuse were collected from Plum Creek and its tributaries including 82 tires, 6 automotive batteries, 2 sofas, 1 drier, 1 refrigerator, 1 motorcycle, 1 television, 6 mattresses and various automotive parts. Totals for the two cleanup efforts were 22,820 pounds of refuse, 9 batteries, 144 tires, and various appliances.

Hays County agreed to assess and cleanup known sites in the Plum Creek Watershed for illegal dumping. Funds from the TCEQ 106 Grant were utilized to purchase signs to deter illegal dumping and they were installed by Hays County. Hays County has done a good job enforcing illegal dumping and keeping the areas clean around Plum Creek.

Community Clean Up Events in Lockhart and Kyle

TCEQ CWA §106 funds were used to initiate an annual stream clean-up event for Town Branch in the City of Lockhart and to expand ongoing efforts for the Plum Creek Watershed Clean-Up in the City of Kyle. Citizen volunteers work together to remove trash and debris from tributaries in these urban areas of the watershed. In Lockhart, volunteer clean-up days have approximately 300 participants. These events are used to provide education and increase awareness of broader issues and efforts throughout the watershed (Figure 16). All participants are given educational materials on stewardship of water resources and Partnership activities. The events also are supported by Keep Texas Beautiful and local sponsors, and city funds have and will be used to continue these programs in the future. Unfortunately, Keep Texas Beautiful lost funding for the creek cleanup program that provided educational materials as well as trash pick-up tools, gloves and trash bags for the events. Local sponsors will be sought to cover program costs in 2012.

Figure 16. Community stream clean up events during 2010 in Lockhart (top) and Kyle (bottom).

Measures of Success

Routine Water Quality Monitoring Data

The Plum Creek WPP was released prior to TCEQ publishing the 2008 Texas Water Quality Inventory and 303(d) List. At that time, only the upper portion of Plum Creek near Uhland was considered impaired by *E. coli* bacteria. All three monitoring stations indicated concerns for nitrate, and the central portion near Lockhart exhibited additional concerns for orthophosphorus, ammonia, and total phosphorus. With the release of the 2008 Texas Water Quality Inventory, both the lower portion near Luling and the upper portion were listed as impaired by *E. coli*. All of the monitoring stations indicated concerns for nitrate. Ammonia was removed as a concern for 1810_02, but depressed dissolved oxygen and total phosphorus were added as new concerns for 1810_03. In the Draft 2010 Texas Integrated Report, these concerns remain in addition to the new *E. coli* impairment of 1810_02. Over the period of December 1, 2001 to November 30, 2008 (which is the period of record for the 2010 IR), each of the stations had an *E. coli* geometric mean in excess of the criterion. Table 10 identifies the current impairments and concerns in Plum Creek as described in the 2010 Texas Integrated Report.

Table 10. 2010 Texas Integrated Report impairments and concerns for Plum Creek.

Assessment Unit	Parameter	Status
1810_01: Confluence with San Marcos River to approximately 2.5 miles upstream of the confluence with Clear Fork Plum Creek	*E. coli* geometric mean	Nonsupport (4b)
	Nitrate screening level	Concern
1810_02: From approximately 2.5 miles upstream of confluence with Clear Fork Plum Creek to approximately 0.5 miles upstream of SH 21	*E. coli* geometric mean	Nonsupport (4b)
	Nitrate screening level	Concern
	Orthophosphorus screening level	Concern
	Total Phosphorus screening level	Concern
1810_03: From approximately 0.5 miles upstream of SH 21 to upper end of segment	Dissolved Oxygen grab screening level	Concern
	E. coli geometric mean	Nonsupport (4b)
	Nitrate screening level	Concern
	Total Phosphorus screening level	Concern

The PCWP decided that the three stations along Plum Creek could not provide enough data to really see the big picture of this almost 400 square mile watershed that includes such a variation of landuse and potential contributors for pollution depending on locations. To obtain a better understanding of the sources in the watershed, it was determined that additional sampling of tributaries that flow into Plum Creek, the WWTPs, and the springs was necessary. A Clean Water Act 319 program grant was awarded to GBRA to collect water quality data in the

subwatersheds under routine and targeted hydrologic conditions. The monitoring program has increased the number of routine (monthly) monitoring sites from the original three CRP monitored sites to eight. It also included targeted sites that are monitored once under dry weather conditions and once under wet weather conditions each season, collecting field, conventional, flow and bacteria parameter groups. The current monitoring program includes the 8 routine sites, 26 targeted sites spread throughout the watershed, 7 WWTP sites, 3 spring sites and a storm water site (Figure 17 and Table 11). These data will be utilized to track water quality trends and target "hot spots" in the watershed. Only parameters discussed in the WPP are included here. Additional parameters for these locations and results from GBRA targeted monitoring can be found on the website at http://plumcreek.tamu.edu and http://www.gbra.org/plumcreek/data.aspx
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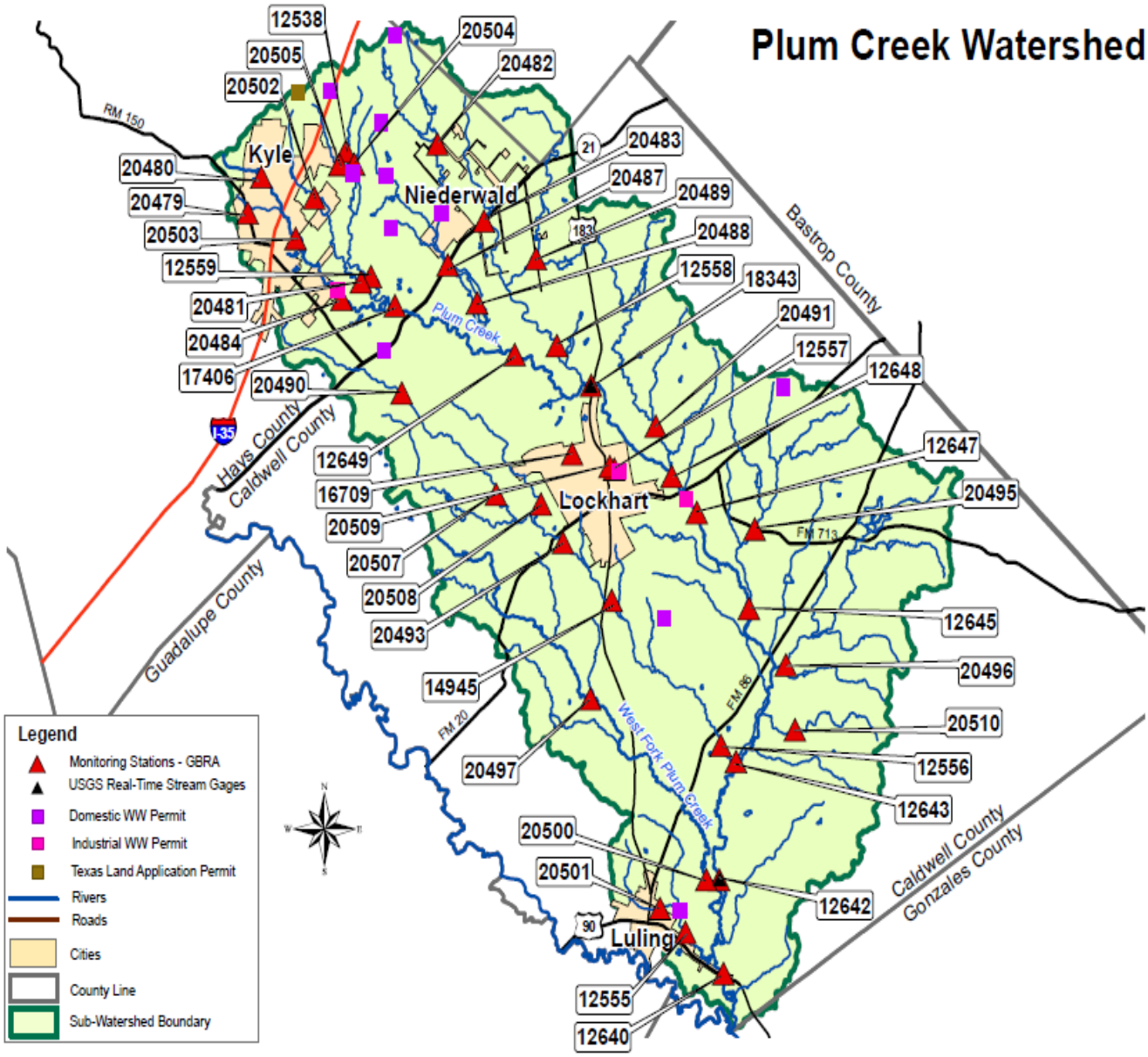


Figure 17. Water quality monitoring in the Plum Creek Watershed.

Table 11. Plum Creek monitoring locations and types of sampling.

Site No.	Site Name	Latitude	Longitude	Sample Type
12538	Andrews Branch at CR 131	30.03	97.827	Targeted
12555	Salt Branch at FM 1322	29.676	97.625	Targeted
12556	Clear Fork Plum Creek at Salt Flat Rd. (CR 128)	29.76	97.602	Routine/Diurnal
12557	Town Branch at E. Market St. (upstream of Lockhart WWTP #1)	29.885	97.665	Targeted
12558	Elm Creek at CR 233	29.96	97.798	Routine/Diurnal
12559	Porter Creek at Dairy Road	29.974	97.812	Targeted
12640	Plum Creek at CR 135	29.657	97.602	Routine/Diurnal
12642	Plum Creek at Biggs Road (CR131)	29.7	97.604	Targeted
12643	Plum Creek at FM 1322	29.753	97.593	Targeted
12645	Plum Creek at Youngs Lane (CR 197)	29.822	97.584	Targeted
12647	Plum Creek at Old McMahan Rd (CR202)	29.865	97.615	Routine/Diurnal
12648	Plum Creek at Old Kelly Road (CR 186)	29.882	97.63	Targeted
12649	Plum Creek at CR 233	29.938	97.725	Targeted
14945	Clear Fork Plum Creek at Old Luling Rd (CR 213)	29.826	97.668	Targeted
16709	Town Branch west of Lockhart	29.826	97.668	Targeted
17406	Plum Creek at Plum Creek Road	29.96	97.798	Routine/Diurnal
18343	Plum Creek upstream of US 183	29.923	97.679	Targeted
20479	Unnamed Tributary at FM 150 near Hawthorn Dr.	30.003	97.887	stormwater
20480	Plum Creek downstream of NRCS 1 spillway	30.019	97.879	Targeted
20481	Bunton Branch at Heidenreich Lane	29.971	97.819	Targeted
20482	Brushy Creek at FM 2001 (dwnstrm of NRCS 12)	30.033	97.771	Targeted
20483	Elm Creek at SH 21 (downstream of NRCS 16)	29.998	97.743	Targeted
20484	Plum Creek at Heidenreich Lane (downstream of Kyle WWTP)	29.963	97.831	Targeted
20486	11041-002 City of Kyle and Aquasource WWTP	29.97	97.832	WW Effluent
20487	Brushy Creek at SH 21	29.978	97.766	Targeted
20488	Brushy Creek at Rocky Road (Upstream of NRCS 14)	29.961	97.748	Routine/Diurnal
20489	Cowpen Creek at Schuelke Road	29.981	97.712	Targeted
20490	Clear Fork Plum Creek at Farmers Road	29.921	97.794	Targeted
20491	Dry Creek at FM 672	29.904	97.64	Routine/Diurnal
20492	10210-001 City of Lockhart WWTP #1	29.884	97.663	WW Effluent
20493	Clear Fork Plum Creek at PR 10 (State Park)	29.853	97.697	Targeted
20494	10210-002 City of Lockhart WWTP #2	29.872	97.622	WW Effluent
20495	Dry Creek at FM 713	29.858	97.58	Targeted
20496	Tenney Creek at Tenney Creek Road	29.796	97.562	Targeted
20497	West Fork Plum Creek at FM 671	29.782	97.681	Targeted
20498	Copperas Creek at Tenney Creek Road (downstream of Cal-Maine)	29.751	97.557	Targeted
20499	10582-002 City of Luling WWTP	29.685	97.627	WW Effluent
20500	West Fork Plum Creek at Biggs Road (CR131)	29.7	97.612	Routine/Diurnal
20501	Salt Branch at Salt Flat Road (Upstrm of Luling WWTP)	29.687	97.64	Targeted

Table 11. (continued).

Site No.	Site Name	Latitude	Longitude	Sample Type
20502	Bunton Branch at Dacy Lane (upstream of NRCS 5)	30.009	97.847	Targeted
20503	Plum Creek at Lehman Road	29.991	97.858	Targeted
20504	Porter Creek at Quail Cove Road	30.024	97.822	Targeted
20505	Richmond Branch at Dacy Lane	30.024	97.831	Targeted
20507	Clear Fork Springs at Borchert Loop (CR 108)	29.869	97.731	Spring
20508	Boggy Creek Springs at Boggy Creek Road (CR 218)	29.865	97.713	Spring
20509	Lockhart Springs	29.887	97.668	Spring
20510	Hines Branch at Tenney Creek (CR 141, downstream of Cal-Maine)	29.767	97.557	Targeted
99923	11060-001 City of Buda and GBRA WWTP	30.057	97.836	WW Effluent
99936	14431-001 GBRA Shadow Creek WWTP	30.043	97.811	WW Effluent
99937	14377-001 GBRA Sunfield WWTP	30.083	97.799	WW Effluent

GBRA Routine Monitoring Results

The water quality data collected at eight routine sites on Plum Creek, including five tributaries, is compiled in the following tables. The data were collected as part of the CWA Section 319 grants, a TSSWCB state grant and the Clean Rivers Program. Only parameters discussed in the WPP are listed. The data have been separated based on the hydrologic conditions of each sampling event. Rainfall data, additional parameters for these locations and results from targeted monitoring can be found on the GBRA website at http://www.gbra.org/plumcreek/data.aspx and http://pcwp.tamu.edu.

The region experienced severe drought in 2008-09 and again in 2011. These severe conditions impacted the sampling events designed to characterize water quality under different hydrologic conditions. The dry conditions were drier than normal over the period of record. The events conducted under wet hydrologic conditions were few and far between. For example, the routine site on the Dry Creek was only collected four times under dry conditions and five times under wet conditions, as compared to the sampling events conducted at the Plum Creek sites that averaged 30 and 18 events, respectively. The drought has made evaluation of implementation projects difficult, but recognizing the limitations of the small data set, some general observations can be made.

Plum Creek was listed on the 303d list because of *E. coli* concentrations. The *E. coli* results of the monitoring at the routine stations are in Table 12. The upper main stem sites continue to exceed the water quality contact recreation standard of 126 organisms per 100 mL. Rainfall events contribute significant *E. coli* loads but it is important to note that the bacterial contamination is still present and highly variable under baseflow conditions.

Table 12. Water quality monitoring results for *E. coli* at routine stations in Plum Creek categorized by meteorological conditions during sampling (dry weather or wet weather).

Site	No. of Samples	Median Flow-Dry	E. coli Geometric Mean - Dry	Range-Dry	No. of Samples	Median Flow-Wet	E. coli Geometric Mean - Wet	Range-Wet	% Change btwn Dry and Wet *
Plum Creek at Plum Creek Road	30	1.5	320	36-2420	17	4.45	797	73-24000	149.06
Plum Creek at CR 202	27	3.2	155	46-550	19	13	389	16->24200	150.97
Plum Creek at CR 135	31	5	112	9-1200	17	27.5	418	56-9800	273.21
Clear Fork Plum Creek at Salt Flat Road	25	0.13	54	3-3150	14	5.25	534	41-12030	888.89
West Fork Plum Creek at Biggs Road	24	dry w pools	24	1-240	14	0.01	276	10-2500	1050.00
Elm Creek at CR 233	12	0	26	4-300	8	0.6	423	10-17330	1526.92
Dry Creek at CR 672	4	0	231	48-700	5	0.2	1142	330-4160	394.37
Brushy Creek at Rocky Road	15	<0.01	44	5-260	8	3.6	732	43-5480	1563.64

* Positive change indicates an increase in pollutant load with rainfall. Negative change indicates that rainfall is diluting the base flow pollutant concentration.

Stations highlighted have a base flow geometric mean greater than the water quality standard of 126 organisms/100 mL under dry conditions.

Total phosphorus concentrations are assessed for concerns using a screening concentration of 0.69 mg/L. The data collected under dry conditions at the main stem sites exceed this screening concentration consistently due to the high contributions of wastewater effluents to the baseflow. The total phosphorus results of the monitoring at the routine stations are in Table 13. Comparing the phosphorus concentrations measured under dry conditions to the concentrations measured under wet conditions, the majority of the routine sites show a reduction in the phosphorus load as a result of dilution from runoff. Conversely, the Clear Fork Plum Creek at Salt Flat Road site showed a significant percent increase in phosphorus loading as a result of runoff, but still remained below the screening concentration. Because of the rarity of runoff events over the period of record, it is best to hold judgment on consistency and extent of the phosphorus loading until a larger data set can be compiled.

Table 13. Water quality monitoring results for phosphorus at routine stations in Plum Creek categorized by meteorological conditions during sampling (dry weather or wet weather).

Site	No. of Samples	Median Flow	Total P Mean - Dry	Range-Dry	No. of Samples	Median Flow	Total P Mean - Wet	Range-Wet	% Change btwn Dry and Wet *
Plum Creek at Plum Creek Road	30	1.5	3.45	0.76-5	17	4.45	1.22	0.29-2.83	-64.64
Plum Creek at CR 202	27	3.2	1.51	0.65-2.09	19	13	1.18	0.46-7.06	-21.85
Plum Creek at CR 135	31	5	1.02	0.22-2.69	17	27.5	0.7	0.23-1.48	-31.37
Clear Fork Plum Creek at Salt Flat Road	25	0.13	0.08	<0.05-0.31	15	5.25	0.19	<0.05-0.9	137.50
West Fork Plum Creek at Biggs Road	23	dry w pools	0.54	0.06-2.14	15	0.01	0.35	0.08-0.84	-35.19
Elm Creek at CR 233	12	0	0.14	0.09-0.19	8	0.6	0.17	0.06-0.45	21.43
Dry Creek at CR 672	4	0	0.36	0.23-0.47	5	0.2	0.3	0.11-0.41	-16.67
Brushy Creek at Rocky Road	24	<0.01	0.12	<0.05-0.21	14	3.6	0.14	<0.05-0.27	16.67

* Positive change indicates an increase in pollutant load with rainfall. Negative change indicates that rainfall is diluting the base flow pollutant concentration.

Stations highlighted have a base flow mean concentration greater than the screening concentration of 0.69 mg/L Total Phosphorus, under dry conditions.

According to the TCEQ assessment protocol, a stream will have a concern for nitrate nitrogen if the mean concentration exceeds 1.95 mg/L. Table 14 shows that the upper two main stem sites on Plum Creek exceed the screening concentration under dry flow conditions due to the contribution of wastewater effluents. As the water flows down the Plum Creek, the mean nitrate nitrogen concentration drops to below the screening concentration. This reduction could be due to the long residence time between the CR 202 and the CR 135 sites at low flows, which allows biological uptake of nitrate by macrophytes and algae. It is important to reiterate that drought impacts the stream by reducing baseflow which increases the percent of wastewater effluent under baseflow conditions and by reducing the contributions of tributaries which have been dry for a significant amount of time during the monitoring period.

Table 14. Water quality monitoring results for nitrate nitrogen at routine stations in Plum Creek categorized by meteorological conditions during sampling (dry weather or wet weather).

Site	No. of Samples	Median Flow	NO3-N Mean - Dry	Range-Dry	No. of Samples	Median Flow	NO3-N Mean - Wet	Range-Wet	% Change btwn Dry and Wet *
Plum Creek at Plum Creek Road	30	1.5	17.44	4.45-27.3	17	4.45	7.68	0.46-20.8	-55.96
Plum Creek at CR 202	27	3.2	7.51	2.8-16.3	19	13	4.39	1.07-11.5	-41.54
Plum Creek at CR 135	31	5	1.59	<0.05-5.88	17	27.5	2.52	0.18-6.76	58.49
Clear Fork Plum Creek at Salt Flat Road	25	0.13	0.72	<0.05-3.02	14	5.25	0.82	<0.05-2.05	13.89
West Fork Plum Creek at Biggs Road	22	dry w pools	0.3	<0.05-1.06	14	0.01	0.23	<0.05-0.88	-23.33
Elm Creek at CR 233	12	0	0.1	<0.05-0.35	8	0.6	0.4	<0.05-1.39	300.00
Dry Creek at CR 672	4	0	0.24	<0.05-0.8	5	0.2	0.95	<0.05-3.78	295.83
Brushy Creek at Rocky Road	24	<0.01	0.13	<0.05-0.69	14	3.6	0.55	<0.05-1.44	323.08

* Positive change indicates an increase in pollutant load with rainfall. Negative change indicates that rainfall is diluting the base flow pollutant concentration.

Stations highlighted have a base flow mean concentration greater than the screening concentration of 1.95 mg/L Nitrate Nitrogen, under dry conditions.

Sources of ammonia nitrogen include decomposition of organic material present in the stream, agricultural contributions and wastewater discharges (Table 15). Comparing water quality conditions under dry and wet conditions, at the majority of the sites, the mean concentration of ammonia nitrogen was reduced to or remained below the screening concentration of 0.33 mg/L after runoff events.

Table 15. Water quality monitoring results for ammonia-nitrogen at routine stations in Plum Creek categorized by meteorological conditions during sampling (dry weather or wet weather).

Site	No. of Samples	Median Flow	NH3-N Mean - Dry	Range-Dry	No. of Samples	Median Flow	NH3-N Mean - Wet	Range-Wet	% Change btwn Dry and Wet *
Plum Creek at Plum Creek Road	29	1.5	0.53	<0.1-5.62	16	4.45	0.32	<0.1-3.16	-39.62
Plum Creek at CR 202	27	3.2	0.13	<0.1-0.22	18	13	0.1	<0.1-0.18	-23.08
Plum Creek at CR 135	31	5	0.15	<0.1-0.25	16	27.5	0.2	<0.1-0.42	33.33
Clear Fork Plum Creek at Salt Flat Road	25	0.13	0.18	<0.1-0.45	14	5.25	0.15	<0.1-0.35	-16.67
West Fork Plum Creek at Biggs Road	23	dry w pools	0.2	<0.1-0.98	14	0.01	0.1	<0.1-0.4	-50.00
Elm Creek at CR 233	12	0	0.33	<0.1-1.24	8	0.6	0.25	<0.1-1.04	-24.24
Dry Creek at CR 672	4	0	0.22	0.12-0.39	5	0.2	0.25	<0.1-0.0.66	13.64
Brushy Creek at Rocky Road	24	<0.01	0.17	<0.1-0.63	14	3.6	0.14	<0.1-0.32	-17.65

* Positive change indicates an increase in pollutant load with rainfall. Negative change indicates that rainfall is diluting the base flow pollutant concentration.

Stations highlighted have a base flow mean concentration greater than the screening concentration of 0.33 mg/L Ammonia-Nitrogen, under dry conditions.

Data collected at the wastewater treatment facilities are tabulated in Table 16. The upper site on Plum Creek is dominated by wastewater effluent. During the drought, the site near Uhland would have been dry if not for the wastewater effluents discharged upstream. This site experienced a fish kill caused by the discharge of poorly treated wastewater, resulting in the discharge of high levels of ammonia and low dissolved oxygen from the Kyle AquaSource Wastewater Treatment facility in November 2010.

Data collected from Boggy Springs, Lockhart Springs, and Clear Fork Springs can be found in Table 17. The samples were collected quarterly but the hydrologic conditions were noted. The mean *E. coli* concentrations are at or above the water quality standard for contact recreation under both hydrologic conditions. These results could be impacted by the difficulty of collecting a representative sample of the springs, one that would not be impacted by either low flow conditions or after a rainfall event that contributes pollutant loads via surface runoff to the channel at the outlet of the springs.

Table 16. Wastewater treatment plant water quality monitoring results in the Plum Creek Watershed.

Site	Effluent Requirements E.coli/TotP/NH3-N	No. of Samples	Median Flow	E. coli Geometric Mean	Range	Total P Mean, mg/L	Range	NO3-N Mean, mg/L	Range	NH3-N Mean, mg/L	Range
Kyle and AquaTX	126/NA/3	11	2.6	129	1-4840	4.3	3.5-5.7	23.5	12.4-33.8	0.58	<0.2-4.21
Buda and GBRA	NA/1.2/2	11	1.2	2	<1-25	0.38	0.24-0.49	20.73	16.1-25.7	0.13	<0.2-0.28
Shadow Creek and GBRA	NA/1/2	10	0.1	3	<1-1300	0.4	0.1-1.14	8.86	0.52-15.8	3.98	<0.2-6.01
Sunfield and GBRA	NA/1/2	7	0.1	<1	<1	0.41	0.33-0.45	54.67	50-63.5	<0.2	<0.2
Lockhart #1 and GBRA	126/NA/3	11	0.62	10	1-820	3.02	1.91-5.32	15.95	9.88-26.3	0.8	<0.2-1.91
GBRA Lockhart #2	126/NA/3	11	1.5	30	4-240	2.91	0.73-4.92	6.88	0.15-16	<0.2	<0.2-0.52
Luling	NA/NA/3	11	0.3	<1	<1-3	3.7	1.98-4.89	13.05	0.19-25.2	0.46	<0.2-2.37

Table 17. Water quality monitoring results for three springs sites in the Plum Creek Watershed.

Site	No. of Samples - Dry	Median Flow - Dry	E. coli Geomean - Dry	E. coli Range-Dry	No. of Samples - Wet	Median Flow - Wet	E. coli Geomean - Wet	E. coli Range-Wet	Tot P Mean - Dry	Tot P Range - Dry	Tot P Mean - Wet	Tot P Range-Wet	NO3-N Mean - Dry	NO3-N Range-Dry	NO3-N Mean - Wet	NO3-N Range-Wet	NH3-N Mean - Dry	NH3-N Range-Dry	NH3-N Mean - Wet	NH3-N Range-Wet
Boggy Springs	4	0.25	124	64-190	3	0.1	1078	200-9800	<0.05	<0.05	0.04	0.02-0.06	6.78	5.58-8.28	5.81	5.4-6.28	0.24	<0.1-0.31	0.16	<0.1-0.19
Lockhart Springs	5	0.64	359	160-770	2	1.4	384	200-370	0.05	<0.05-0.05	0.05	<0.05-0.05	9.61	7.35-11.4	9.08	8.56-9.6	0.23	<0.1-0.36	0.13	<0.1-0.13
Clear Fork Springs	5	0.4	287	91-2420	2	2.35	362	460-860	<0.05	<0.05	0.05	0.03-0.07	6.04	5.22-6.6	5.48	5.36-5.6	0.21	<0.1-0.29	0.13	<0.1-0.13
			Stations highlighted have a base flow geometric mean concentration greater than the water quality standard of 126 organisms/100 mL under dry conditions.						No stations highlighted since none have a base flow mean concentration greater than the screening level of 0.69 mg P/L under dry conditions.				Stations highlighted have a base flow mean concentration greater than the screening level of 1.95 mg NO_3-N/L under dry conditions.				No stations highlighted since none have a base flow mean concentration greater than the screening level of 0.33 mg NH_3-N/L under dry conditions.			

ANALYSIS OF WATER QUALITY TRENDS AT CRP STATIONS

A trend analysis was calculated at the three CRP stations that are monitored monthly and located in Uhland (Figure 18), Lockhart (Figure 19) and Luling (Figure 20) using a running 3-year geometric mean or median calculated for each 6-month period in February and August over the time period. Three years of monitoring data were used to calculate a geometric mean for *E. coli* and a median for nitrate nitrogen and total phosphorus to develop graphs showing water quality trends. These data are influenced by the extreme drought that this area has experienced which has greatly reduced flows at the sites. The red line on the graphs indicates the water quality standard for *E. coli* and the state's screening criteria level for nitrate nitrogen and total phosphorus. To meet water quality standards or screening criteria levels the blue area should be below the red line.

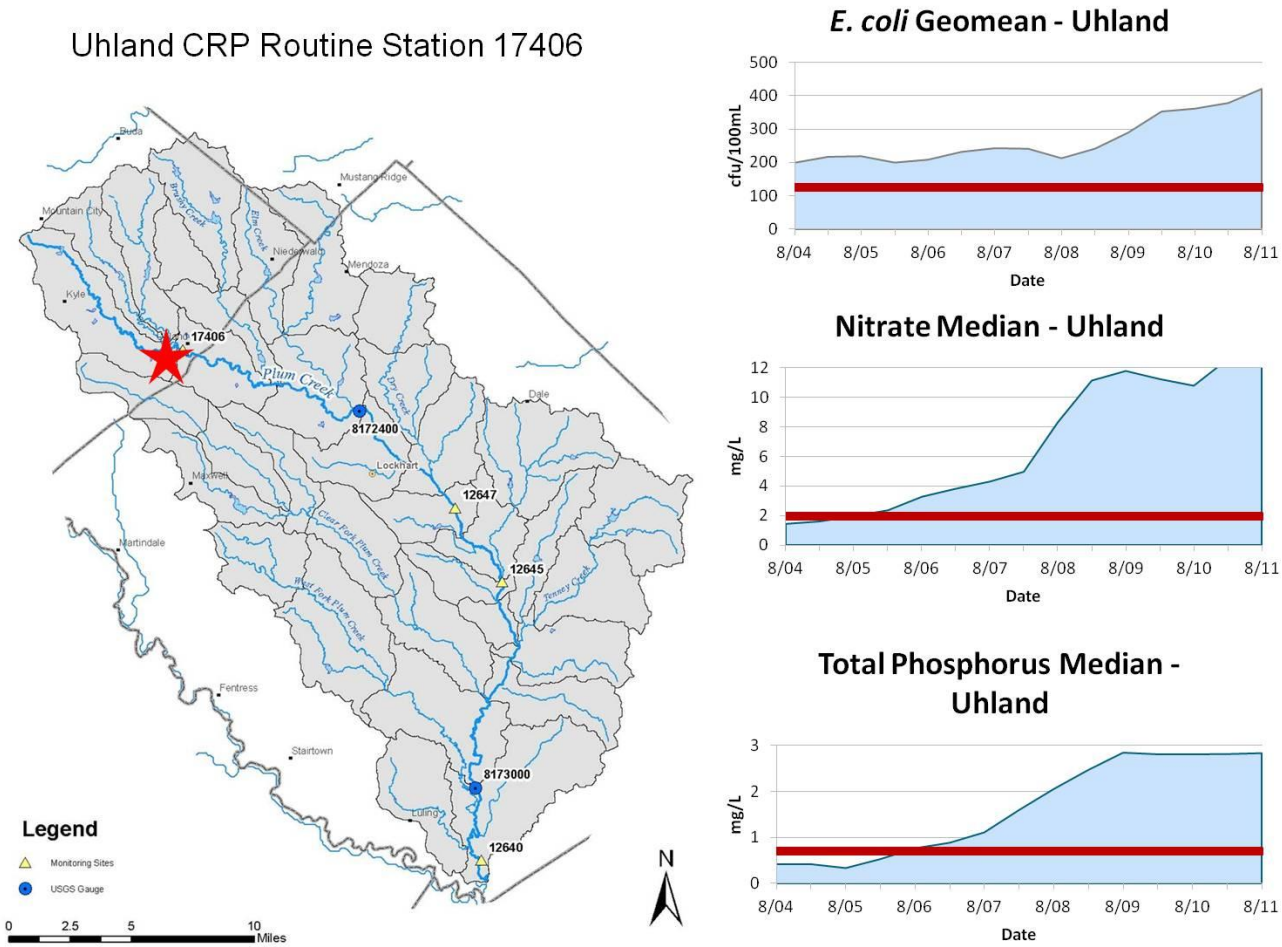


Figure 18. Uhland CRP routine monitoring station and water quality trend analysis for *E. coli*, nitrate nitrogen, and total phosphorus.

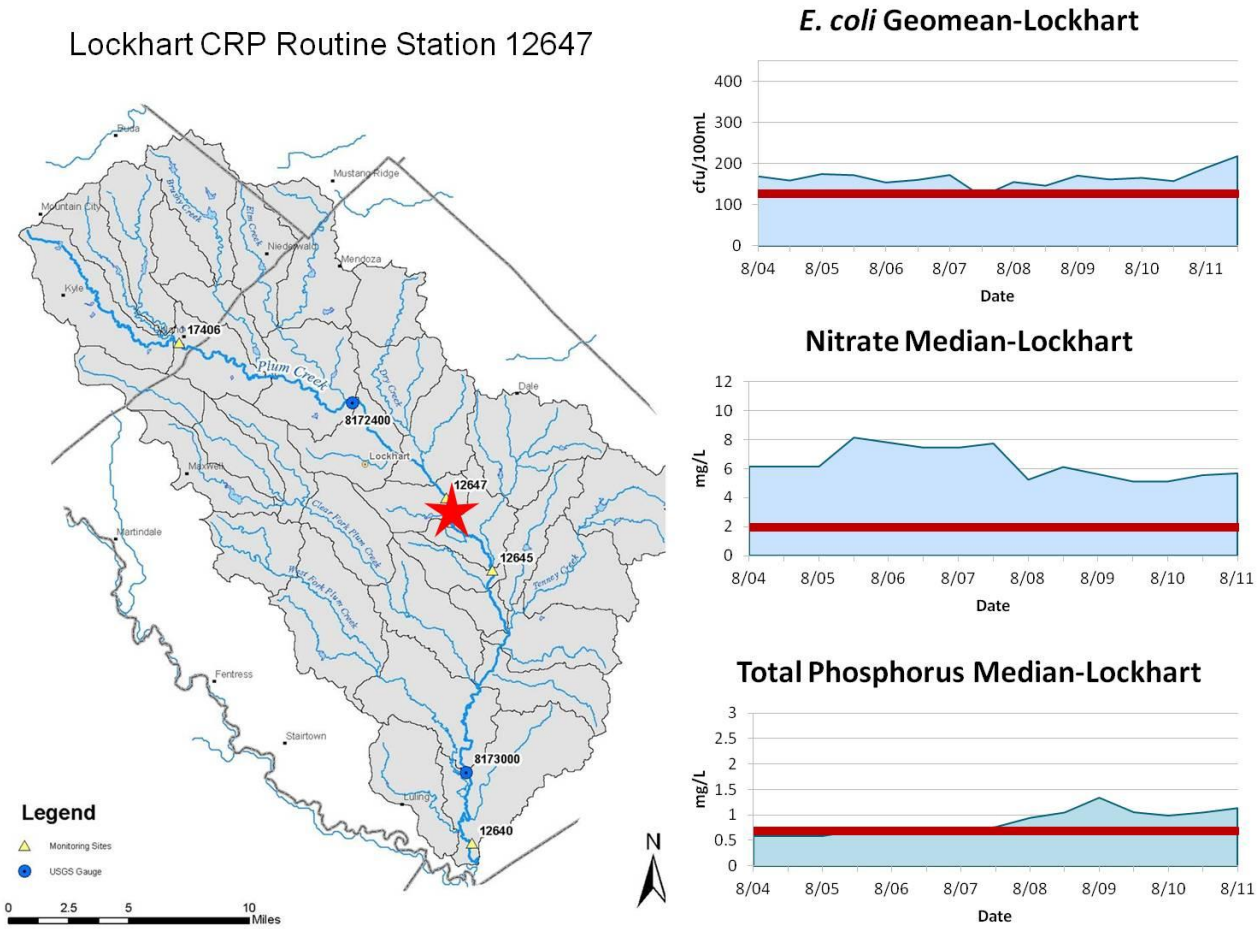


Figure 19. Lockhart CRP routine monitoring station and water quality trend analysis for *E. coli*, nitrate nitrogen, and total phosphorus.

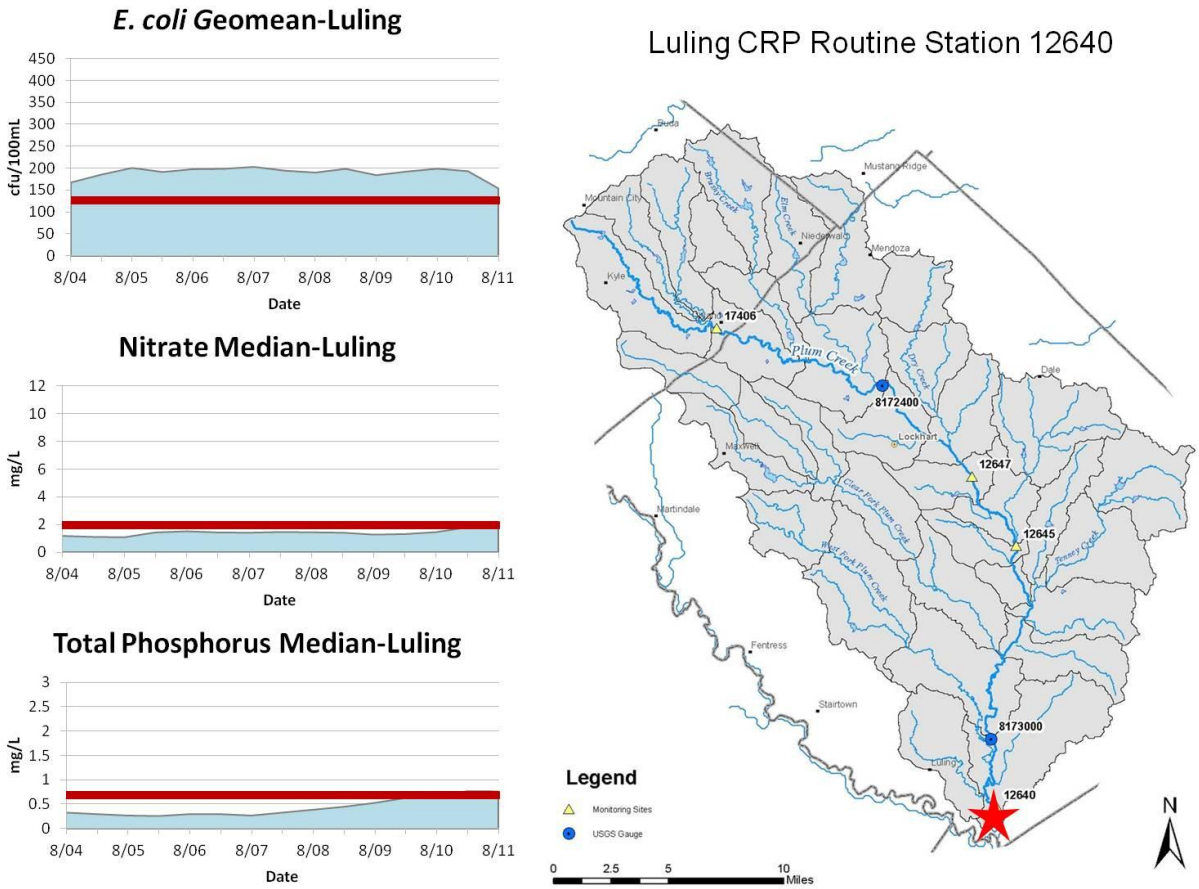


Figure 20. Luling CRP routine monitoring station and water quality trend analysis for *E. coli*, nitrate nitrogen, and total phosphorus.

GBRA Targeted Monitoring Results

TSSWCB provided CWA §319(h) funding for the GBRA to conduct an intensive targeted monitoring project to supplement data collected for TCEQ assessment purposes. In addition to expanding the number of routine monthly monitoring stations from three to eight sites monthly (as discussed in the previous section), 35 sites are now sampled twice per season during both dry and wet weather conditions; six WWTFs are sampled once per season, three springs are sampled seasonally; and automated stormflow sampling of selected rainfall events was conducted at an urban site in the City of Kyle (Table 18). After the initial period of funding (May 2007 through March 2010), TSSWCB utilized state general revenue to continue the mainstem and tributary portions of this monitoring regime through December 2010. GBRA will continue this comprehensive monitoring regime for three additional years (through October 2013) with another §319(h) grant from TSSWCB. This increased monitoring strategy provides a higher level of understanding of the spatial and temporal trends of pollutant loading, serves to refine the focus of management efforts, and helps track the performance of ongoing implementation activities. Because this is a critical part of adaptive management in the Plum Creek watershed, the targeted monitoring will play a key role in future watershed efforts and should continue. The following table summarizes data collected thus far. There is a considerable variation between and within sites, depending on the water quality parameter.

Table 18. Routine and targeted monitoring data in the Plum Creek Watershed categorized by meteorological conditions during sampling (dry weather or wet weather).

Site	No. of Samples - Dry	Median Flow - Dry	*E. coli* Geomean - Dry	*E. coli* Range-Dry	No. of Samples - Wet	Median Flow - Wet	*E. coli* Geomean - Wet	*E. coli* Range-Wet	Tot P Mean - Dry	Tot P Range-Dry	Tot P Mean - Wet	Tot P Range-Wet	NO3-N Mean - Dry	NO3-N Range-Dry	NO3-N Mean - Wet	NO3-N Range-Wet	NH3-N Mean - Dry	NH3-N Range-Dry	NH3-N Mean - Wet	NH3-N Range-Wet
Andrews Branch at CR 131	8	0.85	146	38-490	7	1.2	720	41-10460	0.28	0.18-0.34	0.24	0.16-0.44	12.89	2.49-2.26	7.73	1.14-20.6	0.17	0.1-0.35	0.16	0.05-0.33
Brushy Creek at FM2001	1	0	4	NA	4	0.3	547	110-6800	0.10	NA	0.21	0.05-0.46	<0.05	<0.05	1.47	<0.05-5.7	0.42	NA	0.25	0.05-0.47
Brushy Creek at SH21	5	0	20	1-79	6	0.8	626	120-7270	0.10	0.05-0.16	0.17	0.06-0.33	0.07	<0.05-0.17	0.85	<0.05-2.83	0.23	0.05-0.46	0.16	0.05-0.45
Bunton Branch at Dacy Lane (CR205)	5	0.01	36	16-150	5	0.65	653	50-3550	0.05	<0.05-0.07	0.1	0.05-0.22	0.1	<0.05-0.19	0.57	0.19-1.03	0.14	0.1-0.17	0.14	0.05-0.36
Bunton Branch at Heidenreich Lane (CR152)	1	dry	140	NA	4	1.2	1335	630-2360	0.06	NA	0.09	<0.05-0.22	0.09	NA	0.08	0.2-1.82	0.17	NA	0.11	0.05-0.2
Clear Fork Plum Creek at Old Luling Road (CR213)	8	0.54	88	35-270	8	0.79	372	20-2000	0.06	<0.05-0.12	0.15	<0.05-0.34	1.15	0.05-3.12	1.64	0.18-5.4	0.2	<0.1-0.6	0.2	0.1-0.59
Clear Fork Plum Creek at CR 228	3	dry	59	10-750	3	0	210	10-3080	0.14	0.13-0.15	0.14	0.06-0.24	0.03	<0.05	0.48	0.15-1.04	0.17	<0.1-0.29	0.14	<0.1-0.35
Clear Fork Plum Creek at PR 10	8	0.69	48	19-130	8	0.9	351	160-1700	0.04	<0.05-0.06	0.11	<0.05-0.39	2.55	0.12-5.3	2.44	0.96-5.44	0.13	<0.1-0.3	0.11	<0.1-0.16
Copperas Creek at Tenney Creek Rd (CR141)	1	0	180	NA	4	0.04	642	10-17000	0.12	NA	0.54	0.14-0.93	0.22	0.22	0.49	0.05-1.2	0.46	NA	0.23	0.02-0.37
Cowpen Creek at Schuelke Rd (CR222)	0	dry	NA	NA	3	<0.01	1258	160-46100	NA	NA	0.24	0.06-0.39	dry	NA	0.5	<0.05-1.02	dry	NA	0.2	<0.1-0.5
Dry Creek at FM713	2	0	66	10-440	4	0.14	713	420-1610	0.22	0.17-0.27	0.22	0.15-0.27	1.47	0.14-2.79	0.47	0.1-1.24	0.16	0.14-0.17	0.19	<0.1-0.32
Elm Creek at SH 21	0	dry	NA	NA	2	<0.1	226	160-320	NA	NA	0.14	0.09-0.19	dry	NA	0.71	<0.05-1.4	NA	NA	0.2	<0.1-0.34
Hines Branch at Tenney Creek Rd (CR141)	1	0	70	NA	4	0	606	60-4000	0.16	NA	0.18	0.06-0.37	0.03	<0.05	0.78	<0.05-1.55	0.27	NA	0.22	0.13-0.4
Plum Creek at Biggs Rd (CR131)	8	5.8	188	86-460	8	20.5	1206	170-11200	0.80	0.44-1.34	1.03	0.34-1.69	1.81	0.09-4.26	1.72	0.22-3.75	0.17	<0.1-0.33	0.15	0.12-0.24
Plum Creek at CR 186	8	3.1	217	70-540	8	8.3	864	150-24200	1.13	0.67-2.07	1.05	0.31-2.04	8.09	1.08-12.7	2.87	0.97-9.06	0.11	<0.1-0.23	0.13	<0.1-0.19
Plum Creek at CR 233	8	1.4	96	45-210	7	6.1	711	120-10460	2.64	0.86-4.08	1.42	0.26-3.96	12.17	3.33-19.7	4.39	0.38-18.6	0.16	<0.1-0.33	0.2	<0.1-0.4
Plum Creek at FM 1322	8	2.6	145	53-400	8	12.5	915	150-3650	0.91	0.46-1.53	1.25	0.38-2.14	3.57	0.07-8.74	3.28	0.91-7.08	0.16	<0.1-0.26	0.13	0.1-0.17

Stations highlighted have a base flow geometric mean concentration greater than the water quality standard of 126 organisms/100 mL under dry conditions.

Stations highlighted have a base flow mean concentration greater than the screening level of 0.69 mg P/L under dry conditions.

Stations highlighted have a base flow mean concentration greater than the screening level of 1.95 mg NO_3-N/L under dry conditions.

Stations highlighted have a base flow mean concentration greater than the screening level of 0.33 mg NH_3-N/L under dry conditions.

Site	No. of Samples - Dry	Median Flow - Dry	*E. coli* Geomean - Dry	*E. coli* Range-Dry	No. of Samples - Wet	Median Flow - Wet	*E. coli* Geomean - Wet	*E. coli* Range-Wet	Tot P Mean - Dry	Tot P Range-Dry	Tot P Mean - Wet	Tot P Range-Wet	NO3-N Mean - Dry	NO3-N Range-Dry	NO3-N Mean - Wet	NO3-N Range-Wet	NH3-N Mean - Dry	NH3-N Range-Dry	NH3-N Mean - Wet	NH3-N Range-Wet
Plum Creek at Heidenreich Lane (CR152)	8	1.85	1793	770-4840	7	3.1	5269	1100->24200	3.83	2.71-4.96	2.05	0.33-3.92	18.42	7.05-26.5	11.35	0.65-27	0.94	0.15-5.3	0.45	<0.1-1.63
Plum Creek at Lehman Rd	8	0.01	79	5-260	8	0.7	1283	97-19860	0.04	<0.05-0.08	0.08	<0.05-0.17	0.2	<0.05-0.7	0.49	<0.05-1.07	0.13	<0.1-0.24	0.13	<0.1-0.34
Plum Creek at Youngs Lane (CR197)	8	275	149	76-380	7	10.1	1942	660-17330	1.33	0.47-2.14	1.16	0.33-2.8	4.28	0.17-10.7	4.45	1.16-10.7	0.16	<0.1-0.3	0.14	<0.1-0.17
Plum Creek downstrm of NRCS 1	8	0	39	5-1120	8	0	133	20-1190	0.37	0.18-0.8	0.34	0.06-0.87	1.29	<0.05-7.84	0.99	<0.05-6.52	0.76	0.1-2.81	0.15	<0.1-0.46
Plum Creek upstrm of Hwy 183	8	0.14	62	12-220	7	18	528	50->24200	2.05	0.82-3.42	1.28	0.3-3.18	4.95	0.13-10.3	2.28	0.63-8.48	0.16	0.11-0.3	0.12	<0.1-0.18
Porter Creek at Dairy Rd (CR151)	5	dry	98	8-480	5	1.1	2058	600-24200	0.08	<0.05-0.16	0.1	0.05-0.2	0.14	<0.05-0.55	0.46	<0.05-0.8	0.24	<0.1-0.7	0.17	<0.1-0.38
Porter Creek Trib at Quail Cove Rd	0	dry	NA	NA	2	0.1	382	40-3650	NA	NA	0.17	0.12-0.22	NA	NA	0.43	0.15-0.7	NA	NA	0.25	0.12-0.37
Richmond Branch at Dacy Lane (CR205)	6	0	209	53-690	6	0.58	1408	170-18600	0.06	<0.05-0.14	0.16	0.05-0.43	0.1	<0.05-0.18	1.31	0.07-3.89	0.14	<0.1-0.21	0.22	<0.1-0.75
Salt Branch at CR128	5	0	498	70-4840	9	0.04	2775	350->24200	1.27	0.34-4.13	0.39	0.28-0.7	0.23	<0.05-0.57	0.38	0.07-1.33	5.41	0.23-0.32	0.21	0.14-0.32
Salt Branch at FM 1322	8	<0.01	154	17-2150	8	1.88	2321	100-13000	3.20	1.93-4.02	1.53	0.24-3.69	6.22	0.08-14.6	1.63	0.23-4.59	0.59	0.17-2.59	0.36	0.17-0.64
Tenney Creek at Tenney Creek Rd (CR141)	0	dry	NA	NA	3	0	136	5-960	NA	NA	0.44	0.32-0.65	NA	NA	0.28	0.16-0.47	NA	NA	0.12	<0.1-0.18
Town Creek at E. Market St	8	0.72	253	140-460	8	1.3	665	70-16000	0.05	<0.05-0.07	0.09	0.05-0.18	9.02	0.69-12.4	7.7	3.9-10.3	0.15	<0.1-0.24	0.09	<0.1-0.14
Town Creek W of Lockhart (Stueve Lane)	0	dry	NA	NA	4	0	172	5->24200	NA	NA	0.6	0.15-0.93	NA	NA	0.96	<0.05-3.14	NA	NA	0.21	<0.1-0.51
West Fork Plum Creek at FM671	0	dry	NA	NA	5	0.08	310	10-1200	NA	NA	0.11	<0.05-0.2	NA	NA	0.25	<0.05-0.75	NA	NA	0.16	<0.1-0.41

Stations highlighted have a base flow geometric mean concentration greater than the water quality standard of 126 organisms/100 mL under dry conditions.

Stations highlighted have a base flow mean concentration greater than the screening level of 0.69 mg P/L under dry conditions.

Stations highlighted have a base flow mean concentration greater than the screening level of 1.95 mg NO_3-N/L under dry conditions.

Stations highlighted have a base flow mean concentration greater than the screening level of 0.33 mg NH_3-N/L under dry conditions.

Rainfall Patterns from January 2008 – November 2011

This region of Texas has seen historic drought levels that have led to crop failures, livestock sell off, and wildfires. Dry conditions in the Plum Creek watershed in 2007-2009 dramatically affected the landscape. Rainfall returned in fall and winter of 2009; however, dry conditions returned by the end of 2010 and continued with unprecedented intensity throughout 2011. The average monthly rainfall is plotted along with the historic average monthly amounts for the period of 1943-2011 (Figure 21). These recent weather patterns have substantially affected pollutant loading characteristics throughout the watershed. Decreased plant cover likely resulted in greater loss of soil and associated nutrients in many areas as rains returned.

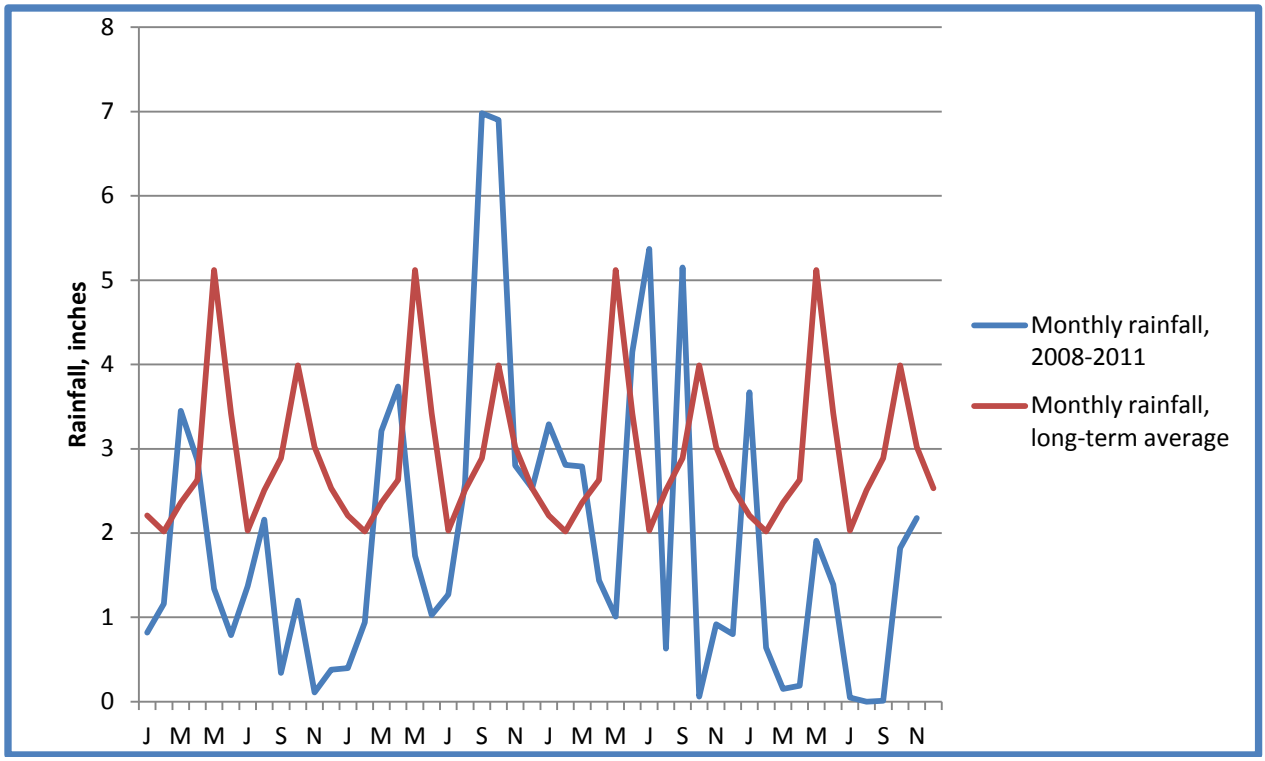


Figure 21. Rainfall data from 2008-2011 compared to the long-term average.

Stream Biological Assessments

In addition to water quality analyses, GBRA conducts annual biological and habitat assessments at two sites in the Plum Creek watershed under the Clean Rivers Program: Plum Creek at CR 202 near Lockhart (12647) and Plum Creek at Plum Creek Road near Uhland (17406). Surveys of the fish and macroinvertebrate communities in the stream as well as the plant communities and physical characteristics of the environment adjacent to the stream serve as indicators of positive or negative responses to changes in stream conditions. The type and the number of fish and macroinvertebrate species collected are used to calculate the Index of Biotic Integrity (IBI). Table 19 gives the IBI scores and the classifications that are based on those scores for each site since 2006. Bioassessments were not performed at either site in 2007 and at the Plum Creek at Plum Creek Road site in 2009 due to high flow events that scoured the stream.

The TCEQ Clean Rivers Program (CRP) funded the GBRA to perform one biological monitoring event per year at the Plum Creek at Plum Creek Road (TCEQ ID #17406) monitoring station near Uhland. The GBRA began monitoring the fish community, benthic macroinvertebrate community and physical habitat characteristics at station 17406 in 2004. Each monitoring event was conducted under the GBRA CRP quality assurance project plan (QAPP) and followed the sampling protocols defined in either the TCEQ Surface Water Quality Monitoring Procedures Manual: Volume 2, published in June of 2007, or the Receiving Water Assessment Procedures Manual, published in June of 1999. These monitoring events were scheduled at this location in order to "screen" the creek for undiagnosed biological impairments or concerns. During the March 2009 Guadalupe River Basin coordinated monitoring meeting, the CRP stakeholders agreed to remove the biological monitoring event at station 17406 after fiscal year 2010 in order to re-distribute the funding into new monitoring projects elsewhere in the basin. The decision to discontinue the biological assessment at this station was largely due to the results from the last available assessment event in September of 2008 using the newly published SWQM Procedures Manual: Volume 2 aquatic life monitoring (ALM) protocols. This event showed that all three calculated biological monitoring criteria were meeting the designated "High" aquatic life use for the stream segment. The removal of biological monitoring at station 17406 was also possible because aquatic life use monitoring had been added to another station (12647) on the Plum Creek at Old McMahan Road, downstream of the City of Lockhart, which represented a larger portion of the Plum Creek watershed.

Table 19. Stream biological assessments at two sites on Plum Creek.

Stream Biological Assessments - IBI Score (Classification)										
Site	**2006**		**2008**		**2009**		**2010**		**2011**	
	Nekton	**Benthics**	**Nekton**	**Benthics**	**Nekton**	**Benthics**	**Nekton**	**Benthics**	**Nekton**	**Benthics**
Plum Creek at Plum Creek Road (17406)	33 Limited	20 Limited	42 High	42 High	Flooding	Flooding	42 High	24 Intermed	Removed from Monitoring Schedule	
Plum Creek at CR 202 (12647)	24 Intermed	17 Limited	42 High	24 Intermed	33 Limited	24 Intermed	24 Intermed	24 Intermed	42 High	24 Intermed

* Assessment not conducted in 2007.

The IBI classification system for nekton species developed by the Texas Parks and Wildlife Department is specific to each ecoregion. The IBI classification system for the benthic community developed by the TCEQ is applied to all ecoregions across the state. The following are the stream classifications assigned based on IBI scores (Table 20):

Table 20. Stream classifications assigned based on IBI scores.

Classification	Nekton	Benthic
Exceptional	≥49	>36
High	41-48	29-36
Intermediate	35-40	22-28
Limited	<35	<22

GBRA has observed that the majority of macroinvertebrate species collected at both locations are *tolerant species*. Additionally, there are very few nekton species collected per unit effort and those fish species caught included very few benthic invertivores (fish that feed on invertebrates).

The lower species diversity and number of individuals collected have negatively impacted the IBI scores at the Plum Creek sites. There are more tolerant species found at these sites than intolerant species.

The TCEQ assesses the biological integrity of streams by comparing the classification given a site based on the IBI score to the water quality standard for flowing streams. The presumed use for flowing streams is High Aquatic Life Use. Aquatic Life Monitoring (ALM) protocol used by TCEQ requires that two assessments be conducted each year for two years, with one of the annual assessments done in the critical period (July-September) and one done outside the critical period (March-October). The biological assessments conducted by GBRA on the Plum Creek sites were done only in the critical period of each year. ALM performed by GBRA on the Plum Creek sites was to provide baseline data on environmental conditions.

Soil and Water Assessment Tool (SWAT)

The use of the SWAT model was investigated during WPP development to help guide implementation efforts. However, due to a lack of critical data and incomplete understanding of the fate and transport of *E. coli* bacteria in freshwater streams, the approach was inconclusive. While calibration and validation of flows was successful, replication of bacteria loads proved very problematic. In some instances, removal of pollutant sources resulted in a net increase in bacteria loading. The use of LDCs in concert with SELECT analysis was very effective for quantifying and targeting implementation measures. Due in part to the extreme drought, but also because more time is needed for practice implementation and to address issues of lag time, neither LDC nor SELECT analyses was conducted for the purposes of this update. The SWAT approach may again receive attention in the future, but current adaptive management approaches and implementation guidance primarily will rely on pollutant loading trends as indicated by the targeted water quality monitoring.

Bacterial Source Tracking

Bacterial source tracking (BST) is a valuable tool for identifying human and animal sources of fecal pollution. BST has not yet been utilized to determine in-stream source loading in the watershed. The Partnership and technical advisory group determined that the initial approach to determining target sources and geographic areas using SELECT analysis was adequate at that stage of developing the WPP. The Partnership will continue to investigate opportunities to employ BST strategies, and if satisfactory progress toward water quality restoration is not apparent, use of this technique may be reconsidered.

The state of BST science, methodologies, application and confidence has evolved greatly in the past few years since the Plum Creek WPP was published. The Texas *E. coli* BST library was developed based on known source isolates from different domestic sewage, wildlife, livestock and pet fecal samples from selected watersheds across the state. Expansion of the library to include additional known source isolates from other Texas watersheds and different animal hosts is continuing. Investments by the state in building BST analytical laboratory infrastructure and the use of the Texas *E. coli* BST library will provide for significant cost and time savings for the identification of nonpoint source pollution should the Partnership reconsider the use of BST.

NITRATE NITROGEN ISOTOPE STUDY

Plum Creek is 52 miles in length and has a drainage area of 389 mi^2. According to the 2008 Texas Water Quality Inventory and 303(d) List, all three assessment units of Plum Creek that make up the classified stream segment exhibit nutrient enrichment concerns for ammonia, nitrate+nitrite nitrogen and total phosphorus. Data collected from December 2001 through November 2008, reports the mean concentration of nitrate nitrogen for Assessment Unit (AU) 1810_01 as 3.07 milligrams per liter (mg/L) with 25 out of 82 samples exceeding the screening concentration; the mean concentration for AU 1810_02 as 8.89 mg/L with 24 out of 27 samples exceeding the screening concentration; and, the mean concentration for AU 1810_03 as 9.5 mg/L with 50 out of 82 samples exceeding the screening concentration.

Since monitoring of Plum Creek began in the late 1990's it has shown elevated concentrations of nitrate-nitrogen. Currently, because the state stream water quality standards are not numeric for nutrients, exceedences of a screening concentration of 1.95 mg/L nitrate-nitrogen have been used to designate a stream as having a concern for nitrate-nitrogen. The possible sources of the nutrient concern are numerous. Plum Creek is effluent-dominated and is also fed by springs that come from the Leona Aquifer, known to have elevated concentrations of nitrate-nitrogen. Stakeholders in the watershed have long suspected fertilizer use as the source of the nitrates in the Leona, but oddly enough, elevated concentrations of nitrates had been seen in well testing long before commercial inorganic fertilizers came into use. Septic systems, organic fertilizers, nitrifying plants and atmospheric deposition round out the list of possible sources.

The Texas Commission on Environmental Quality (TCEQ) has begun to develop numeric water quality standards for nitrate-nitrogen. At the end of that process, the standards established by TCEQ and the USEPA could move Plum Creek from a designation of "concern for nutrients" to the 303(d) List of Impaired Waterbodies. The Plum Creek Watershed Partnership has not waited for "impaired waterbody" status to start working on best management practices that could reduce sources of nitrates. In order to help direct efforts and funding toward the most likely or most influential source(s) of nitrate, this project will look to isotopic signatures of nitrogen and oxygen in the nitrates. The ratios of the isotopes of nitrogen and oxygen in nitrate often are useful for determining sources of nitrates in groundwater and surface water. Isotopic ratios are expressed as the ratio of the heavier isotope to the lighter isotope relative to a standard in parts per thousand (USGS, 2011). Figure 22 describes graphically the relationship of nitrogen and oxygen isotopes, and the nitrogen cycle.

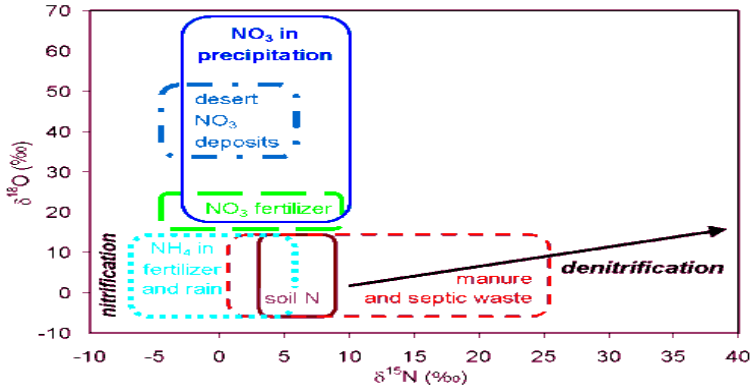


Figure 22. Relationships of nitrogen and oxygen isotopes and the nitrogen cycle.

A total of 10 sites in the Plum Creek and the Geronimo Creek watersheds will be sampled for major ions, selected nutrient species including nitrate-nitrogen, and ($^{15}N/^{14}N$) and oxygen ($^{18}O/^{16}O$) isotopes four times during the first year. A total of 40 environmental samples and six (6) quality-assurance samples will be collected. The quality-assurance samples will consist of 2 field blanks and 4 replicates samples. Sample collection will occur approximately every quarter and if possible, sampling will occur over a range in hydrologic conditions. Field parameters and flow measurements will be collected at the same time as the water-quality samples. In Plum Creek, five routine monitoring locations included in the CRP and the TSSWCB CWA Section 319(h) project 10-07, "*Surface Water Quality Monitoring and Additional Data Collection Activities to Support the Implementation of the Plum Creek Watershed Protection Plan*," will be sampled. In addition one well and one spring identified in the TSSWCB CWA Section 319(h) project 10-07 (Plum Creek), will be sampled for the same constituents at the same time as the surface water samples are collected. Sample collection and analyses for nutrients, major ions, and nitrogen isotopes will be performed by the USGS; measurements of field parameters and flow will be collected by GBRA. Quality-assurance samples including blanks and replicates will be collected to ensure the integrity of the dataset. The USGS will evaluate the data and submit a technical report at the end of the study if funded.

BACTERIA REDUCTIONS (Revisions to WPP Tables 5.1 and 10.3.)

An error was identified in the calculations which influenced reported values for Table 10.3 in relation to Table 5.1 in the WPP. For Table 5.1 (page 38 in the WPP) the footnote was corrected to state *E. coli* loads (Table 21). For Table 10.3 (page 120 of the WPP), values for the Luling monitoring station have been revised to be consistent with Table 5.1 (Table 22).

Table 21. Table 5.1 from WPP with updated footnotes. Annual load characteristics and *E. coli* reductions for each station (in billions of cfu).

Monitoring Station	Average Annual *E. coli* Load (cfu/year)	Lower 95% CI	Upper 95% CI	Load Reduction (cfu/year)	Target Load (cfu/year)
Uhland (17406)	1.12E+05	8.74E+04	1.36E+05	7.28E+04	3.92E+04
Lockhart (12647)	4.26E+05	2.46E+05	6.06E+05	6.39E+04	3.62E+05
Luling (12640)	3.02E+07	1.04E+07	5.01E+07	1.24E+07	1.78E+07

[1] The 95% confidence interval for minimum and maximum *E. coli* loads.

Table 22. Revised Table 10.3 in WPP. Estimated regional pollutant load reductions expected upon full implementation of the Plum Creek WPP.

Management Measure	Expected Load Reduction								
	Uhland			Lockhart			Luling		
	Ec[1]	N[2]	P[3]	Ec	N	P	Ec	N	P
Urban Stormwater Management Measures									
Pet Waste Collection Stations	7.2E+12	70.6	8.2	7.3E+12	158.5	17.9	**6.0E+14**	1.4	N/A
Comprehensive Urban Stormwater Assessment	4.3E+13	531.7	19.1	1.9E+13	929.6	32.5	**1.8E+15**	7.8	N/A
Retrofit Stormwater Detention Basins									
Initiate Street Sweeping Program									
Manage Urban Waterfowl Populations									
Rehabilitate Stormwater Retention Pond									
Wastewater Management Measures									
Wastewater Upgrade (TSS Reduction)	3.5E+10	N/A	N/A	2.1E+10	N/A	N/A	**3.2E+12**	N/A	N/A
Wastewater Upgrade (Phosphorus Removal)									
Voluntary Monthly *E. coli* Monitoring									
Voluntary Monthly Phosphorus Monitoring									
Sanitary Sewer Pipe Replacement									
Lift Station SCADA Installation									
Initiate Sanitary Sewer Inspection Program									
Septic System Inspection/Enforcement (New Position)	6.1E+12	22.7	13.3	5.0E+12	42.2	24.2	**3.8E+14**	0.4	N/A
Septic System Repair									
Septic System Replacement									
Septic System Connection to Sewer									

Table 22. (continued).

Management Measure	Expected Load Reduction								
	Uhland			Lockhart			Luling		
	Ec[1]	N[2]	P[3]	Ec	N	P	Ec	N	P
Agricultural Management Measures									
WQMP Technician (New Position)	9.6E+12	5,472	827	2.1E+13	30,427	4,772	**5.6E+15**	542	N/A
Livestock Water Quality Management Plans									
Cropland Water Quality Management Plans									
Non-Domestic Animal and Wildlife Management Measures									
Feral Hog Control (New Position)	7.3E+12	1,615	327	1.2E+13	5,902	1,163	**4.0E+15**	105	N/A
Feral Hog Control (Equipment)									

[1] Ec: *E. coli* reduction indicated in cfu/year.
[2] N: Nitrogen reduction in kg/year.
[3] P: Phosphorus reduction in kg/year.

ADAPTIVE MANAGEMENT

Adaptive management is a type of natural resource management in which decisions are made as part of an ongoing science-based process. Adaptive management involves testing, monitoring, and evaluating applied strategies, and incorporating new knowledge into management approaches that are based on scientific findings and the needs of society. Results are used to modify management policy, strategies, and practices [65 Fed. Reg. 62566-62572 (October 18, 2000)].

The essence of successful watershed planning and management is a commitment to adaptive management. The Plum Creek Watershed Partnership is committed to adaptive management of the Plum Creek WPP. Over the course of project implementation, instream monitoring data provided by GBRA will be compared with interim milestones and water quality criteria to determine progress in achieving WQS. If water quality improvement is not being demonstrated within the proposed timeframes, efforts will be made to increase adoption of BMPs and/or adjust strategies or focus areas if and when necessary.

The Plum Creek WPP Update report is a document that will be developed and approved to be published approximately every two years. This report will contain updates on tracking the progress of implementation, outreach activities, and water quality monitoring in the watershed. The report will document and provide updates and any issues or adaptive management decisions on all of the measures within the WPP and any modifications to the goals and strategies identified in the WPP. In addition it will include an analysis of up to date water quality data to determine progress in achieving water quality restoration.

IMPLEMENTATION SCHEDULE AND MILESTONES

The WPP was developed based on a 10-year implementation schedule with implementation proceeding through the end of calendar year 2018. The projected timeline for achievement of pollutant load reductions and bacteria concentration targets was presented in Table 9.1 (p. 104) of the WPP. Table 23 is an updated version of Table 9.1 as the *E. coli* data originally used for the WPP were official TCEQ reported geometric means from the 2006 Texas Water Quality Inventory and 303(d) List that evaluated data through 2004. These were the only official data at the time the WPP was developed. However, it was determined that measured data now available for February 2008 should be used as the starting point for bacteria targets (shown in red). Table 23 will be used to assess interim progress in achieving the long-term load reduction goals. While it is not expected that the interim target concentrations will be precisely met in any given year, Table 23 serves as a blueprint for gauging water quality progress as a result of implementation. The water quality goals are for each site to be under the water quality standard for *E. coli* of a 7-year geometric mean below the 126 cfu/100 ml.

The 3-year geometric mean for *E.coli* bacteria was computed every 6 months through August 2011 to examine trends in Plum Creek (Table 24). The data for the Uhland and Luling locations were above the bacteria standard of 126 cfu/100 ml. The 3-year bacteria geometric mean for the Lockhart sampling station (12647) was 121cfu; however, the next month there was a fish kill and the recalculated 3-year bacteria geometric mean in March 2008 was 174 cfu/100 ml.

The 2014 Integrated Report, published by TCEQ, will be a key juncture for assessing interim progress in achieving restoration with full implementation of the WPP measured in the 2020 Integrated Report.

Table 23. Revised Table 9.1 utilizing CRP data for February 2008 to establish *E. coli* interim target to evaluate process over 10-year implementation period.

Date	*E. coli* Concentration (cfu/100mL)		
	Uhland (17406)	Lockhart (12647)	Luling (12640)
Feb-08	240	121	195
Aug-09	217	118	183
Feb-11	193	116	171
Aug-12	170	113	159
Feb-14	146	110	147
Feb-16	115	107	131
Feb-18	84	103	115

Table 24. Computed actual geometric means for *E. coli* based on 3-years of data.

Date	*E. coli* Concentration (cfu/100mL)		
	Uhland (17406)	Lockhart (12647)	Luling (12640)
Feb-08	240	121	195
Aug-08	212	155	191
Feb-09	241	146	194
Aug-09	289	171	183
Feb-10	352	161	196
Aug-10	361	165	212
Feb-11	377	157	171
Aug-11	419	189	135

Tables 25 and 26 serve as a progress update to the implementation schedule outlined in the WPP. The tables indicate work completed through the third year of implementation (end of FY2011) and can be compared with water quality trends to determine the need for adaptive management. While implementation of some measures began almost immediately, work toward others has required significant additional effort to secure participation and funding. For certain strategies, major work is not expected until later stages of the overall effort. It is anticipated that changes in water quality will experience a lag period following the implementation of management measures, and substantive changes may require several years to be discernible.

Table 25. Progress toward implementation of management measures identified in Table 10.1 of the Plum Creek WPP.

Management Measure	Responsible Party	Year			
		1-3	**Status thru Nov 30, 2011**	4-6	7-10
Urban Stormwater Management Measures					
Pet Waste Collection Stations	City of Kyle	13	**16**	4	4
Pet Waste Collection Stations	City of Lockhart	10	**16**	4	4
Pet Waste Collection Stations	City of Luling	6	**6**	2	2
Pet Waste Collection Stations	City of Buda	10	**18**	4	4
Comprehensive Urban Stormwater Assessment	City of Kyle	1	**Completed**	---	---
Retrofit Stormwater Detention Basins	City of Kyle	2	**2 Completed**	---	---
Initiate Street Sweeping Program	City of Kyle	---	**Initiated and continuing**	---	---
Comprehensive Urban Stormwater Assessment and Illicit Discharge Survey	City of Lockhart	1	**In progress**	---	---
Manage Urban Waterfowl Populations	City of Lockhart	---	**Ongoing**	---	---
Comprehensive Urban Stormwater Assessment	City of Luling	1	**0**	---	---
Rehabilitate Stormwater Retention Pond	City of Luling	1	**0**	---	---
Initiate Street Sweeping Program	City of Buda	1	**Initiated and continuing**	---	---

Table 25. (continued).

Management Measure	Responsible Party	Year			
		1-3	**Status thru Nov 30, 2011**	4-6	7-10
Wastewater Management Measure					
Wastewater Upgrade (TSS Reduction)	WWTF Operators	---	**0**	3	7
Wastewater Upgrade (Phosphorus Removal)	WWTF Operators	---	**0**	3	7
Voluntary Monthly *E. coli* Monitoring	WWTF Operators	---	**3**	---	---
Voluntary Monthly Phosphorus Monitoring	WWTF Operators	---	**2**	---	---
Sanitary Sewer Pipe Replacement	City of Kyle	2400 ft	**4660 ft**	2400 ft	3200 ft
Lift Station SCADA Installation	City of Kyle	3	**1**	4	---
Sanitary Sewer Pipe Replacement	City of Lockhart	1800 ft	**4000 ft**	1800 ft	2400 ft
Initiate Sanitary Sewer Inspection Program	City of Luling	1	**1**	---	---
Sanitary Sewer Pipe Replacement	City of Luling	2400 ft	**16672 ft**	2400 ft	3200 ft
Lift Station SCADA Installation	City of Luling	4	**0**	1	
Sanitary Sewer Pipe Replacement	City of Buda	--	**2652 ft**	8523 ft	--
Septic System Inspection/Enforcement (New Position)	Caldwell County	2	**0**		
Septic System Repair/Replacement	Hays County	300	**208**	300	400
Septic System Repair/Replacement	Caldwell County.	150	**34**	150	200
Septic System Connection to Sewer	City of Uhland	100	**0**	100	150

Table 25. (continued).

Management Measure	Responsible Party	Year			
		1-3	**Status thru Nov 30, 2011**	4-6	7-10
Agricultural Management Measures					
WQMP Technician (New Position)	SWCD	---	**Funded through FY 2012**	---	---
Livestock Water Quality Management Plans	SWCD	65	**8 certified 4 in progress**	70	102
Cropland Water Quality Management Plans	SWCD	6	**1**	9	9
Non-Domestic Animal and Wildlife Management Measures					
Feral Hog Education (New Position)	AgriLife Extension	---	**Funded through FY 2012**	---	---
Feral Hog (Demonstration Equipment)	AgriLife Extension	---	**$10,000 of Equip.**	---	---
Monitoring Component					
Targeted Water Quality Monitoring	GBRA	---	**Funded through FY 2013**	---	---
Comprehensive Stream Assessment	GBRA	12	**8**	12	16
Bacterial Source Tracking	TAMU	1	**0**	---	---

Table 26. Progress toward implementation of management measures identified in Table 10.2 of the Plum Creek WPP.

Outreach Activity	Responsible Party	Year			
		1-3	**Status thru Nov 30, 2011**	4-6	7-10
Broad-Based Programs					
Texas Watershed Steward Training Sessions	AgriLife Extension	3	**2**	2	1
Elementary School Water Quality Project	GBRA	---	**over 1,000 kids/yr funded through 2012**	---	---
Plum Creek Watershed Protection Brochure	GBRA/ AgriLife Extension	---	**7,200 distributed of 12,000**	---	---
Tributary and Watershed Roadway Signage	AgriLife Extension	60	**TxDOT denied**	---	---
Displays at Local Events	AgriLife Extension/TSSWCB	9	**11**	9	9
Watershed Billboards	AgriLife Extension	Partnership decided against moving forward with this option			
Urban Programs					
Pet Waste Programs	Cities/TCEQ/ AgriLife Extension	2	**4**	---	---
NEMO Workshops	GBRA/TCEQ/ AgriLife Extension	2	**2**	---	---
Fats, Oils, and Grease Workshop		2	**0**	---	---
Municipal Site Assessment Visits		4	**9**	---	---
Urban Sector Nutrient Education	AgriLife Extension	3	**3**	3	3
Sports and Athletic Field Education (SAFE)	AgriLife Extension	3	**1**	3	3

Table 26. (continued).

Outreach Activity	Responsible Party	Year			
		1-3	**Status thru Nov 30, 2011**	4-6	7-10
Wastewater Programs					
Develop Online Training Modules	GBRA	4	**4**	---	---
Septic System Workshops and Assistance	AgriLife Extension/GBRA	4	**7**	3	3
Agricultural Programs					
Soil and Water Testing Campaigns	AgriLife Extension	3	**3**	3	3
Agriculture Nutrient Management Education	AgriLife Extension	3	**3**	3	3
Crop Management Seminars	AgriLife Extension	3	**3**	3	3
Agricultural Waste Pesticide Collection Days	TCEQ	1	**1**	No longer funded by TCEQ	No longer funded by TCEQ
Lone Star Healthy Streams – Grazing Cattle Education	AgriLife Extension	3	**3**	3	3
Non-Domestic Animal and Wildlife Programs					
Lone Star Healthy Streams - Feral Hog Management Workshop	AgriLife Extension	2	**3**	1	2
Additional Programs					
Stream and Riparian Workshops	AgriLife Extension	2	**2**	1	2
Illegal Dumping Site Targeted Cleanup	GBRA, AgriLife Extension, Keep Texas Beautiful, Cities, Counties	3	**12**	3	3
Community Stream Cleanup Events		2	**4**	3	3
Rainwater Harvesting Education/ Demonstration	AgriLife Extension	2	**2**	1	2

PROGRAM COORDINATION AND PARTNERSHIP SUSTAINABILITY

The Partnership recognized early in the process that the fundamental issues associated with long-term project sustainability are extremely complex. These include concerns about how and by whom the implementation strategy will be facilitated, and how funding will be obtained and managed to support active project management and achieve project goals. To address these critical questions, the Partnership created a sustainability subcommittee to research strategies and provide information and options. Experience, input, and recommendations regarding potential approaches were obtained from numerous agencies, entities, groups, and existing watershed efforts both in Texas and across the nation.

To date, AgriLife Extension has facilitated project implementation efforts utilizing personnel located in College Station (i.e., the Plum Creek Watershed Coordinator). However, it became apparent to the Partnership that there is a need to establish a full-time, locally-housed watershed coordinator to actively facilitate implementation efforts. The key questions related to this issue were: 1) What "entity" is most appropriate to administer the local position, and 2) How will the position be funded both in the short-term and over the long-term, assuming a 10-year planning horizon.

In the Plum Creek watershed, the preferred strategy was for project management by either GBRA or AgriLife Extension. It was determined that GBRA would be the managing entity of the TSSWCB CWA §319(h) grant for a local watershed coordinator to take over when the grant managed by AgriLife Extension ended.

AgriLife Extension in collaboration with the GBRA and steering committee members engaged personnel and officials with each of the municipalities and counties within the watershed to build strong cooperative partnerships. This effort led to the development and signing (July 2011) of an interlocal agreement (available on the Partnership website) with local partner entities that provided the 40% match required for a new TSSWCB CWA §319(h) implementation grant to be administered by GBRA. Numerous meetings and presentations were conducted with City Councils, County Commissioner's Courts, and organization boards to provide project updates and information on the interlocal agreement and match structure for the new project. The 12 participating entities include Caldwell and Hays Counties, the cities of Lockhart, Luling, Kyle, Uhland, and Buda, GBRA, Plum Creek Conservation District, Polonia Water Supply Corporation, Hays County Soil and Water Conservation District and the Caldwell Travis Soil and Water Conservation District. The project will establish a new local watershed coordinator position managed by GBRA and housed by Caldwell County in Lockhart. The watershed coordinator will actively promote WPP implementation, coordinate the PWCP, continue to build and strengthen local partnerships, and seek external grants to facilitate implementation activities and provide the balance of funds needed to sustain the position. These efforts are founded on the understanding that watershed management programs should strive to transition dependency on federal support to local sponsorship. This is the first watershed in Texas to solidify, through an interlocal agreement, local governmental entities' commitment to jointly funding a watershed coordinator for the mutual benefit of all the entities involved.

Establishment of a non-profit entity was explored as one option for fiscal management. However, several limitations precluded the selection of this option, including: 1) Concerns regarding the ability of selected key stakeholder groups to actively participate in and serve on the board of directors for a non-profit organization, 2) Oversight and management of the entity, 3) Oversight, technical support, and management of the watershed coordinator position that would be funded through the non-profit entity, and 4) Accountability of the non-profit organization and watershed coordinator to the Partnership and Steering Committee.

Other Developments

In addition to the strategies outlined in the WPP, a number of other efforts and events in the watershed are expected to have significant impacts on watershed stewardship into the future. While some of these only indirectly address water quality, all have implications with regard to education, planning, and regulatory activities in the watershed.

City of Kyle Plum Creek Preserve

In 2009, the City of Kyle received $500,000 from the Texas Parks and Wildlife Department to purchase land and develop the Plum Creek Preserve and Nature Trail as part of an open space initiative. The project will include more than six miles of nature trails, two large fishing lakes, wildlife viewing areas, picnic sites, a wetland preserve, and a wildflower meadow. Construction at the Lake Kyle site, located within the Preserve is approximately 30% complete with an expected grand opening in March 2012. Lake Kyle is one of the flood control structures in the watershed (Site 2). The Kyle Parks and Recreation Department is working to remove livestock and develop the 119 acres in a managed park preserve. The nature trail along the South side of Plum Creek is still under development, with several miles of the trail complete. In addition to the recreational benefits, much of the approximately 350 acres of parkland will be devoted to protecting riparian corridors within the urbanized upper portion of the watershed. This effort will enhance the ability of area residents to interact with more visible components of the watershed system, improving understanding and appreciation, hopefully leading to an increased desire to participate in stewardship of environmental resources. The Plum Creek watershed logo developed by the Partnership will be used on signs for the preserve and trail.

State Highway 130 Wetland Mitigation

As a result of construction of State Highway 130, TxDOT was required to mitigate construction impacts on wetlands as part of a CWA §404 permit issued by the U.S. Army Corps of Engineers. In response, a 265 acre floodplain site north of Lockhart directly along Plum Creek was selected for development of a multi-purpose complex that includes the creation and preservation of 175 acres of wetland and woodland environments lost due to highway construction along the entire Highway 130 corridor (Figure 23). The Plum Creek Mitigation Site will serve the following functions: preservation of wildlife habitat, stream bank stabilization, biodiversity maintenance, water quality improvement, stormwater retention, and flood control. Upon completion, a portion of the site will be made available as public parkland through a cooperative agreement between Caldwell County and the City of Lockhart after five years from development. Unfortunately, planning for the development of this site already was nearing completion before discussions took place with the Partnership. As a result, an important opportunity to incorporate water quality benefits into this project was missed. However, as with the Plum Creek Preserve in the City of Kyle, this site still will serve to increase local interaction with environmental resources and present a multitude of educational opportunities.

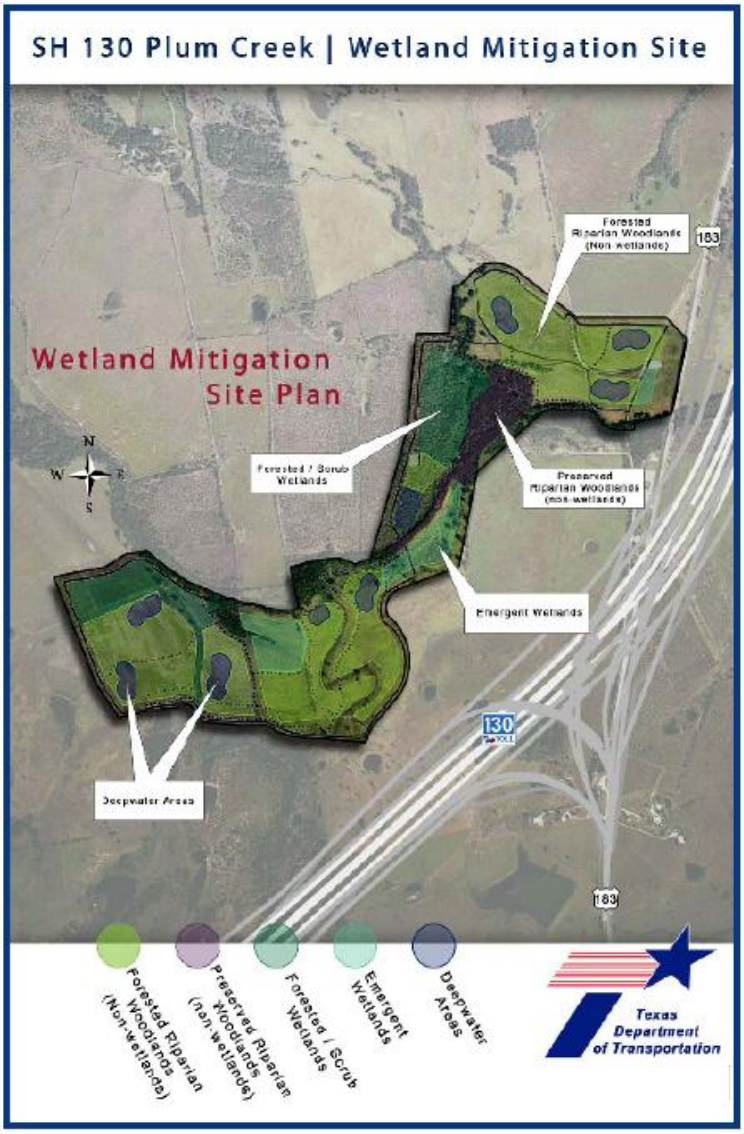


Figure 23. Wetland mitigation site for SH 130 in the Plum Creek Watershed.

The United States Army Corps of Engineers and TxDOT should be encouraged to investigate all opportunities for water quality enhancement in the process of wetland mitigation planning. In this case, the distribution of mitigated acres throughout the watershed and targeted to critical areas with water quality issues might have tremendously enhanced the shared goals of these projects.

CENTRAL TEXAS GREENPRINT FOR GROWTH

The Trust for Public Land, Envision Central Texas, and the Capital Area Council of Governments completed the Central Texas Greenprint for Growth to help area communities make informed land use decisions and guide where growth and development ideally should occur in relation to the protection of important natural, cultural, and recreational resources. The project identified high priority areas for conservation in Hays, Caldwell, and Bastrop Counties that meet ecosystem protection goals, provide open space and park needs, and support the

overarching vision of sustainable growth for the Central Texas area. In both Hays and Caldwell Counties, protecting water quality and quantity were selected as the highest priority goal. Efforts in these areas will benefit watershed stewardship as the region undergoes significant development in the future. The goal of the planning effort is for cities and counties to incorporate the Greenprint into their planning/zoning and master plan processes to identify opportunities for conservation and protection of the high priority areas. More information on the process and results from Caldwell and Hays Counties can be found at http://www.tpl.org/centraltxgreenprint.

Oil Spill Detected and Repaired

On September 15, 2009 GBRA staff conducting water quality sampling north of Luling discovered a 2-inch pipe spraying oily water into Salt Branch near Caldwell County Road 128/Salt Flat Road. As a result of the spill, the stream bottom and both streambanks for at least 30 feet downstream were coated with a thick deposit of oil, and water appeared very dark and cloudy. Water quality analysis revealed very high levels of total dissolved solids at the site. After being contacted by GBRA, Railroad Commission of Texas personnel identified the responsible party and provided oversight during pipe repair and pumping to remove polluted water from the area. Additional field analysis of water samples at the time of initial response indicated very high chloride levels in the stream. However, when the site was revisited after one week, the spill had been cleaned up, and there was no evidence of oil contamination. Fortunately, the spill site was cleaned up immediately before heavy rains returned to the watershed, thus preventing spilled oil from being washed downstream. This incident highlights the need to continue work in oil and gas production areas in southern portions of the watershed.

Flood Control

The Plum Creek Conservation District (PCCD), in partnership with the Caldwell-Travis SWCD and Hays County SWCD, operates 28 floodwater retarding structures in the Plum Creek watershed. While the primary purpose of these flood control dams is the protection of lives and property by reducing the velocity of floodwaters and thereby releasing flows at a safer rate, a secondary benefit is the reduction of pollutants (e.g., sediment) in floodwater downstream (i.e., NPS pollution). While not expressly identified as an implementation strategy in the Plum Creek WPP, properly maintained and functioning floodwater retarding structures contribute to protecting water quality in Plum Creek.

Through the American Recovery and Reinvestment Act of 2009 (ARRA), USDA-NRCS has provided over $2.9 million in federal funds to PCCD to rehabilitate and repair aging flood control structures in the Plum Creek watershed. A number of these structures have been designated high hazard dams, meaning dam failure may cause loss of life; serious damage to homes, industrial or commercial buildings; important public utilities; and main highways or railroads. The PCCD received $883,071 of ARRA funding for repairs and $364,598 for engineering and design services and construction inspection on Site #8 (located in subwatershed LO-4, Figure 24). The PCCD also received $1,100,000 in Watershed Rehabilitation Program Financial Assistance (construction funds) for rehabilitation of site #5 (located in subwatershed UH-2) and $629,000 in Watershed Rehabilitation Program Technical Assistance for Site #5

design and construction inspection, and for a planning study for Site #6 (located in subwatershed UH-3).

In addition, TSSWCB has allocated over $113,089 in state general revenue in FY2010 and FY2011 through its Flood Control Operation and Maintenance Grant Program to the Caldwell-Travis SWCD and Hays County SWCD to conduct operation and maintenance activities on the flood control structures in the Plum Creek watershed.

Together, these efforts will improve the ability of these watershed dams to remain viable and prolong their contribution to flood control and stormwater management (e.g., sediment trapping) as development increases in critical areas of the watershed.

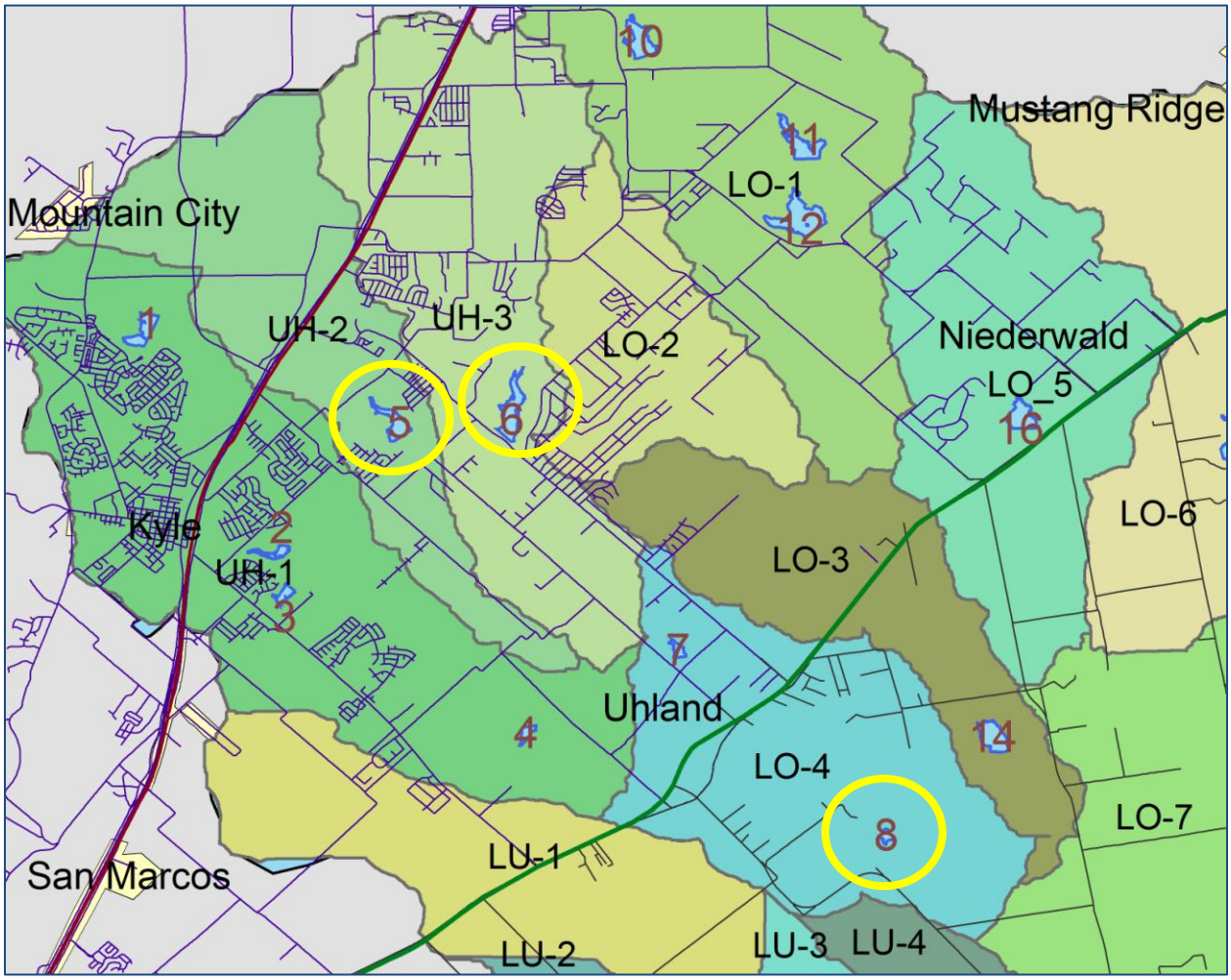


Figure 24. Locations of Plum Creek Conservation District dams at sites 5, 6, and 8 that have received funding for rehabilitation from USDA-NRCS.

Progress Toward Implementation Milestones

PROJECT FACILITATION AND OUTREACH UPDATE THROUGH AUGUST 2012

The Plum Creek Watershed Protection Plan was designed by the local steering committee and partnership to identify strategies, management measures, outreach and education within the watershed to reduce pollutants and improve water quality in the Plum Creek Watershed. Since the completion of the WPP the Partnership has accomplished many of these measures, which are outlined in the Plum Creek Watershed Protection Plan update that was approved and finalized in May 2012 and reports from February 2008 through November 2011. This report includes the activities from December 2011 – October 2012.

Plum Creek Watershed Partnership

All materials for the Plum Creek Watershed are updated on the Plum Creek Watershed Websites that include http://plumcreek.tamu.edu and http://www.gbra.org/PlumCreek. The Plum Creek Website has been visited by 16,401 viewers in all 50 states plus the District of Columbia, the website was visited by viewers from 78 countries since February 2008. The GBRA Plum Creek website has had over 44,345 page views since it began in September 2009. The GBRA hosted Plum Creek website and five modules that include: wastewater module, septic system module in English and Spanish, fats, oils, and grease (FOG) module, and a stormwater module.

The Plum Creek Watershed Partnership met Quarterly during 2012. These meetings enabled discussion and updates on ongoing activities within the watershed to implement the plan and updates on all grant programs in the watershed. The Partnership held meetings at the Lockhart State Park Recreational Hall on the following dates:

- November 10, 2011
- February 9, 2012
- May 3, 2012
- August 9, 2012

Outreach through the Media

Many press articles on the project have been released including the following (Appendix B):

- September 11th water quality, quantity training in Lockhart to focus on Plum Creek (7/30/12)
- Meeting of Plum Creek Partners to address watershed issues set for August 9 (7/25/12)
- Feral hog 'community of practice' provides multi-state expertise, resources (6/11/12)
- Plum Creek partnership, other regional watershed protection meetings scheduled (04/25/12)
- New publication explains how feral hogs negatively affect native plants (2/13/2012)
- Feb. 9 meeting will address Plum Creek watershed efforts (01/30/12)
- Feral Hog Management Workshop scheduled Feb. 14 in Luling (1/18/12)
- New AgriLife Extension publication helps keep the hogs out (12/22/11)
- Plum Creek Watershed Partnership Meeting set for Nov. 10 in Lockhart (11/2/11)
- Educational, informational opportunities offered for Plum Creek watershed stakeholders (10/18/11)

Dictson developed an update article on Plum Creek Watershed Protection Plan program for the Texas Stream Team Newsletter in March 2012.

Reporting
Nikki Dictson and Mark McFarland drafted the Plum Creek Watershed Protection Plan Update to comprehensively report implementation activities in the watershed. In addition, water quality data were analyzed by GBRA. The draft update was provided for public comment on February 6, 2012- February 29, 2012. The final draft was approved by the Steering Committee at the May 3, 2012 partnership meeting. Printed copies were distributed at the Partnership meeting in August 2012. Extension has continued to track implementation of the Plum Creek WPP to ensure accomplishment of plan implementation goals and the latest data and information are included in this final grant report and will also be reported in the next biennial update.

Nikki Dictson worked with Jared Timmons and BJ Westmoreland to develop quarterly progress reports. The team prepared annual reports on the grant projects for the Plum Creek Watershed Partnership for inclusion in the Non Point Source Management Program report by TCEQ and TSSWCB. In addition, Extension provided materials to GBRA for the Clean Rivers Program Basin Highlights Report.

Presentations
Dictson attended the 2012 Guadalupe River Basin Clean Rivers Program Steering Committee meeting to give a project update (3/22/12).

Project update presentations were provided by Dictson and Magin at quarterly Watershed Coordination Steering Committee Meetings in Columbus, Texas on 12/1/11, 3/15/12 and attended the 6/07/12 meeting.

Dictson provided Dornak with tri-fold brochures, other educational handouts, and the table display and Plum Creek poster for a booth at the March 31 Bastrop-Caldwell Wildlife Management Association Extravaganza at which he and Jared Timmons represented the PCWP.

Texas Watershed Planning Short Course and Round Table
The Plum Creek Watershed Protection Plan was used again as a case study in over 5 presentations during the week-long course in Bandera in November 2012 for watershed coordinators. Extension presented at the Texas Watershed Planning Coordinators Roundtable during January in Waco on Tracking Implementation Progress in Plum Creek Watershed.

2012 Feral Hog Workshop
Nikki Dictson assisted Jared Timmons and County Agents in a six-county area in coordinating the 2012 Feral Hog Workshop in Luling. Teleconference calls and emails during December led to the date, location and draft agenda for the speakers for this event. Five hours of Texas Department of Agriculture CEUs were provided for commercial, non-commercial and private applicators including two hours general, 2 hours IPM, and 1 hour of laws and regulations. The event had over 310 attendees. Feral hog fact sheets and Plum Creek Watershed Protection Plan brochures were distributed.

Kyle's Plum Creek Watershed Cleanup
The Plum Creek Watershed Cleanup in Kyle was held on February 25, 2012. East of IH-35, the Plum Creek runs through hundreds of acres of park land and open space. During the rainy

months of winter, trash and debris wash into the creek and are deposited along the banks in the parks. Since 2004, this award-winning program has removed the pollution and trash levels in Plum Creek. The city facilities involved in this event include Steeplechase Park, Lake Kyle, Waterleaf Park and the Plum Creek Preserve and Nature Trail.

Stormwater Management and Illicit Discharge Survey
The City of Lockhart's TCEQ CWA §319(h) project includes funds for an illicit discharge survey. In addition to the stormwater mapping and control plan, and installation of stormwater inlet tiles and inlet protection filter devices, city staff will conduct an illicit discharge survey of the stormwater system to assess the nature of dry weather flows and determine the need for further action. The QAPP is under development.

Kyle Water Reuse Feasibility Study
The City of Kyle is conducting a study of the feasibility of implementing the Region L water supply strategy of using reclaimed water from WWTF effluent by identifying potential users and costs of expanding an existing single user system. The one year study is 100% grant funded (50% TWDB and 50% Bureau of Reclamation). Study objectives include: 1) identify viable means of implementing the regional objective of conserving the Barton Springs/Edwards Aquifer groundwater resources and Guadalupe River surface water resources through water recycling and reuse; 2) reduce the annual discharge of nutrients to Plum Creek; 3) provide sustainable water sources for the continued growth of Kyle; 4) meet the increasing recreation service expectations of a growing community. The Plum Creek Watershed Partnership is represented on the Technical Advisory Group and attended the kickoff meeting on September 28, 2011 and public meetings during the project. The project will be completed in November 2012 and materials have been provided on the PCWP project website.

Septic System Connection to Sewer: Hillside Terrace
The Partnership continues to work with Hays County and the City of Buda on a potential project to connect a 264-home subdivision (Hillside Terrace) located in Plum Creek subwatershed UH-3 to central sewer service. This project is located in Hays County and is in the Buda ETJ. This subdivision has been identified by local citizens and city and county staff as a site of chronically failing septic systems on small lots and is located in a critical subwatershed identified in the watershed planning process as having a high likelihood of impacting water quality. An unnamed tributary of Andrews Branch passes through and drains much of this neighborhood before it flows into Andrews Branch and Porter Creek that meets with Bunton Branch just before entering Plum Creek upstream of the Uhland water quality monitoring site.

AgriLife Extension worked with Hays County and the City of Buda to conduct a socioeconomic survey of Hillside Terrace residents and develop an application for the TWDB CWSRF Intended Use Plan for 2012.The survey indicated an annual median household income of $25,500, and qualified the project area as a disadvantaged community with potential to receive up to 70% loan forgiveness. The project is categorized as a nonpoint source project which also places it in a separate ranking category of NPS projects. The Hillside Terrace project for $5,600,000 ranked third in the NPS projects category with a score of a 71, but the small amount of loan forgiveness money was all utilized by the first project. The project was invited to apply for a loan in the full amount of the project, but the city and county declined the loan for this round and opted to apply

again next year to potentially receive some of the loan forgiveness funding. Another potential future funding option for wastewater and water issues in the watershed that will be explored is Texas Department of Agriculture's Community Development Block Grant funds with Hays County as the applicant for the Hillside Terrace Project.

Dictson has continued meeting with Buda staff regarding the Hillside Terrace Project to develop the pre-application to TWDB Clean Water State Revolving Fund for the $5.6 Million project. Extension facilitated and assisted Buda and Hays County in applying again for TWDB Clean Water State Revolving Funding for the Hillside Terrace Project for FY2013. Extension assisted Buda with submission of applications to both the Nonpoint Source and POTW programs for the project due in March 2012. Dictson presented a project update and an update on applying again to TWDB CWSRF for the Hillside Terrace Project to the Buda City Council on March 6, 2012.

Dictson and Dornak continued discussions with Hays County through teleconference calls with Hays County Commissioner Mark Jones about the Hillside Terrace applications to TWDB and potential applications for CDBG funding through CAPCOG and TDA. Dictson also followed up with calls and emails to Jeff Hauff, Grants and Contracts Coordinator for Hays County, on the potential of a future grant.

In June, Dictson made follow up calls to the Texas Water Development Board on the 2012 intended use plan application and assisted Buda with coordinating a pre-application meeting with TWDB and Buda staff on the Hillside Terrace Project to develop a full application to TWDB Clean Water State Revolving Fund. Dictson helped the City of Buda draft a request for an extension as the City would not have a Council Meeting to pass the resolution to submit the full application by the due date of July 3, 2012; however the was denied. The City of Buda was not able to meet the 2012 application deadline, and opted to await the results of the 2013 Intended Use Plan and apply for planning and design funds through the FY2013 funding. Dictson presented at the Draft Intended Use Plan and results of the June pre-application meeting with TWDB at the Buda City Council Meeting on July 17, 2012. A follow up meeting with Buda staff and Hays County Commissioner Mark Jones occurred on August 1, 2012 to discuss moving forward with the FY2013 application that is due November 1, 2012.

Luling Foundation Field Day

The 85th Annual Luling Foundation Field Day was held on May 17, 2012 and the Plum Creek Watershed Partnership, Feral Hog Education Program and 319 Agricultural Finance Incentives program had booths with information for the attendees.

Leave Our Land Alone (LOLA) Meetings

On October 25, 2011 Dictson was contacted by Caldwell County Commissioner Fred Buchholtz about some public meetings being held around the County by a group concerned about private property rights issues. Dictson and Westmoreland as well as Troy Freeman and Donnie Graham with the Caldwell-Travis SWCD met with three individuals to discuss the PCWP project and explain that it was a totally voluntary program. Dictson attended the private property rights meeting in Luling on November 7, 2011and answered questions about the Plum Creek Project. BJ Westmoreland, Judge Tom Bonn, Commissioner Buchholtz, and Johnie Halliburton also attended the meeting in support of the project.

Republican Women for Caldwell County
Debbie Magin, BJ Westmoreland, and Oscar Fogle as a team conducted a 20 minute presentation on programs in Caldwell County including the Plum Creek Watershed Protection Planning project at a meeting of the Caldwell County Republican Women's group.

Coordination with County Extension Agents
Timmons and Dictson have stayed in contact with Michael Haynes and Richard Parrish on future workshop planning and topics including the Feral Hog Workshop, Agricultural Crop Production field days, Texas Watershed Steward Workshop, Soil and Water Testing Campaigns, etc.

Pet Waste Stations and Article
Dictson developed a press release that was emailed to the parks directors and city managers in Kyle, Buda, Lockhart, and Luling in the Plum Creek Watershed to announce TSSWCB 319 funding for pet waste stations. This project resulted in the purchase of a total of 37 additional pet waste stations for Kyle (3), Buda (18), Lockhart (10), and Luling (6) in the Plum Creek Watershed to reduce the potential of bacteria and nutrients from pets.

Selection Committee for Local Watershed Coordinator Position
A 319(h) grant through TSSWCB was awarded to the GBRA to hire a local watershed coordinator. Dictson coordinated a nomination/election process for the selection committee. The selection committee was composed of Hays County Judge Tom Bonn, Lee Weatherford of Lockhart, Johnie Halliburton of PCCD, Frank Hamilton of PCWP Steering Committee, Magin of GBRA and Dictson. The selection committee reviewed and ranked the 12 candidates, and held a meeting to select the individuals to interview. The top 4 candidates were interviewed and Nick Dornak was hired as the local Watershed Coordinator. Dornak started in March, with Extension and GBRA providing training. All project files, documents, and information have subsequently been transferred to Dornak.

CAPCOG Solid Waste Grant
Dictson sent out an email reminder on the CAPCOG Solid Waste Grant to all the cities and counties in the watershed. Judge Bonn expressed interest in assistance to develop a solid waste grant for Household Hazardous Waste Collection events in Caldwell County. Dictson and Dornak held a conference call with Judge Bonn on March 29, 2012. Dornak and Dictson held conference calls with Caldwell County and assisted them with a solid waste grant application to CAPCOG submitted on April 19, 2012; the county was selected for funding. Dornak has taken the lead on assisting the county with the presentation of this project to CAPCOG and with implementation.

Training and Program Transfer to New Watershed Coordinator
Dictson met with and provided files for Plum Creek to Dornak and started discussing the project. Dornak traveled to College Station to meet with Dictson to continue training and update programs on the afternoon of March 29, 2012.

Dictson has started training Dornak on the Website program Umbraco used to update the Plumcreek.tamu.edu website and set Dornak up as an administrator on the PCWP Facebook page and Constant Contacts for the online newsletter.

Extension participated by teleconference in the meeting with TSSWCB, GBRA, and Nick Dornak to discuss the new contract and transition to the new local watershed coordinator (6/8/12).

Dictson and Dornak conducted multiple meetings to discuss the project and transition project responsibilities, and Dictson provided all project files and information. Monthly Plum Creek program manager calls with Dornak, Westmoreland, Timmons and Dictson have been conducted to discuss scheduling, updates, and materials.

Update Presentations to Local Partners

Extension, GBRA and Dornak have conducted presentations at County Commissioner Courts, City Councils, and Board Meetings to provide an update on the project and introduce Dornak as the new watershed coordinator. These meetings have included the following presentations:

1. Hays County Commissioners Court (4/17/12)
2. Plum Creek Conservation District Board (4/17/12)
3. Caldwell County Commissioners Court (5/7/12)
4. Buda City Council (3/6/12)
5. Luling City Council (5/10/12)
6. Lockhart City Council (5/15/12)
7. Polonia Water Supply Corporation Board Meeting (5/15/12)
8. Uhland City Council (5/16/12)
9. Kyle City Council (7/3/12)

Dictson and Dornak attended the Capital Area Council of Governments Regional Review Committee Meeting discussing new scoring criteria for Community Development Block Grant Funds for FY2013 and recommended updates in the criteria for smaller communities (4/18/12).

Caldwell-Travis SWCD Agriculture and Natural Resource Fair at Chisolm Trail Roundup

Dictson and Westmoreland sent the Partnership the flier for the 1st Annual Caldwell-Travis Soil and Water Conservation District Agriculture and Natural Resource Fair at the Lockhart Chisolm Trail Roundup. Westmoreland posted fliers for the event. Dictson and Dornak set up an educational booth representing the PCWP, Timmons set up a booth on Feral Hogs, Westmoreland set up a booth on the Plum Creek WQMP programs, and GBRA had a booth on recycling (Saturday 6/9/12).

NRCS Conservation Initiative Grants

Extension participated in TSSWCB conference calls and development of the proposal for the USDA-NRCS Conservation Innovation Grant for Feral Hog Removal in the Plum Creek Watershed (3/7, 3/14, 3/19, 3/21, 3/28, and 4/4). Teleconference meetings also included monitoring design discussions as well as final review and comments on the grant proposal. The proposal was submitted by the TSSWCB to the USDA-NRCS in April 2012.

FERAL HOG MANAGEMENT OUTREACH UPDATE THROUGH OCTOBER 2012

Feral Hog Control
A total of 718 feral hogs have been reported as removed from the watershed, including both producer activity and project-related control programs (Table 27). This has been accomplished through a combination of efforts including workshop training events, direct technical assistance and publications, websites, newsletters, news releases, and related resources.

Technical Assistance
The AgriLife Extension Wildlife and Fisheries Assistant stationed in the watershed has provided technical assistance to landowners on feral hog management through 69 site visits and 40 community presentations to over 4,741 attendees. A total of 4,922 individuals have obtained direct assistance with approximately 3,475 contact hours recorded from project start date through October 2012.

Feral Hog Reporting System
AgriLife Extension developed an online feral hog reporting system to track sightings and damage caused by the animals. The system is used by project personnel to target areas for focused management assistance. In addition, the system has been useful in validating the SELECT analysis performed during plan development. A total of 53 public reports have been made, with some from areas not in the watershed. In addition, landowners have reported a total of 329 feral hogs removed from the watershed (see Table 27) since implementing reporting. The reporting system is located in the feral hog section of the Partnership website. The reporting website has been a beneficial tool in tracking the removal of feral hogs from the watershed. Continued use of this system is suggested with some upgrades: a map visual for identification of hog removal locations, an automated e-mail requesting monthly reports, and a section to better identify the location of the property from which feral hogs have been removed.

Feral Hog Management FactSheets
A significant project accomplishment has been the production of a series of factsheets addressing feral hog management. Developed by AgriLife Extension with TSSWCB CWA §319(h) funds, the following list of publications (See Appendix C) are available on the Partnership website and some are in Spanish (Figure 25):

- *Feral Hogs, Plum Creek, and You*
- *Recognizing Feral Hog Sign* (Spanish)
- *Box Traps for Capturing Feral Hogs* (Spanish)
- *Corral Traps for Capturing Feral Hogs* (Spanish)
- *Snaring Feral Hogs* (Spanish)
- *Building a Feral Hog Snare* (Spanish)
- *Placing and Baiting Feral Hog Traps* (Spanish)
- *Door Modifications for Feral Hog Traps* (Spanish)
- *Feral Hogs Impact Ground-nesting Birds*
- *Feral Hog Laws and Regulations in Texas*
- *Feral Hogs and Disease Concerns*

- *Feral Hogs and Water Quality in Plum Creek*
- *Feral Hog Transportation Regulations*
- *Using Fences to Exclude Feral Hogs from Wildlife Feeding Stations*
- *Feral Hogs Negatively Affect Native Plant Communities*
- *Feral Hog Population Growth, Density and Harvest in Texas*
- *Feral Hog Approved Holding Facility Guidelines in Texas*

Over 10,000 of the publications have been distributed throughout the watershed and are available on the project website. These publications have been very popular, and a review of website traffic indicates they have been downloaded over 28,971 times from scribd.com and 1,837 times from the Texas AgriLife bookstore. They have been viewed by visitors from 48 states plus the District of Columbia. Feral hog management has become a significant issue across the Nation, and efforts in the Plum Creek watershed have provided resources that will have a far-reaching impact. In addition, 15 hardcopy and internet news releases were created with AgriLife Communications. There have been over 31 feral hog blogs posted to the AgriLife Extension Service Wildlife and Fisheries Sciences Department wild wonderings blog at http://wild-wonderings.blogspot.com/.

There are 10 feral hog videos on the Wildlife and Fisheries Department YouTube site that have been viewed over 156,000 times. On the Plum Creek Watershed Partnership website, two voice-over power-point presentations are available for viewing. Two radio interviews were conducted with Texas Farm Bureau Radio, which reaches 89 counties in Texas.

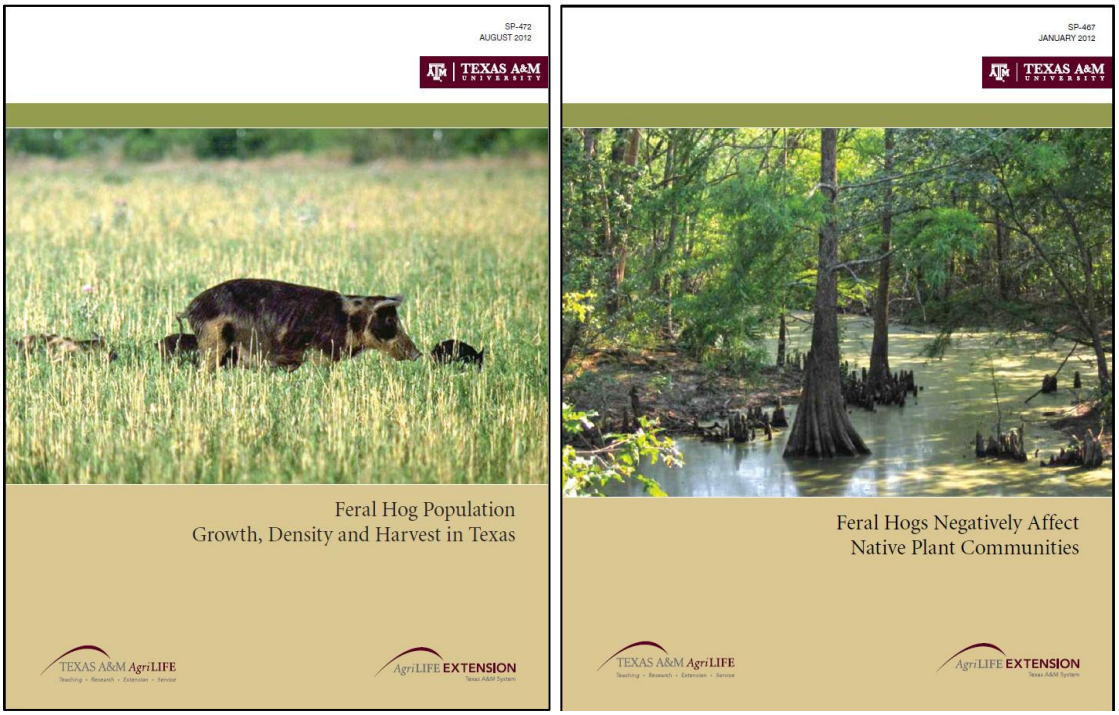


Figure 25. Two examples of the latest feral hog management factsheets developed for the watershed.

Table 27. Progress of feral hog control since the implementation of online reporting. The ♦ denotes subwatersheds flown during aerial control that removed 372 hogs.

Region	Subwatershed	Total Hogs	Reduction Goals for Hogs	Online Reporting of Hogs Removed	Locations of 2010 Aerial Control
Uhland	UH-1	127	83	1	♦
	UH-2	89	58	0	♦
	UH-3	192	125	0	♦
	Region Total	408	266	1	--
Lockhart	LO-1	167	25	0	0
	LO-2	67	10	0	0
	LO-3	122	18	0	0
	LO-4	90	14	0	♦
	LO-5	96	14	0	0
	LO-6	184	28	0	0
	LO-7	207	31	0	♦
	LO-8	53	8	16	♦
	LO-9	114	17	0	0
	LO-10	159	24	0	0
	LO-11	177	27	0	0
	Region Total	1436	216	16	--
Luling	LU-1	98	40	0	♦
	LU-2	111	46	0	♦
	LU-3	87	36	0	♦
	LU-4	119	49	0	♦
	LU-5	146	60	1	♦
	LU-6	316	130	13	♦
	LU-7	130	53	21	♦
	LU-8	146	60	0	♦
	LU-9	90	37	31	♦
	LU-10	93	38	19	0
	LU-11	173	71	0	♦
	LU-12	280	115	0	0
	LU-13	131	54	0	♦
	LU-14	177	73	0	0
	LU-15	206	84	14	0
	LU-16	220	90	0	♦
	LU-17	40	16	0	♦
	LU-18	139	57	0	♦
	LU-19	239	98	20	♦
	LU-20	194	80	171	♦
	LU-21	160	66	40	0
	Region Total	3295	1353	329	--
Total		5139	1835	**346**	**372**
				718	

Outreach through the Media from December 2011 – October 2012

- During the entire project there have been 31 blog articles pertaining to feral hogs posted on the Texas AgriLife Extension Service's Wildlife and Fisheries Sciences blogspot, located at http://wild-wonderings.blogspot.com/.
- TSSWCB news release: "Feral Hog Management Workshop Draws Large Crowd in Luling" (2/27/12).
- Fall feral hog webinar series set (8/30/12)
- New feral hog publication strives to set the record straight on accurate numbers (9/14/12)
- Feral hog 'community of practice' provides multi-state expertise, resources (6/11/12)
- New publication explains how feral hogs negatively affect native plants (2/13/2012)
- Feral Hog Management Workshop scheduled Feb. 14 in Luling (1/18/12)
- New AgriLife Extension publication helps keep the hogs out (12/22/11)
- All press releases for the entire project can be found in Appendix B.

Reporting

Nikki Dictson worked with Jared Timmons and BJ Westmoreland to develop quarterly progress reports. The team prepared annual reports on the grant projects for the Plum Creek Watershed Partnership for inclusion in the Nonpoint Source Management Program report by TCEQ and TSSWCB. In addition, Extension provided materials to GBRA for the Clean Rivers Program Basin Highlights Report.

Presentations Conducted during December 2011 – October 2012

- Jared gave a feral hog presentation to landowners in Harwood at a Beef Cattle Program. (1/25/12).
- Jared gave a feral hog presentation to the Capital Area Master Naturalist's (2/29/12).
- Jared gave a presentation about the Plum Creek Feral Hog Education Program at the Cedar Bayou Watershed Partnership meeting (3/7/12).
- Jared had a booth at the Bastrop-Caldwell Counties Wildlife Management Association Extravaganza distributing fact sheets and information about feral hogs in the Plum Creek Watershed (3/31/12).
- Jared attended the Clear Fork Wildlife Management Association meeting (4/12/12).
- Jared presented about the Plum Creek Feral Hog Educational Program at the International Wild Pig Conference, for conference program visit http://www.wildpigconference.com/pdf/2012%20International%20Wild%20Pig%20Conference%20Program.pdf (4/16/12).
- Jared gave a youth presentation about feral hogs at the Hays County Youth Ag Day (4/27/12).
- Jared had a booth at the Luling Foundation Field Day distributing fact sheets and information about feral hogs in the Plum Creek Watershed (5/17/12).
- Jared gave a feral hog presentation to the Lost Pines Master Naturalists (5/21/12).
- Jared had a booth at Chisholm Trail Roundup Ag Fair distributing fact sheets and information about feral hogs in the Plum Creek Watershed (6/9/12).
- Jared attended the Hays County Master Naturalists meeting (6/28/12).
- Jared attended the Hays County Master Naturalists Board Meeting (7/5/12).
- Jared presented at Feral Hog Symposium in Cat Spring (7/13/12).
- Jared attended the Caldwell County Commissioner's Court meeting (7/16/12).

- Jared gave a youth presentation about feral hogs at the Caldwell County Summer Series Ag Day (7/17/12).
- Jared attended the Hays County Master Naturalists meeting (7/26/12).
- Jared gave a project update presentation to the Plum Creek Watershed Partnership (8/9/12).
- Jared attended the Hays County budget workshop (8/14/12).
- Jared gave a presentation about the Plum Creek Watershed Feral Hog Educational Project at the Texas Invasive Species Coordinating Committee meeting (10/10/12).
- Jared attended the Clear Fork WMA meeting (10/11/12).
- Jared gave two presentations at Cabela's in Buda (10/25/12).
- Jared gave a presentation at the Texas Riparian Association meeting in Bastrop (10/26/12).
- Jared gave two presentations at Cabela's in Buda (10/28/12).
- Jared presented at the Hays County Feral Hog Educational Workshop (10/30/12).

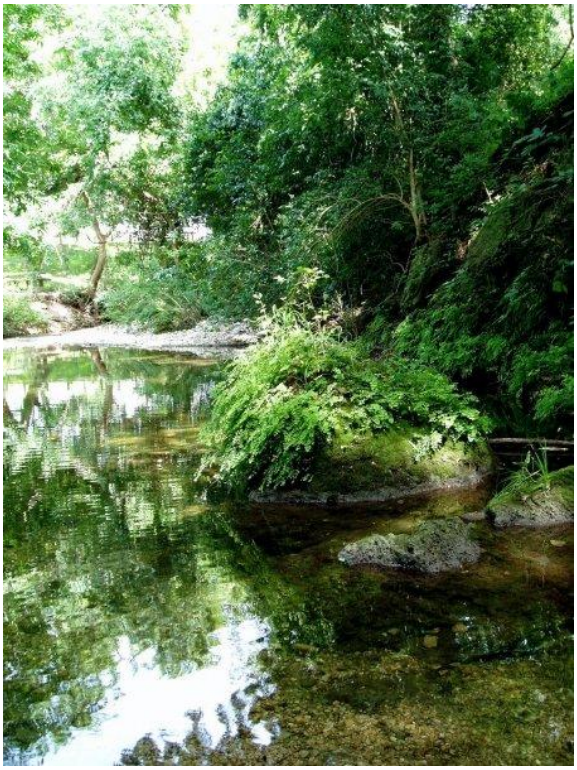
Coordination with County Extension Agents

Timmons and Dictson have stayed in contact with Michael Haynes and Richard Parrish on future workshop planning and topics including the Feral Hog Workshop, Agricultural Crop Production field days, Texas Watershed Steward Workshop, Soil and Water Testing Campaigns, etc.

SOIL AND WATER CONSERVATION DISTRICT WATER QUALITY MANAGEMENT PLAN DEVELOPMENT, IMPLEMENTATION, AND/OR MAINTENANCE ASSISTANCE

IMPLEMENTATION SUPPORT PROJECT IN THE PLUM CREEK WATERSHED

FINAL REPORT
TSSWCB PROJECT #08-07A



HAYS COUNTY AND CALDWELL-TRAVIS SOIL AND WATER CONSERVATION DISTRICTS

FUNDING PROVIDED THROUGH A CLEAN WATER ACT §319(h) NONPOINT SOURCE GRANT FROM THE TEXAS STATE SOIL AND WATER CONSERVATION BOARD AND THE U.S. ENVIRONMENTAL PROTECTION AGENCY

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EXECUTIVE SUMMARY

The Hays County and Caldwell-Travis Soil and Water Conservation Districts (SWCDs), working cooperatively with the Texas State Soil and Water Conservation Board (TSSWCB) Wharton Regional Office and the United States Department of Agriculture- Natural Resources Conservation Service (NRCS), provided technical and financial assistance to agricultural producers in the Plum Creek watershed.

The development, installation, and maintenance of water quality management plans (WQMPs) in the Plum Creek watershed was and continues to be a success. A District Technician was hired and worked cooperatively with the TSSWCB Wharton Regional Office and NRCS to provide agricultural producers with the opportunity to voluntarily implement best management practices (BMPs) that would have a positive impact on the Plum Creek watershed.

Through this project, a total of 9 WQMPs were developed and implemented on approximately 1,265.8 acres. A majority of the practices installed were related to the establishment of pastureland. In addition, nutrient management, pest management, and prescribed grazing were applied to almost all 1,265.8 acres. The District Technician and TSSWCB Wharton Regional Office worked with the SWCDs and local producers to educate them on their operation, the WQMP program, proper soil sampling, and water quality. They also presented at field events, field days, and were active in the development of the Plum Creek Watershed Protection Plan (WPP).

Implementation of WQMPs has and will continue to be a key component in the overall effort to reduce nutrients and sedimentation and improve water quality in the Plum Creek watershed.

INTRODUCTION

The Plum Creek Watershed has a drainage area of 397 square miles and lies within the Guadalupe River Basin, which drains South Central Texas from the Hill Country to the Gulf of Mexico. The Plum Creek Watershed includes portions of Hays and Travis Counties and much of Caldwell County. Elevations in the area range from 303 feet near the San Marcos River to 891 in the northern reaches of the watershed. The upper reaches of Plum Creek fall within the Texas Blackland Prairies ecoregion, which historically was dominated by tallgrass species on uplands and by deciduous woodlands along riparian corridors. The downstream landscape is located in the East Central Texas Plains ecoregion, an area originally characterized by post oak savanna, having tallgrasses interspersed with oaks and other hardwoods, as well as juniper. Riparian corridors in the Plum Creek Watershed are characterized by pecan, elm, and oak bottomlands, in the past, open areas in both ecoregions were maintained by natural fires and grazing by larger herbivores. Fire suppression has resulted in encroachment of woody plant species in many areas. Animals native to the area include white-tailed deer, javelin, beaver, bobcat, coyote, fox, skunk, raccoon, squirrel, turkey, and a diverse array of small mammals and birds. In addition, feral hog populations in the area are believed to be significant and increasing.

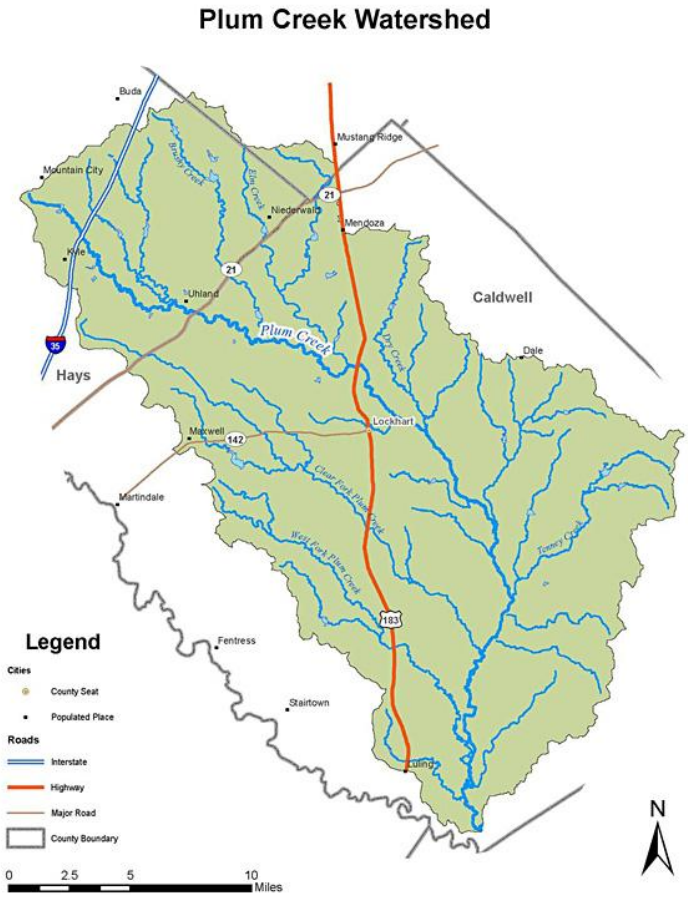

Figure 1. Plum Creek Watershed

Due to their natural characteristics and location with respect to topography, soils, and weather patterns, both the Texas Blackland Prairies and East Central Texas Plains ecoregions in this part of the state have undergone widespread conversion for agricultural use, as both cultivated croplands and rangelands. Current agricultural land uses in the Plum Creek Watershed include beef cattle and hay production in addition to row cropping of corn, sorghum, wheat, and cotton. Watermelon production is also a locally important industry around the city of Luling. In 2004, approximately 11% of the Plum Creek Watershed was under active cultivation for the production of annual crops. While land in cotton production has remained relatively constant the last 2-3 years, much of the land previously devoted to sorghum and wheat has been converted to corn production in response to rises in market value.

Rangeland for grazing cattle comprises a large percentage of the landscape (approximately 38% in 2004), and is by far the most common land use class in the watershed. As a result, cattle production is a dominant industry in the watershed. While rangeland dominated by grasses is common, much of the rangeland in Caldwell, Hays, and Travis Counties has experienced widespread invasive growth of brush including mesquite, which is particularly problematic in areas without active brush management. Excessive growth by invasive plant species affects the distribution of cattle which cannot move easily through dense brush, and reduces production of desirable forage plants.

The vast majority of oil wells in the watershed are concentrated in Caldwell County in an area north of Luling. According to the Railroad Commission of Texas (RRC), the number of oil wells in production in Caldwell County has remained relatively stable at around 3,500, with slight fluctuations between years. Of these, most are located in the Plum Creek Watershed, with the remainder found near the San Marcos River. In 2006, high market values of crude oil resulted in a higher number of wells in production than had been seen in several years.

The Plum Creek Watershed overlies the Carrizo-Wilcox formation and a small section of the Edwards-Balcones Fault Zone in Hays County, both of which are water-bearing geologic formations. The Carrizo and Wilcox aquifers in the southern and eastern portions of the watershed contain the majority of the usable groundwater storage in the area and are considered to be stable and dependable. These formations have been the focus of widespread development of groundwater resources. Water quality in the Carrizo Sand and Wilcox group is generally suitable for public municipal supply, irrigation, and industrial purposes, though some areas are affected by high nitrate and chloride concentrations. Much of Clear Fork Plum Creek, mostly in Caldwell County, is fed by perennial Leona formation springs arising near State Highway 142. Additional springs located around Lockhart contribute flow to Plum Creek, resulting in year-round flow at the southern end of the watershed.

Surface water plays a major role in the watershed and is considered sufficient for agricultural use in most areas. However, surface water is susceptible to heavy siltation during runoff events and may become severely limited in periods of drought. Through the Watershed Protection and Flood Prevention Program, the Plum Creek Conservation District currently operates 28 flood control structures in Hays and Caldwell Counties, which have a total storage of approximately 46,800 acre feet and a flood storage capacity of 36,300 acre feet. The Conservation District also oversees the use and quality of groundwater resources in the area. Though groundwater has been

the primary drinking water supply in the past, a significant portion of water supplies in the Plum Creek Watershed now comes from surface water, including reliance on San Marcos River water pumped from lower portions of Caldwell County near Luling. The City of Luling depends on supply of surface water, as do many other cities in the watershed. Lockhart currently receives 80% of its water from the San Marcos River, following recent completion of a pipeline to the city.

The Plum Creek Watershed is very diverse, ranging from one of the state's most rapidly growing urban areas in the north to rural lands near the confluence with the San Marcos River. The creek itself played an important role in early development in the area and continues to be a valued resource for local citizens, and communities. However, based on routine water quality sampling, the Texas Commission on Environmental Quality listed portions of Plum Creek for high nutrient concentrations in 1998, and in 2002, *E. coli* bacteria levels were identified as a concern. By 2004, *E. coli* date indicated that Plum Creek no longer supported the designated use of human contact recreation, and additional sections of the stream were identified as having high nutrient levels. While not all *E. coli* cause disease, their presence can indicate a potential health threat in the water. When nutrients are present at high levels, excessive growth of algae and aquatic plants can occur and result in damage to aquatic habitat, loss of recreation opportunities, and fish kills.

The Plum Creek Watershed Partnership, composed of local stakeholders, was formed to guide the planning process and address the bacteria and nutrient concerns in the stream. Led by a Steering Committee, the Partnership works with citizens, businesses, and officials in the watershed to restore the health of Plum Creek, recognizing that success in improving and protecting water resources depends on the people who live and work there. The Plum Creek Watershed Protection Plan created through these efforts will serve as a guidance document for restoring and protection local water quality.

Through scientific analysis, researchers supporting the Partnership determined how much bacteria and nutrient levels in Plum Creek should be reduced in each monitored region of the watershed. Based on existing water quality data and watershed characteristics and information, work groups recommended management measures needed to reduce pollutant levels in Plum Creek. The Agricultural Nonpoint Source work group recommended implementation of voluntary site-specific Water Quality Management Plans (WQMP) for individual farms. Enhanced planning and financial assistance was provided to farmers and ranchers for development of management plans that reduce bacteria and nutrient losses and meet the needs of each farm operation. Activities included prescribed grazing, buffer strips, and nutrient management were highly recommended to producers as pollution control approaches in the Plum Creek Watershed.

A WQMP is a site-specific plan developed through and approved by SWCDs for agricultural or silvicultural lands. The plan includes appropriate land treatment practices, production practices, management measures, technologies or combinations thereof. The purpose of WQMPs is to achieve a level of pollution prevention or abatement determined by the TSSWCB, in consultation with local SWCDs, to be consistent with state water quality standards. This project was incorporated into the WPP in order to address the potential agricultural sources of NPS pollution and will be coordinated with educational and assessment activities planned within the Plum Creek watershed.

PROGRAM DEVELOPMENT

This project consisted of the TSSWCB working with the Hays County SWCD #351 and Caldwell-Travis SWCD #304 to provide technical and financial assistance to landowners for the development, implementation, and/or maintenance of WQMPs.

Through this project, a District Technician was hired by the Caldwell-Travis SWCD to coordinate technical and financial assistance activities between the TSSWCB, cooperating SWCDs, NRCS and all other interested parties in the Plum Creek watershed. The District Technician promoted the availability of assistance through the local SWCDs and several publications and press releases. (Appendix A).

After compiling the list of producers who were interested in assistance, they were ranked based on priority. A two-tier system was established based on land units that are in the greatest need of WQMP implementation in targeted subwatersheds. Highest priority was given to the implementation of the most cost effective and most needed pollution abatement practices based upon the recommendation stated in the Plum Creek Watershed Protection Plan. The two-tier system included the following:

1st priority: Subwatersheds designated as critical for contributions of nutrients and E. Coli from agriculture
2nd priority: All other subwatersheds

The District Technician, working in cooperation with the NRCS, developed WQMPs based on the criteria outlined in the Field Office Technical Guide (FOTG), a publication of the NRCS. The FOTG represents the best available technology and is already tailored to meet the needs of SWCDs all over the nation. A WQMP includes the following:

- Conservation plan map showing boundaries, fields, land use, acres and facilities
- Soils map
- Soils description
- Topography map
- Conservation Plan of Operation
- Soil test (required when nutrients are applied)

Once the WQMP was developed and approved by NRCS and the local district, it was then sent to the TSSWCB Wharton Regional Office for technical review and certification. Upon certification of the WQMP, the plan could be implemented. The District Technician worked with landowners to implement BMPs laid out in the WQMP. The major BMPs installed included:

Forage and Biomass Planting (512)
Establishing adapted and/or compatible species, varieties, or cultivars of herbaceous species suitable for pasture, hay, or biomass production. This practice applies to all lands suitable to the establishement of annual, biennial, or perennial species for forage or biomass production. This practice does not apply to the establishment of annually planted and harvested food, fiber, or oilseed crops.

Cross Fencing (382)
Locate fences to help facilitate management of different land uses and special management areas within land uses such as ecological sites, pasture types, riparian areas, critical eroding areas, etc. For domestic livestock, install fences in areas that will best facilitate the handling, feeding, watering and movement of the type of livestock managed.

Water Well (642)
This practice is to be installed on land uses where a suitable aquifer is available. The water well will be drilled to provide drinking water for livestock, and must be drilled by a licensed water well driller.

Nutrient Management (590)
This practice manages the amount, source, placement, form, and timing of the application of plant nutrients and soil amendments.
4,912 acres were placed under nutrient management. Soil sampling occurred on an annual basis on WQMPs that included nutrient management.

Other BMPs installed were water well pumping plant (533), pipeline (516), pest management (595), prescribed grazing (528), forage harvest management (511). The District Technician helped landowners acquire any cost-share assistance available. Once the practice was implemented and certified, the cost-share was paid on. Status reviews were conducted annually on all WQMPs developed and certified through this project to ensure the BMPs were installed and maintained properly.

In addition to the development, installation, and maintenance of WQMPs, the District Technician and TSSWCB Wharton Regional Office worked with the SWCDs and local producers to educate them on their operation, the WQMP program, proper soil sampling, and water quality. The District Technician and TSSWCB Wharton Regional Office attended field days and educational events in the Plum Creek watershed disseminating information on this project and other agricultural related issues

CONCLUSIONS

The development, installation, and maintenance of WQMPs in the Plum Creek watershed was and continues to be a success. The District Technician, working cooperatively with the TSSWCB Wharton Regional Office and NRCS, provided agricultural producers with the opportunity to voluntarily implement BMPs that would have a positive impact on the Plum Creek.

Through this project, a total of 9 WQMPs were developed and implemented on approximately 1,265.8 acres. On the majority of the 1,265.8 acres, nutrient management, pest management, and grazing management were planned and initiated. The majority of the cost shared practices included pasture and hayland planting, water wells, watering facilities, and cross fencing.

There is still a need to address agricultural NPS issues in the Plum Creek watershed. In 2012, the TSSWCB funded "*Implementation of Agricultural Best Management Practices in Support of the Plum Creek Watershed Protection Plan*" (project 08-10) to continue efforts in providing local landowners with technical and financial assistance. Through these efforts, there will be a continued reduction in nutrient and sediment loads that will help to improve water quality in the Plum Creek Watershed.

BROCHURE

Practices Eligible for Cost-Share Assistance

1. Watering Facility
2. Water Well
3. Pumping Plant
4. Pipeline
5. Cross Fencing
6. Riparian Herbaceous Buffer
7. Riparian Forest Buffer
8. Rangeland Planting
9. Pasture and Hayland Planting
10. Grassed Waterways
11. Field Borders
12. Filter Strips
13. Critical Area Planting

Caldwell-Travis Soil and Water Conservation District and Hays County Soil and Water Conservation District

NRCS

TSSWCB

Plum Creek Watershed Partnership

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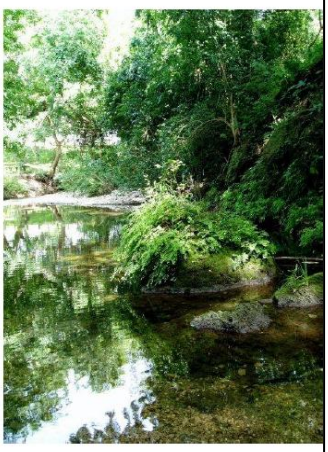
Version 08/12/2009

TECHNICAL AND FINANCIAL ASSISTANCE FOR RANCHERS AND FARMERS IN THE PLUM CREEK WATERSHED

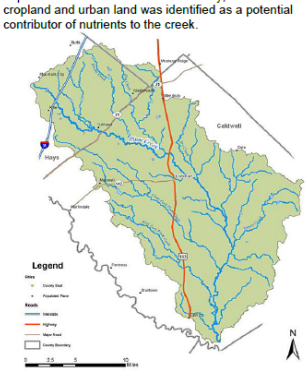


Caldwell-Travis Soil and Water Conservation District and Hays County Soil and Water Conservation District

Plum Creek Watershed

In 1998 and 2002, water quality data in Plum Creek indicated high levels of nutrients and bacteria. By 2004, some stretches of Plum Creek in both urban and rural areas were identified as not meeting the State Water Quality Standard for bacteria and not supporting contact recreation (swimming and wading). High levels of bacteria suggest fecal contamination and the possible presence of pathogens which pose a health risk to humans. Elevated levels of nutrients can affect dissolved oxygen levels impacting aquatic life (fish).

Through analysis of water quality data from across the watershed, human (wastewater treatment facilities and septic systems) and animal (livestock, pets, wildlife) waste was identified as a significant potential contributor of pollutants to Plum Creek. Additionally, runoff from cropland and urban land was identified as a potential contributor of nutrients to the creek.



The Caldwell-Travis Soil and Water Conservation District (SWCD), the Hays County SWCD, and the Texas State Soil and Water Conservation Board (TSSWCB) have partnered to provide technical and financial assistance to ranchers and farmers in order to reduce bacteria and nutrients in Plum Creek through the implementation of best management practices on agricultural lands. Through a grant from the TSSWCB, the Caldwell-Travis SWCD will aid producers in the development, certification, and implementation of water quality management plans (WQMPs) on pastureland, rangeland, and cropland.

What is a Water Quality Management Plan?

A WQMP is a site-specific plan developed through and approved by SWCDs for agricultural and silvicultural lands. The plan includes appropriate land treatment practices, production practices, management measures, technologies or combinations thereof. The purpose of a WQMP is to achieve a level of pollution prevention or abatement determined by the TSSWCB, in consultation with SWCDs, to be consistent with State Water Quality Standards.

Process for Obtaining a WQMP

1. An owner or operator of agricultural land in the Plum Creek watershed requests planning assistance through the Caldwell-Travis or Hays County SWCDs.
2. The Caldwell-Travis SWCD Technician will provide technical assistance to individuals throughout the watershed in the development of a WQMP. There is no charge to the producer for the development of the WQMP.
3. The WQMP is agreed to by the landowner and then reviewed and certified by the TSSWCB.
4. The individual implements the WQMP on their land. Cost-share is available from the SWCDs and TSSWCB for certain practices in the WQMP.
5. The Caldwell-Travis SWCD Technician will conduct annual status reviews on all WQMPs implemented throughout the watershed to ensure that the landowners implement BMPs as specified and agreed to in the WQMP implementation schedule.

Benefits of Participating

By partnering with the Caldwell-Travis and Hays County SWCDs to implement a WQMP on your agricultural land, you will:

- Demonstrate that voluntary conservation programs promote agricultural production and environmental quality as compatible goals.
- Implement the Plum Creek Watershed Protection Plan to restore water quality in our local streams and creeks.
- Demonstrate to the State of Texas that you are voluntarily using the best available technology to prevent nonpoint source water pollution and comply with State Water Quality Standards.
- Have a strategic plan developed for your agricultural operation to help you make decisions on how to best manage your natural resources.
- Demonstrate to other sectors in the watershed (industry, municipalities, urban residents) that agriculture is doing our part to protect our local water resources.
- Enhance the value of your operation and achieve watershed-wide environmental goals at the same time.
- Be eligible for certain forms of cost-share to help defray costs of implementing management practices on your land.

Appendix A: Updated Appendix J - Management Practice Efficiencies

For use in determining optimal management practices for implementation in urban and agricultural areas, the following reduction efficiencies were assumed. All values are load reductions unless otherwise stated.

URBAN MANAGEMENT PRACTICES

For use in determining optimal management practices for implementation in urban and agricultural areas, the following reduction efficiencies were assumed. All values are load reductions unless otherwise stated.

Definition of Acronyms:

Bacteria: *E. coli* or fecal bacteria
Cu: copper
Pb: lead
TP: total phosphorus
Zn: zinc
BOD: biological oxygen demand
Metals: heavy metals
TN: total nitrogen
TSS: total suspended solids

Table A1. Load reductions for Media Filters.

TSS	TN	TP	Metals	Bacteria	References	
89%	17%	59%	72-86%	65%	Glick et al., 1998	Calif Handbook
95%	-[2]	41%	61-88%	-	Stewart 1992	
85%	-	4%	44-75%	-	Leif 1999	
85%	-	80%	65-90%	-	Pitt et al. 1997	
83%	-	-	9-100%		Pitt 1996	
98%	-	84%	83-89%	-	Greb et al. 1998	
70%	21%	33%	45%	76%(FC)	Galli, 1990	EPA Fact Sheet 1999
99%	38%	97%	94-99%	-	Hatt et al. 2008	
85%	35%	45%	-	-	NCDENR 2007	
82%	42%	49%	-	31%	N.P.R.D. 2007[1]	
70-90%	30-50%	43-70%	-	-	Bell et al. 1995; Horner & Horner 1995; Young et al. 1996	StormWater BMPs FHWA
75-92%	27-71%	27-80%	-	-	City of Austin 1990; Welborn & Veenhuis 1987	
90-95%	55%	49%	48-90%	90%	Claytor & Schueler 1996; Stewart 1992; Stormwater Management 1994	
66-95%	44-47%	4-51%	34-88%	-	USEPA 2004	

[1] Reductions based on an average of multiple studies.
[2] No data.

Table A2. Load reductions for wetlands.

Volume	TSS	TN	TP	Bacteria	Metals	BOD	Reference	
10%	45%	27%*	28%	31%[2]	-[5]	28%	Newman & Clausen 1997	
-	83%	26%,	43%	76%**[2]	36-85%	-	Winer 2000	EPA NPDES 2006
-	69%	56%	39%	-	80-63%	-		
-	71%	19%	56%	-	0-57%	-		
-	83%	19%	64%	78%[2]	21-83%	-		
-	-	37%	2%	-	-	-	Kovacic et al. 2000	
-	-	11%	17%	-	-	-	Raisin et al. 1997	
-	-	-	-	-	-	80%	Huddleston et al. 1999	
-	85%	85-90%	47%[4]	-	84%(Fe)	-	Lake Tahoe	EPA National Management Measures 2005
-	70%	-	-	-	-	-	Shop Creek	
-	94%	76%	90%	-	-	-	Lake Jackson	
-	55%	36%	43%	-	83%(Pb), 70%(Zn)	-	Orange County	
-	55-83%	36%	43%	-	55-83% (Pb, Zn)	-	Orlando	
-	50%	-	62%	-	-	-	Palm Beach	
-	71%	-	47%	-	-	-	Tampa	
-	86-90%	61-92%	65-78%	-	-	-	Des Plaines	
-	95-97%	-	82-91%	-	-	-	Long Lake	
-	95%	-	92%	-	-	-	St. Agatha	
-	96%	74%	78%	-	90%(Pb)	-	Spring Creek	
-	55%	24%	44%	76%[3]	-	-	N.P.R.D. 2007***	
-	65%	20%	25%	-	35-65%		USEPA 1993	StormWater BMPs FHWA
				99%[1]			Stenstrom and Carlander	
				93%[2]			de J. Quinonez-Diaz et al., Gerba et al., Khatiwada et al., Neralla et al, Rifai 2006	

* Total Kjeldahl-N reduction.
** Based on fewer than 5 data points.
*** Reductions based on an average of multiple studies.
[1] *E. coli.*
[2] Fecal coliform.
[3] Indicator species not specified.
[4] Particulate phosphorus reduction only.
[5] No data.

Table A3. Load reductions for bioretention.

Volume	TSS	TP	TN	Cu	Pb	Zn	Oil & Grease	Bacteria	Reference
-[3]	97%	35-65%	33-66%	36-93%	24-99%	31-99%	99%	70%[2]	MD Envir. Service 2007
96.5%	60%	31%[1]	32%	54%	31%	77%	-	69%(FC) 71%(EC)	Hunt et al. 2008
-	-	-	40%	99%	81%	98%	-	-	Hunt et al. 2006
-	-	58-63%	47-88%	-	-	-	-	-	Passeport et al. 2009
-	-	65-87%	49%	43-97%	70-95%	64-95%	-	-	EPA BMP Menu
40%	-	35-50%	70-80%	-	-	-	-	97%(FC)*	Smith & Hunt
51%	-	16%	43%	-	-	-	-	-	Sharkey 2006
48%	-	-39%	38%	-	-	-	-	-	
-	-	65-87%	49%	43-97%	70-95%	64-95%	-	-	Davis et al. 1997 ; EPA NPDES 2005
-	29%	-11%	44%	68%	-	23%	-	-	N.P.R.D. 2007**
-	75%	50%	50%	75-80%	75-80%	75-80%	-	-	StormWater BMP FHWA; Prince George's County 1993
-	80%	65-87%	49%	-	-	-	-	-	USEPA 2004
								97%(EC) 44%(FC)	Peterson et al. 2011

* Values based on only 6 collected samples, not a statistically significant finding.
** Reductions based on an average of multiple studies.
[1] Negative value represents an increase in pollutant concentration.
[2] Indicator species not specified.
[3] No data.

Table A4. Load reductions for infiltration trench/basin.

TSS	TN	TP	Metals	Bacteria	Reference	
50%	-[2]	51%	52-93%	96%(FC)	Birch et al. 2005	
99%	60-70%	65-75%	95-99%	98%[1]	Schueler, 1987	Wisconsin Manual 2000
90%	60%	60%	90%	90%[1]	Schueler, 1992	EPA Fact Sheet
85%	-	85%	-	-	PA Stormwater Manual 2006	
75-99%	45-70%	50-75%	75-99%	75-98%[3]	Young et al. 1996	StormWater BMPs FHWA
75%	55-60%	60-70%	85-90%	90%[1]	USEPA 2004	

[1] Indicator species not specified.
[2] No data.

Table A5. Load reductions for dry ponds.

TSS	TN	TP	Metals	Bacteria	Reference	
61%	31%	19%	26-54%	-[3]	Schueler 1997	EPA BMP Menu
71%	-	-	26-55%	-	Stanley 1996	
47%	19%	21%	-	88%[2]	N.P.R.D. 2007**	
61%	19%	31%	26-54%	-	USEPA 2004	
				90%[1]	BMP Database Project 3	

** Reductions based on an average of multiple studies.
[1] Fecal coliform.
[2] Indicator species not specified.
[3]No data.

Table A6. Load reductions for wet ponds.

TSS	TN	TP	Metals	Bacteria	Reference	
67%	31%	48%	24.73%	65%[1]	Schueler 1997	EPA BMP Menu
76%	31%	54%	-[2]	68%[1]	N.P.R.D. 2007**	
68%	55%	32%	36-65%	-	USEPA 2004	
				47%(FC)	Rifai (2006),Gerba et al., Mallin	

** Reductions based on an average of multiple studies.
[1] Indicator species not specified.
[2] No data.

Table A7. Load reductions for swales.

TSS	TN	TP	Cu	Pb	Zn	Bacteria	Reference	
60-85%	10-90%	15-90%	45-80%	-[4]	68-88%	-	CRWA 2008	
81%	38% *	9%	51%	67%	71%	-	U.S. EPA Fact Sheet 1999	
--	51%, 41%	63%, 42%	70%, 49%	56%, 76%	93%, 77%	-	Yousef et al. 1987**	
30-90%	0-50%	20-85%	0-90%	0-90%	0-90%	-	City of Austin (1995) Claytor & Schueler (1996); Kahn et al. (1992); Yousef et al. (1985); Yu & Kaighn (1995); Yu et al. (1993 & 1994)	StormWater BMPs FHWA
						-		
-	-	-	-	-	-	-388[2]	Randafi (2006), Dayton Ave Project [3]	

* Value reduction of nitrate only.
** Observations from two sites respectively.
[2] Fecal coliform.
[3] MS Dept. of Marine Resources – http://www.dmr.state.ms.us/CMP/Storm/APPENDIX-C/Dayton%20Biofilter%20Grass%20Swale.pdf.
[4] No data.

Table A8. Load reductions for street sweeping.

TSS	TP	TN	Metals	Bacteria	Reference	
55-93%	40-74%	42-77%	35-85%	-[1]	NVPDC 1992	StormWater BMPs FHWA

[1] No data.

Table A9. Load reductions for porous pavement.

Volume	TSS	TP	TN	Metals	Bacteria	Reference	
-[1]	82-95%	60-71%	80-85%	33-99%	-	MWCOG 1983 Hogland et al. 1987 Young et al. 1996	StormWater BMPs FHWA
-	82-95%	65%	80-85%	98-99%	-	USEPA 2004	
31-100%*	-	-	-	-	-	Smith et al. 2006	
66%**	-	-	-	-	-		
75%**	-	-	-	-	-		
81%**	-	-	-	-	-		
53%**	-	-	-	-	-		

* Represents the range of reduction for 4 types of porous pavement from 17 rainfall events.
** Represents an average reduction for one of the 4 types of porous pavement tested from 17 rainfall events.
[1] No data.

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Table A10. Load reductions for filter strips.

Sediment/Solids	N	P	Fecal Coliform*	Length of Strip		Reference
97.6%	95.3%	93.6%	-[1]	18.3m	Load(kg/ha)	Lim et al. 1998
91.9%	90.1%	83.8%	-	18.3m	Conc.(mg/L)	
77.3%	86.9%	92.6%	-	21m	Load(kg/ha)	Chaubey et al. 1994
92.1%	94.6%	96.9%	86.8%	21m	Conc.(mg/L)	
95%	80%	80%	-	9.1m	Load(kg/ha)	Dillaha et al. 1988
99%	-	-	74%	9m	Load(kg/ha)	Coyne et al. 1995
79%	84%	83%	69%		Conc.(cfu/mL)	Young et al. 1980
-	-	-	95%	1.37m	Conc.(cfu/mL)	Larsen et al. 1994
-	-	-	FC-54% EC-13%	-	-	Rifai (2006),Goel, et al.
-	-	-	FC-30-100% EC-58-99%	-	-	Peterson et al. 2011

* Concentration reductions are for fecal coliform unless otherwise labeled.
[1] No data.

Table A11. Load reductions for riparian herbaceous buffers.

Sediment/Solids	N	P	Fecal Coliform*	Width	Reference
79%	84%	83%	69%	27m	Young et al. 1980
84%	73%	79%	-[1]	9.1m	Lee et al. 1999
66%	0%	27%	-	4.6m	Magette et al. 1999
70%	50%	26%	-	4.3 & 5.3m	Parsons et al. 1991
99%	-	-	-	5-61m	Dosskey et al. 2002
67%	-	-	-	5-61m	Dosskey et al. 2002
59%	-	-	-	5-61m	Dosskey et al. 2002
41%	-	-	-	5-61m	Dosskey et al. 2002
			95%	1.37m	Larsen et al. 1994

* Concentration reductions in cfu/mL.
[1] No data.

Table A12. Load reductions for Field Borders.

Sediment/Solids	N	P		Reference
57%	55%	50%	Load(kg/ha)	Arabi 2005
45%	35%	30%	Load(kg/ha)	Arabi 2005
50%	45%	25%	Load(kg/ha)	Arabi et al. 2006
48%	45%	24%	Load(kg/ha)	Arabi et al. 2006
81%	32%	-[1]	Load(kg/ha)	Tate et al. 2000

[1] No data.

Table A13. Load reductions for grassed waterways.

Sediment/Solids	N	P	Fecal Coliform		Reference
97%	-[1]	-	-	Load(kg/ha)	Fiener & Auerswald 2003
77%	-	-	-	Load(kg/ha)	Fiener & Auerswald 2003
95%	-	-	-	Load(t/ha)	Chow et al. 1999
-	-	-	95%	Conc.(cfu/mL)	Larsen et al. 1994
-	-	-	16%	Conc.(cfu/mL)	Dickey and Vanderholm, 1981

[1] No data.

Table A14. Load reductions for riparian forest buffers.

Sediment/Solids	N	P		Reference
97.2%	93.9%	91.3%	Load(kg/ha)	Lee et al. 2003
76%	-[1]	-	Mass(g/event)	Schoonover et al. 2005
61.3%	-	-	Conc.(mg/L)	Schoonover et al. 2005
90%	-	-	Conc.(mg/L)	Peterjohn & Correll 1984
-	89%	80%	Load(kg/ha)	Peterjohn & Correll 1984

[1] No data.

Table A15. Load reductions for alternative watering facilities.

Sediment/ Solids	N	P	Bacteria	Reduction in Time Spent in Stream	Reduction in Time Spent Near Stream	Reduction in Time Spent Drinking From Stream		Reference
96.2%	55.6%	97.5%	-[3]	-	-	92%	Load (kg/ha)[1]	Sheffield et al. 1997
90%	54%	81%	FC-51%	-	-	92%	Conc. (mg/L)[2]	Sheffield et al. 1997
-	-	-	-	85%	53%	73.5%	-	Clawson 1993
-	-	-	-	-	75%	-	-	Godwin & Miner et al. 1996
-	-	-	-	90%	-		-	Miner et al. 1992
77%*	-	-	EC-85% FC-51-94%	-	-	-	-	Peterson et al. 2011

* Estimated reduction in stream bank erosion.
[1] Load Reductions based on measurements taken only from the watershed outlet.
[2] Concentration Reduction based on measurements averaged from all 5 sample sites in the studied watershed.
[3] No data.

Table A16. Load reductions for nutrient management.

N*	NO_3-N**	P*	Management Practice	Reference
-[1]	47%	-	Variable Rate Application	Delgado & Bausch 2005
-	59%	-	Nitrification Inhibitor	Di & Cameron 2002
-	-	12-41%	Variable Rate Application	Wittry & Mallarino 2004

* Reductions in Nutrient Applied to crop and continuing to maintain yield.
** Reduction in Residual Soil NO3-N and NO3-N leaching potential.
[1] No data.

Table A17. Load reductions for conservation cover.

Sediment/Solids	N	P	Bacteria	Reference
71%	-	-	-	USEPA 2009 STEPL BMP Efficiency Rates
90%	-	-	-	Grace 2000
99%	-	-	-	Robichaud et al. 2006
89%	-	-	-	Robichaud et al. 2006

[1] No data.

Table A18. Load reductions for prescribed grazing.

Consumption of Weed Species	Reduction of Weed Population	Reduction of Stem Density	Increase in Population of Preferred Veg.	Weed Species	Livestock Species	Reference
40-90%	-	-	-	Tall larkspur	Sheep	Ralphs et al. 1991
-	-	98%*	-	Leafy Spurge	Goats	Lym et al. 1997
-	93%	-	13%	Leafy Spurge	Sheep	Johnston & Peake 1960
-	90%	-	-	Barley	Sheep	Hartley et al. 1978
-	100%	-	-	Bull Thistle	Goats	Rolston et al. 1981
-	90%	-	-	Leafy Spurge	Sheep	Olson & Lacey 1994

* Reduction achieved in combination with herbicide application.
[1] No data.

Table A19. Load reductions for prescribed grazing.

Sediments / Solids	N	Bacteria	Runoff Volume*	Livestock Species	Reference
8%	34%	EC – 66-72% FC – 90-96%	[1]Mod. Grazed—29% [2]Lightly Grazed—89%	Cattle	Peterson et al. 2011

* Reduction as compared to Heavily Grazed (1.35 AUM/acre).
[1] (2.42 AUM/acre).
[2] (3.25 AUM/acre).

Table A20. Load reductions for stream crossings.

Sediments / Solids	N	P	Bacteria*	References
18-25%	18-25%	18-25%	EC—46% FC—44%-52%	Peterson et al. 2011
-[3]	35%[1]*	78%[2]*		

* Concentration Reductions.
[1] Nitrate Nitrogen.
[2] Particulate Phosphorus.
[3] No data.

Table A21. Load reductions for alternative shade.

Sediments / Solids	N	Bacteria	Reference
-[1]	-	EC – 85%*	Peterson et al. 2011

* When combined with an off-stream water source.
[1] No data.

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Appendix B: Press Releases during the Project

- New feral hog publication strives to set the record straight on accurate numbers (9/14/12)
- Fall feral hog webinar series set (8/30/12)
- September 11th water quality, quantity training in Lockhart to focus on Plum Creek (7/30/12)
- Meeting of Plum Creek Partners to address watershed issues set for August 9 (7/25/12)
- Feral hog 'community of practice' provides multi-state expertise, resources (6/11/12)
- Plum Creek partnership, other regional watershed protection meetings scheduled (04/25/12)
- Feral Hog Management Workshop Draws Large Crowd in Luling" (2/27/12).
- New publication explains how feral hogs negatively affect native plants (2/13/2012)
- Feb. 9 meeting will address Plum Creek watershed efforts (01/30/12)
- Feral Hog Management Workshop scheduled Feb. 14 in Luling (1/18/12)
- New AgriLife Extension publication helps keep the hogs out (12/22/11)
- Plum Creek Watershed Partnership Meeting set for Nov. 10 in Lockhart (11/2/11)
- Educational, informational opportunities offered for Plum Creek watershed stakeholders (10/18/11)
- Plum Creek Watershed Partnership completes long-term sustainability meetings (7/18/11)
- Water quality-related financial incentives available to qualifying Plum Creek Watershed landowners (6/23/11)
- Feral hogs ruffle feathers of groundnesting birds (5/10/11)
- May marked by Plum Creek Watershed Activities (4/19/11)
- Extension pubs provide info on porcine pest (4/6/11)
- This little piggy had tularemia (3/29/11)
- State law regulates trapping, transporting of feral hogs (3/17/11)
- He's your hog, Charlie Brown! (3/2/11)
- Residents in Plum Creek Watershed to discuss progress towards improving water quality (12/6/10)
- Luling Foundation Water Field Day to be held Oct. 29 (10/19/10)
- Landowners learn about stream health inside Plum Creek Watershed (10/18/10)
- Plum Creek initiative wins Envision Central Texas award (5/13/10)
- Feral hog workshop in Luling draws crowd despite bad weather (3/2/10)
- New feral hog publications aim to help landowners thwart growing menace (2/18/10)
- Free home septic system maintenance workshop offered in Caldwell County (6/12/09)
- Free home septic system workshop in Hays County (6/12/09)
- New online feral hog reporting tool (6/3/09)
- Free home aerobic septic system workshops in Hays and Caldwell counties (4/29/09)
- Parks, golf course and sports field management workshop in San Marcos (3/10/09)
- Plum Creek Watershed team wins award for water quality efforts (2/3/09)
- Texas Watershed Steward Training Offered in Lockhart (7/15/08)

Fall feral hog webinar series set

Writer: Steve Byrns, 325-653-4576, s-byrns@tamu.edu

Contact: Jared Timmons, 254-485-4886, jbtimmons@ag.tamu.edu

SAN MARCOS – The eXtension Feral Hogs Community of Practice will conduct a feral hog educational webinar series this fall for anyone needing information on this growing problem, said the webinar's coordinator.

"Despite all the control efforts and the public's awareness of the issue, feral hog numbers in the state continue to rise at an alarming rate," said Jared Timmons, AgriLife Extension Plum Creek Watershed Feral Hog Education Program assistant at San Marcos. "The purpose of this series is to provide the public with the most current feral hog-related facts available in such a way that participants can interact with the experts from anywhere as long as they have Internet access."

The Feral Hogs Community of Practice is a resource area within eXtension concentrating on the control, adaptive management, biology, economics, disease risks, and the human interface of feral hogs across the U.S., Timmons said. Its goal is to provide critical information, resources and expert application of knowledge.

To join the webinars, log in as a "guest" to: https://connect.extension.iastate.edu/feralhog . There is no charge for the series.

The four sessions are from noon-1 p.m.

The session dates, topics and speakers include:

– Sept. 18, The History and Biology of Feral Hogs in the United States, Dr. John J. Mayer, manager, Environmental Sciences, Savannah River National Laboratory, Savannah River Nuclear Solutions LLC.

– Oct. 23, Control Techniques and Managing Feral Hog Populations, Dr. Billy Higginbotham, AgriLife Extension wildlife specialist, Overton.

– Nov. 20, Feral Hog Disease Issues, Dr. Joseph Corn, Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, University of Georgia.

– Dec. 18, Current and Future Feral Hog Research, Dr. Tyler Campbell, Feral Swine Project Leader, U.S. Department of Agriculture-Animal and Plant Health Inspection Service, National Wildlife Research Center, Florida Field Station.

For more information, contact Timmons at 254-485-4886, jbtimmons@ag.tamu.edu .

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New feral hog publication strives to set the record straight on accurate numbers

Figures show feral hog harvest numbers lag behind population growth

Writer: Steve Byrns, 325-653-4576, s-byrns@tamu.edu
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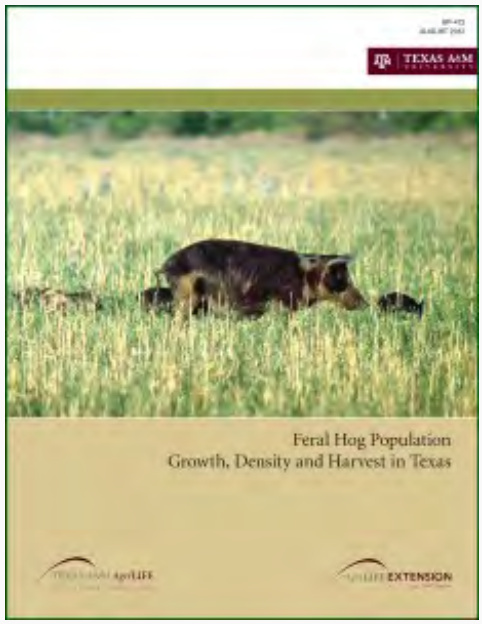
COLLEGE STATION – Hardly a day goes by that the feral hog invasion doesn't draw media mention, but the math associated with many of the reports has been mostly speculative – until now, said a Texas A&M AgriLife Extension Service expert.

Jared Timmons, AgriLife Extension Plum Creek Watershed Feral Hog Education Program assistant in San Marcos, said the new publication Feral Hog Population Growth, Density and Harvest in Texas (SP-472), has solid numbers backed by research to substantiate many of the claims made by those following the feral hog invasion. The publication available for $1 per copy joins more than a dozen other feral hog-related publications available at http://agrilifebookstore.org .



A new publication, "Feral Hog Population Growth, Density and Harvest in Texas (SP-472)" puts facts behind figures. (Texas A&M AgriLife Extension Service photo)

"It's pretty well accepted that feral hogs cause at least $52 million in agricultural losses each year in Texas," Timmons said. "But what's poorly understood are the pests' population dynamics; their survival, reproduction and density for example. The work represented in this publication literally puts facts to figures when it comes to this invasive species that exhibits the highest reproductive capability of any hoofed animal. That trait alone makes population reduction difficult."

The publication reports the number of feral hogs in the state as between 1 million and 4 million. These estimates are not based on scientific fact, though increased reports of damage suggest the statewide population is growing and expanding in range.

By examining a number of scientific studies throughout the southeastern U.S. and Texas, the publication authors were able to create a statewide mathematical model of feral hog populations

using sex, age and reproductive characteristics.

“The population model estimated an 18-21 percent annual population growth with the current average statewide population being 2.6 million head,” Timmons said. “Using these improved population figures, agencies and landowners can better understand the scope of the feral hog problem in Texas.

“Bottom-line, it’s not good. In order to hold our feral hog population at its current level, the annual harvest rate needs to be at least 66 percent for the next five years or more. This alone should be a major cause for concern since the estimated annual harvest is currently only 29 percent.”

Joining Timmons as coauthors for the publication were: Drs. Billy Higginbotham and Jim Cathey, AgriLife Extension specialists at Overton and College Station respectively; Dr. Roel Lopez, Janell Mellish and Jonathan Griffin with Texas A&M University’s department of wildlife and fisheries sciences; Dr. Aaron Sumrall, AgriLife Extension agent in Newton County; and Kevin Skow, GIS specialist with Texas A&M Institute of Renewable and Natural Resources and the Texas Water Resources Institute in College Station.

Support for the Plum Creek Watershed Feral Hog program is provided through Clean Water Act §319(h) Nonpoint Source funding from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency.

For more information regarding feral hog management efforts in the Plum Creek watershed, visit http://plumcreek.tamu.edu/feralhogs/ or contact Timmons at 254-485-4886, jbtimmons@ag.tamu.edu .

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AgriLife NEWS

May 13, 2010

Plum Creek initiative wins Envision Central Texas award

Community Stewardship Award for water quality awareness campaign

By: Paul Schattenberg, 210-467-6575

Contact(s): Nikki Dictson, 979-458-3478, n-dictson@tamu.edu

AUSTIN – The Plum Creek Watershed Partnership, Guadalupe-Blanco River Authority and Texas AgriLife Extension Service were recently awarded a 2010 Envision Central Texas Community Stewardship Award for their public awareness program, "Taking Charge of Water Quality in the Plum Creek Watershed."

The award, announced at a luncheon at the Hilton Austin Hotel on May 7, was presented by Envision Central Texas, a nonprofit promoting regional cooperation and planning to "preserve and enhance the natural resources, economic vitality, social equity and overall quality of living in Central Texas," according to organization materials.

The campaign was chosen from numerous submissions received from throughout the five-county Central Texas statistical area of Bastrop, Caldwell, Hays, Travis and Williamson counties.

"Awareness efforts have included educating city and county officials, residents, business and community leaders and other stakeholders in the Plum Creek Watershed," said Nikki Dictson, program coordinator with AgriLife Extension.

Dictson said the campaign's public awareness and education efforts address a variety water quality issues, including potential sources of bacteria, non-beneficial nutrients and pollutants, as well as wastewater treatment, storm water and storm drain management, urban growth issues, pet waste cleanup and disposal, illegal dumping, and the proper use and disposal of hazardous chemicals.

"The majority of these awareness efforts relate to water quality impacts through everyday actions by individuals at home or work, such as disposal of waste or chemicals," Dictson said.

Sally Campbell, executive director of Envision Central Texas, said her organization's Community

Stewardship Awards are presented to groups, agencies or organizations making significant contributions to planning and preparing for the future growth of Central Texas through helping protect and preserve the resources needed to support that growth.

"Central Texas will add more than a million people over the next 20 to 40 years, according to growth estimates," Campbell said. "These awards spotlight efforts that will have a positive impact on Central Texas and improve the way in which we grow so we can sustain the region's quality of life and competitiveness."

Campbell said award judges were impressed with the comprehensiveness of the awareness program, its various components and messages tailored for diverse audiences. She added that the initiative was "the clear winner" for their stewardship award in the Raising Public Awareness category.

Dictson said the Outreach and Education Work Group of the Plum Creek Watershed Partnership developed the award-winning public awareness effort, with support from a Texas Commission on Environmental Quality Clean Water Act Section 106 grant. She added that the overall program team also consisted of the Plum Creek Watershed Partnership Steering Committee, river authority staff including Debbie Magin, Cinde Thomas-Jimenez, Liz Sedlacek, Lee Gudgell, Scott Rolfe and hydroelectric crew members; AgriLife Extension staff including Dictson, Bruce Lesikar, Matt Berg and Mark McFarland; Kyle and Lockhart Parks and Recreation Departments; and environmental quality commission project manager David James.

Awareness activities included educational workshops for more than 85 municipal officials in the region, as well as organizing and conducting eight septic system workshops to benefit system installers, inspectors, maintenance providers and homeowners.

Other efforts include development of four online training course addressing wastewater treatment processes, on-site sewage systems, best management practices for handling fats, oils, greases and household chemicals, and storm water and storm sewer management for municipal operations. A "Don't Be Clueless" landowners watershed protection educational brochure was developed for use in the Plum Creek Watershed area and as a template for use in other watershed areas.

Dictson said awareness activities also included an illegal dumping/litter awareness campaign to identify priority clean-up sites around the watershed, conducting coordinated large-scale cleanups along streams in city parks with 350-450 participants at each event, posting signs in strategic areas to discourage further dumping, and public presentations on watershed protection.

Workshops and assistance were also given to city and county employees and city officials in the Kyle/Buda and Lockhart/Luling areas and additional educational activities are now being

coordinated with the authorized agents and inspectors of on-site sewage facilities toward making sewage assessments in high-risk areas.

"We're going to continue these efforts to reach a broad audience on an array of issues and to encourage watershed stakeholders to be proactive by helping prevent non-point source pollution," Dictson said.

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Extension pubs provide info on porcine pest

Texas AgriLife Extension Service feral hog fact sheets and various materials give farmers, ranchers and other landowners information about the non-native animals' behavior and sign, as well as details on how to build snares and traps to capture the pervasive pest. (Texas AgriLife Extension Service photo)

COLLEGE STATION – Though feral hogs are well-known pests to landowners throughout the state, there is still much people are unaware of regarding their behavior and what may be done to manage them, said Texas AgriLife Extension Service experts.

To help fill in the blanks on feral hogs, a group of AgriLife Extension experts have developed several fact sheets relating to management of this problematic species, said Dr. Jim Cathey, a specialist in wildlife ecology at Texas A&M University in College Station and contributing author to these publications.

Cathey and other AgriLife Extension personnel — Chancey Lewis, assistant; Matt Berg, program coordinator; Dr. Jim Gallagher, wildlife specialist; Nikki Dictson, program specialist; and Dr. Mark McFarland, soil fertility and water quality specialist — collaborated on several new feral hog fact sheets reflecting a variety of expertise and perspectives.

“We tried to address the realistic and practical aspects of feral hog identification and management through these publications,” Cathey said. “Their content is based on what we know from our individual experience and professional expertise, as well as from input received from farmers, ranchers and other landowners who have had encounters with feral hogs.”

The new fact sheets address topics ranging from recognizing evidence of feral hogs to methods of capturing these non-native animals.
Feral hogs cause an estimated $52 million in damages to the Texas agriculture industry each year. They also cause problems in suburban areas, and in rural areas they compete with wildlife for food, cover, and space.

“Feral hogs not only damage crops and other property in the Plum Creek Watershed and other areas of the state, they also have been identified as a possible source of non-point pollution to the water table in many locations,” McFarland said. “And their aggressive rooting and wallowing contributes to the problem of soil erosion in many areas of the state.”

While the publications are focused on feral hog management in the Plum Creek Watershed area of Travis, Caldwell and Hays counties, most of the information is applicable statewide, according to the authors. The publications include photographs, capture-method building instructions and tips for successful capture.

The new fact sheets can be found on the Plum Creek Watershed Partnership website at http://pcwp.tamu.edu/feral-hogs/capture-techniques and may be downloaded free from that site. Color versions of these publications may be obtained for a charge from the Texas AgriLife Extension Bookstore at https://agrilifebookstore.org, and also are available in Spanish from that site.

One of the new publications titled “Recognizing Feral Hog Sign” deals with indicators of feral hog activity, including damage from rooting, crop damage, wallows and rubs, tracks and trails, droppings and beds.

“Hogs are very mobile and often travel from field to field in search of food,” said Gallagher, who works at the Texas A&M AgriLife Research and Extension Center in Uvalde. “It’s important to know where they’ve been and to anticipate where they may be going in order to increase the chance of success in capturing them. Recognizing their sign will help landowners in that process.”

Additional new publications “Box Traps for Capturing Feral Hogs,” “Building a Feral Hog Snare” and “Corral Traps for Capturing Feral Hogs” give detailed instructions on how to construct and use these different means of capture.

A new associated fact sheet titled “Placing and Baiting Feral Hog Traps” provides instruction on how to choose promising locations for trap placement and the best types of bait to use. It also includes a hog bait recipe, list of baits and trapping tips.

“Feral hogs are not considered wildlife and are not classified as a game species in Texas,” Cathey said. “Instead, this exotic species is considered free-ranging livestock.”

Cathey said feral hogs and their damage are the responsibility of the landowner where they are found, and, as a result, landowners spend considerable time and money in attempt to manage these animals.

“Once feral hogs are established in an area, complete eradication is unlikely,” he said. “There is no silver bullet or a single quick fix. However, by using multiple approaches, landowners and managers can limit the size of feral hog populations and reduce the level of damage.”

Cathey said each management approach referred to in the new fact sheets may be viewed as one option in the “toolbox” for feral hog management.
“A combination of techniques will likely be needed to have a sustained effect and diminish feral hog impacts,” he said. “And to produce the best results, these different techniques should be used simultaneously.”

In addition to these new publications, other publications and materials relating to feral hogs can be found at the Plum Creek Watershed Partnership and AgriLife Bookstore websites.

“The feral hog problem in the Plum Creek Watershed area is substantial,” said Jared Timmons, an AgriLife Extension assistant who addresses feral hog issues in the Plum Creek watershed.

Timmons said he and other contributors from AgriLife Extension, the Caesar Kleberg Wildlife Research Institute, U.S. Department of Agriculture – Animal and Plant Health Inspection Service and Texas Wildlife Services soon will complete another feral hog publication. This publication, “Using Fences to Exclude Feral Hogs from Wildlife Feeding Stations,” also will be available at both the partnership and bookstore websites.

“Hunters and wildlife managers often provide feed for white-tailed deer in Texas, and use an estimated 150,000 tons of corn to feed primarily deer each year,” Timmons said. “In addition to corn, many deer managers also supply high-protein pellet feed, but research has shown much of this supplemental feed is consumed by non-target species such as feral hogs.”

He said to meet management goals and reduce feed costs, deer managers should take steps to prevent feral hogs from accessing deer feed, and that the new publication will provide “useful, practical information” toward reaching these ends.

Timmons added that the Plum Creek Watershed Partnership website also contains an online tool for reporting feral hog sightings or control measures, with one type of report for cooperating landowners and another for the general public.

Funding and support for the Plum Creek Watershed Partnership is provided by the Texas State Soil and Water Conservation Board through a Clean Water Act §319(h) non-point source grant from the U.S. Environmental Protection Agency.

For more information or technical assistance on feral hogs in the Plum Creek Watershed area, contact Timmons at 254-485-4886 or jbtimmons@ag.tamu.edu.

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Environment Wildlife

Feral hogs ruffle feathers of ground-nesting birds

Along with the other damage they do, feral hogs can negatively affect populations of ground-nesting birds by eating both them and their eggs, such as the quail eggs pictured above. (Texas AgriLife Extension Service photo)

COLLEGE STATION — Landowners in the Plum Creek Watershed area and elsewhere in the state should be aware that feral hogs not only damage crops and pastures, but also have a negative impact on ground-nesting birds, according to Texas AgriLife Extension Service experts.

“Typically, feral hogs are not thought of as predators, but they fill that role as well,” said Dr. Jim Cathey, AgriLife Extension wildlife specialist in College Station. “They are opportunistic omnivores, eating whatever plant or animal matter is available as they compete with other wildlife for food sources.”

Cathey said that means ground-nesting birds, like northern bobwhite quail and wild turkey, along with their eggs, are often on the feral hogs’ menu.

“For an animal that keeps its nose close to the ground, these birds’ nests can be especially vulnerable,” he said.

The northern bobwhite has been declining over much of its historic range in Texas for several decades, according to Dr. Dale Rollins, an AgriLife Extension wildlife specialist in San Angelo.

To better understand predation of northern bobwhite nests, Rollins has been teaming up with landowners and AgriLife Extension agents to monitor predation rates in the Rolling Plains area of the state, using simulated bobwhite nests to help determine the extent of feral hog predation.

Rollins said during trials conducted in 1993 and 1994, he and the other participants found that on a ranch in Foard County 23.5 percent of the simulated bobwhite nests he and others set out were consumed by feral hogs. They also found that 11.5 percent of simulated nests they had set out on a ranch in Shackelford County were depredated by feral hogs.

“This suggests that nest predation by feral hogs is conceivably a contributing factor to the northern bobwhite population decline,” Rollins said. “And those experiments were conducted nearly 20 years ago, so the feral hog populations have increased substantially since that time.”

Cathey noted that three subspecies of wild turkey are found in Texas, with the most common being the Rio Grande subspecies followed by the eastern subspecies.

“Researchers have documented nest predation by feral hogs for each of these birds,” Cathey said. “The eastern subspecies was extirpated in much of its Texas range, typically east of the Trinity River. Texas Parks and Wildlife Department reintroduced eastern wild turkey with hopes of re-establishing the population.”

He said the Gus Engeling Wildlife Management Area between Palestine and Corsicana was one location where these turkeys were released.

“To monitor movement and nest success, these turkeys were fitted with radio transmitters and nests were located and observed,” Cathey said. “Observations showed that feral hogs, among other predators, consumed eggs from nests.”

In a previous attempt to increase nesting success among ground-nesting birds, Texas Parks and Wildlife

staff also increased control of feral hogs. They discovered that in 1998, when only 68 hogs were removed, the nest success was zero percent. But in 1999, when control was increased and a total of 313 feral hogs were removed just before the nesting season, the nest success rate increased to 25 percent.

“While feral hogs are not the only nest predators of wild turkeys, this research suggested an effect where reducing or driving feral hogs from the area increased nest success,” Cathey said. “Other factors like rainfall could also contribute to nest success, but removal of a non-native predator like feral hogs should be considered a part of successful ranch management.”

He noted that landowners should utilize several control methods for feral hogs, which may include trapping, snaring, shooting, use of dogs and hunting.

“Given the high reproductive rate of feral hogs, many more native wildlife species are likely impacted,” he said. “The bottom line is that native wildlife species need a reprieve and this can be provided through aggressive feral hog reduction.”

To help landowners in the Plum Creek Watershed and other areas of the state understand more about feral hogs and the methods used to manage them, AgriLife Extension has developed publications in English and Spanish that can be downloaded at no charge. To view and/or download these publications, go to the Plum Creek Watershed Partnership website at http://plumcreek.tamu.edu/feralhogs.

The site also contains an on-line tool for reporting feral hog sightings or control measures, with one report for cooperating landowners and another for the general public.

For more information on feral hogs in the Plum Creek Watershed area, contact AgriLife Extension assistant Jared Timmons at 254-485-4886 or jbtimmons@ag.tamu.edu.

Funding and support for the development of the Plum Creek Watershed Protection Plan is provided through a Clean Water Act §319(h) nonpoint source grant from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency.

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Environment Wildlife

He’s your hog, Charlie Brown!

Each year, feral hogs cause millions of dollars in damage to crops and property throughout the state, including the Plum Creek Watershed area. But feral hogs are essentially the property of the landowner, according to state codes. (Texas AgriLife Extension Service photo)

LOCKHART — Landowners in the Plum Creek Watershed area who are frustrated with the damage feral hogs are doing to their property may be surprised to know who actually “owns” the problem, said Texas AgriLife Extension Service experts.

Jim Cathey, an AgriLife Extension wildlife ecology specialist in College Station, said feral hogs originated from domestic species and were first introduced into the U.S. by early explorers and settlers as a food source. Escapes and intentional releases of the formerly domestic animals over the centuries have resulted in a free-ranging feral hog population in Texas estimated at between 1 and 4 million.

“Feral hogs are not a game or non-game species in Texas,” Cathey explained. “Instead, they are considered ‘exotic livestock’ as described in both Texas Parks and Wildlife and Texas Agriculture codes.”

He said due to this distinction, feral hogs fall under the “ownership” of the landowner and not the citizens of the state, which means the landowner is primarily responsible for managing feral hogs on his or her property.

“It is not surprising that landowners are fed up with feral hogs,” Cathey said. “Damage to the agricultural industry in Texas is estimated at $52 million annually according to our agency. And this figure doesn’t account for damage in suburban areas or growing concerns over the impact feral-hog activity may be having on areas such as the Plum Creek Watershed.”

Stream water quality studies by the Texas Commission for Environmental Quality have determined there are excessive bacteria and nitrogen levels in Plum Creek Watershed, added Nikki Dictson, AgriLife Extension program specialist and Plum Creek Watershed Partnership coordinator.

“Non-point source pollution from feral hogs is a potential threat to the watershed’s water quality,” Dictson said. “Fecal material from feral hogs can be a source of pollution and contribute to bacteria and nitrogen levels if the waste enters the creek either directly or from storm water. Their aggressive rooting can cause serious damage to croplands and grasslands pretty quickly, and this rooting also can contribute to soil erosion in the watershed area.”

She added that funding and support for a Plum Creek Watershed Protection Plan has been provided through a Clean Water Act §319(h) non-point source grant from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency.

Pam Cantwell, who lives on a 106-acre ranch in McMahan near Lockhart, said she and her family recently have had their property damaged by feral hogs.

“Along with uprooting our front lawn, they’ve run rampant in our hay fields and have dug them up, as well as digging up around the roots of our oak trees, some of which are more than 100 years old, along with our pecan, plum, fig, peach and apricot trees,” Cantwell said. “We’ve trapped about 12 and have shot two so far, but they seem to multiply faster than we can control them.”

Cantwell said she feels small-acreage landowners must fend for themselves more than larger landowners who can use control options such as dogs and helicopters, which may not be feasible on smaller plots.

“Landowners or their agents are allowed to kill feral hogs on their property without a hunting license if feral hogs are causing depredation to the land,” said Jared Timmons, AgriLife Extension assistant addressing feral hog issues in Caldwell, Hays and Travis counties and supporting the Plum Creek Watershed Partnership. “However, it is a good idea for them to have a hunting license if they also plan to trap or snare feral hogs, as these activities could affect other native wildlife species.”

Timmons added that a Texas hunting license is required for people hunting feral hogs for trophies or food, and that the Texas Parks and Wildlife Department outlines these requirements in its annual hunting and fishing regulations publication, the Outdoor Annual.

“It’s important to read and understand all the regulations,” Timmons said, “but a hunting license permits use of firearms, snaring and trapping in the fight against feral hogs.”

He added that exotic species, including feral hogs, may be hunted throughout the year and that there is no closed season or bag limit.

“Feral hogs may be hunted at night with the use of a spotlight, but it is a good idea to provide a courtesy call to your local game warden to let them know where and when you will be hunting,” Timmons said.

Cathey noted that several publications developed by AgriLife Extension, including publications relating to signs of feral hog activity, traps and capture techniques, can be downloaded at no charge from the Plum Creek Watershed Partnership website by going to http://plumcreek.tamu.edu/feralhogs.

“Here you’ll also find an online tool for reporting feral hog sightings or control measures,” he said. “There’s one type of report for cooperating landowners and another for the general public.”

For more information or technical assistance on feral hogs in the Plum Creek Watershed area, contact Timmons at 254-485-4886 or jbtimmons@ag.tamu.edu.

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Environment Wildlife

May marked by Plum Creek Watershed activities

During the month of May, there will be activities in three cities -- San Marcos, Lockhart and Luling -- relating to ongoing efforts to protect and preserve the water quality of the Plum Creek Watershed and properly manage that important regional water source. (Texas AgriLife Extension Service photo)

SAN MARCOS/LOCKHART/LULING – Preserving and protecting water quality in the Plum Creek Watershed will be the focus of three activities in May taking place in three cities served by that watershed, said coordinators.

“There will a meeting, a workshop and a field day – all in May and all for the purpose of addressing issues related to management of the Plum Creek Watershed and improving its water quality now and for the future,” said Nikki Dictson, Texas AgriLife Extension Service program specialist.

The first of these watershed-related activities will be the free Riparian Management Workshop from 8:30 a.m. – 4 p.m. on May 2 in San Marcos.

Morning workshop activities will be indoors at the San Marcos Activity Center, 501 East Hopkins Road. Afternoon activities will be in the field, where participants will tour riparian areas around San Marcos.

“The workshop was developed for landowners and land-management decision-makers and addresses issues related to riparian areas and what can be done to protect and preserve the water quality of creeks, streams and other water bodies,” Dictson said.

Topics will include how creeks and rivers move and work, flooding, river flow during drought, and how riparian activity can enhance wildlife habitat.

“Participants will learn basic riparian dynamics, such as the interaction of hydrology, vegetation and erosion/deposition,” Dictson said. “This information has been successfully used in many locations to promote cooperative riparian management among landowners. The riparian experts teaching this workshop will change the way participants look at creeks and rivers.”

The Riparian Management Workshop is sponsored by the Plum Creek Watershed Partnership, San Marcos River Foundation, Nueces River Authority, Texas Parks and Wildlife Department, Texas Riparian Association and AgriLife Extension.

To register for the workshop, contact Dictson at 979-575-4424 or n-dictson@tamu.edu.

The second Plum Creek activity in May will be the quarterly Plum Creek Watershed Partnership meeting on May 5 at Lockhart State Park Recreation Hall, 4179 State Park Road/FM 20, west of US-183 in Lockhart. Meeting sign-in and refreshments will begin at 6 p.m., with presentations from 6:30-9 p.m.

Meeting topics will include: an update and discussion on long-term watershed sustainability; updates on the Hillside Terrace Wastewater Project and Kyle C

WA §319 implementation grant; an update on the Plum Creek Feral Hog Education Program; ongoing implementation of agricultural best management practices; a Texas Stream Team update; and an update on the Plum Creek Water Quality Data Project.

The third activity, the Luling Foundation Field Day, will be from 7:30 a.m.-3 p.m. on May 19 at the Luling Foundation, 523 S. Mulberry Street in Luling, will include a variety of information and booths, including a booth by the Plum Creek Watershed Partnership and AgriLife Extension, and will be the third and final

watershed-related activity in May.

The field day will include farm tours, an exhibit viewing, scholarship presentations, seminars and guest speakers and equipment demonstrations.

“We hope people in the Plum Creek Watershed area will participate in one or more of these opportunities to get involved in protecting this vital resource for themselves and future residents of the area it serves,” Dictson said.

For more information on the Plum Creek Watershed Partnership, go to: http://pcwp.tamu.edu/.

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Environment Water

Plum Creek Watershed partnership completes long-term sustainability meetings

Members of the Plum Creek Watershed Partnership have signed an interlocal agreement to support long-term sustainability of the partnership and to secure matching fund commitments for a new water conservation-related grant. (Texas AgriLife Extension Service photo)

CENTRAL TEXAS — Meetings were held recently with members of Plum Creek Watershed Partnership — a collaboration of cities, agencies, organizations and citizens in Central Texas — to help ensure long-term sustainability of the partnership and secure matching funds for a new grant proposal, said partnership officials.

The Guadalupe-Blanco River Authority led the effort to develop and submit a new three-year grant proposal for $360,000 of additional funding from the Texas State Soil and Water Conservation Board. The purpose of the grant is to fund a local watershed coordinator position and implement educational activities related to watershed protection and management, according to partnership participants.

The coordinator position would be located in Lockhart, but will work across the entire watershed area, especially Caldwell and Hays counties, said Nikki Dictson, Texas AgriLife Extension Service program specialist in College Station and current project coordinator. The new coordinator will conduct water resource and related environmental outreach and education efforts across the watershed, as identified in the watershed protection plan.

“The partnership is currently in the third year of implementation of the Plum Creek watershed protection plan funded through the Texas State Soil and Water Conservation Board by a Clean Water Act grant, and there already have been numerous efforts toward improving water quality within the watershed,” Dictson said. “This project already has obtained over $2 million in grant funding to implement a protection plan for the Plum Creek watershed.”

Debbie Magin, director of water quality services at the Guadalupe-Blanco River Authority, said the new funding will provide the partnership with a dedicated coordinator based in the watershed area, plus an enhanced ability to educate and inform watershed residents of all ages about the need for improved water quality and conservation.

“Long-term sustainability of the partnership has been a major discussion for the last three years,” Dictson said.

Dictson and Magin coordinated sustainability meetings with area city councils, county commissioners, water boards and other entities within the partnership to provide updates on the watershed protection project and coordinate development and approval of the interlocal agreement.

“These meetings resulted in the development of an interlocal agreement with area partner entities to provide the 40 percent local matching funds required to secure the new implementation grant,” Dictson said. The $120,000 annual budget for the new project will require $48,000 in matching funds.

The 12 collaborating entities that have signed the interlocal agreement are: Caldwell County, Hays County, the cities of Lockhart, Luling, Kyle, Uhland and Buda, the Guadalupe-Blanco River Authority, Plum Creek Conservation District, Polonia Water Supply Corporation, the Hays County Soil and Water Conservation District and the Caldwell-Travis Soil and Water Conservation District.

A breakdown of participating entities and funding for the new grant can be found at the Plum Creek Watershed Partnership website at: http://pcwp.tamu.edu.

“As part of this effort, a variety of training programs will be conducted in the watershed to target different potential sources of water pollution, including homeowner workshops for on-site septic systems and aerobic systems, nutrient management for urban areas and agricultural crops, feral hog management, as well as a municipal officials’ workshop on reducing pollution and managing growth,” Magin said. “The coordinator will track the projects that are ongoing and assist the partners with obtaining additional technical and financial resources needed to improve water quality.”

Dictson noted that the next quarterly meeting of the Plum Creek Watershed Partnership will take place at 6:30 p.m. on Aug. 11 at the Lockhart State Park, 4179 State Park Road in Lockhart, and that those interested in getting involved or learning more about the project should attend.

The park is south of Lockhart off U.S. Highway 183 and Farm-to-Market Road 20. To reach the park, go southwest on FM 20 for two miles to Park Road 10, then travel one mile south on Park Road 10.

Funding for the Plum Creek Watershed Partnership was made available through a Section 319(h) Clean Water Act nonpoint source grant from the Texas State Soil and Water Conservation Board and U.S. Environmental Protection Agency.

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Central Conservation Environment Regional Water

State law regulates trapping, transporting of feral hogs

State law regulates the trapping, transportation and relocation of feral hogs. Texas AgriLife Extension Service experts recommend landowners understand the regulations concerning what can be done with feral hogs prior to implementing management methods. (Texas AgriLife Extension Service photo)

COLLEGE STATION – Landowners who trap feral hogs on their property also need to know about the regulations regarding the transportation, potential release and other means of utilizing these creatures, said Texas AgriLife Extension Service experts.

“Landowners in the Plum Creek Watershed of Hays, Caldwell and Travis counties who decide to trap feral hogs should ask themselves what they’re going to do with them after they’re trapped,” said Jared Timmons, AgriLife Extension assistant supporting the Plum Creek Watershed Partnership.

Timmons said trapping, then cooking and eating feral hogs is one viable option.

“Feral hog meat is delicious when properly prepared,” he said. “And with this option, the trapped animals never have to leave your property.”

However, he added, some people may be averse to eating feral hog or sometimes trapping yields more than can be consumed.

“In such instances, moving live feral hogs must meet a set of rules, and this plays into management decisions,” he said.

The Texas Animal Health Commission regulates the movement of feral hogs, holding facilities and some aspects of hunting preserves, said Dr. Jim Cathey, AgriLife Extension specialist in wildlife ecology.

“However, some clarification is needed here,” Cathey said. “Hunting preserves must have a hunting lease permit issued by the Texas Parks and Wildlife Department. And feral hog gender is regulated differently.”

Cathey said female feral hogs, sows and gilts, may not be transported and released onto another property.

“Instead, female feral hogs may be held for up to seven days in an escape-proof pen or trailer,” he explained. “They can then be taken directly to slaughter or sold to an approved holding facility which would take them to slaughter.”

A list of approved feral hog holding facilities may be found at the commission’s website at http://www.tahc.state.tx.us/animal_health/feral_swine.html.

Male feral hogs, boars and barrows, also may be held for up to seven days in an escape-proof pen or trailer and may be taken directly to slaughter or sold to an authorized holding facility, he said.

That facility then may either take them to slaughter or sell them to an authorized hunting preserve.

“Authorized hunting preserves must have swine-proof fencing and must individually identify every feral hog released on the property,” he noted. “They are also subject to periodic inspections by the Texas Animal Health Commission.”

Domestication of feral hogs is allowed, but discouraged as a further option, Cathey said.

“This process would require quarantine of a minimum of 150 days, and each animal must be tested four times as being free of pseudorabies and swine brucellosis.”

Timmons said that in addition to damaging the property of Plum Creek Watershed residents, feral hogs also have been identified as possible contributors to non-point pollution of the watershed and may be partially

responsible for the water source's elevated levels of bacteria and nitrogen.

"Feral hogs are among the topics addressed in the Plum Creek Watershed Protection Plan, which addresses multiple aspects of water quality and source preservation," he said.

Several publications on feral hogs developed by AgriLife Extension can be downloaded free from the Plum Creek Partnership website at http://plumcreek.tamu.edu/feralhogs.

These publications address evidence of feral hogs, hunting and trapping methods and other salient topics. The site also contains online tools for use by landowners and the general public in reporting feral hog sightings or control measures.

Funding and support for the development of the Plum Creek Watershed Protection Plan is provided through a Clean Water Act §319(h) non-point source grant from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency.

For more information or technical assistance with feral hogs in Plum Creek Watershed area, contact Jared Timmons at 254-485-4886 or jbtimmons@ag.tamu.edu.

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Farm & Ranch Pests, weeds

This little piggy had tularemia…

Along with the damage or destruction they cause, feral hogs also sometimes carry diseases that can affect animals and humans. The three diseases of greatest concern related to feral hogs in Texas are swine brucellosis, psuedorabies and tularemia, but the animals can be vectors for other diseases too. (Texas AgriLife Extension Service photo)

COLLEGE STATION – Along with being upset over damage caused by feral hogs, landowners in the Plum Creek Watershed and elsewhere in Texas are concerned about disease from the pervasive pest, according to Texas AgriLife Extension Service experts.

"Residents of the Plum Creek Watershed area of Hays, Caldwell and Travis counties have expressed concern about diseases feral hogs may transmit to other animals or humans," said Jared Timmons, an AgriLife Extension assistant addressing feral hog issues in those counties.

Timmons, whose work supports the Plum Creek Watershed Partnership, said several area residents have had property damaged by feral hogs and that the partnership has identified these animals as potential contributors to non-point source bacteria and nutrient pollution of that watershed.

"But another negative aspect of feral hogs is that they may carry bacteria and viruses that can be transmitted to other animals and possibly even humans," he said. "This makes them more than just a destructive nuisance — they're a potential health concern."

Dr. Jim Cathey, an AgriLife Extension specialist in wildlife ecology, said the three diseases people should have the greatest cause for concern about relative to feral hogs in Texas are swine brucellosis, psuedorabies and tularemia, but that the animals may harbor other diseases as well.

Cathey said swine brucellosis, Brucella suis, is a bacterium transmitted among feral hog populations through breeding and through ingestion of the bacteria.

"When humans contract swine brucellosis it is called undulant fever because body temperatures rise and fall with flu-like symptoms. Untreated cases can result in severe orchitis, arthritis and bacterial meningitis," he said. "In pigs, symptoms include miscarriages, lameness, arthritis, abscesses and infertility. It can even lead to death in pigs contracting the disease."

In the recent past, there have been over 40 identifications of this bacterium in cattle in Texas, which will cause them to falsely test positive for bovine brucellosis, he added.

"False positives due to exposure to swine brucellosis from feral swine will result in quarantine of the cattle herd of origin and unnecessary economic lose to the owner," Cathey said.

Tests for Brucella abortus, the cause of bovine brucellosis, are required upon change of ownership by the U.S. Department of Agriculture and the Texas Animal Health Commission.

Cathey said it is extremely rare for humans to contract pseudorabies, also known as Herpesvirus suis, from feral hogs, but that domestic livestock such as sheep and cattle, as well as some wildlife, can be affected.

"Though some of its symptoms are similar to rabies, this disease is not, in fact, rabies. It is spread by nose-to-nose or sexual contact, as well as by ingestion or inhalation of the virus."

Cathey said symptoms of pseudorabies in feral hogs include miscarriage, mortality among piglets, and coughing and fever among the adults.

“The common name for pseudorabies is ‘mad itch,’” he said. “In cattle and dogs, intense itching and incessant scratching and biting of the skin may occur. There also may be other neurological symptoms. In most cases, the eventual outcome for these animals will be death.”

Tularemia, Francisella tularensis, is commonly known as rabbit fever. It is a disease feral hogs in Texas more recently have been discovered to carry and transmit.
Researchers at Texas Tech University tested 130 feral hogs and found that 50 percent of tested hogs in Crosby County and 15 percent in Bell and Coryell counties showed past exposure or were currently infected with tularemia.

“Humans contract the disease by direct contact through a wound, eating infected meat, and by ticks and biting flies that harbor the disease,” Cathey said. “When humans contract tularemia, flu-like symptoms such as fever, aches and chills occur, along with swollen lymph nodes. Severe cases can result in pneumonia, blood infections or meningitis.”

The tularemia bacterium can survive for weeks in wet environments, he added.

Other diseases potentially caused or carried by feral swine include many infectious or parasitic diseases transmitted by fecal material, said Dr. Don Davis, Texas AgriLife Research specialist in parasitic and infectious diseases of wildlife at the College of Veterinary Medicine at Texas A&M University.

“In many circumstances, traditional livestock, exotic game and white-tailed deer are fed supplements such as protein cubes, pellets or corn,” Davis said. “If these supplements are either fed on the ground or in places where feral swine have also been present, then the possibility of fecal contamination of the food is a real possibility.”

Davis added that bacterial diseases such as swine brucellosis and tularemia are not generally spread this way, but diseases such as salmonellosis and foot rot, as well as enteric bacteria, viruses and parasites, are commonly transmitted by this route.

“But one disease feral hogs do not carry is what has become commonly referred to as swine flu,” he said. “That’s a misnomer, as pigs – either wild or domestic – do not get this disease.”

“Although feral hog disease issues come up, water quality is a focal point for the Plum Creek Watershed Protection Plan,” said Timmons. “These animals also contribute to many problems in the area, including crop and property damage, soil erosion and pollution. But it’s important that landowners be alert to any potential disease-related issues with them as well.”

Timmons added that hunters who come in contact with feral hogs may risk exposure to swine brucellosis, tularemia and other diseases.

“Feral hogs that show signs of illness should not make it onto the menu,” he said. “And to further reduce chances of exposure, a double set of rubber or plastic gloves should be worn while processing and handling meat from feral hogs. Likewise, shield your eyes with glasses, wash your hands often with soap and warm water, and clean tools and surfaces with a dilute bleach solution.”

Feral hogs, however, can make great table fare when common-sense practices are followed, Timmons said, adding that when cooking feral hog meat it’s best to use a meat thermometer to ensure it reaches a minimum internal temperature of 160 degrees.

“To hone your knowledge of feral hogs, several publications were developed by Texas AgriLife Extension Service and can be downloaded at no charge by going to the Plum Creek Watershed Partnership website,” he added. These publications, which address feral hog signs, trapping and capture methods, as well as other related publications, can be found at http://plumcreek.tamu.edu/feralhogs.

“The site also has an online tool for reporting feral hog sightings or control measures,” he added. “There’s one report for cooperating landowners and another for use by the general public.”

For more information on feral hogs in the Plum Creek Watershed area and for technical assistance, contact Timmons at 254-485-4886 or jbtimmons@ag.tamu.edu.

Funding and support for the development of the Plum Creek Watershed Protection Plan is provided through a Clean Water Act §319(h) non-point source grant from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency.

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Environment Wildlife

Water quality-related financial incentives available to qualifying Plum Creek Watershed landowners

There are financial incentives through the local water district for Plum Creek Watershed landowners who develop a water quality management plan that includes approved water quality protection practices. One such practice might be providing alternative watering facilities for cattle to keep them away from riparian areas. Research shows cattle may be a source of nonpoint pollution of rivers and streams, and that producers may reap financial advantages from providing cattle with water from an alternative, "off-stream" source. (Texas AgriLife Extension Service photo)

LOCKHART – With the prolonged drought conditions throughout Texas, residents of the Plum Creek Watershed area who own livestock would be well-advised to plan and implement alternative watering facilities that meet water quality management plan criteria, said area water conservation professionals.

An alternative watering facility is a permanent or portable off-stream water supply that can be a trough, pond or similar system providing an adequate quantity and quality of drinking water for livestock and/or wildlife. Some alternative water facilities may require drilling a well and/or the use of an electrical or solar pump or windmill to bring water to the surface.

According to B.J. Westmoreland, district technician for the Caldwell-Travis Soil and Water Conservation District, residents of the Plum Creek Watershed can apply for financial assistance through the district to defray much of the cost for approved water quality protection practices such as alternative watering facilities.

“We’re hoping to further encourage water conservation in Plum Creek by making residents aware of the availability of financial incentives to implement some water quality management practices, especially alternative livestock watering facilities, which are vital given the prolonged drought,” he said.

Westmoreland said the Caldwell-Travis Soil and Water Conservation District, Hays County Soil and Water Conservation District and Texas State Soil and Water Conservation Board have partnered to provide technical assistance and financial incentives to ranchers and farmers that will help reduce bacteria and nutrient levels in Plum Creek through the implementation of best management practices on agricultural lands.

“The financial assistance portion of approved water conservation practices typically covers 60 percent of implementation costs and can apply for approved practices costing up to $15,000,” he said. ”Plum Creek area landowners can request, free of charge, a water quality management plan for their property through their local soil and water conservation district. This plan would include water conservation practices eligible for financial assistance, including alternative watering facilities.”

Costs differ based on the type and quality of materials used for alternative water facilities, Westmoreland said. He will be available to answer landowner’s questions, help provide cost estimates and identify the best opportunities to get financial assistance with a project.

According to U.S. Department of Agriculture Natural Resource Conservation Service estimates, a watering trough can cost $450 to $7,600, depending on size and materials. An electric water pump can cost $2,000 to $4,000, depending on size, and a solar water pump $5,700 to $12,000, depending on well depth. Additionally, the agency estimates the cost of a windmill at between $8,200 and $17,800, depending on fan diameter.

“Nonpoint source pollution is a major problem in many Texas watersheds and reducing the time that livestock spend near creeks, streams and other water sources can significantly reduce the amount of sediment,

nutrients and bacteria, especially E. coli, entering the water body," said Nikki Dictson, Texas AgriLife Extension Service program specialist and Plum Creek Watershed Partnership watershed coordinator.

Dictson said studies have shown that bacteria levels can be reduced by 50 percent to 85 percent when an off-stream watering facility is made available to livestock. She also noted that recent studies have shown cattle spend 43 percent to 57 percent less time in streams when given an alternative watering source.

Results from other research have shown: 1) that cattle provided alternative water sources spend more time drinking from troughs than streams, 2) calves gain more weight from cows that drink trough water, and 3) off-stream water supplies can increase the annual grazing capacity of cattle.

Westmoreland said another benefit of a watering facility may be a reduction in foot disease and physical injury among livestock as a result of mud and unstable footing around riparian areas.

"The water quality management plan program can greatly reduce the material and labor costs of implementing water conservation practices," Westmoreland said. "And improving water quality in Plum Creek is in the long-term best interests of all landowners and citizens in the watershed."

Additional practices eligible for financial incentives include cross fencing, rangeland planting, riparian herbaceous and forest buffers, pasture and hayland planting, grassed waterways, field borders and filter strips. Technical assistance and financial incentives are available through a Clean Water Act 319(h) nonpoint source grant from the Texas State Soil and Water Conservation Board and U.S. Environmental Protection Agency.

For general information on watering facilities and available financial assistance programs, contact the NRCS office at the local USDA Service Center.

For information on the approved watering facilities and conservation practices eligible for financial incentives in the Plum Creek Watershed area, contact Westmoreland at 512-398-2121, Ext. 3 or bradford.westmoreland@tx.nacdnet.net.

For more information on water quality and conservation efforts in the Plum Creek Watershed, go to http://plumcreek.tamu.edu/ or contact Dictson at 979-458-3478 or n-dictson@tamu.edu.

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Environment Water

AgriLife NEWS

February 18, 2010

New feral hog publications aim to help landowners thwart growing menace

By: Steve Byrns, 325-653-4576
Contact(s): Dr. Jim Cathey, 979-845-2862, jccathey@tamu.edu

COLLEGE STATION – The Texas AgriLife Extension Service has developed five new feral hog control publications to help landowners corral this growing menace, according to an AgriLife Extension specialist.

These publications were funded by the Texas State Soil and Water Conservation Board and U.S. Environmental Protection Agency through a Clean Water Act § 319(h) nonpoint source grant. Publications are available online at: http://plumcreek.tamu.edu/feralhogs/ .

These publications specifically target the Plum Creek Watershed in Hays and Caldwell counties, an area especially hard hit by the marauders, but are applicable wherever feral hogs are a problem, said Dr. Jim Cathey, AgriLife Extension wildlife specialist at College Station.

Chancey Lewis, AgriLife Extension wildlife assistant at Lockhart and his colleagues developed the new publications. Lewis works closely with landowners in Hays and Caldwell counties, giving instruction and technical guidance on hog trapping, as part of the implementation of the Plum Creek Watershed Protection Plan.

The five publications are:

– “Recognizing Feral Hog Sign,” deals with the evidence or sign the hogs leave in passing. By being able to read sign, Cathey said landowners can learn where the animals are traveling and apply the appropriate management technique to reduce their numbers.

– “Corral Traps for Capturing Feral Hogs,” discusses large traps that Cathey said have proven useful in reducing hog numbers quickly. According to Lewis, feral hogs typically travel in large family groups called “sounders,” and a corral trap can often be used to capture the entire group.

– “Box Traps for Capturing Feral Hogs,” deals with a second option that should be considered after

corral traps, Cathey said. While they are not the best choice for removing large hog numbers, box traps, because they are readily movable, can be used to quickly remove small numbers from trouble spots.

– “Snaring Feral Hogs,” offers instructions on placement and handling of snares. Snares are ideal for situations where feral hogs have become wary of box or corral traps. Snares are also much cheaper than traps, according to Lewis.

- "Building a Feral Hog Snare," provides step-by-step instructions for producing snares used for catching feral hogs.

For more information contact Lewis at 979-393-8517 or cdlewis@ag.tamu.edu .

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Feral Hog Workshop in Luling Draws Crowd Despite Bad Weather

Release Date
3-2-2010
Location
Temple, Texas
Contact
Pamela Casebolt
Contact Phone
254-773-2250

Despite the wintry weather across the state on Tuesday, February 23, 2010, nearly 300 people attended a feral hog management workshop in Luling. The Texas AgriLife Extension Service coordinated the event, with topics including feral hog biology, current research, and control methods for this invasive exotic species.

The workshop was made possible through a Clean Water Act §319(h) nonpoint source grant from the U.S. Environmental Protection Agency and the Texas State Soil and Water Conservation Board. This workshop was held to implement portions of the Plum Creek Watershed Protection Plan, which is a voluntary and holistic management plan for restoring water quality in this creek as it flows through Caldwell and Hays Counties.

Presenters at the workshop where from state and federal agencies including the Texas Parks and Wildlife Department, the Texas AgriLife Extension Service, USDA-Texas Wildlife Services, and the Texas Animal Health Commission. Attendees heard informational presentations, observed demonstrations, and participated in a question and answer session.

A grain farmer from Lavaca County stated, “I really enjoyed the trapping demonstrations. I’ve been dealing with feral hogs for a long time, and I found the workshop to be very informative.”

Oscar Fogle, a Caldwell county landowner and member of the Guadalupe-Blanco River Authority Board of Directors, said, “I’ve been to several of these workshops, and I always learn something new. It was really worthwhile.”

Chancey Lewis, Extension Wildlife Assistant assigned to work in the Plum Creek watershed, emphasized, “Landowners in Hays and Caldwell Counties are working together to deal with the growing feral hog problem. Feral hogs have increased substantially throughout the watershed in the last 10 years.” Lewis offers technical assistance to landowners and provides information on feral hog biology, behavior, and available management options.

As feral hogs congregate around water sources to drink and wallow, this concentration of high numbers in small riparian areas poses a threat to water quality. Fecal matter deposited directly in streams by feral hogs contributes bacteria and nutrients, polluting the State’s waterbodies, including Plum Creek. In addition, extensive rooting activities of groups of feral hogs can cause extreme erosion and soil loss. The destructive habits of feral hogs cause an estimated $52 million worth of damage each year in Texas alone.

The Plum Creek Watershed Protection Plan identifies feral hogs as a significant contributor of pollutants to the creek. Landowners recommended in the Plan that efforts to control feral hogs be undertaken to reduce the population, limit the spread of these animals, and minimize their effects on water quality and the surrounding environment. In order to achieve the necessary pollutant load reductions to restore water quality in Plum Creek, the Plan sets a goal of permanently removing at least 36% of the feral hog population from the watershed.

Lewis encourages landowners, residents, and hunters in the Plum Creek watershed to report feral hog damage to crops, pastures, food plots, wildlife feeders, lawns, and landscaping. Individuals observing feral hogs or signs of possible hog damage are asked to make a report online at **http://plumcreek.tamu.edu/feralhogs**. For those without internet access, reports can be directed to Lewis at 979-393-8517.

AgriLife Extension recently released five new publications about feral hog control methods to help landowners corral this growing menace. These publications were also funded by the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency. The publications discuss recognizing feral hog sign and several different management tools including corral traps, box traps, and snares and are available online or at either the Caldwell or Hays County Extension offices. These publications specifically target the Plum Creek watershed, but are applicable wherever feral hogs are a problem.

For more information regarding feral hog management efforts in the Plum Creek watershed, visit **http://plumcreek.tamu.edu/feralhogs/**. For more information on watershed management efforts in Plum Creek and how you can get involved, contact Matt Berg with AgriLife

Extension at 979-845-2862.

The Texas State Soil and Water Conservation Board is the lead agency for planning, implementing, and managing programs and practices for preventing and abating agricultural and silvicultural nonpoint sources of water pollution. The Texas State Soil and Water Conservation Board also coordinates the programs of the state's 216 soil and water conservation districts and administers the state brush control program.

For more information about Texas State Soil and Water Conservation Board programs in the Plum Creek watershed, please contact Pamela Casebolt at 254-773-2250 ext. 247 or **pcasebolt@tsswcb.state.tx.us**.

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AgriLife NEWS

April 30, 2009

Free home aerobic septic system workshops in Hays and Caldwell counties

By: Paul Schattenberg, 210-467-6575
Contact(s): Dr. Bruce Lesikar, 979-845-7451, b-lesikar@tamu.edu
Nikki Dictson, 979-458-3478, n-dictson@tamu.edu

SAN MARCOS – Homeowners interested in learning about the maintenance of their aerobic treatment system are invited to attend a free Texas AgriLife Extension Service workshop in San Marcos.

A "Homeowner Maintenance of Aerobic Treatment Units Workshop" will be held from 9 a.m.- 4:30 p.m. May 27 at the AgriLife Extension office for Hays County, 1253 Civic Center Loop.

"The workshop will be of interest to homeowners who want to learn more about the components and maintenance of an aerobic treatment unit and spray field of their on-site systems," said Dr. Bruce Lesikar, AgriLife Extension water and wastewater resource specialist in biological and agricultural engineering. It is important for homeowners to properly maintain and operate these systems to help protect water quality.

"The purpose of the course is to present information on the function, operation and maintenance of aerobic treatment units, and to provide hands-on demonstration of evaluation techniques to determine operational status of the treatment system," Lesikar said.

Topics will include the importance of maintaining the system, health and safety considerations, basic concepts about the aerobic treatment processes, and system testing and reporting. It also will address "care and feeding" of the unit, system maintenance, system evaluation tools and supplies, and how effective wastewater treatment protects water resources.

"The workshop is free thanks to funding provided by the Plum Creek Watershed Partnership and Guadalupe-Blanco River Authority through a U.S. Environmental Protection Agency grant administered by the Texas Commission on Environmental Quality," said Nikki Dictson, AgriLife

Extension water quality program specialist.

Workshops are being offered in Hays and Caldwell counties as part of the Plum Creek Watershed Protection Plan implementation strategies to reduce potential pollutants from entering area streams and creeks by way of aerobic and septic systems.

Another South Central Texas homeowner aerobic treatment unit maintenance workshop will be held from 9 a.m.- 4:30 p.m. June 24 at the AgriLife Extension office in Caldwell County, 1402 Blackjack Street, Suite B, Lockhart.

Class attendance is limited, so attendees are required to pre-register to ensure adequate space.

To pre-register for either workshop and to get a registration form or more information, contact Susan Levien at 979-845-7451 or s-levien@tamu.edu .

A registration form also can be downloaded from the Plum Creek Watershed Partnership Web site at http://pcwp.tamu.edu/PChomeowner-workshop.html .

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AgriLife NEWS

June 12, 2009

Free home septic system maintenance workshop offered in Caldwell County

By: Paul Schattenberg, 210-467-6575
Contact(s): Dr. Bruce Lesikar, 979-845-7451, b-lesikar@tamu.edu
Nikki Dictson, 979/458-3478, n-dictson@tamu.edu

LOCKHART – Homeowners interested in learning about the maintenance of their aerobic treatment system are invited to attend a free Texas AgriLife Extension Service workshop to be held June 24 in Lockhart.

The "Homeowner Maintenance of Aerobic Treatment Units Workshop" will take place from 9 a.m.-4:30 p.m. at the AgriLife Extension office in Caldwell County, 1402 Blackjack Street, Suite B.

"The workshop will be of interest to homeowners who want to learn more about the components and maintenance of an aerobic treatment unit and spray field of their on-site systems," said Dr. Bruce Lesikar, AgriLife Extension water and wastewater resource specialist in biological and agricultural engineering. "It is important for homeowners to properly maintain and operate these systems to help protect water quality."

Lesikar said the workshop will include information on the function, operation and maintenance of aerobic treatment units, and provide a hands-on demonstration of evaluation techniques to determine operational status of the treatment system.

"The workshop will address the importance of maintaining the system, health and safety considerations, basic concepts about the aerobic treatment processes, and system testing and reporting," he said. Lesikar added the workshop would also cover the "care and feeding" of the unit, system evaluation tools and supplies, and how effective wastewater treatment protects water resources.

The workshop is being offered in Caldwell County as part of the Plum Creek Watershed Protection Plan. The plan, developed by the Plum Creek Watershed Partnership, includes strategies to reduce potential pollutants from entering area streams and creeks by way of aerobic and septic systems.

“The workshop is free thanks to funding provided by the Plum Creek Watershed Partnership and Guadalupe-Blanco River Authority through a U.S. Environmental Protection Agency grant administered by the Texas Commission on Environmental Quality,” said Nikki Dictson, AgriLife Extension water quality program specialist.

Class attendance is limited, so attendees are required to pre-register to ensure adequate space. To pre-register for the workshop and to get a registration form or more information, contact Susan Levien at 979-845-7451 or s-levien@tamu.edu .

A registration form also can be downloaded from the Plum Creek Watershed Partnership Web site at http://pcwp.tamu.edu/PChomeowner-workshop.html .

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AgriLife NEWS

June 12, 2009

Free home septic system workshop in Hays County

By: Paul Schattenberg, 210-467-6575
Contact(s): Dr. Bruce Lesikar, 979-845-7451, b-lesikar@tamu.edu
Nikki Dictson, 979-458-3478, n-dictson@tamu.edu

SAN MARCOS – Homeowners interested in learning about the maintenance of their home septic system are invited to attend a free Texas AgriLife Extension Service workshop from 9 a.m.-4:30 p.m. June 23.

The "Homeowner Maintenance of Septic Systems Workshop" will be held at the AgriLife Extension office for Hays County, 1253 Civic Center Loop in San Marcos.

"The workshop will be of interest to homeowners who want to learn more about the operation and maintenance of their on-site septic systems," said Bruce Lesikar, AgriLife Extension water and wastewater resource specialist in biological and agricultural engineering. "It is important for homeowners to properly maintain and operate these systems to help protect water quality."

The purpose of the course is to present information on the function, operation and maintenance of on-site septic systems, and to provide hands-on demonstration of evaluation techniques to determine operational status of the treatment system, Lesikar said.

Workshop topics will include the importance of maintaining the treatment system, septic/trash tank operation, how home activities affect the treatment system, tips for maintaining a septic tank and aerobic treatment unit, how the soil-treatment unit works, wastewater treatment and water resource protection.

"The workshop is free thanks to funding provided by the Plum Creek Watershed Partnership and Guadalupe-Blanco River Authority through a U.S. Environmental Protection Agency grant administered by the Texas Commission on Environmental Quality," said Nikki Dictson, AgriLife Extension water quality program specialist.

Class attendance is limited, so attendees are required to pre-register to ensure adequate space.

To receive a registration form and for more information, contact Susan Levien at 979-845-7451 or

s-levien@tamu.edu .

To download a registration form, go to http://pcwp.tamu.edu/PChomeowner-workshop.html .

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AgriLife NEWS

February 03, 2009

Plum Creek Watershed team wins award for water quality, conservation efforts

By: Paul Schattenberg, 210-467-6575
Contact(s): Rachel Bauer, 512-581-7186, rbauer@ag.tamu.edu

COLLEGE STATION – The Plum Creek Watershed Protection Planning Team was presented with a Superior Service team award at the recent Texas AgriLife conference in College Station.

The award was for the team's efforts in planning, developing and implementing the Plum Creek Watershed Protection Plan. The watershed, which runs through Hays, Caldwell and Travis counties, was deemed an "impaired water body" by the state.

Team members consisted of Texas AgriLife Extension Service personnel, including AgriLife Extension agents from Bastrop and Hays counties andAgriLife Extension specialists from Texas A&M's department of soil and crop sciences.

Project partners included the Texas State Soil and Water Conservation Board; Texas A&M's biological and agricultural engineering department; Spatial Science Laboratory; and Guadalupe-Blanco River Authority. According to the award citation, the 12-member team was "not only under tremendous external scrutiny, but also the pressure to complete a comprehensive plan within 24 months."

The plan, which was finished on schedule, received overwhelming support from stakeholders and from state and federal agencies, the citation noted.

"We're very proud to have received this award," said Rachel Bauer, AgriLife Extension agent for agriculture and natural resources in Bastrop County. "Winning this means we were able to make landowners and the general public more aware of water quality issues specific to the Plum CreekWatershed."

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Landowners learn about stream health inside Plum Creek Watershed

Release Date 10-18-2010

Contact Brian Koch

LOCKHART, TEXAS - A larger than expected crowd gathered recently in Lockhart for a riparian workshop hosted by Texas AgriLife Extension Service and the Plum Creek Watershed Partnership (PCWP).

A primary objective of the workshop was to develop a common vocabulary and understanding of riparian areas among people who live and work on the land. Riparian and wetland areas occur along water courses or waterbodies and occupy the transitional area between the upland and water ecosystems. The PCWP is actively implementing a watershed protection plan for the watershed to improve water quality.

This workshop featured presentations by Nueces River Authority, USDA-Natural Resources Conservation Service and Texas Parks and Wildlife Department personnel. The presented information focused on management of riparian areas, including restoration of degraded areas, indicators for riparian health and factors that cause degradation.

“It is important to have informed landowners in the watershed to help achieve watershed planning goals,” said Nikki Dictson, Texas AgriLife Extension Service program specialist. “This workshop was a great way to provide understanding of land management techniques to protect the stream and riparian areas.”

Plum Creek is a 52-mile stream that begins in Hays County north of Kyle and flows southeast through Caldwell County, passing Lockhart and Luling and then confluences with the San Marcos River near the Caldwell-Gonzales County line. With additional flow from Clear Fork, West Fork, Bunton Branch, Town Branch, Salt Branch, and other small streams, Plum Creek and its tributaries drain an area of 397 square miles. Other municipalities with all or part of their city limits within the watershed include Buda, Niederwald, Uhland, Mustang Ridge, and Mountain City.

“Proactive, informed landowners will be more inclined to use practices that improve or maintain the integrity of the creeks, benefiting water quality and quantity, habitat, and even recreation,” said Melissa Parker, Texas Parks and Wildlife riparian ecologist.

Funding and support for the development and implementation of the Plum Creek Watershed Protection Plan is provided through a Clean Water Act §319(h) Nonpoint Source grant from the Texas State Soil and Water Conservation Board (TSSWCB) and the U.S. Environmental Protection Agency. For more information about the Plum Creek Watershed visit

http://plumcreek.tamu.edu/ or contact Brian Koch, TSSWCB regional watershed coordinator, at bkoch@tsswcb.state.tx.us.

The TSSWCB is the lead agency for planning, implementing, and managing programs and practices for preventing and abating agricultural and silvicultural nonpoint sources of water pollution. The TSSWCB also coordinates the programs and activities of the state's 216 soil and water conservation districts, administers a Water Supply Enhancement Program for the selective control of water depleting brush and facilitates the Texas Invasive Species Coordinating Committee.

Luling Foundation Water Field Day to be held Oct. 29

http://agrilife.org/today/2010/10/19/luling-foundation-water-field-day-to-be-held-oct-29/?pfstyle=wp

January 6, 2011

October 19, 2010 By: Paul Schattenberg

AgriLife TODAY
Sharing Stories of Everyday Solutions

Print PDF

LULING – The Texas AgriLife Extension Service, Plum Creek Watershed Partnership and Luling Foundation will be presenting the Luling Foundation Water Field Day from 9 a.m.- 4:15 p.m. on Oct. 29.

The program will take place at the Luling Foundation on 523 South Mulberry St. in Luling.

The field day is free and includes lunch, however attendees must pre-register with the AgriLife Extension office for Caldwell County to ensure an accurate count for the meal. Registration is from 8:30-9 a.m. with presentations to follow.

Tour stops will address rainwater catchment systems and sustainable gardens, a solar-powered water well, the Riparian Area Management and Conservation Reserve Program area, and a rainwater harvesting system at the barn. Presentations will include the new technical and financial assistance program available to producers in the Plum Creek Watershed, the Lone Star Healthy Streams Program, and soil nutrient management and water law.

This program is offered as part of the educational outreach and awareness efforts relating to the Plum Creek Watershed, said Nikki Dictson, AgriLife Extension program specialist and partnership coordinator.

Three Texas Department of Agriculture continuing education credits in the general category will be offered, she said.

Dictson said the watershed is used for a number of recreational purposes and provides an important habitat for a variety of aquatic plants and animals, but high levels of bacteria and non-beneficial nutrients are threatening it.

“From May 2006 through February 2008, the partnership developed a watershed protection plan to protect the water in the creek.” she said. “Since that plan was adopted, the

partnership and other stakeholders have been participating in plan implementation community education efforts, which include the upcoming field day on Oct. 29."

Dictson added that of particular interest at the program will be a lunchtime presentation by B.J. Westmoreland on a new program offering technical and financial assistance for farmers and ranchers in the Plum Creek Watershed.

"The Caldwell-Travis and Hays County Soil and Water Conservation Districts and the Texas State Soil and Water Conservation Board partnered to provide this assistance to develop and implement water quality management plans on agricultural lands," said Westmoreland, a district technician for the Caldwell-Travis Soil and Water Conservation District.

The site-specific plan developed through and approved by local SWCDs includes appropriate best management practices, land treatment practices, production practices, and technologies that prevent and abate agricultural and silvicultural nonpoint source pollution.

"Livestock waste has been identified as a significant potential contributor of pollutants to the watershed," he said. "Providing technical and financial assistance to farmers and ranchers to identify and initiate best management practices will help address this and other agriculture-related issues which are having a negative effect on water quality."

"Some benefits of participating in this program, in addition to improving environmental quality, include creating a strategic plan for how to best manage an operation's natural resources, enhancing the value of the operation and eligibility for cost-sharing to help defray applicable land-management practices," he said.

Funding and support for the development of the Plum Creek Watershed Protection Plan and technical and financial assistance to implement agricultural components of the plan are provided through a Clean Water Act §319(h) Nonpoint Source grant from the TSSWCB and the U.S. Environmental Protection Agency.

Those interested in attending the water field day in Luling are asked to pre-register by Oct. 23 to ensure an accurate meal count and materials. To pre-register, contact the AgriLife Extension office for Caldwell County at 512-398-3122.

-30-

Contacts

Nikki Dictson, 979-458-3478, n-dictson@tamu.edu

B.J. Westmoreland, 512-398-2121, ext. 3, B.J. Westmoreland, 512-398-2121, ext. 3, Bradford.westmoreland@tx.nacdnet.net

Conservation Environment Water Plum Creek, Texas Watershed Stewards, watershed

Meeting of Plum Creek Partners to Address Watershed Issues set for August 9

Release Date
7-25-2012
Location
Lockhart
Contact
Jana Lloyd
Contact Email
jlloyd@tsswcb.texas.gov
Contact Phone
254-773-2250

LOCKHART - The Plum Creek Watershed Partnership will hold its quarterly meeting from 6:30 -8:30 p.m. Aug. 9 at the Lockhart State Park Recreation Hall.

The park is located at 4179 State Park Road and Farm-to-Market Road 20, west of U.S. Highway 183 in Lockhart.

The meeting is free and open to the public. Sign-in begins at 6 p.m., with presentations to start at 6:30 p.m.

"The partnership is composed of area stakeholders who are leading efforts to work with citizens and landowners to implement voluntary strategies to protect and improve water resources in Caldwell and Hays counties," said Nick Dornak, Plum Creek watershed coordinator in Lockhart.

Agenda items include a roundtable discussion with the Plum Creek watershed coordinator; an update and discussion on Caldwell County community clean up events, the Texas Hog Out Challenge and other activities of the watershed coordinator; an update on the Hillside Terrace project; and status reports on the implementation of agricultural best management practices and the Plum Creek Feral Hog Education Program.

"At our May meeting, final comments were received on a draft update to the Plum Creek watershed protection plan," Dornak said. He added that the comments have now been incorporated into the draft, and a final version of the update is available on the Plum Creek watershed partnership website. "The watershed protection plan was designed to be a living document," says Dornak.

The update evaluates the progress of partnership activities since the original watershed protection plan was adopted in February of 2008 and provides direction for future programs and funding opportunities.

"I am excited to work with our critical stakeholders and concerned citizens to continue the progress made by the partnership and find new solutions to improve and protect water quality in the Plum Creek watershed. It is imperative to our success that the people who live and work within the watershed understand what we are trying to accomplish and that they adopt activities that will result in improved water quality for themselves, their family and their community," Dornak said.

"I would also like to thank the many partnership members that entered into an Interlocal Agreement in July of 2011 to provide additional funding and local support for the implementation of the Plum Creek watershed protection plan. These members include Hays County, Caldwell County, the cities of Luling, Kyle, Buda, Lockhart and Uhland, the Guadalupe-Blanco River Authority, Plum Creek Conservation District, Polonia Water Supply Corporation, Caldwell-Travis Soil and Water Conservation District #304, and the Hays County Soil and Water Conservation District #351," said Dornak.

For more information on the partnership, or to download a copy of the watershed protection plan and update, go to http://plumcreek.tamu.edu/. You can also email Dornak at ndornak@plumcreekwatershed.org, or mail a request to 1403 Blackjack Street, Suite B, Lockhart, Texas, 78644.

Funding for the development and support of the Plum Creek Watershed Protection Plan is through a Clean Water Act grant provided by the Texas State Soil and Water Conservation Board and U.S. Environmental Protection Agency.

The Texas State Soil and Water Conservation Board administers Texas' soil and water conservation law and delivers coordinated natural resource conservation programs through the State's 216 soil and water conservation districts. The Texas State Soil and Water Conservation Board is the lead agency for planning, implementing, and managing programs for preventing and abating agricultural and silvicultural nonpoint sources of water pollution. The agency also administers a water supply enhancement program through the targeted control of water-depleting brush; works to ensure the State's network of 2,000 flood control dams are protecting lives and property by providing

operation, maintenance, and structural repair grants to local government sponsors; and facilitates the Texas Invasive Species Coordinating Committee.

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New online feral hog reporting tool

Paul Schattenberg | *Southwest Farm Press* *Jun. 8, 2009*

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The Texas AgriLife Extension Service has developed an online system to report feral hog activity that may be affecting water quality in the Plum Creek Watershed area.

The new system, being piloted in Caldwell and Hays counties, will be used to support efforts by the Plum Creek Watershed Partnership. The partnership consists of area landowners and citizens, city and county officials, and state and federal agencies working together to protect water quality in Plum Creek and its tributaries.

"The partnership has identified feral hogs as a significant potential source of water pollution in their watershed," said Matt Berg, AgriLife Extension water quality program specialist and Plum Creek Watershed coordinator. "In response to this concern, we have developed an online tool to allow local residents and drivers passing through the area to report feral hog sightings and any evidence of activity."

The system also will track feral hog damage and financial loss, as well as update the feral hog abatement efforts of several cooperating landowners, he added.

Public reporting of feral hog sightings and/or signs of damage will help locate areas of high activity and guide management efforts to reduce their impact in the watershed, Berg said. On behalf of the partnership, AgriLife Extension is requesting the assistance of watershed-area residents and visitors to help manage feral hogs by making use of the new system.

Individuals observing feral hogs or signs of possible damage by them are asked to make a report through the new Web site at http://plumcreek.tamu.edu/feralhogs/.

AgriLife Extension also has created a new position dedicated to feral hog management outreach in the Plum Creek Watershed through a Clean Water Act grant from the Texas State Soil and Water Conservation Board.

Chancey Lewis, the new AgriLife Extension assistant for feral hog management

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education, has been assigned to the Plum Creek Watershed area, which serves Caldwell, Hays and a small portion of Travis County. He will provide technical assistance to landowners, and educate them and others on feral hog biology, behavior and management options.

Lewis, who began his new position mid-April, can be contacted at 979-393-8517 or cdlewis@ag.tamu.edu.

“While feral hogs are often associated with crop losses and erosion impacts, they can also cause damage to livestock, pets, vehicles, lawns, wetlands, wildlife habitat, and other aspects of both rural and urban landscapes,” said Dr. Jim Gallagher, AgriLife Extension wildlife specialist in Uvalde.

Feral hog numbers have increased significantly over the last 15 years, and their destructive habits cause an estimated $52 million in damage annually in Texas, Gallagher said. Agricultural and wildlife habitat damage occur as a result of rooting, wallowing, predation and other feral hog behavior.

“Feral hogs also compete with wildlife and livestock for habitat, harbor endemic and exotic diseases, and transmit parasites to domestic livestock and humans,” he said.

Gallagher said feral hog distribution and behavior result in increases of sediments, nutrients and E. coli bacteria in streams and other water resources throughout Texas.

For more information regarding feral hog management efforts in the Plum Creek Watershed, go to: http://plumcreek.tamu.edu/feralhogs/.

For more information on the Plum Creek Watershed Partnership, contact Berg at 979-845-2862 or mberg@ag.tamu.edu.

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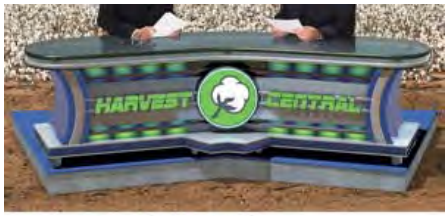

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Plum Creek Watershed Partnership Meeting set for Nov. 10 in Lockhart

November 2, 2011 By: Paul Schattenberg

LOCKHART — A Plum Creek Watershed Partnership meeting has been set for 6:30-9 p.m. Nov. 10 at Lockhart State Park Recreation Hall, 4179 State Park Road and Farm-to-Market 20, west of U.S. Highway 183 in Lockhart.

Topics will include discussion of incremental progress to implement the Plum Creek Watershed Protection Plan, updates on the City of Kyle Clean Water Act implementation grant and the new City of Kyle Water Reuse Feasibility Study, Plum Creek Feral Hog Education Program, implementation of agricultural best management practices and the new grant to continue funding the partnership's efforts.

The next Plum Creek Watershed Partnership meeting will be from 6:30-9 p.m. Nov. 10 at Lockhart State Park Recreation Hall. (Texas AgriLife Extension Service photo)

"The partnership is composed of area stakeholders who are leading efforts to work with citizens and landowners to implement voluntary strategies to protect and improve water resources in Caldwell and Hays counties," said Nikki Dictson, Plum Creek watershed coordinator and Texas AgriLife Extension Service program specialist in College Station.

Plum Creek rises in Hays County north of Kyle and runs south through Caldwell County, passing through Lockhart and Luling, then joining with the San Marcos River in northern Gonzales County.

"The effort to develop the Plum Creek Watershed Protection Plan was initiated in 2006 based on results from monthly water quality monitoring that indicated Plum Creek was impaired due to elevated levels of bacteria which exceeded state water quality standards and had nutrient levels above recommended thresholds," Dictson said. "Landowners and citizens and local governments have been implementing the plan since it was finalized in 2008."

Plan objectives are to identify potential sources of water pollution, and then educate and enable watershed residents to use voluntary approaches to improve the quality of vital water resources for the area.

"To develop this plan, public meetings were held to facilitate decision-making by landowners, citizens, community leaders, local water districts, and city and county officials on what strategies would be included in the plan," Dictson said. "Most importantly, all aspects of the plan are completely voluntary, so that cities, counties, businesses, homeowners and landowners can chose and do only those things they know will work the best for them."

Dictson said strategies within the plan include ways to reduce pollution from all of the potential sources including neighborhoods, city streets, cropland, and pastures, as well as working to address special problems like feral hogs.

"The primary pollutant of concern is E. coli bacteria, which is found in waste materials from people, pets, livestock and wildlife. Sources of nutrients include these same waste materials, as well as fertilizers and composts which are used for lawns, athletic fields and parks, businesses, cropland, pasture and hayland."

The partnership is currently in the fourth year of implementation and there are numerous ongoing efforts to improve water quality within the watershed, Dictson said. For more information on the partnership and its efforts, go to http://plumcreek.tamu.edu/ or contact Dictson at 979-458-3478 or n-dictson@tamu.edu

According to B.J. Westmoreland, district technician for the Caldwell-Travis Soil and Water Conservation District, landowners in the Plum Creek watershed can apply for financial incentives through the district to defray much of the cost of certain water quality protection practices.

“Farmers and ranchers can chose from a number of management practices, most of which are eligible for financial incentives,” Westmoreland said. “The decision by landowners to select and install best management practices on their property is voluntary. The district is there to help landowners with the process. These practices will not only benefit their land and the economics of their operation, but their entire community – now and in the future.”

Westmoreland said the Caldwell-Travis Soil and Water Conservation District, Hays County Soil and Water Conservation District and Texas State Soil and Water Conservation Board have partnered to provide technical assistance and financial incentives for certain best management practices.

Eligible financial incentives include alternative watering facilities, cross fencing to support rotational grazing, rangeland planting, riparian herbaceous and forest buffers, pasture and hayland planting, grassed waterways, field borders and filter strips.

“The financial assistance typically covers 60 percent of implementation costs with a maximum reimbursement of up to $15,000,” he said. “Plum Creek area landowners also can request a free water quality management plan for their property through their local soil and water conservation district that would include water conservation practices eligible for financial assistance.”

For general information on available financial assistance programs, or specific information on conservation practices eligible for financial incentives in the Plum Creek watershed, contact Westmoreland at 512-398-2121, ext. 3 or bradford.westmoreland@tx.nacdnet.net.

Funding for the development and implementation of the Plum Creek Watershed Protection Plan is provided through federal Clean Water Act §319(h) grants from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency.
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Environment Water

Educational, informational opportunities offered for Plum Creek watershed stakeholders

October 18, 2011 By: Paul Schattenberg

COLLEGE STATION — Three upcoming educational and informational opportunities in October and November will be held for residents of the Plum Creek watershed area, as well as area stakeholders and members of the Plum Creek Watershed Partnership, according to Texas AgriLife Extension Service personnel.

The first opportunity is a Feral Hog Workshop to be presented from 6:30-8:30 p.m. on Oct. 20 at the Texas AgriLife Extension Service office, 1253 Civic Center Loop in San Marcos, said Richard Parrish, AgriLife Extension agent, Hays County.

Oct. and Nov. educational and informational opportunities on feral hogs, environmental issues and other topics for residents and stakeholders in the Plum Creek watershed area will be presented in San Marcos, Schertz and Lockhart. (Texas AgriLife Extension Service photo)

Two Texas Department of Agriculture pesticide applicator continuing education units — 1½ in general and ½ in laws and regulations — will be offered at the program.

Topics will include basic biology and history of feral swine, laws and regulations regarding feral hogs and feral hog control, Parrish said.

Attendees should preregister with the AgriLife Extension office in Hays County. The cost is $15.

For more information or to preregister contact the Hays County Extension office at 512-393-2120 or email Parrish at re-parrish@tamu.edu.

Nikki Dictson, an AgriLife Extension program specialist in College Station, said the second opportunity will be the first-ever Central Texas Environmental Summit in Schertz hosted by the Texas Commission on Environmental Quality. The summit will be held from 9 a.m.-2 p.m. on Nov. 3at the Schertz Civic Center.

According to the summit agenda, agency commissioners will speak about environmental issues along the San Antonio/Austin I-35 corridor. Following presentations, participants can attend town hall meetings with elected officials or visit exhibits presented by the commission, state agencies, groundwater conservation districts, river authorities and councils of governments.

The summit is free but requires registration, Dictson said. Attendees should register at http://www.tceq.texas.gov/assistance/summitsreg.

Additional summit information can be found at http://www.texasenvirohelp.org/ or by contacting Nathan Weiss in the commission's San Antonio Regional Office, 210-403-4092.

Dictson said in addition to the workshop and summit, there will be steering committee meeting of the Plum Creek Watershed Partnership from 6-9 p.m. on Nov. 10 at Lockhart State Park Recreation Hall, 4179 State Park Road and Farm-to-Market 20, west of U.S. Highway 183 in Lockhart.

Main agenda topics will include discussion of the update to the Watershed Protection Plan to the Texas Commission on Environmental Quality and U.S. Environmental Protection Agency, as well as updates on the Kyle Clean Water Act §319 Implementation Grant and new City of Kyle Water Reuse Feasibility Study, Buda Wastewater Project, Plum Creek Feral Hog Education Program, implementation of agricultural best management practices and the new Plum Creek Implementation Grant.

"These upcoming opportunities will provide Plum Creek watershed area residents and other stakeholders with a lot of information on water quality and other environmental issues of importance to the future of their community and this vital water resource," Dictson said. "We hope these opportunities also will help promote further interest and involvement in water conservation and water quality improvement efforts in the area."

For more information on these opportunities and the Plum Creek Watershed Partnership, go to http://plumcreek.tamu.edu/. The website also contains several publications on feral hog issues which may be downloaded.

Funding for the development and implementation of the watershed protection plan for the Plum Creek Watershed Partnership was provided through a federal Clean Water Act §319(h) grant to the Texas AgriLife Extension Service from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency.

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Central Environment Regional Water

Residents in Plum Creek Watershed to discuss progress towards improving water quality

Contact: Pamela Casebolt

TEMPLE, TEXAS – Residents living in the Plum Creek Watershed are continuing their efforts toward water quality protection and will soon be discussing a number of topics concerning watershed health at an upcoming meeting.

The Plum Creek Watershed Partnership Steering Committee, a diverse group of stakeholders who live and work in the watershed, will meet at 6:30 p.m. on December 9, 2010 at the Lockhart State Park in Lockhart.

A highlight of the meeting will be a discussion by Jared Timmons Texas Agrilife Extension Service assistant and Dr. Jim Cathey, Texas Agrilife Extension Service wildlife specialist. They will update the committee on feral hog activity and education efforts to control this invasive species in the area.

Information for agricultural producers will be presented by BJ Westmoreland, Caldwell-Travis Soil and Water Conservation District technician. He will discuss the implementation of beneficial land management practices and cost-share funding available to eligible landowners.

“We will also discuss the long-term sustainability of the Plum Creek Watershed Partnership, the recent wastewater spill and fish kill on Plum Creek, as well as other implementation activities around the watershed,” said Pamela Casebolt, Texas State Soil and Water Conservation Board (TSSWCB) Project Manager. “This is a great opportunity to learn about the successes and struggles watershed landowners are facing as they work to improve water quality.”

Plum Creek is a 52-mile stream that begins in Hays County north of Kyle and flows southeast through Caldwell County, passing Lockhart and Luling to its confluence with the San Marcos River near the Caldwell-Gonzales County line. With additional flow from Clear Fork, West Fork, Bunton Branch, Town Branch, Salt Branch, and other small streams, Plum Creek and its tributaries drain an area of 397 square miles. Other municipalities with all or part of their city limits within the watershed include Buda, Niederwald, Uhland, Mustang Ridge, and Mountain City.

Funding and support for the development and implementation of the Plum Creek Watershed Protection Plan is provided through federal Clean Water Act §319(h) Nonpoint Source grant from the TSSWCB and the U.S. Environmental Protection Agency.

For more information about the Plum Creek Watershed, including an agenda for this meeting, visit http://plumcreek.tamu.edu/ or contact Casebolt at pcasebolt@tsswcb.state.tx.us or 254-773-2250.

The TSSWCB is the lead agency for planning, implementing, and managing programs and practices for preventing and abating agricultural and silvicultural nonpoint sources of water pollution. The agency also coordinates the programs and activities of the state's 216 soil and water conservation districts, administers a water supply enhancement program for the selective control of water-depleting brush, and facilitates the Texas Invasive Species Coordinating Committee.

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Feb. 9 meeting will address Plum Creek watershed efforts

http://today.agrilife.org/2012/01/30/feb-9-plum-creek-mtg/ July 2, 2012

LOCKHART – The Plum Creek Watershed Partnership will hold its quarterly meeting from 6:30 -9 p.m. Feb. 9 at the Lockhart State Park Recreation Hall.

The park is located at 4179 State Park Road and Farm-to-Market Road 20, west of U.S. Highway 183 in Lockhart.

The meeting is free and open to the public. Sign-in begins at 6 p.m., with presentations to start at 6:30 p.m.

“The partnership is composed of area stakeholders who are leading efforts to work with citizens and landowners to implement voluntary strategies to protect and improve water resources in Caldwell and Hays counties,” said Nikki Dictson, Texas AgriLife Extension Service program specialist in College Station and Plum Creek watershed coordinator.

Presenters will include experts from AgriLife Extension, the Texas State Soil and Water Conservation Board, Guadalupe-Blanco River Authority, partnership steering committee, Texas Stream Team and Caldwell-Travis Soil and Water Conservation District.

A Plum Creek Watershed Partnership committee meeting will be held Feb. 9 at Lockhart State Park Recreation Hall to include discussion of stakeholder feedback and comments on the progress and implementation of Plum Creek watershed efforts. (Texas AgriLife Extension Service photo)

Agenda items include an update and discussion of public comment and approval of the Plum Creek Watershed Protection Plan Update; updates on the 4b status for the watershed, and new Guadalupe-Blanco River Authority implementation grant and watershed coordinator position; Texas Stream Team update; and status reports on the implementation of agricultural best management practices and the Plum Creek Feral Hog Education Program.

The draft watershed protection plan details implementation and educational efforts to reduce pollution. It was developed by stakeholders and drafted by AgriLife Extension, and is now complete and available for review and comment, Dictson said. She said the purpose of the public comment period and discussion is to allow watershed partnership members to provide comments on the report and discuss the progress of the efforts to reduce pollution with those in attendance.

“Stakeholder feedback and comments on the progress and implementation efforts of the watershed protection plan are critical to ensure we are capturing all of the implementation occurring in the watershed,” she said. “So is incorporating any new potential avenues of programs or funding into the update report.”

The meeting will provide a brief overview of any comments received by the time of the meeting and any new or revised information since the last meeting.

“The time between now and the February meeting will allow folks to read through the watershed protection plan and formulate any comments or questions,” Dictson said.

Anyone wanting a copy of the update or who has comments on the watershed protection plan can email Dictson at n-dictson@tamu.edu, mail them to 2474 TAMU, 355A Heep Center, College Station, Texas 77843-2474 or bring them to the Feb. 9 meeting. The public comment period will close on Feb. 17, and all comments, edits and additional information will be incorporated into the final report.

For more information on the partnership, go to http://plumcreek.tamu.edu/. Funding for the development and support of the Plum Creek Watershed Protection Plan is through a Clean Water Act grant provided by the Texas State Soil and Water Conservation Board and U.S. Environmental Protection Agency.

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Feral hog ‘community of practice’ provides multi-state expertise, resources

http://today.agrilife.org/2012/06/11/feral-hog-cop/ July 2, 2012

By: Paul Schattenberg, 210-467-6575, paschattenberg@ag.tamu.edu
Conatct: Jim Cathey, 979-845-0916 or jccathey@tamu.edu.

COLLEGE STATION – Texas AgriLife Extension Service, part of the Texas A&M University System, along with other land-grant university Extension entities and agencies in a multi-state Feral Hog Community of Practice, have launched an important new resource, said a top project participant.

“Through this community of practice, experts from across the nation will produce and convey critical information to the public about feral hogs through web-based resources,” said Dr. Jim Cathey, AgriLife Extension wildlife specialist who for the past year has served as leader for the effort. “We’re providing these resources through eXtension.org, an interactive learning environment that delivers objective, well-researched knowledge from some of the best minds within the nation’s land-grant university system.”

A multi-state, multi-organizational community of practice related to feral hogs has established web-based resources for sharing expertise and information on feral swine. (Texas AgriLife Extension Service photo)

The Feral Hog Community of Practice within eXtension.org is ready for viewing, Cathey said. To see the site, go to http://www.extension.org/feral_hogs.

Cathey said a “community of practice” is typically a group of professional educators with expertise in a topic or subject matter area who join together to address that area of mutual interest. It is usually a multi-institutional, multi-state and multi-disciplinary educational and informational effort to bring the best and most timely educational resources to the public.

“For the past year, our group has been developing educational resources for feral hog management and now those resources can be viewed by the general public,” Cathey said. “And while some of these resources are targeted toward the feral hog situation in Texas, other resources are specific to feral hog management in partnering states.”

Cathey said the website includes many creative resources aimed at the public and natural resource professionals. Through eXtension.org there are already 35 communities of practice related to other important public resource areas that can be viewed at http://www.extension.org.

“eXtension.org provides credible expertise, reliable answers based upon sound research, creative solutions to today’s complex challenges, and answers addressing users’ specific needs by means of trustworthy, field-tested data,” Cathey said.

“This new resource area on eXtension.org will concentrate on the control, adaptive management, biology, economics, disease risks and human interface relating to feral hogs across the U.S.,” Cathey

said. “The goal of this community of practice is to provide critical information, resources and expert application of knowledge to meet the demand for timely and accurate information, as well as provide a venue to bring experts together to deliver new ideas and strategies to reduce feral hog numbers.”

Leaders of this community of practice represent a mix of researchers, managers and Extension specialists, bridging the gap between research, management and outreach, he explained. Researchers and educators within universities and state and federal natural resource agencies also make up the community.

“The U.S. Department of Agriculture through the National Institute of Food and Agriculture, as well as the national Cooperative Extension system, provided tools and resources to allow for creative collaboration among scientists and stakeholders to address important public issues like feral hogs,” he said.

Cathey said so far community of practice efforts related to feral hogs have led to recruiting 15 leaders and 38 members representing 17 states; resolving numerous Ask the Expert inquiries; face-to-face meetings; web trainings; developing a cache of FAQs, articles and videos; coordinating national feral hog webinars and creating a Feral Hog Community of Practice Facebook page: http://www.facebook.com/FeralHogCoP .

Cathey said those interested in joining the community may provide contact information and will be sent an invitation to join. They may then establish an eXtension ID and password to access the group.

“You do not have to work for Extension to participate,” Cathey said. “Resource professionals are welcome.”

He said some of the benefits of participation in the group include collaboration with peers from across the nation, reaching a large audience of Internet users and getting practical experience, while developing peer-reviewed articles and other materials to help hone professional writing skills.

To learn more about the Feral Hog Community of Practice, contact Cathey at 979-845-7471 or jccathey@tamu.edu.

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Feral Hog Management Workshop scheduled Feb. 14 in Luling

http://today.agrilife.org/2012/01/18/feral-hog-w orkshop-luling/ July 2, 2012

LULING — The Texas AgriLife Extension Service, in cooperation with the Texas State Soil and Water Conservation Board, will conduct a free Feral Hog Management Workshop from 8:30 a.m.-3:45 p.m. Feb. 14 at the Luling Civic Center.

Registration begins at 8 a.m. Five Texas Department of Agriculture pesticide applicator continuing education units are being offered – two general, two integrated pest management, and one laws and regulations.

a A free Feral Hog Workshop will be held on Feb. 14 at the Luling Civic Center. (Texas AgriLife Extension Service photo)

Topics at the workshop will include feral swine biology, population dynamics, the impact of feral hogs in the Plum Creek Watershed, Plum Creek Watershed Protection Plan implementation, a research update, feral hog hunting laws and regulations, agricultural regulations related to feral hogs, and control, safety and disease concerns.

The workshop includes lunch, refreshments and handouts.

According to the Texas Department of Agriculture, Texas has one of the largest feral hog populations of any state, and AgriLife Extension has estimated that the destructive habits of hogs cause about $52 million in damages annually to Texas farms, ranches and the state's agriculture industry. Feral hogs are also significant contributors of pollutants to creeks and rivers across the state.

"As feral hogs congregate around water sources to drink and wallow, their fecal matter is deposited directly in streams, adding bacteria and nutrients to the water bodies," said AgriLife Extension wildlife specialist Dr. Jim Cathey, College Station. "Extensive rooting by groups of feral hogs causes extreme erosion and soil loss."

Landowners and other stakeholders in the Plum Creek watershed have identified feral hogs as a contributor to elevated bacteria levels in the creek, said Jared Timmons, AgriLife Extension wildlife assistant. where?

"Through the Plum Creek Watershed Protection Plan, landowners have identified management and control of this invasive species as a priority mechanism to restore and protect water quality in Plum Creek," Timmons said.

Workshop attendees are asked to preregister through the AgriLife Extension office for Caldwell County by Feb. 10 to ensure an accurate count for meals and handouts. For more information or to preregister, visit the office at 1403 Blackjack St., Suite. B in Lockhart or contact by phone at 512-398-3122 or

email at caldwell@ag.tamu.edu.

The event is free of charge through a Clean Water Act Section 319(h) nonpoint source grant from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency.

Additional information on feral hogs and feral hog control is available at http://plumcreek.tamu.edu/feralhogs and http://feralhogs.tamu.edu/

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New AgriLife Extension publication helps keep the hogs out

http://today.agrilife.org/2011/12/22/new-feral-hog-publication/ July 2, 2012

COLLEGE STATION – A team of experts has developed a new Texas AgriLife Extension Service publication focused on keeping feral hogs from raiding wildlife feeding stations.

The four-page "Using Fences to Exclude Feral Hogs from Wildlife Stations" publication was developed by Texas A&M University System and U.S. Department of Agriculture Animal and Plant Health Inspection Service wildlife experts. It provides advice and direction on how landowners can protect corn and protein pellets intended for wildlife from being eaten by feral hogs.

The new publication may be downloaded from the Texas AgriLife Bookstore website at http://agrilifebookstore.org or Plum Creek Watershed Partnership website at http://pcwp.tamu.edu/feral-hogs.

"We developed this resource primarily for residents of the Plum Creek watershed area, but it's applicable to landowners throughout the state," said Jared Timmons, an AgriLife Extension assistant who addresses feral hog issues in the Plum Creek watershed.

Feral hogs consume a significant portion of supplemental feed intended for deer and other wildlife. A new Texas AgriLife Extension Service publication shows how to keep feral hogs away from wildlife feeding stations using 'exclosure' fencing. (Texas AgriLife Extension Service photo)

"In many parts of Texas, feral hogs damage landscapes, pollute the water, and hinder farming, ranching and wildlife management," said Dr. Billy Higgenbotham, AgriLife Extension wildlife and fisheries specialist. "Using fencing to exclude them from supplemental feed should be a part of every ranch-management plan."

He added that feral hogs are responsible for more than $52 million in damage to the state's agriculture industry each year.

"Feral hogs not only damage crops and other property in the Plum Creek Watershed and other areas of the state, they also have been identified as a possible source of nonpoint pollution to the water table in many locations," Higginbotham said.

Hunters and wildlife managers often provide feed for white-tailed deer and other wildlife in Texas, using an estimated 150,000 tons of corn each year.

"In addition to corn, many deer managers also supply high-protein pellet feed, but research has shown much of this supplemental feed is consumed by non-target species such as feral hogs," Timmons said.

To meet management goals and reduce feed costs, Timmons said, deer managers should take steps to prevent feral hogs from accessing deer feed, and the new publication will provide "useful, practical information" toward reaching that end.

“Research conducted in South Texas brush country showed that fencing around feeding stations that excludes feral hogs is an effective way to keep them getting to and eating the corn and other supplemental feed landowners put out for wildlife,” Timmons said. “And while exclosure fences are time and labor intensive, they will pay for themselves in feed savings.”

Timmons said a result demonstration was conducted to determine appropriate fence heights of exclosure fences around wildlife feeding stations, and that the publication provides results of this study. The publication also has photos, a list of materials, fence height recommendation and cost estimates related to building an exclosure fence.

Other materials on feral hogs and feral hog management also may be found on the Texas AgriLife Bookstore or Plum Creek Watershed Partnership websites. The partnership website has 12 additional feral hog-related publications as well as voice-over presentations and a feral hog reporting website. On that site’s reporting portion, landowners may report feral hog activity, including removal, and non-landowners may report feral hog sightings.

Funding for the result demonstration was funded by the USDA Renewable Natural Resources Extension Act. Publication costs were funded through the Plum Creek Watershed Feral Hog Project with funding support from the U.S. Environmental Protection Agency through a Clean Water Act §319(h) Nonpoint Source grant administered by the Texas State Soil and Water Conservation Board and from the Cooperative State Research, Education, and Extension Service, USDA and National Integrated Water Quality Program.

New publication explains how feral hogs negatively affect native plants

http://today.agrilife.org/2012/02/13/new-pub-feral-hogs-native-plants/ July 2, 2012

COLLEGE STATION –Not only do feral hogs cause harm to crops and landscaping, they also inflict significant damage upon native plant communities, according to a new Texas AgriLife Extension Service publication.

“Feral hogs root pastures and grasslands, consume native vegetation and have a negative impact on water quality,” said Jared Timmons, AgriLife Extension wildlife assistant and one of the authors of “Feral Hogs Negatively Affect Native Plant Communities.”

A new Texas AgriLife Extension Service publication addresses how feral hogs damage native plant life and what can be done to help mitigate the damage. (Texas AgriLife Extension Service photo)

“They cause significant ecological damage by their rooting, which turns over soil and damages native plant communities, possibly leading to greater erosion,” he said.

To educate people on the ramifications of this additional damage and what can be done to mitigate it, he and other AgriLife Extension and Texas A&M University System experts wrote the 10-page publication, Timmons said.

“It was originally produced in conjunction with efforts relating to improving water quality in the Plum Creek watershed, but the information and principles apply to forest and riparian areas throughout Texas,” he said.

Timmons said he and the other authors were indebted to researchers from Rice University and Texas A&M University who conducted a study in the Big Thicket National Preserve that was cited in their publication.

“Researchers used fences to exclude feral hogs from some areas of the preserve while leaving other areas unfenced to allow them access,” Timmons said. “They discovered that fenced plots had more large-seeded trees such as oaks, less non-native tree species and higher plant diversity.”

Timmons said such study results can be explained by the disturbance created by feral hogs and consumption of native large seeds such as acorns and nuts, therefore allowing non-native species a chance to invade.

“Non-native feral hogs also compete with native wildlife to consume these seeds and this may produce a disproportionate effect on seed abundance and future tree population,” Timmons said. “This can have a negative effect on riparian areas that consist of native grasses, forbs, shrubs and largely of trees such as oaks and hickories.”

“Corral traps are very effective in trapping large numbers of feral hogs at one time,” said Blake Alldredge, AgriLife Extension wildlife associate and publication co-author. “Snaring or hunting may also be necessary to reduce feral hog numbers.”

Alldredge added that excluding hogs from environmentally sensitive areas such as riparian forests will allow the soil to remain undisturbed by feral hogs and allow new saplings to establish and grow.

Timmons said riparian areas provide many positive “ecosystem services” that benefit humans, including floodwater retention, groundwater recharge, water filtration, erosion protection, wildlife habitat, and providing for greater recreational and timber-production opportunities. He noted that excluding feral hogs from these areas increased the diversity and survival rate of native tree species, adding that study data showed large-seeded-species saplings were more than twice as abundant in areas where feral hogs were excluded.

“High plant diversity is important in every ecosystem as it helps increase ecosystem productivity, provides a buffer from floods and other natural disasters and supports numerous species of wildlife,” he said.

The publication may be downloaded from the Texas AgriLife Bookstore website at http://agrilifebookstore.org or from the Plum Creek Watershed Partnership website at http://pcwp.tamu.edu/feral-hogs/. Other materials on feral hogs and feral hog management may be found on both websites.

The partnership website also has voice-over presentations and a feral hog reporting website, where landowners may report feral hog activity, including removal, and the general public may report feral hog sightings, Timmons said.

This publication was developed as part of the Plum Creek Watershed Feral Hog Project, with funding support from the U.S. Environmental Protection Agency through a Clean Water Act §319(h) nonpoint source grant administered by the Texas State Soil and Water Conservation Board and from the Cooperative State Research, Education, and Extension Service and the U.S. Department of Agriculture’s National Integrated Water Quality Program.

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Plum Creek partnership, other regional watershed protection meetings scheduled

http://today.agrilife.org/2012/04/25/plum-creek-other-meetings/ July 2, 2012

LOCKHART – The quarterly meeting of the Plum Creek Watershed Partnership will be May 3 at Lockhart State Park Recreation Hall, 4179 State Park Road and Farm-to-Market Road 20 in Lockhart.

Sign-in and refreshments will be at 6 p.m. with presentations to begin at 6:30 p.m. The meeting is open to the general public.

“We will have a discussion of the Plum Creek Watershed Protection Plan update and will introduce the group to the new watershed coordinator,” said Nikki Dictson, Texas AgriLife Extension Service program specialist in College Station.

The quarterly meeting of the Plum Creek Watershed Partnership, as well as other meetings related to watershed protection efforts in the region, have been scheduled during the month of May. (Texas AgriLife Extension Service photo)

Dictson said the quarterly meeting would also have a wrap-up of the city of Kyle Clean Water Act implementation grant and an update on the Kyle water reuse feasibility study, as well as information on Hillside Terrace and Caldwell County solid waste grant applications. There also will be discussion of implementation of agricultural best management practices and the Plum Creek feral hog education program.

Dictson added that she and Nick Dornak, the new watershed coordinator for the Plum Creek Watershed Partnership, would be providing watershed protection-related project updates to partner cities, counties and boards in May. The following is a list of the upcoming meetings and start times. The public is invited.

May 7 - Caldwell County Commissioners Court at 9 a.m.
May 10 – Luling City Council at 6 p.m.
May 15 – Lockhart City Council at 6:30 p.m.
May 15 – Polonia Water Supply Corporation Board at 7:30 p.m.
May 16 – City of Uhland Meeting at 6 p.m.

“AgriLife Extension and the Plum Creek Watershed Partnership will have a booth from 7:30 a.m. to 3 p.m. on May 17 at the Luling Foundation Field Day,” Dictson said. “We hope people interested in regional water quality and availability will visit us and learn more about area watershed protection efforts and how to get involved in them.”

For more information on regional watershed protection projects, contact Dornak at 512-213-7389, ndornak@plumcreekwatershed.org, or Dictson at 979-458-3478, n-dictson@tamu.edu.

For more information on the Plum Creek Watershed Partnership, go to http://pcwp.tamu.edu/.

Funding for the development and implementation of the Plum Creek Watershed Protection Plan is provided through federal Clean Water Act grants from the Texas State Soil and Water Conservation Board and the U.S. Environmental Protection Agency.

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AgriLife NEWS

July 15, 2008

Texas Watershed Steward Training Offered Aug. 6 in Lockhart

By: Paul Schattenberg, 210-467-6575
Contact(s): Jennifer Peterson, 979-862-8072, jlpeterson@ag.tamu.edu

LOCKHART – The Texas AgriLife Extension Service and the Texas State Soil and Water Conservation Board present a free Texas Watershed Steward training program from 8 a.m. to 4 p.m. on Aug. 6.

The training will be held at The Fountains reception hall located on 10450 Hwy 183 South in Lockhart.

The program is for anyone interested in water-quality issues and who may want to become more directly involved in watershed protection and management in their area, said Jennifer Peterson, AgriLife Extension program specialist.

“Lockhart is home to the Plum Creek Watershed,” Peterson said. “This watershed is used for fishing and a wide variety of additional recreational purposes. It also provides a habitat for many types of aquatic plants and animals.”

However, high levels of nutrients and bacteria from animal sources and human sources now threaten the Plum Creek Watershed and its future water quality, she added.

“The Texas Watershed Steward program will help area residents better understand the issues associated with their watershed and how to address them,” Peterson said.

Training will cover the fundamentals of watershed systems, water quality regulation and monitoring, watershed improvement methods, enhancing watershed functions, and community-driven water quality protection and management.

Along with training, participants receive a free copy of the Texas Watershed Steward Curriculum Handbook and a certificate of completion. They also may be eligible for a number of the following continuing education units and/or credit hours:

• Seven American Institute of Certified Planners certificate maintenance hours (1.5 hours in certificate maintenance law and 5.5.hours in certificate maintenance).

• Seven Texas Board of Professional Engineers continuing education program hours for engineers.

• Seven Certified Crop Advisors continuing education units in soil and water management.

• Seven State Board for Educator Certification continuing education credits for certified teachers.

• Three general Texas Department of Agriculture continuing education units for pesticide license holders.

Although there is no charge for the workshop, space is limited and attendees are requested to register as soon as possible, Peterson said.

To register, visit the Texas Watershed Steward Web site at http://tws.tamu.edu or contact Peterson at 979-862-8072 or at jlpeterson@ag.tamu.edu .

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AgriLife Communications

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Feral Hog Management Workshop Draws Large Crowd in Luling

Release Date
2-27-2012
Location
Temple
Contact
Jana Lloyd
Contact Phone
254-773-2250

TEMPLE - On February 14, 2012 approximately 310 people attended a feral hog management workshop in Luling, Texas. This workshop was coordinated by the Texas AgriLife Extension Service with topics covering: Basic Biology of Feral Swine, Feral Hogs in the Plum Creek Watershed, Plum Creek Watershed Protection Plan Implementation, Population Dynamics, Update on Feral Hog Research, Laws and Regulations for Hunting Feral Hogs, Agricultural Regulations Regarding Feral Hogs, Feral Hog Control, and Feral Hog Safety and Disease Concerns.

The workshop was made possible through a Clean Water Act §319(h) nonpoint source grant from the U.S. Environmental Protection Agency and the Texas State Soil and Water Conservation Board. This workshop was held to implement portions of the Plum Creek Watershed Protection Plan, a voluntary and integrated management plan for restoring water quality in this creek as it flows through Caldwell, Hays, and Travis counties.

Presenters represented several state and federal agencies including the Texas Parks and Wildlife Department, the Texas AgriLife Extension Service, the Texas Department of Agriculture, and USDA-APHIS Wildlife Services. In addition to these presentations displays and demonstrations of fencing, trap gates, and snare were provided.

Fourteen fact sheets that were created for feral hog management in the Plum Creek Watershed covering everything from laws and regulations concerning feral hogs to trapping techniques were also distributed. These fact sheets are also available on the Plum Creek Watershed Partnership website and the Texas AgriLife Extension Service Bookstore.

As feral hogs congregate around water sources to drink and wallow, their fecal matter is deposited directly in streams, adding bacteria and nutrients to the water bodies. Extensive rooting by groups of feral hogs causes extreme erosion and soil loss.

Landowners and other stakeholders in the Plum Creek watershed have identified feral hogs as a contributor to elevated bacteria levels in the creek. Through the Plum Creek Watershed Protection Plan, landowners have identified management and control of this invasive species as a priority mechanism to restore and protect water quality in Plum Creek.

Individuals are also encouraged to report feral hog sightings, damage, and control efforts through the Plum Creek Watershed partnership website's online feral hog reporting tool at **http://plumcreek.tamu.edu/feralhogs/**. On this website is a monthly reporting tool for landowners and a reporting tool for the general public to report feral hog sightings. This information aids future efforts of feral hog education through the Plum Creek Watershed Protection Plan.

For more information regarding feral hog management efforts in the Plum Creek watershed, visit **http://plumcreek.tamu.edu/feralhogs/**, or contact Jared Timmons at **jbtimmons@ag.tamu.edu** or 979-845-7471.

The Texas State Soil and Water Conservation Board administers Texas' soil and water conservation law and delivers coordinated natural resource conservation programs through the State's 216 soil and water conservation districts. The Texas State Soil and Water Conservation Board is the lead agency for planning, implementing, and managing programs for preventing and abating agricultural and silvicultural nonpoint sources of water pollution. The agency also administers a water supply enhancement program through the targeted control of water-depleting brush; works to ensure the State's network of 2,000 flood control dams are protecting lives and property by providing operation, maintenance, and structural repair grants to local government sponsors; and facilitates the Texas Invasive Species Coordinating Committee.

-30-

The Texas State Soil and Water Conservation Board grants permission for the use of this information as a free service to the news media. Articles may be used either in their entirety or in part, provided that attribution remains. You may print the story and/or post it on the Internet.

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Appendix C: Factsheets

Watershed Factsheets

- The Plum Creek Watershed: Your Water, Your Home
- Don't Be Clueless About Water
- Plum Creek Watershed Partnership Factsheet
- Feral Hogs, Plum Creek, and You
- Texas Watershed Steward Factsheet
- Plum Creek WQMP Brochure

Feral Hog Factsheets

Using Fences to Exclude Feral Hogs from Wildlife Feeding Stations	
Feral Hogs Negatively Affect Native Plant Communities	
Feral Hog Laws and Regulations in Texas	
Feral Hogs and Disease Concerns	
Feral Hogs and Water Quality in Plum Creek	
Feral Hogs Impact Ground-nesting Birds	
Feral Hog Transportation Regulations	
Recognizing Feral Hog Sign	Spanish
Corral Traps for Feral Hogs	Spanish
Box Traps for Feral Hogs	Spanish
Placing and Baiting Feral Hog Traps	Spanish
Door Modifications for Feral Hog Traps	Spanish
Snaring Feral Hogs	Spanish
Making a Feral Hog Snare	Spanish

AgriLIFE EXTENSION
Texas A&M System

The Plum Creek Watershed

Your Water, Your Home

Matt Berg, Extension Water Quality Program Specialist I
Mark McFarland, Professor and Extension Specialist
Nikki Dictson, Extension Water Quality Program Specialist II
Department of Soil and Crop Sciences
Texas AgriLife Extension Service

Plum Creek Watershed Partnership

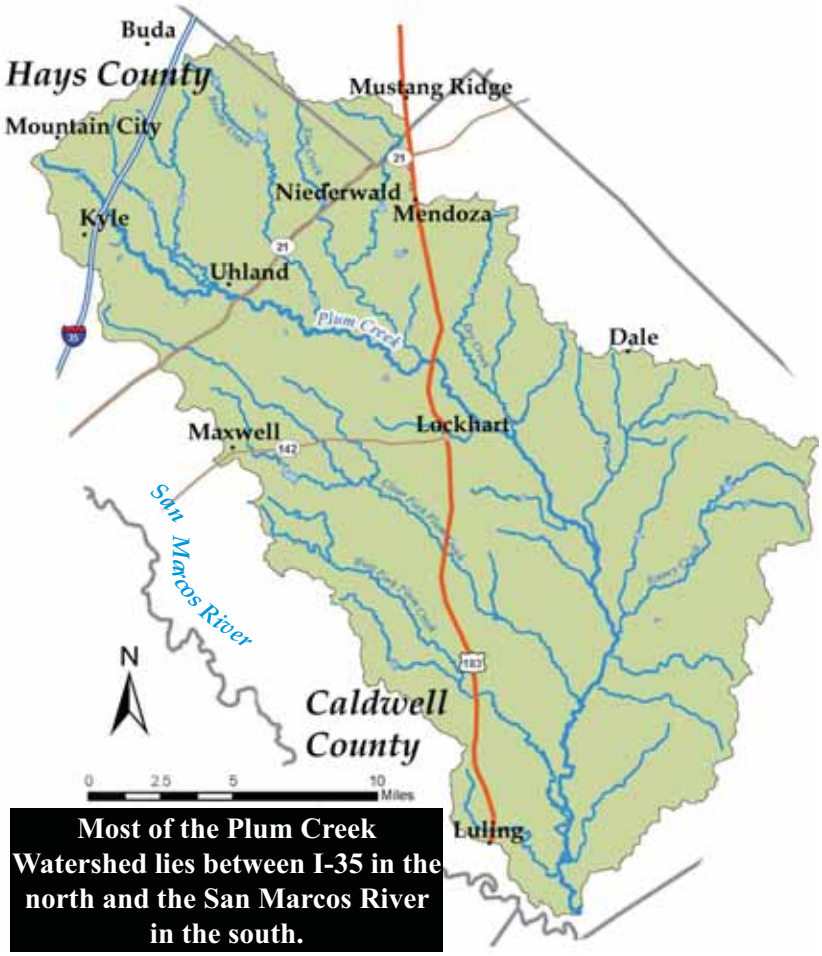
The Plum Creek Watershed

Most of Caldwell County and parts of Hays and Travis Counties are in the Plum Creek Watershed, a roughly 400 square mile area that drains to Plum Creek, which in turn flows to the San Marcos River. All water that falls as rain or rises from springs makes its way to this common point after draining both rural and urban areas around Kyle, Lockhart, Luling, and many smaller communities.

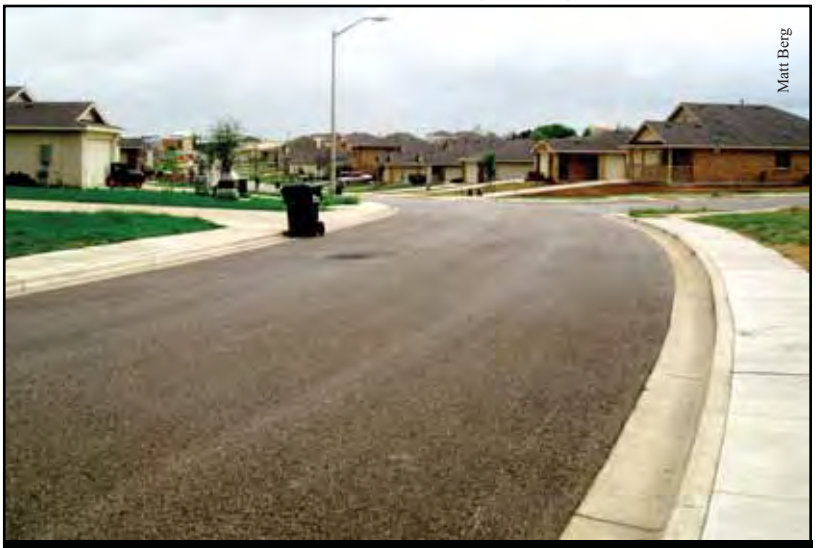
Since long before the watershed resembled what it does today, Plum Creek has been an important part of the local landscape. Abundant freshwater springs flowing into Plum Creek around present day Lockhart have attracted people for hundreds of years. Plum Creek continues to play a critical role in the area, and the largest cities in the watershed are found very close to the stream and its tributaries. Water from the Plum Creek Watershed can be used for drinking water, irrigating both agricultural crops and lawns, watering livestock, and recreational purposes.

Because there are many different ways people use the Plum Creek Watershed and its water resources, there are many ways it can be affected. People that live, work, or play in the Plum Creek Watershed influence how much water is in the stream and how clean it is, both now and in the future.

Much of the watershed is dominated by pastures and cropland in rural areas.



Most of the Plum Creek Watershed lies between I-35 in the north and the San Marcos River in the south.



Housing developments and businesses are concentrated in a few areas of the watershed but are expanding rapidly as local populations grow.

Plum Creek Watershed Partnership

Nikki Dictson

The Plum Creek Watershed Partnership receives information to help make decisions that improve water quality.

Matt Berg

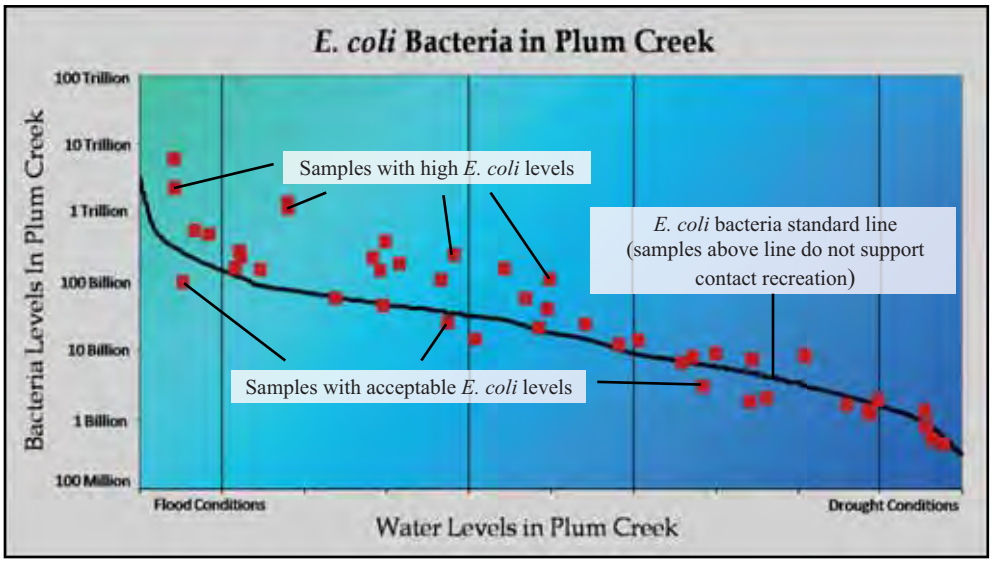
High pollution levels are found during many different flow conditions, with bacteria highest during floods and nutrients highest during droughts.

Water Pollution in Plum Creek

After high nutrient levels were found in Plum Creek in 1998, the Texas Commission on Environmental Quality also became concerned about *E. coli* bacteria in 2002. High levels of bacteria can pose a serious disease risk to humans, while nutrients (nitrogen and phosphorus) can cause excessive aquatic plant growth and lead to fish kills. By 2004, parts of Plum Creek in both urban and rural areas were classified as not meeting bacteria limits for recreation (swimming and wading). Nutrient levels also have remained high and pose a threat to stream health.

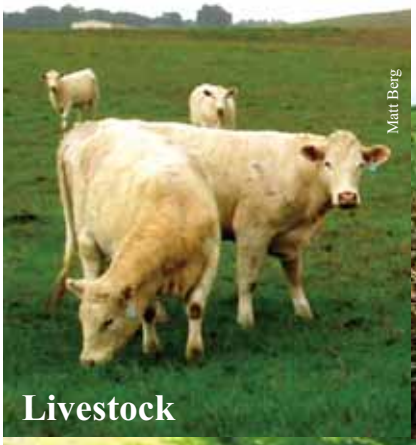
To focus on cleaning up water in the stream, the Texas AgriLife Extension Service partnered with the Texas State Soil and Water Conservation Board to assemble a group of local citizens, city and county officials, and regional and state agencies. The resulting Plum Creek Watershed Partnership began to identify the causes of water pollution and develop strategies to increase awareness and improve conditions in Plum Creek. These strategies were used to create the Plum Creek Watershed Protection Plan, which details ways to work toward cleaning up the stream now and protecting it from pollution in the future.

The Plum Creek Watershed Partnership began gathering information on the ways people use land in the watershed and when the highest levels of pollution occur. In water samples collected along Plum Creek, pollution is found both at low flows during dry periods and at high flows during floods. This means that some pollution enters Plum Creek directly when the creek is low and some flows to the stream in runoff that washes bacteria and nutrients off the land during rainfall. In certain locations, pollution levels are high throughout the year, regardless of flow.



Left: Load Duration Curves are used to show when pollution levels in Plum Creek are higher than acceptable limits.

Plum Creek Watershed Partnership



Sources of Pollution

Some sources of water pollution are located close to the stream, like wastewater treatment plants and groups of feral hogs, and can impact water quality directly. Other sources, which can be much farther away, increase water pollution levels when runoff during and after rainshowers or thunderstorms carries pollution to Plum Creek and smaller streams that flow into it. Pollution from neighborhoods, city streets, cropland, and pastures is picked up and washed to the closest stream. *E. coli* bacteria in waste materials from livestock, wildlife, pets, and people (leaky septic systems) and fertilizers and other chemicals from lawns and landscapes, parks, cropland, and industrial sites can all add to the problem, regardless of where they are on the landscape.

Like most other watersheds, Plum Creek has many potential sources of *E. coli* bacteria and nutrients. As a result, everyone who lives, works, and plays in the watershed has an important role in preventing water pollution and protecting Plum Creek. Actions you take around your home, place of business, and where you and your family play can add pollution, unless you act responsibly. Join with others across the watershed as they move forward in implementing the Watershed Protection Plan. Do your part to protect water resources and preserve the Plum Creek Watershed for future generations! To view the Plum Creek Watershed Protection Plan and learn more about efforts to protect water quality, visit **http://plumcreek.tamu.edu/**.

Plum Creek Watershed Partnership

What You Can Do

Learn more about your watershed

Get involved in a local watershed group

Pay special attention to what you do around the house or where you work

Around the house:

- When landscaping, use native plants that can tolerate drought and local soil conditions.
- Mulch bare soil or provide plant cover to reduce soil loss.
- If a herbicide is needed to kill weeds, choose one that kills the species in question and use sparingly.
- Do a soil test of your lawn and only use the necessary amount of the recommended fertilizer.
- Do not pour unwanted hazardous chemicals on the ground or down the drain. Instead, take them to special collection events in your city or county.
- Water your lawn only when necessary and keep water from falling on sidewalks, driveways, and streets.
- Pick up and properly dispose of pet waste to prevent bacteria and viruses from affecting Plum Creek, other animals, and you.
- Fix leaky bathroom fixtures and report broken sewer pipes so they can be replaced.

If you raise livestock:

- Use a proper animal stocking rate, and do not overgraze pastures, which causes soil loss and pollution.
- Use cross-fencing, and rotate animals between pastures to give grass time to recover after grazing.
- Minimize animal access to streams and drainage areas to reduce the potential for water pollution.

If you grow crops:

- Do a soil test of your fields or pastures and only use the necessary amount of the recommended fertilizer (*more fertilizer does not always equal more yield*).
- Conduct integrated pest management and choose the appropriate pesticide, applying it at the proper rate and time.
- Use minimum tillage or no tillage after harvesting to prevent loss of valuable soil and nutrients.
- Plow and plant along the contours of the land rather than planting up and down slopes. This will help retain soil, water, and nutrients.
- Use a cover crop of grasses or legumes after harvesting for seasonal protection from soil loss.
- Use filter strips or buffer strips where possible along streams and drainages to retain soil, water, and nutrients.

If you have a septic system:

- Inspect your septic system every year, preferably using a certified professional.
- Avoid using an in-sink garbage disposal, which can cause septic system failure.
- Have your system pumped out every 3-5 years.
- Do not dump toxic products down drains or toilets, since these can kill the treatment process.
- Do not drive or build on the drainfield, since this can crush the septic system and require replacement.

YOU ARE PART OF THE SOLUTION!

Plum Creek Watershed Partnership

For More Information

Watershed Protection Plan and ongoing efforts in the watershed: **Plum Creek Watershed Partnership**
http://plumcreek.tamu.edu

Educational public outreach events in the watershed and soil testing campaigns: **Texas AgriLife Extension Service**

(Caldwell County)	**http://caldwell-tx.tamu.edu/**	**(512) 398-3122**
(Hays County)	**http://hays-tx.tamu.edu/**	**(512) 393-2120**

Flood prevention/groundwater management in the Plum Creek Watershed: **Plum Creek Conservation District**
http://pccd.org/ **(512) 398-2383**

Water quality and conservation efforts in the Guadalupe River Basin: **Guadalupe-Blanco River Authority**
http://www.gbra.org **(800) 413-5822**

Preventing/reducing water pollution in agricultural/forestry areas: T**exas State Soil and Water Conservation Board**

http://www.tsswcb.state.tx.us	**(800) 792-3485**
(Caldwell-Travis Soil and Water Conservation District)	**(512) 398-4176**
(Hays County Soil and Water Conservation District)	**(512) 392-3202**

Other state programs to prevent and reduce water pollution: **Texas Commission on Environmental Quality**

http://www.tceq.state.tx.us	**(512) 239-1000**
24-hour Hotline	**(888) 777-3186**

Reporting a pollution spill or fish kill: **Texas Parks and Wildlife Department Kills and Spills Team**
http://tpwd.state.tx.us/landwater/water/environconcerns/kills_and_spills/ **(512) 389-4848**

Progams for the conservation and responsible development of water: **Texas Water Development Board**
http://www.twdb.state.tx.us/home/index.asp **(512) 463-7847**

Federal programs to improve, protect, and conserve natural resources: **USDA-NRCS**

http://www.tx.nrcs.usda.gov/Programs/	**(254) 742-9800**
(Lockhart Service Center)	**(512) 398-4176**
(San Marcos Service Center)	**(512) 392-3202**

Federal environmental programs: **United States Environmental Protection Agency Region 6**
http://www.epa.gov/Region6/ **(800) 887-6063**

Educational programs conducted by the Texas AgriLife Extension Service serve people of all ages regardless of socioeconomic level, race, color, sex, religion, handicap or national origin.

Issued in furtherance of Cooperative Extension Work in Agriculture and Home Economics, Acts of Congress of May 8, 1914, as amended, and June 30, 1914 in cooperation with the United States Department of Agriculture. Edward G. Smith, Director, Texas AgriLife Extension Service, The Texas A&M University System.

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http://pcwp.tamu.edu

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The Plum Creek Watershed Partnership, a collaboration between local citizens and entities, state and federal agencies, was established in April 2006 to address water quality issues in Plum Creek through the development and implementation of a Watershed Protection Plan (WPP). A major tributary of the San Marcos River, the 397 square mile Plum Creek watershed lies within the larger Guadalupe River Basin and covers portions of Hays and Travis Counties and much of Caldwell County.

Based on routine water quality sampling, Plum Creek is impaired by elevated bacteria concentrations and has nutrient enrichment concerns. High bacteria concentrations do not support contact recreation use and high levels of nutrients can cause excessive growth of aquatic vegetation leading to a decreased ability to support aquatic life use.

A Steering Committee, created as the decision-making body for the Partnership, has been meeting bi-monthly in order to 1) identify desired water quality conditions and measurable goals, 2) prioritize appropriate best management practices and needed education and awareness programs to achieve those goals, 3) assist in the development of the WPP document, 4) lead implementation of the plan at the local level, and 5) communicate implications of the WPP to other interested individuals and groups within the Plum Creek Watershed.

Watershed Planning & Implementation Process

1) Build Partnerships
2) Characterize the Watershed
3) Finalize Goals and Identify Solutions
4) Design an Implementation Plan
5) Implement Watershed Plan
6) Measure Progress and Make Adjustments

Topical work groups were created by the Steering Committee to study specific issues, identify and make recommendations on implementation strategies, and support development of the WPP. The five work groups established are Outreach and Education, Agricultural Nonpoint Source, Urban Stormwater and Non-point Source, Wastewater Infrastructure and Industry, and Water Quality and Habitat. A Technical Advisory Group consisting of state and federal agencies with water quality responsibilities provides guidance to the Steering Committee and work groups, and answers questions related to matters falling under the jurisdiction of each agency.

Soil Water TSSWCB

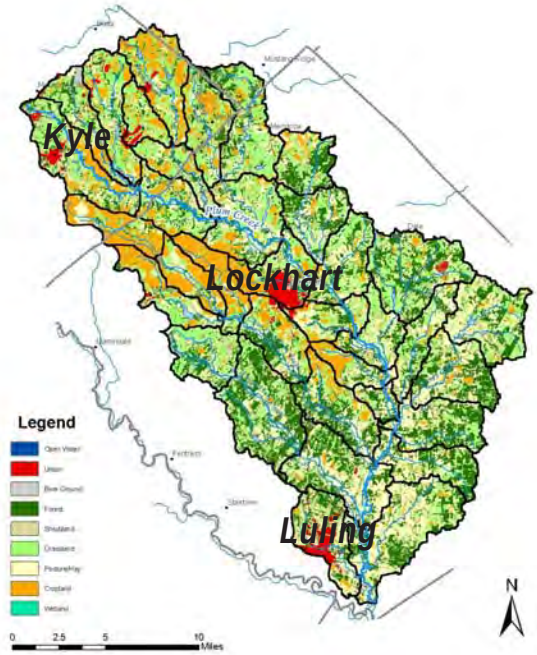
Plum Creek Watershed Partnership

Texas Cooperative EXTENSION
The Texas A&M University System

Based on 2004-2005 data, major land uses in the Plum Creek watershed include rangeland (38%), forestland (23%), pastureland (17%), cropland (11%) and developed/urbanized (8%). Current agricultural land uses include beef cattle and hay production in addition to row cropping of corn, sorghum, wheat, and cotton. Extensive oilfields have been developed in an area running southwest to northeast across the watershed, north of Luling.

Though the area has a largely agricultural history and remains heavily influenced by farming and livestock, some portions of the watershed are experiencing significant urbanization. Northern areas of the watershed, particularly near Kyle and along the Interstate 35 corridor, have been marked by rapid suburban growth, with city populations rising quickly over only a few years. As development and population growth continue, the percentage of urban land use will rise and play an increasingly important role in the hydrology and water quality of Plum Creek and its tributaries.

Plum Creek Watershed Land Use Map



Through a federal Clean Water Act §319(h) grant from the Texas State Soil and Water Conservation Board, Texas Cooperative Extension, is facilitating the stakeholder process and technical analysis of water quality data and potential pollutant sources. Load Duration Curves are being developed to examine the relationship between stream flow and monitored concentrations of particular pollutants, including bacteria. By considering what processes are at work during high, intermediate, and low flows, it is possible to link high concentrations with potential point source or nonpoint source pollution contributors.

To more specifically identify pollutant contributions, the SELECT (Spatially Explicit Load Enrichment Calculation Tool) approach was developed to estimate potential contaminant loads from various sources. Using the best available data for numbers and estimated distributions of livestock, wildlife, human households, pets, and septic systems, as well as the location of permitted wastewater treatment facilities, a pollutant load is estimated for each potential source and then compared across different subwatersheds and to each other. Using this approach, areas with the greatest potential for impacting water quality can be identified, and major contributors in those areas can be selected for the implementation process.

For more information visit http://pcwp.tamu.edu

Caldwell-Travis Soil and Water Conservation District and Hays County Soil and Water Conservation District

Texas Water Resources Institute
make every drop count

TCEQ

GBRA

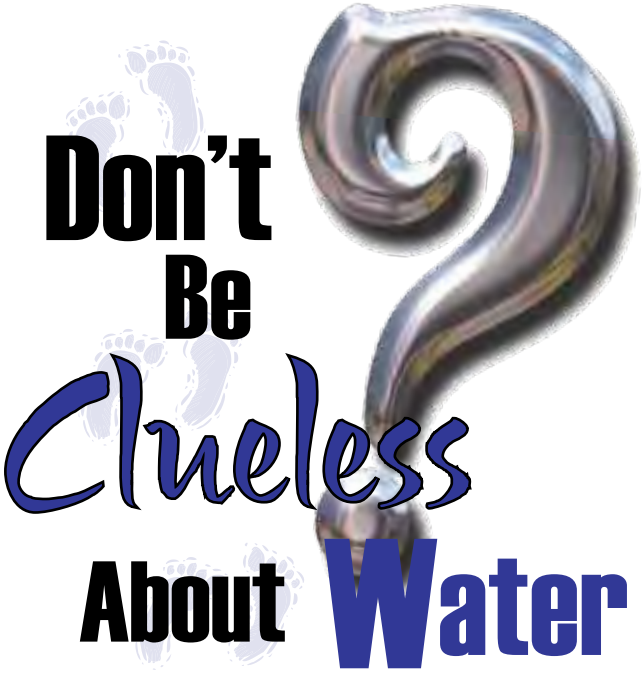
NRCS

Southern Regional Water Program
Applying knowledge to improve water quality
A Partnership of USDA CSREES & Land Grant Colleges and Universities

CSREES USDA EDUCATION · RESEARCH · EXTENSION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Plum Creek Conservation District
Flood Control & Underground Water Resources



Are You Helping to Protect Your Watershed?

When it comes to pollution, what comes around goes around (and around and around) the watershed. Your actions can leave footprints... footprints that can affect others downstream.

Learn to say "No" to common practices that contribute to pollution in the Plum Creek Watershed of the Guadalupe River Basin -- together, we can preserve it as one of the most unique in Texas.

Watershed Awareness

Footprints Inside the House

Footprints Outside the House

Clues Underground

Clues Above the Ground

Stewardship: Top Ten Things You Can Do to Show You Care

Who's In The Know and Can Tell You More

Watershed Awareness: *Just the Facts!*

Exercise your rights and your responsibility to be *In the Know* about watersheds.

First of all, what is a 'Watershed'?

A watershed is the area of land that drains into a specific water body. You live in the Plum Creek Watershed, one of ten mini-watersheds that make up the Guadalupe River Basin – possibly the most beautiful river basin in the state of Texas.

What do you REALLY need to know about watersheds?

You need to know that your actions can have an impact on the water quality (how clean the water is) in your watershed. Whether you know it or not, you can leave 'footprints' that can have a detrimental effect on the water quality in our creeks and rivers…. And this is water that is used by thousands of folks for drinking water. It is also used for agriculture, industry and recreation.

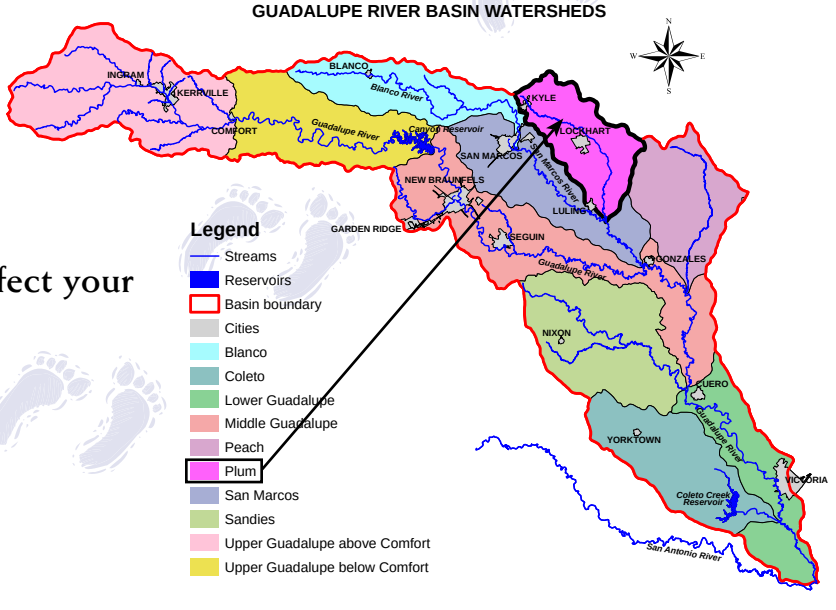
Now that we know about these 'footprints'….. What can you do to help preserve and protect your watershed?

Get to know your watershed --

-- Are there any creeks or streams nearby?
-- Where is the headwaters, or source of the stream?
-- Where does the water travel from there?
-- How is the water used downstream?

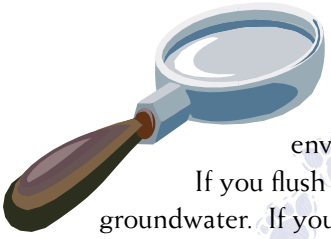
Understand how your footprints can affect your watershed's water quality --

-- What kind of pollutants are leaving your property in runoff?
-- What activities do you conduct on your property that could produce these pollutants?
-- Is there a drinking water treatment facility downstream?



Watershed Awareness

Dos and Don'ts: *Inside the House*



How Do Your Actions *Indoors* Affect Water Quality *Outdoors*?

Every household creates Household Hazardous Waste (HHW), which is one of the environmental concerns we face. HHW leaves behind some pretty significant footprints. If you flush HHW down the toilet or sink, it can create problems underground and possibly get into the groundwater. If you toss those wastes outdoors, HHW can get caught up in the runoff during a rain. That runoff will end up in our creeks, streams, and eventually the rivers in our basin. In addition, medicines and many personal care products should not be flushed or poured down the toilet or sink. Instead, they should be thrown away in the trash.

What in the World is Household Hazardous Waste?

Get one thing perfectly clear: We are not talking about drums of nuclear waste. We are talking about things that are often left lying around --under our bathroom or kitchen sinks, maybe in our garages. Things like batteries, household cleansers, solvents, polishes, pesticides and cans of oil-based paint are considered to be hazardous. The federal and state government encourages recycling these items.

To make the situtation even more challenging, many of our electronic gadgets and tools can add to the hazardous waste stream. For example, computer monitors, hard drives, televisions and cell phones need to be handled properly.
The improper disposal of HHW can cause problems for the entire community. Wastes can be explosive or highly flammable. Sewers have exploded and garbage trucks have burned because people have carelessly discarded flammable or reactive waste. Hazardous wastes can also be corrosive. The acids from discarded auto batteries can eat away at many substances. Some wastes are poisonous to humans or wildlife, while others can cause cancer, birth defects or other serious medical problems. You should also know that using the garbage grinder in the kitchen sink or pouring cooking grease down the drain can cause sewer back ups into your home. These wastes can also plug sewer pipes in the city or on your septic system.

What To Do With These Wastes -- So That You Don't Leave Footprints

One thing is for sure... dumping HHW down the drain is not a good idea. Septic tanks and municipal wastewater systems are not designed to handle such harsh wastes. Disposing of these wastes in a landfill (by throwing them in the garbage) is not a good idea either. Not all landfills are designed for HHW, which can leach into the groundwater over time.

There are some preventive measures you can take in your home to reduce the amount of household waste you generate. One of the easiest things you can do is to find alternatives for some of the products you use. If you do happen to generate HHW, check the WHO'S IN THE KNOW section for disposal sites. You could also try following the "3 Environmental R's" -- Reduce, Reuse and Recycle.

Reduce -- Buy only the amount you need for a job, that way you won't have to dispose of any excess. Also, only use the amount indicated on the label.
Reuse -- If you have a product that is usable, but you don't need or want it, give it to someone who will use it.
Recycle -- Take your batteries to a drop off center and return lead-acid batteries to the place of purchase.

Check out CLUES UNDERGROUND and CLUES ABOVE THE GROUND to help you learn more about what to do with these types of wastes.

Footprints Inside the House

Dos and Don'ts: Outside the House

How Do Your Actions *Outdoors* Affect Water Quality?

Your impact on water quality through your activities outdoors can be easily measured through the approach you take to landscaping. Both WHAT you PUT on your yard and HOW you TREAT your yard are a good reflection of your understanding of the footprints you leave behind. If you improperly use, store or dispose of Household Hazardous Wastes outdoors, its residues can be caught up in the runoff during a rain event, and become a part of the stream and river. This creates challenges for water users downstream such as drinking water treatment facilities and aquatic life that live in the water.

Household Hazardous Waste -- It is Not Only Found Indoors!

Yes, its true – HHW can be found both INSIDE and OUTSIDE the house. A large percentage is either stored outside or improperly applied to the ground. The average household contains between three and eight gallons of materials that could be hazardous to human health or to the natural environment. If improperly stored or disposed of these materials can poison our water (both groundwater and surface water) if not used properly, stored carefully and disposed of correctly.

Learn to Love Your Lawn - *Naturally*

Many homeowners take great pride in the development and maintenance of a visually appealing lawn and its associated landscaping. One of the biggest culprits is the grass – although it looks nice, some grasses (like St. Augustine) can be very needy – the use of chemical fertilizers and pesticides is quite common. Unfortunately, many homeowners operate under the "more is better" practice, using on average eight times more chemicals than needed.

Many homeowners are gradually coming to the conclusion that a hands-off approach to landscaping is easier, cheaper, and less time intensive. You may want to consider using grasses that do not have the maintenance issues often associated with St. Augustine lawns, such as Zoysia, Bermuda or Buffalo grass. Or get rid of some of the grassy areas, by converting it into natural areas that use native Texas plants (commonly called 'xeriscape plants'). This will improve the quality of the runoff leaving your property because it eliminates the need for pesticides and fertilizers. Native landscapes also provide habitat for birds and animals. In addition, it frees up your time from mowing the lawn, and you don't have to water it much! When you do have to mow, leave the grass clippings on the lawn to provide natural fertilizer instead of blowing them into the street. You might also consider building a compost pile. Composting yard and food wastes is a great way to make your own organic fertilizer and reduce waste that goes into landfills. For information on composting see WHO'S IN THE KNOW AND CAN TELL YOU MORE. If you can't make your own, consider purchasing and using organic fertilizers – their footprints are minimal because they break down easily in the environment, as opposed to chemicals.

If You Use or Store Hazardous Wastes on Your Property, Take Care of It

As mentioned in FOOTPRINTS INSIDE THE HOUSE, you don't want to dispose of HHW by pouring it on the ground outside. These types of actions leave evident footprints – the residues of these products will potentially get caught up in the runoff, and could severely compromise the water quality downstream. While one resident's footprints alone may not have much of an impact, cumulatively it all adds to the deterioration of our water quality. Imagine all of your neighbors, as well as residents both upstream and downstream overapplying chemicals outside and illegally dumping HHW. Sooner or later, we all have to pay the costs.

Addressing HHW can be challenging, but not overwhelming. First, you should read the labels before you purchase a product. Make sure it is what you want and recognize what disposal issues you face when you are finished with it. Don't buy or use more than you need – follow the directions! If possible, use less toxic alternatives. And if you do have HHW lying about, make sure you properly store and dispose of it.

Check out CLUES UNDERGROUND and CLUES ABOVE THE GROUND to help you learn more about what to do with these types of wastes.

Footprints Outside the House

What's Underground Can Come Back Ground

"Out of sight, out of mind" is the typical attitude most of us have when it comes to flushing the toilet, draining the bathtub or running the dishwasher or washing machine. But all that used water (or "wastewater") goes somewhere. Twenty-four percent of American rural and suburban homes rely on septic systems to handle household wastes. Hopefully, if your home has a septic tank, you know how important it is to take care of it.

If Your Home Has A Septic Tank, What Do You Need To Know About It?

First, you should know what and where it is. A septic tank is an underground collection tank and system of outlying pipes that treat and dispose of household wastewater. A septic tank typically treats all the water used in your house: water from the sinks, showers and tubs, toilets, dishwashers and washing machines. The biggest concern is the wastewater from your toilets, which is full of harmful bacteria and microorganisms that can make people sick. Other wastewater produced in your home is considered to be graywater, and typically does not contain harmful bacteria. For information on the proper operation of your septic system, visit www.tceq.state.tx.us/nav/permits/on-site.html.

What Is Graywater?

Some conservation-minded homeowners now use water from sinks, showers, dishwashers and washing machines to irrigate lawns and landscapes. This water, called graywater, is collected separately from the toilet water (which is all directed to the septic tank). Graywater makes up 50-80% of residential wastewater. Using it outdoors does not leave footprints, and it makes sense – you can use the water you paid for twice! However, construction of a graywater system must comply with state rules and any requirements of the local permitting authority. Contact the Texas Commission on Environmental Quality for more information.

What Can You Do To Keep Your Waste From Escaping?

Septic tanks must be maintained in order to function properly. Septic systems rely on microscopic organisms to break down the organic wastes. Most important, sludge must be removed from the tank regularly (usually every 2-5 years). If not, the tank can fill with solids and overflow. When septic systems fail, untreated wastewater can enter and pollute nearby streams or pollute groundwater. This untreated wastewater carries nutrients that can cause an overgrowth in aquatic plants and algae, sometimes creating an algal bloom. Algal blooms can cause an oxygen imbalance, which can affect aquatic life.

Dumping hazardous chemicals (things like paints, varnishes, waste oil and pesticides) down your drain or toilet can cause a septic system failure by killing the microorganisms. Other items to keep out of septic systems include cleaners, medicines, plastics, diapers, condoms, coffee grounds, kitchen waste, cooking oil, and cat litter. If you are using a graywater system, you should not pour these things down the drain – it will end up directly on your yard, leaving footprints in the rainfall runoff.

What If Your Home Is Hooked Up To A Municipal Wastewater System?

Municipal wastewater systems rely on the same basic principles as septic tanks, but on a much larger scale and working in a much faster timescale. Treated wastewater from these systems is released back into the environment, either through a reuse application (like watering golf courses), or discharged directly into a stream, which eventually flows into a stream or river. Homes that are served by a municipal wastewater system should follow the same basic rules about what not to flush down the toilet or pour down the sink. In recent years, traces of medications have shown up in the waste stream. These chemicals and pharmaceuticals can have a negative impact on the microorganisms at work in the wastewater treatment plant.

What Do You Need to Know About Drinking Water Wells?

The good news is that as long as a septic system is properly maintained, there should not be any cross contamination between its drainfield and a well. The bad news is that toxic chemicals can contaminate wells through nearby leaking underground storage tanks or through improper disposal (dumping) of wastes like motor oil, degreasers, antifreeze or fertilizers. Improper application of chemical pesticides (such as fire ant killer) or herbicides could also release toxins into the groundwater. Overuse of fertilizers (both commercial & organic) may contaminate groundwater with high nitrate levels. Well owners should have their wells tested annually to check for harmful chemicals and bacteria.

What Is The Bottom Line About Clues To What Is Happening Underground?

It's really pretty simple. Even though you can't see what is happening underground, your footprints - or actions - can affect the quality of drinking water. This includes groundwater as well as surface water. The key is to properly maintain septic tanks, don't toss unused medications and chemicals out with disregard, and use fertilizers and pesticides in moderation. If you use hazardous chemicals, make sure you properly store and dispose of them. You can find more clues on how do to this by checking out WHO'S IN THE KNOW AND CAN TELL YOU MORE.

What's Above the Ground Moves Around:

Non-Point Source Pollution and Impervious Cover

When things like fertilizers, pesticides, automotive products, pet waste, grass clippings and some chemicals get caught up in runoff, they do not disappear quickly. They flow into creeks, rivers and lakes, harming plants and animals and contaminates the water we drink. The term for this is "Non-Point Source Pollution"(or NPS) because it comes from many different places, rather than a single source that anyone can 'point' to. NPS is more difficult to control because it comes from everyday activities, including fertilizing your lawn, using a pesticide, or constructing a new building. The clue to understanding NPS is to realize that everything that takes place in a watershed can affect our quality of water.

True or False? -- Factories are the Major Source of Pollutants in our Waters

False. Thirty years ago that statement was true. But, in recent decades, we've made a lot of progress reducing pollution from factories and wastewater treatment plants. Today, many of our water quality problems are often attributed to impervious cover (an area on land that does not allow water to percolate through naturally), even in suburban and rural areas. In a city, gutters that run along the curb of the streets are the drainage outlets for the watershed. Water from these gutters is diverted straight into a creek or stream. Comparatively, runoff within a small watershed of a suburban neighborhood likely flows directly into a nearby stream that may flow into a larger steam or river.

Why Do We Hear So Much About Impervious Cover?

In addition to the building of new structures, development practices often include paving over natural areas to make parking lots, driveways and roads. Impervious covers are a hindrance to water quality, because their non-porous surfaces make rainwater 'run off' quickly, instead of slowly soaking into the ground like it would have naturally. Rainwater gets caught up in runoff that often accelerates in speed as it travels over these hard surfaces. This rapidly moving runoff carries along whatever contaminants were on the ground, depositing them directly into the stream, river or lake. To make matters even worse, impervious cover and its associated runoff may be contributing to the frequency of flooding in our basin. Increased development and associated impervious cover are creating more non-point source pollution and are real concerns to water quality throughout the Guadalupe River Basin.

What Types of Pollutants Can Be Caught Up in Non-Point Source Pollution?

- Excess fertilizers, herbicides, and insecticides from residential areas
- Oil, grease, and toxic chemicals from runoff
- Sediment from improperly managed constructions sites and eroding stream banks
- Improper disposal of motor oil, car batteries, and home chemical containers
- Bacteria and nutrients from livestock, pet wastes, sewer system overflows, and faulty septic systems

What Can You Do To Help Minimize Non-Point Source Pollution?

First, take a look at your own backyard. You can help to control soil erosion by planting ground cover or stabilizing erosion-prone areas. Clean up after your pets – pick up their waste and throw it away. Consider making a commitment to using native plants, including turf grass. Native plants need less water and require less attention in the way of fertilizers and pesticides. Also consider using organic products on your lawn and in your garden, including fertilizers and pesticides. When improperly used, chemical lawn and garden fertilizers can enter the runoff and cause an increase in nutrient levels, which can stimulate algae growth, choking waterways and robbing fish of oxygen. When improperly used, chemical pesticides can also contaminate the food chain, causing long-term effects on wildlife and human health. Composting is a much more environmentally friendly way to control pests and keep your lawns healthy. Check out WHO'S IN THE KNOW AND CAN TELL YOU MORE to find out more about composting, native plants, and organic products.

If you choose to use chemical products, take care to use them safely and follow the directions! Use only non-toxic products in your garden. The same goes for the use of indoor chemicals – consider using nontoxic or natural cleaners. All unused chemical products, whether it is HHW from indoors or outdoors, should be recycled or disposed of properly. Many communities have begun to hold Household Hazardous Waste Collection events. Check out WHO'S IN THE KNOW AND CAN TELL YOU MORE to find out what is available in your local area. You can also find information on where to find alternative cleaning products. In addition, don't pour kitchen grease down the drain. Instead, put it into covered containers and throw it away in the trash. Rather than using a garbage disposal unit in the sink, scrape food scraps from dishes into the trash can or garbage bags. Food scraps can also be composted. Visit www.TexasFOG.org for more tips.

Next, take a look at how you take care of your vehicles. Properly maintain your vehicles to prevent oil and gasoline leaks. If you change the oil, don't dump the used oil on the ground – recycle it by taking it to a used oil collection facility! When used motor oil is disposed of improperly, it has a huge impact on our waterways, harming fish and wildlife. Check out WHO'S IN THE KNOW AND CAN TELL YOU MORE to learn more about recycling used motor oil and oil filters.

What Is The Bottom Line To What Is Happening Above The Ground?

It's simple. Non-point source pollution is everyone's problem because we all contribute to it. Follow the clues and do what you can to help minimize NPS. Help keep the Plum Creek Watershed and the Guadalupe River Basin clean!

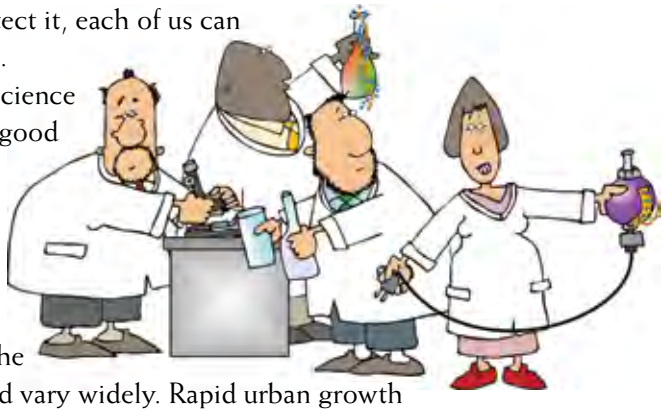
Clues Above the Ground

Stewardship:
Clues on How To Be a Plum Creek Steward

Let's go back to the beginning. People, animals, birds, fish and plants all live in a watershed and all need clean water to survive. Not all watersheds are the same – they come in many shapes and sizes, and have different natural and man-made features. Watersheds in the Guadalupe River Basin can have rocky hills or be on flat prairies. They can be made up of farmland, ranchlands, small communities and big cities. Big or small, urban, suburban or rural, we should all understand our connection to watersheds and want them to be healthy.

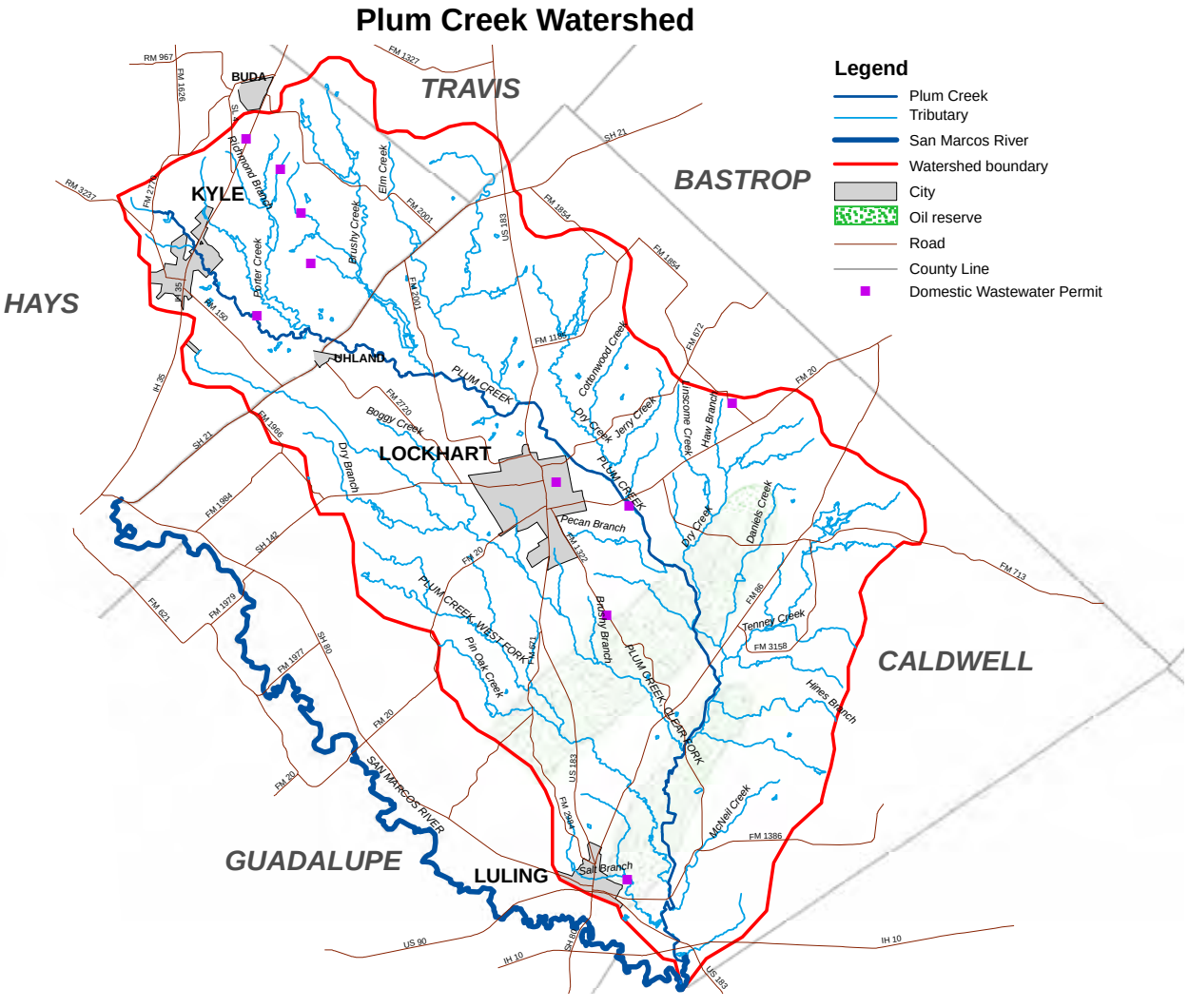
Understanding this is one thing. Showing that you understand through your everyday choices and decisions makes you a Watershed Steward. A steward is one who strives to increase public awareness about watersheds and follows through with good pollution prevention practices.

By now you understand that everyday activities taking place in the Plum Creek Watershed, including what you do in and around the house, have a direct impact on the quality of water. Government regulations seek to preserve and protect our water for its users. However, regulation alone is not enough. According to the Environmental Protection Agency (EPA), about 80% of our water pollution comes from non-point source pollutants, which is difficult to regulate. By learning how our activities affect water and how we can change our habits to protect it, each of us can make an important contribution to protecting this valuable resource. Knowing how your activities affect the watershed, and making conscience choices are indicators that you are well on your way to becoming a good steward of the river basin.



The Plum Creek Watershed is 397 square miles and the creek is 52 miles long. The watershed includes portions of the city of Buda, as well as the cities of Kyle, Lockhart, and Luling. It includes all of the land that drains into Plum Creek as the creek makes its way to the San Marcos River at Luling. Land uses in the Plum Creek Watershed vary widely. Rapid urban growth in the northern region can contribute to non-point source pollution. In addition, there are a number of wastewater treatment plants that use Plum Creek and its tributaries as their discharge point. In the middle to southern regions, agriculture activities, along with petroleum and gas production activities, may also be causes of non-point source pollution. In the southern point of the watershed, Plum Creek merges into the San Marcos River. The San Marcos River then flows into the Guadalupe River at Gonzales. The Guadalupe River then flows into San Antonio Bay at the Gulf of Mexico.

Remember, everybody lives "downstream". Many of the communities downstream of Plum Creek use this same water for their drinking water, recreation and industry.



Top Ten Things You Can Do To Protect The Plum Creek Watershed

1. Water only when and where it is really needed.
2. Limit the use of pesticides and fertilizers.
3. Plant native vegetation.
4. Redirect rooftop runoff.
5. Dispose of pet waste properly.
6. Carefully choose where you wash your car.
7. Properly maintain vehicles.
8. Recycle and dispose of household chemicals properly.
9. Properly maintain septic systems.
10. Properly dispose of all wastes - no illegal dumping.

Keep in Mind - The choices that you and your household make influence what happens in your watershed. Remember that your watershed, no matter how small, affects other watersheds downstream. We all live 'downstream'.

Stewardship: Top Ten Things You Can Do to Show You Care

Who to Contact for More Information

This is just a sampler of the many places you can contact for more information about how to protect our water quality. There is a ton of information out there about water quality, about who is doing what to protect it and who to call if you have a local concern. Thanks to the Internet, most of this information is only a click away. Dig in to investigate the water quality concerns that are in the Plum Creek and Guadalupe watersheds, and explore what you can do to make a difference.

Regional Resources

The Plum Creek Partnership Project **www. pcwp.tamu.edu**
The Plum Creek Watershed Partnership was formed by Texas State Soil and Water Conservation Board and Texas AgriLife Extension Service to develop and implement a plan that protects water resources in the Plum Creek Watershed now, and into the future. A steering committee made up of local stakeholders guides the watershed planning and implementation process for the project.

Guadalupe-Blanco River Authority **www.gbra.org** **830-379-5822 or 800-413-5822**
Find out more about efforts to preserve, protect and conserve the Guadalupe River Basin.

Clean Rivers Program (Guadalupe River Basin) **www.gbra.org/?datapage=crp.asp**
www.tceq.state.tx.us/compliance/monitoring/crp/
The Clean Rivers Program is administered by the TCEQ. The Guadalupe River Basin Highlights Report, routine water quality monitoring data and special studies are available on GBRA's website.

State Agencies

Texas Commission on Environmental Quality **www.tceq.state.tx.us or 512-239-1000**
TCEQ, the state environmental regulatory agency, sets policy for management of our air, water and waste. The TCEQ website has links to thousands of publications about water quality, watershed management and stewardship. The local field offices can be contacted if there are concerns specific to your area. **Region 11 Austin Field Office 512-339-2929**

Texas State Soil and Water Conservation Board **www.tsswcb.state.tx.us or 800-792-3485**
Administers Texas soil and water conservation law and coordinates conservation and pollution abatement programs.

TCEQ's Household Hazardous Waste (HHW) **www.tceq.state.tx.us/assistance/hhw/hhw.html**
Management Program helps citizens and municipalities with educational and regulatory information on HHW programs, technical assistance setting up a HHW collection program, and general information on HHW issues.

Local Environmental Recycling Information **www.1800Cleanup.org or www.earth911.com**
(by ZIP code) on recycling HHW, automotive used oil, pesticides, batteries, electronics, and other items.

Texas Illegal Dumping Resource Center **www.tidrc.org or 903/891-3632**
Enforcement education for Texas cities and counties.

TCEQ's Agriculture Waste & Pesticide Collection **www.tceq.state.tx.us/assistance/Agwaste/agwaste.html**
Helps rural and agricultural communities with recycling and safe disposal of unused pesticides and other unwanted products.

Texas Emergency Spill Reporting **800-832-8224**
www.tpwd.state.tx.us/landwater/water/environconcerns/kills_and_spills/
Hays or Caldwell Counties **512-353-3474 or 512-389-4848 (24 hour line)**
Call if you are a witness to or are concerned about a possible hazardous waste spill.

EPA Pharmaceutical & Personal Care Product Disposal **www.epa.gov/ppcp/**
Information why these products are environmental concerns and Federal guidelines for the proper disposal of prescription drugs.

Federal Agencies

Environmental Protection Agency (EPA) Region 6 www.epa.gov 1-800-887-6063

The EPA is the guiding policy and enforcement source behind TCEQ's programs. EPA's website has an abundance of information on how to protect our precious water sources.

County Resources

Texas AgriLife Extension

Hays County	www.hays-tx.tamu.edu	512-393-2120
Caldwell County	www.caldwell-tx.tamu.edu	512-398-3122

Plum Creek Conservation District

www.pccd.org 512-398-2383

Conservation Resources

Native Texas Plants -- Visit your local nursery or plant retailers to find out what plants are native to your region of Texas. You can also visit http://yardwise.org or the **Native Plant Society of Texas**

http://www.npsot.org/ 830-997-9272

Composting and the Use of Organic Products -- local nurseries and plant retailers have organic fertilizers and pesticides.

http://yardwise.org
http://vegweb.com/composting/
http://www.texasstar.org/index.php?pg=composting
http://aggie-horticulture.tamu.edu/extension/

Alternatives for Household Cleaners

http://www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/gi/gi-328_4233910.pdf
http://www.ecocycle.org/hazwaste/recipes.cfm

Health Care Industry Disposals

http://www.noharm.org/us

Volunteer Opportunities

Texas Stream Team – www.txstreamteam.rivers.tx.state.edu
Master Naturalists -- http://masternaturalist.tamu.edu
Master Gardeners -- http://aggie-horticulture.tamu.edu/mastergd/gd.html
Texas Nature Trackers -- www.tpwd.state.tx.us/learning/texas_nature_trackers
Keep Texas Beautiful -- www.ktb.org/programs/index.html

Step Back to the Facts:

Improper use and disposal of hazardous household and landscape products can lead to the contamination of groundwater and surface water. The average American household generates 15 pounds of household hazardous waste each year. At any given time, our homes contain an average of three to eight gallons of hazardous waste in kitchens, bathrooms, garages, and basements. Don't be a part of the problem...be a part of the solution! Eliminate your footprints.

GBRA

GUADALUPE-BLANCO RIVER AUTHORITY

933 East Court Street - Seguin, Texas 78155

(830) 379-5822 or (800) 413-5822

www.gbra.org

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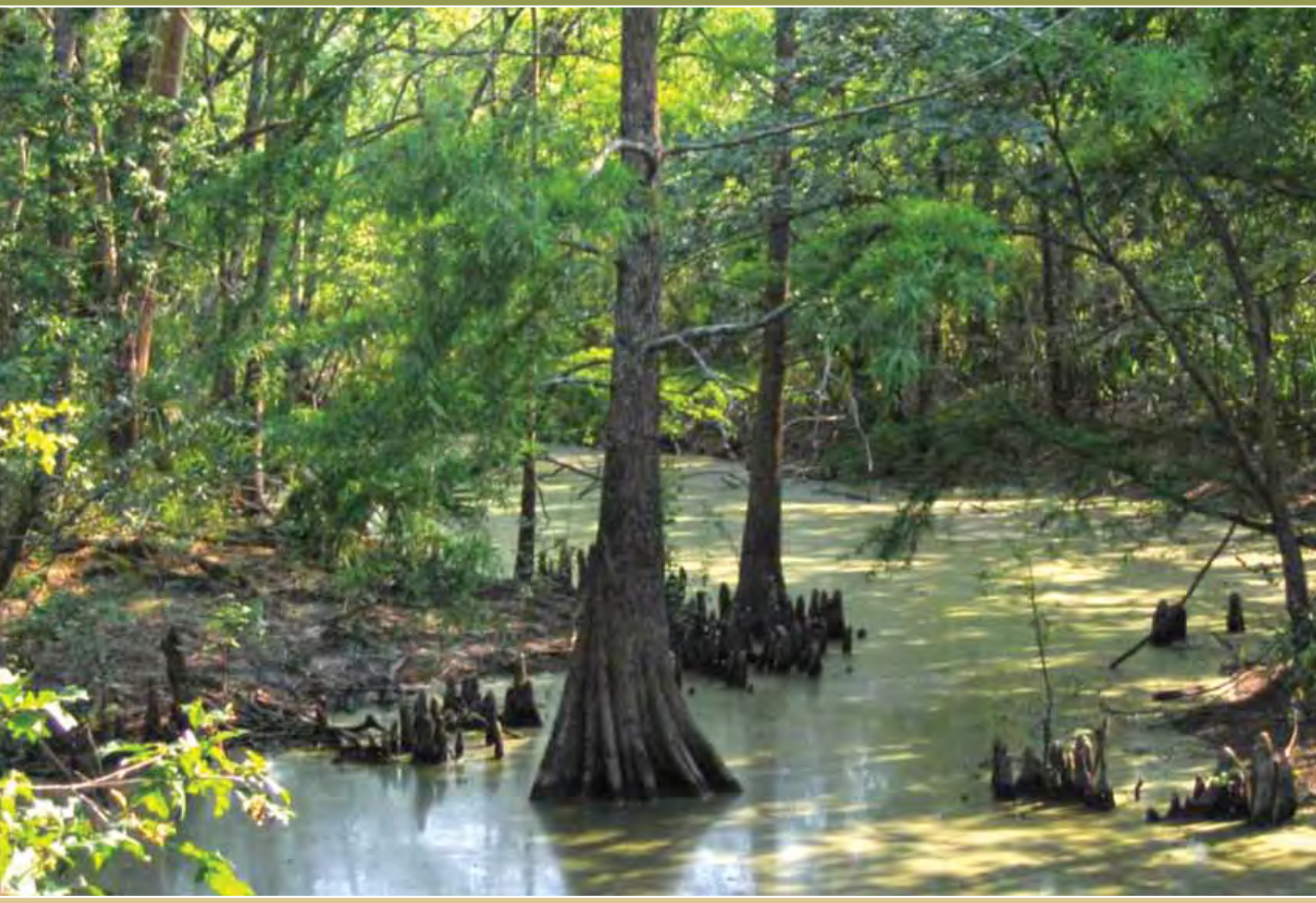

Feral Hogs Negatively Affect Native Plant Communities

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(Photo courtesy Dr. Jim Cathey, Texas AgriLife Extension Service)

Feral hogs (*Sus scrofa*) are non-native, highly adaptable, and cause significant ecological and economic damage in Texas.

Cover photo courtesy Dr. William Rogers

Figure 1. Feral hogs can cause significant ecological damage by their rooting habits that turn over the soil, damaging plant communities and possibly leading to greater erosion. (Photo courtesy Jared Timmons, Texas AgriLife Extension Service)

Feral Hogs Negatively Affect Native Plant Communities

Introduction

Landowners face many challenges as they manage their land for agricultural uses and wildlife habitat. Droughts, flooding, and invasive species are major hindrances that landowners must account for to maximize productivity on their property. One invasive species in particular, feral hogs (*Sus scrofa*), are a significant economic burden to landowners due to their destructive feeding and wallowing habits that cause damage to pastures and crops (Figure 1). Also, feral hogs compete with wildlife species for available resources which can take an economic toll on landowners who manage their land for wildlife.

Feral Hog History

Feral hogs are non-native to North America; they were transported to this continent from Europe and Asia. Beginning in the 1500s early explorers such as Hernando de Soto introduced swine as a food source to the North American mainland (Wood and Barrett, 1979). Many of these domestic swine were free-range livestock, which allowed some animals to escape and become feral (wild) populations. Eurasian wild boars were also introduced to the environment starting in the late 1890s for hunting purposes. All of the initial Eurasian wild boars were released on fenced properties, but later escaped confinement, resulting in more wild hogs in the environment (Mayer and Brisbin, 2008).

Feral Hog Biology

Feral hogs, domestic swine, and Eurasian wild boars belong to the same species and can all interbreed. Sows can produce litters one to two times a year, depending on availability of food resources, and have on average four to six piglets per litter, though more are possible. Few predators are capable of preying upon large, healthy adult feral hogs. Younger feral hogs can become prey to a number of animals such as coyotes, bobcats, foxes, and others. Feral hogs can weigh over 300 pounds, but more commonly weigh between 100 and 150 pounds (Stevens, 2010). Feral hogs rarely reach 400 pounds. Feral hogs are opportunistic omnivores, meaning they can eat both plant and animal matter and switch food sources with availability. Feral hogs also lack functional sweat glands and wallow in streams and other water sources to keep cool.

Figure 2. Oak and hickory trees are a major component of ecosystems in much of Texas and provide habitat for many wildlife species. (Photo courtesy Jared Timmons, Texas AgriLife Extension Service)

Feral Hog Damage

Feral hogs cause an average of $52 million of damage annually to the agricultural industry in Texas. This estimate does not account for growing feral hog damage in suburban areas. Examples of feral hog damage include but are not limited to: rooting pastures and rangeland, consumption of native vegetation, negative effects on water quality, and predation of wildlife.

Riparian Ecology

Oak (*Quercus sp.*) and hickory (*Carya sp.*) trees are among the most ecologically important tree species in Texas (Figure 2). These broad-leaved trees produce large seeds, such as acorns and nuts (mast) respectively, which are highly sought after by wildlife for food. Non-native feral hogs compete with native wildlife, such as deer, squirrels, and birds to consume this mast and may have a disproportionate effect on seed abundance and future tree recruitment. Oaks and hickories provide screening, loafing, and escape cover for many wildlife species, and some animals rely on them for nesting, roosting, and foraging. Additionally, timber from these trees is economically valuable and can be used for construction materials and fuel for burning.

Figure 3. Healthy riparian areas consist of native grasses, forbs, shrubs, and trees that reduce floodwater velocities, thereby inhibiting excess erosion and allowing greater infiltration. (Photo courtesy Blake Alldredge, Texas AgriLife Extension Service)

Oaks and hickories are major components of riparian areas along streams and rivers in many parts of Texas. Riparian areas (Figure 3) are transitional margins between uplands and stream habitats, where

Figure 4. Fenced exclosures were used in this study to evaluate the effects that feral hogs have on this ecosystem. (Photo courtesy Dr. William Rogers)

vegetation is strongly influenced by the presence of water, and is significantly different from upland communities (Wagner, 2003). Feral hogs are known to use riparian areas as travel corridors and the linkage to water and diverse, lush plant life may concentrate feral hog activity in these ecologically important locations. Healthy riparian areas provide many ecosystem services that benefit humans. Examples of these services are:

- Flood water retention as trees and other plants reduce water velocities, increasing groundwater recharge and sediment deposition;
- Improved water quality as sediments and nutrients are filtered by plants and soil;
- Plant roots that protect banks from excess erosion, allowing the channel to maintain its shape;
- Fish and wildlife habitat;
- Timber production;
- Greater recreational opportunities for hunting, fishing, and ecotourism;

Many riparian areas in Texas have undergone reduction in size and/or changes in vegetative species as agriculture, urbanization, deforestation, man-made reservoirs, and invasive species alter these ecosystems. For most trees, as the size of the seed increases, the number of seeds a tree can produce decreases. Since oaks and hickories produce large seeds, they are limited in their seed number production, making them vulnerable to high seed consumption by feral hogs (Sweitzer and Van Vuren, 2002). This high consumption rate may affect forest structure by greatly reducing the chances for large-seeded trees to germinate. Consequently, feral hogs may reduce the ecosystem services in many environments, such as riparian areas, as their actions degrade plant communities. The impacts of feral hogs on crops, livestock, and wildlife have been observed by many, but investigations involving native plant communities are limited and mainly based on observations.

Study

Researchers from Rice University and Texas A&M University conducted a study in the Big Thicket National Preserve, in southeastern Texas, to determine the impact of feral hogs on riparian ecosystems (Siemann et al. 2009). In January 2001, 16 plots (32 feet x 32 feet) were constructed on a 656-yard transect line near Little Pine Island Bayou in Hardin County, Texas. Eight of the plots were fenced using woven wire fencing with strands of barbed wire at the bottom, middle and top of the woven wire (Figure 4). Eight of the plots were not fenced. From these plots, ground cover was determined by counting the number and species of woody plants between 20 and 55 inches tall. In addition, five 10 inch deep by 3/4 inch wide soil cores were taken from each plot and analyzed for percent Carbon and Nitrogen in 2004.

These researchers expected that feral hogs would:

1. Decrease the abundance of large seeded tree species (such as oaks and hickories) by eating their seeds;
2. Increase the abundance of less desirable small-seeded tree species, like Chinese tallow (*Triadica sebifera*) by creating favorable soil conditions and reducing competition from large-seeded species;
3. Increase sapling mortality;
4. Break up and incorporate litter into the soil and lower the Carbon to Nitrogen ratios in the soil.

Figure 5. In unfenced plots, there was significantly more bare ground and Chinese tallow was two times more abundant than in fenced plots. (Photo courtesy Dr. William Rogers)

Results of the Study

In this study, negative effects that feral hogs had on native plant species (oaks and hickories in particular) and the soil chemistry were clearly demonstrated (Table 1). Excluding feral hogs from areas in this east Texas forest using fenced exclosures increased the diversity and survival rate of native tree species. In fact, the large seeded species saplings, such as oaks and hickories, were more than twice as abundant within the fenced plots as in the unfenced plots. This strongly suggests that feral hogs consumed large amounts of mast in forests such as the Big Thicket, which can lead to a change in the plant community overtime as these trees that produce large seeds become less numerous.

Excluding feral hogs increased the growth rate of saplings (juvenile trees not large enough to be considered mature) in this forest. The increased growth rate of saplings was expected, as fencing provided protection from herbivory and reduced the stressful effects of soil disturbance. High plant diversity is important in forests, as in every ecosystem, to increase overall productivity, to promote resistance to natural disasters and diseases, and to support numerous wildlife species. In the unfenced plots, diversity was lower due to invasion by Chinese tallow, which was more than twice as abundant as in fenced plots (Figure 5). Chinese tallow is a non-native invasive tree that grows aggressively in full sunlight

Table 1. Results from Siemann et al. (2009) study conducted in the Big Thicket National Preserve. Comparison between fenced and unfenced plots shows the response of habitat characteristics to feral hog behavior.

Habitat Characteristics	Fenced Plot	Unfenced Plot
Large-seeded species abundance	2X greater than unfenced plots	—
Chinese tallow abundance	—	2X greater than fenced plots
Plant species diversity	—	Decreased
Sapling growth rate	Increased	—
Soil nitrogen levels	—	Increased
Bare ground	—	Increased
Forb cover	Increased	—
Graminoid cover (grass and grass-like)	—	Increased
Litter	Increased	—

Figure 6A. Chinese tallow (*Triadica sebifera*) leaves. (Photo courtesy Jared Timmons, Texas AgriLife Extension Service)

Figure 6B. Chinese tallow leaf. (Photo courtesy Dr. Jeremy Stovall, Stephen F. Austin State University)

Figure 7. Chinese tallow has rapidly taken over this canopy opening in this forest, thereby excluding all other species. (Photo courtesy Blake Alldredge, Texas AgriLife Extension Service)

or shade (Rogers and Siemann, 2002), has very high drought and flooding tolerances (Butterfield et al. 2004), responds positively to increases of nitrogen (Siemann and Rogers, 2007), and is highly tolerant to herbivory damage (Zou et al. 2008; Figure 6A, 6B). Feral hog rooting in the leaf litter and upper soil layers increases nitrogen levels in the soil by accelerating litter breakdown and may negatively impact soil organisms that inhibit the growth of Chinese tallow (sensu Nijjer et al. 2007). Chinese tallow has already altered many ecosystems in the southeastern U.S. by outcompeting native plants. In some areas like the Gulf Coastal Plains of Texas, Chinese tallow dominates the plant community, which is detrimental to many wildlife species, including grassland birds and waterfowl (Figure 7).

Figure 8. In fenced plots, there was significantly higher forb and woody cover and litter compared to unfenced plots. (Photo courtesy Dr. William Rogers)

Fenced plots had higher forb cover, woody cover, and litter compared to the unfenced plots which had higher graminoid (grass and grass-like plants) cover and bare ground (Figure 8). Results in unfenced plots were expected due to the rooting behavior of feral hogs that significantly disturbs the soil. On average, 22% of the ground area in the unfenced plots was disturbed every year during this study (Figure 9). Unfenced plots also had higher nitrogen levels in the soil, due to the turning over of the soil by feral hogs that incorporated the litter layer into the soil more rapidly. In addition, defecation and urination by feral hogs in the unfenced plots likely contributed to the elevated levels of nitrogen in the soil.

Figure 9. In unfenced plots, there was significantly more bare ground and graminoid cover than in fenced plots. (Photo courtesy Dr. William Rogers)

Feral Hog Effects in Other Ecosystems

This study evaluated the effects of feral hogs on riparian forests. However, due to their high adaptability and a wide ranging diet of plant and animal material, feral hogs have the potential to affect many other types of ecosystems as well. Upland forests (Campbell and Long, 2009), native grasslands (Cushman et al. 2004), streams (Kaller and Kelso, 2006), and wetlands (Chavarria et al. 2007) are among the various ecosystem types that are negatively impacted by non-native feral hogs (Figure 10). Feral hogs affect these ecosystems in the following ways:

- Reduce the number of large-seeded tree species by consuming large amounts of mast in upland forests (Campbell and Long, 2009);
- Loss of vegetative ground cover and litter layer that invertebrates and small vertebrates depend on for cover, and that provides critical microclimatic conditions necessary for seedling establishment and growth in forests (Chavarria et al. 2007);
- Disturbance of soil by rooting can lead to conditions that are favorable for exotic plants to invade in many ecosystems (Kotanen, 1995);
- Altered invertebrate and microbe communities that serve as the foundation for the food chain in stream systems (Kaller and Kelso, 2006);
- Contribute fecal coliforms, such as *E. coli* (Jay et al. 2007), to streams which may significantly harm aquatic life (Kaller et al. 2007).

As feral hog populations increase, impacts on the different ecosystems occupied by these animals will also increase, particularly in environmentally sensitive areas. As water quality concerns escalate, it is important to recognize how a non-native species like feral hogs degrade plant communities and water sources.

Figure 10. Native grasses, such as Little Bluestem (*Schizachyrium scoparium*), are important as they provide cover for bird species, such as quail, and allow water to infiltrate. (Photo courtesy Jared Timmons, Texas AgriLife Extension Service)

Figure 11. Corral traps are very effective at trapping high numbers of feral hogs at one time. (Photo courtesy of Blake Alldredge, Texas AgriLife Extension Service)

Soil Chemistry and Water Quality

The increase in soil nitrogen can lead to more run-off of nutrients in streams and rivers. High levels of nitrogen can cause eutrophication, which is a nutrient enrichment of streams. Eutrophication can result in increased amounts of algae, which deplete dissolved oxygen in the water (Baird, 1990). Reduction in dissolved oxygen can result in fish kills and offensive odors in waterways.

Management Implications

Feral hogs cause many problems to riparian ecosystems and their impact should be reduced. It is important to be proactive in efforts to control feral hogs by using several techniques in concert with one another. One of the most effective is trapping and removing feral hogs with the aid of a corral trap (Figure 11). A corral trap can catch an entire sounder, or group, of feral hogs in one effort. Snaring, hunting with dogs, or aerial gunning may also be necessary to reduce population numbers.

If feral hogs continue to persist despite removal efforts, another option is to fence environmentally sensitive areas. These areas can include locations where older trees have fallen, leaving an open area where sunlight can stimulate regeneration. Fencing around these areas allows the soil to remain undisturbed by feral hogs and new saplings to grow and mature.

Fencing for an environmentally sensitive area should consist of woven wire or utility panels with 4-inch squares at least 28 inches in height to exclude feral hogs. The fencing should be fastened to T-posts using bailing wire, making sure to reinforce areas of fence overlap. The fence should be staked tightly against the ground to prevent uprooting and access to protected areas. When constructing the fence, several living old growth trees should be included inside the fenced area to produce seed for future tree production. Often it is not economically or physically feasible to fence an entire property to restrict feral hogs from riparian areas. Fences in riparian areas are often washed away with seasonal flooding. Direct control methods to reduce population densities of feral hogs are preferred in these areas to reduce the negative effects they have on plant and water resources.

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Feral hogs captured in a corral trap (Photo courtesy Dr. Jim Cathey, Texas AgriLife Extension Service)

See other feral hog resources at http://agrilife bookstore.org.

- L-5523 Recognizing Feral Hog Sign
- L-5524 Corral Traps for Capturing Feral Hogs
- L-5525 Box Traps for Capturing Feral Hogs
- L-5526 Placing and Baiting Feral Hog Traps
- L-5527 Door Modifications for Feral Hog Traps
- L-5528 Snaring Feral Hog
- L-5529 Making a Feral Hog Snare
- SP-419 Feral Hogs Impact Ground-nesting Birds
- SP-420 Feral Hog Laws and Regulations
- SP-421 Feral Hogs and Disease Concerns
- SP-422 Feral Hogs and Water Quality in Plum Creek
- SP-423 Feral Hog Transportation Regulations
- L-5533 Using Fences to Exclude Feral Hogs from Wildlife Feeding Stations

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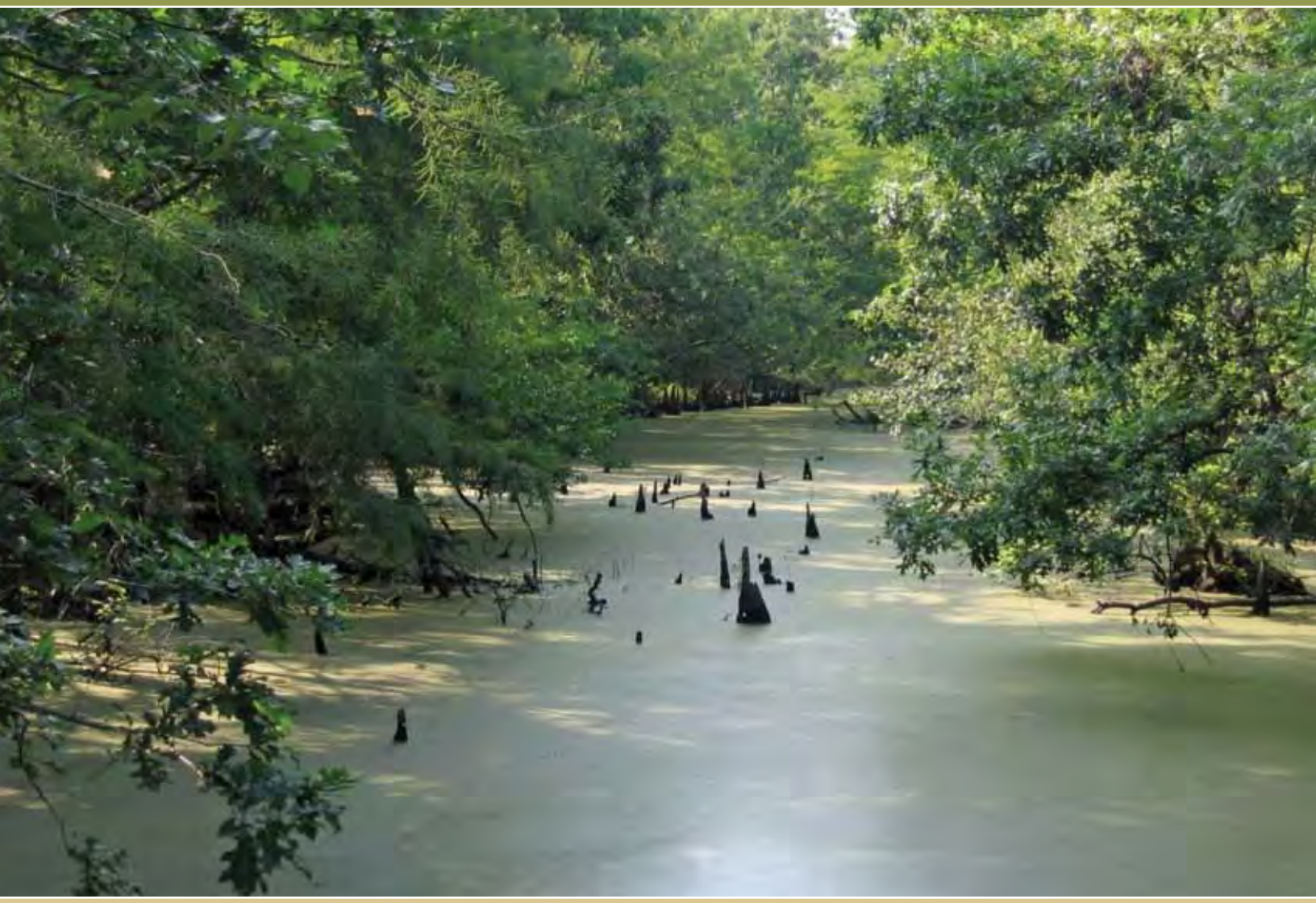

Photo courtesy Dr. William Rogers

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What You Can Do

- Work with your neighbors.
- Remove hogs on a sustained basis.
- Use multiple techniques at the same time.
- Seek private assistance from reputable trappers.
- Access public assistance.
  - -Technical assistance
  - -Informational material
- Use the on-line reporting tool
  - -Report damage
  - -Report sightings
  - -Report removal efforts

Reports can be filed at:

http://plumcreek.tamu.edu/feralhogs/

Be Persistent. Like brush control, feral hog control is a process…..not a project.

In Texas, feral hogs may be taken at any time of the year by any legal means. Contact the Texas Parks and Wildlife Department for questions related to feral hog hunting regulations.

Contact the Texas Animal Health Commission concerning regulations for transporting live wild hogs.

Additional information on feral hogs in Texas is available at http://feralhogs.tamu.edu/

Additional information on feral hog abatement methods is available at http://ws.tamu.edu/

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Feral Hogs, Plum Creek, and You.

Texas AgriLife Extension
Improving Lives. Improving Texas.

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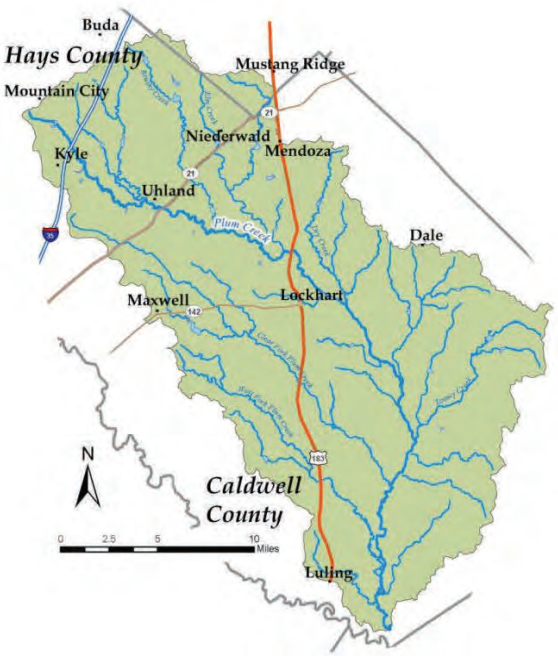
Pollution Within Plum Creek

In 1998 and 2002, water quality data in Plum Creek indicated high levels of nutrients and *E. coli* bacteria, respectively. By 2004, some stretches of Plum Creek in both urban and rural areas were identified as not meeting the bacteria standard for recreation (swimming and wading). High levels of bacteria suggest fecal contamination and the possible presence of pathogens which pose a health risk to humans. Through analysis of watershed data, feral hogs were identified as a significant potential contributor of pollutants to Plum Creek. To focus efforts on restoring water quality to the stream, the Texas AgriLife Extension Service and the Texas State Water Conservation Board assembled a group of local landowners and citizens, city and county officials, and, state and federal agencies to form the Plum Creek Watershed Partnership.



Most of Caldwell County and parts of Hays and Travis Counties are in the Plum Creek Watershed.

Hogs...What's the Big Deal?

Feral hog numbers have increased over the last 15 years and their destructive habits cause an estimated $52 million of damage on a yearly basis in Texas. Feral hogs, a non-native species, cause various kinds of agricultural and habitat damage, mostly by rooting, wallowing and depredation. They also compete with wildlife and livestock for habitat, harbor endemic and exotic diseases, and transmit parasites to domestic livestock and humans. Due to their numbers, distribution, and behavior, feral hogs can increase the levels of sediment, nutrients, and bacteria in streams. As feral hog populations continue to expand, their damage will also increase across Texas and in the Plum Creek watershed. Due to these impacts, the Plum Creek Watershed Partnership recommended that efforts to control feral hogs be undertaken.

Feral Hog Control Methods

With an integrated approach, we can limit the size of feral hog populations and keep damage to an acceptable level. However, once feral hogs have become established in an area, it is difficult to remove all of them.

Hogs can be managed with proper fencing, live traps, and lethal techniques like snares, shooting, and aerial hunting. There are no toxicants, repellents, fertility agents or biological control agents registered for use against feral hogs in the U.S.

Help Us Help You

Through a grant from the Texas State Soil and Water Conservation Board, AgriLife Extension has created a new position dedicated to feral hog management within the Plum Creek watershed. This new Extension Assistant is available to answer questions, provide technical assistance, and educate interested individuals concerning feral hogs and their management.

Landowners in Hays and Caldwell counties are taking serious steps to work together in order to abate feral hogs. To document these efforts, AgriLife Extension will work to track physical damage and financial loss due to hog activity in the watershed, but we need your help!

To better serve you, AgriLife Extension has developed an on-line reporting tool that landowners and citizens may use to report both feral hog sightings and damage. While feral hogs are often associated with crop losses and erosion impacts, they can also cause damage to livestock, pets, vehicles, lawns, wetlands, wildlife habitat, and other aspects of both rural and urban landscapes. The number of animals removed or killed on your property and the control method used should also be reported with this on-line tool. This information will be used to focus efforts in areas of high feral hog density and will allow us to document and quantify our successes in controlling feral hogs across the Plum Creek watershed.

AgriLIFE EXTENSION
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SP-421
7/11

Feral Hogs and Disease Concerns

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Texas AgriLife Extension Service
The Texas A&M University System

Landowners in the Plum Creek Watershed of Hays, Caldwell, and Travis counties are battling feral hogs on their properties. They are upset about the destruction of crops, livestock pastures, wildlife habitat and degradation of water quality.

Many of them are also asking the question, do feral hogs have diseases that cause concern? The answer is yes. Three diseases that cause the most concern are swine brucellosis, psuedorabies, and tularemia, although, feral hogs harbor other diseases as well.

Swine Brucellosis

Swine brucellosis (*Brucella suis*), is a bacterium transmitted among feral hog populations through breeding (semen, reproductive fluids), and ingestion of the bacteria (placenta and aborted fetuses, milk and urine).

When humans contract swine brucellosis it is called undulant fever because body temperature rises and falls along with flu-like symptoms. In pigs, symptoms include abortions, lameness, arthritis, abscesses, infertility, and sometimes death.

Swine brucellosis is of concern to the cattle industry because this bacterium can cause a false positive test for bovine brucellosis (*Brucella abortus*). When a positive test for bovine brucellosis is found, the cattle herd is quarantined leaving the rancher with an economic loss.

Pseudorabies

Humans do not contract pseudorabies (*Herpesvirus suis*); however, domestic livestock like sheep, cattle and some wildlife can be affected. This disease is not a form of rabies as the name implies. Pseudorabies is spread by nose-to-nose or sexual contact, and ingestion or inhalation of the virus. Symptoms include abortion, mortality among piglets, coughing and fever among adults. Cattle and dogs experience intense itching and may incessantly scratch and bite at the skin. Other neurological symptoms may occur, and the endpoint is death.

Tularemia

Tularemia (*Francisella tularensis*) is commonly known as rabbit fever. Humans contract the disease by direct contact through a wound, eating infected meat, and by ticks and biting flies that harbor this disease. When humans contract tularemia, flu-like symptoms occur along with swollen lymph nodes. Severe cases can result in pneumonia, blood infections, or meningitis.

This bacterium can survive weeks in wet environments. Researchers at Texas Tech University tested 130 feral hogs and found that 50% of tested hogs in Crosby County and 15% in Bell and Coryell counties showed past exposure or were currently infected with tularemia.

*Authors are Extension Assistant; Associate Professor and Extension Wildlife Specialist; Associate Professor; Extension Program Specialist; Professor and Extension Soil Fertility Specialist, respectively.

Figure 1. Feral hog in a pasture.

Figure 2. Hunter wearing protective rubber gloves to process a feral hog.

Additional Diseases

Some diseases are transmitted in feral hog fecal material. This can be an issue when supplemental feed for livestock or wildlife is placed on the ground, increasing the chances of fecal contamination by hogs (Figure 1). Bacterial diseases such as swine brucellosis and tularemia are not generally spread this way, but other diseases such as salmonellosis, foot rot, intestinal bacteria, viruses, and parasites are commonly transmitted by this route.

Meat Processing and Handling

Hunters are also at risk for exposure to swine brucellosis, tularemia and other diseases. They should not process a feral hog that shows any signs of illness. To reduce chances of exposure, a double set of rubber or plastic gloves should be worn while processing and handling meat from feral hogs (Figure 2). Likewise, safety glasses should be worn to shield your eyes. Hands also should be washed often with soap and warm water, and tools and work surfaces cleaned with a dilute bleach solution.

Feral hogs make great table fare. However, always use a meat thermometer to ensure an internal temperature of 160°F has been reached and the meat is thoroughly cooked.

Additional Information

To hone your knowledge of feral hogs and reduction methods, several publications were developed by Texas AgriLife Extension Service and can be downloaded at no charge by going to the Plum Creek Watershed Partnership website at http://plumcreek.tamu.edu/feralhogs.

This website also has an on-line tool to report feral hog sightings or control measures, one report for cooperating landowners and another for the general public.

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AgriLIFE EXTENSION
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7/11

Feral Hogs and Water Quality in Plum Creek

Jared Timmons, James C. Cathey, Nikki Dictson, and Mark McFarland*
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The Texas A&M University System

Feral hogs are a major problem in Texas with an estimated population between 1.9 and 3.4 million causing more than $52 million in losses to agriculture annually. Along with crop damage, feral hogs are suspected of predation of wildlife and livestock, disease transmission, and reducing water quality.

Feral hogs impact water quality largely due to behavior related to their physiology. Because feral hogs do not have sweat glands, they commonly wallow in and near water sources to keep cool (Figure 1). This process covers their skin with mud that they rub off on trees and utility poles to remove external parasites.

Figure 1. Feral hog wallowing along a water source.

However, wallowing damages riparian areas and increases sedimentation. At the same time, hogs defecate in and around the water source increasing levels of bacteria and nutrients. In some areas, hogs are contributing to water quality degradation so severe that the waterbody cannot support contact recreation (swimming, wading, etc.) or aquatic life. One example is Plum Creek.

Plum Creek Watershed

Plum Creek is a 52-mile long stream that begins in Hays County north of Kyle and flows southeast through Caldwell County, passing Lockhart and Luling before meeting the San Marcos River near the Caldwell-Gonzales County line (Figure 2). Beginning in 2002, portions of Plum Creek were listed by the Texas Commission on Environmental Quality as not meeting water quality standards for contact recreation because of high levels of bacteria. As of 2010, the entire plum creek watershed was listed for bacteria and also had concerns for nutrients including nitrates and phosphorus which negatively impact aquatic life.

*Authors are Extension Assistant; Associate Professor and Extension Wildlife Specialist; Extension Program Specialist; Professor and Extension Soil Fertility Specialist, respectively.

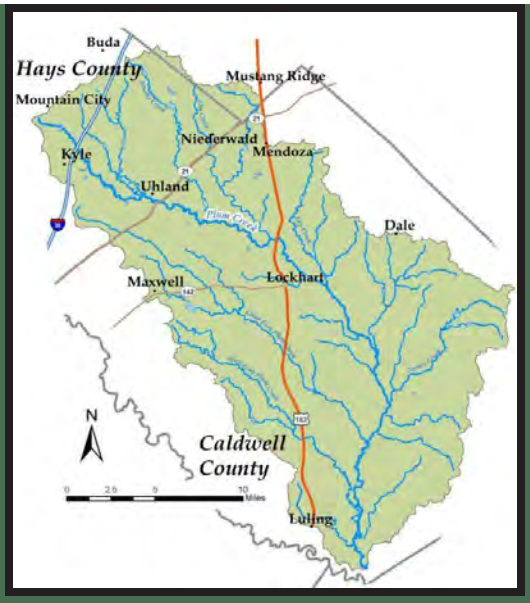

Figure 2. Plum Creek watershed in Hays, Caldwell, and Travis counties.

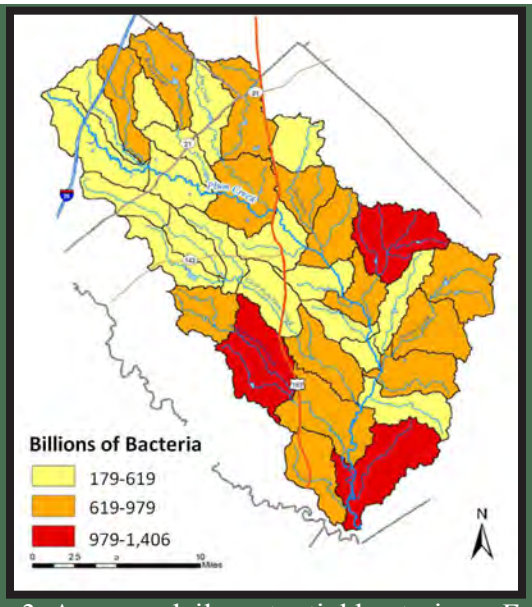

Figure 3. Average daily potential bacteria or *E.coli* load from feral hogs.

The Plum Creek Watershed Partnership is a collaborative effort between the citizens living in the watershed and state, federal, and regional agencies. During development of the Plum Creek Watershed Protection Plan, analysis of potential sources of pollution identified feral hogs as a significant contributor (Figure 3).

An Extension Assistant with the Texas AgriLife Extension's Department of Wildlife and Fisheries has been placed in the watershed to provide information and technical assistance to landowners concerning feral hogs. This individual works directly with landowners to assist them in determining the best methods for feral hog control on their property. In addition, the position develops educational resources and delivers training programs for citizens in the watershed.

Additional Information

To hone your knowledge of feral hogs and methods for their control, several publications were developed by the Texas AgriLife Extension Service and can be downloaded at no charge by going to the Plum Creek Watershed Partnership website at http://plumcreek.tamu.edu/feralhogs.

This website also has an on-line tool which allows landowners and the general public to report feral hog sightings and control measures.

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7/11

Feral Hogs Impact Ground-nesting Birds

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Texas AgriLife Extension Service
The Texas A&M University System

Landowners in the Plum Creek Watershed of Hays, Caldwell, and Travis counties are aware of the damage that feral hogs can cause to crops and pastures. Many also realize that feral hogs compete with native wildlife for food sources. Typically, feral hogs are not thought of as predators, but they fill that role as well.

Feral hogs are opportunistic omnivores, meaning they eat whatever plant and animal matter is available. Eggs of ground-nesting birds like northern bobwhite and wild turkey are on their menu.

Northern Bobwhite

The northern bobwhite (Figure 1) has been declining over much of its historic range for several decades. To better understand predation of northern bobwhite nests Extension wildlife specialists teamed with landowners and county extension agents to monitor predation rates in the Rolling Plains of Texas.

Figure 1. Northern bobwhite male.

During trials conducted in 1993 and 1994, they found 23.5% of simulated nests were consumed by feral hogs on a ranch in Foard County, and 11.5% of simulated nests (Figure 2) were depredated by hogs on a ranch in Shackleford County. This suggests that feral hog nest predation is a contributing factor to the northern bobwhite population decline. Those experiments were conducted nearly twenty years ago, and feral hog populations have increased substantially since that time.

Wild Turkey

Three subspecies of wild turkey are found in Texas. The most common and wide-ranging is the Rio Grande wild turkey. Eastern wild turkey are less common and restocking efforts are underway in eastern Texas to re-establish their population. Small populations of the Merriam's wild turkey are found in western Texas. For Rio Grande and eastern wild turkey, researchers have documented nest predation by feral hogs (Figure 3).

Figure 2. Three eggs used to simulated northern bobwhite quail's nest.

*Authors are Extension Assistant; Associate Professor and Extension Wildlife Specialist; Professor and Extension Wildlife Specialist; Extension Program Specialist; Professor and Extension Soil Fertility Specialist, respectively.

Figure 3. Feral hog consuming wild turkey eggs (Trail camera photo by Dr. Brett Collier).

Figure 4. Eggs found in Rio Grande Wild Turkey nest (Photo by Dr. Brett Collier).

Turkey Nest Success Study

The Gus Engeling Wildlife Management Area, between Palestine and Corsicana, is one location where eastern turkeys were released. To monitor movement and nest success, turkeys were fitted with radio transmitters and nests were located and observed (Figure 4). Observations showed that feral hogs, among other predators, consumed eggs from nests. In an attempt to increase nesting success, researchers increased control of feral hogs on this 10,872 acre wildlife management area. Results in 1998 showed when only 68 hogs were removed nest success was 0%, but when control was increased and 313 feral hogs were removed in the following year 25% of the nests were successful.

While feral hogs are not the only nest predators of wild turkeys, this research indicated that reducing or driving feral hogs from the area increased nest success. Other contributing factors like rainfall could also contribute to nest success, but removal of a non-native predator like feral hogs should be considered a part of ranch management. It is important to utilize several control methods for feral hogs, which may include trapping, snaring, shooting, and use of dogs and hunting. Given the high reproductive rate of feral hogs, many more native wildlife species are likely impacted. The bottom line is that native wildlife species need a reprieve in the form of aggressive feral hog reduction.

Additional Information

To hone your knowledge of feral hogs and reduction methods, several publications were developed by the Texas AgriLife Extension Service and can be downloaded at no charge by going to the Plum Creek Watershed Partnership website at http://plumcreek.tamu.edu/feralhogs.

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Acknowledgement and disclaimer
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7/11

Feral Hog Transportation Regulations

Jared Timmons, James C. Cathey, Nikki Dictson, and Mark McFarland*
Texas AgriLife Extension Service
The Texas A&M University System

Landowners in the Plum Creek Watershed of Hays, Caldwell, and Travis counties sometimes ask themselves, now that I have hogs in my trap, what do I do with them?

The Texas Animal Health Commission (TAHC) regulates the movement of feral hogs, holding facilities, and release on hunting preserves. A point of clarification is required as hunting preserves must have a hunting lease permit issued by the Texas Parks and Wildlife Department.

Female Feral Hogs

Movement and release of females (sows and gilts) and males (boars and barrows), are regulated differently. Think of females as the production factory contributing to increased feral hog populations (Figure 1). They may not be transported and released onto another property. They should be removed from the population.

Female feral hogs may be held for up to seven days in an escape-proof pen or trailer (Figure 2). They can be taken directly to slaughter, or sold to an approved holding facility, who then takes them to slaughter.

For a list of approved holding facilities, visit the TAHC website at http://www.tahc.state.tx.us/animal_health/feral_swine.html.

Male Feral Hogs

Male feral hogs may be held for up to seven days in an escape-proof pen or trailer (Figures 3 and 4). They can be sold to an approved holding facility, slaughter facility, or authorized hunting preserve. An approved holding facility can take them to slaughter or sell them to an authorized hunting preserve. Only male feral hogs may be sold to an authorized hunting preserve.

Figure 1. Female and young feral hogs entering a corral trap. (Photo by Larry Lindsey)

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Figure 2. Transporting live feral hogs in a trailer.

Figure 3. Feral hogs captured in a box trap.

Fencing of authorized hunting preserves must be inspected by TAHC field inspectors and determined to be swine-proof. Male feral hogs must be individually identified using a form of official identification including ear marks, brands, tattoos, or electronic devices prior to release on the hunting preserve. Contact TAHC for other non traditional forms of identification. Authorized hunting preserves are also subject to periodic inspections by the TAHC.

Figure 4. Live feral hog on a trailer.

Additional Information

To hone your knowledge of feral hogs and methods for their control, several publications were developed by the Texas AgriLife Extension Service and can be downloaded at no charge by going to the Plum Creek Watershed Partnership website http://plumcreek.tamu.edu/feralhogs.

This website also has an on-line tool which allows landowners and the general public to report feral hog sightings and control measures.

Contact Information

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Recognizing Feral Hog Sign

*Chancey Lewis, Matt Berg, Nikki Dictson, Jim Gallagher, Mark McFarland, and James C. Cathey**

Feral hog populations are expanding in Texas, impairing water quality, damaging native plant and animal communities, wrecking landscapes and gardens, and reducing agricultural production in many areas of the state. To develop management strategies for feral hogs, a landowner or manager needs to understand their behaviors and recognize their signs.

Feral hogs leave evidence, or sign, of their passing. The most noticeable sign is the damage caused by their destructive rooting behavior. However, during a drought, rooting is minimal, and other signs are more common, such as hog wallows, rubs, tracks, trails, droppings, and beds.

Hogs are very mobile and routinely travel from one field that offers cover to another field that provides food. To increase trapping success, look for signs to determine their key travel corridors, which include creeks, sloughs, ponds, and other water sources.

Figure 1

Feral hogs can cause damage to rural pastures and urban landscapes alike.

Rooting damage

As feral hogs feed, they may severely damage native plant and animal communities as well as agricultural crops. If the hogs' rooting in an area disturbs vegetation and soil extensively, the type and abundance of plants there can shift. Rooting damages lawns, gardens, hay pastures, and native range (Fig. 1). It can also reduce the number of plant species in an area.

Feral hog diets differ throughout the year, depending on the availability of a wide variety of food items. During drought, they compete with native wildlife species for acorns, pecans, and other food.

Crop damage

Field crops commonly damaged by feral hogs include rice, sorghum, wheat, corn, soybeans, peanuts, potatoes, watermelon, and cantaloupe. Hogs not only consume planted seed, emerging

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seedlings, and maturing fruits and grains, but they also trample crops (Fig. 2).

Wallows and rubs

During warm months, feral hogs create wallows in moist areas near ponds, creeks, and sloughs (Fig. 3) to access mud, which helps them cool down and ward off biting insects. In hot weather, hogs often lie in wallows during the day. They deposit waste in these locations that is likely to contribute bacteria and pathogens to stream systems.

After wallowing, hogs rub on fixed objects to remove dried mud, hair, and parasites. Look for mud and hair on trees, fallen logs, fence posts, rocks, and utility poles, particularly those near water or wallows. Hogs have an affinity for utility poles treated with creosote, and many poles within a hog's home range will have visible markings.

Feral hog tracks and trails

Feral hog tracks and trails may yield information on abundance, animal size, direction of travel, and local behavior patterns. Hoofed tracks generally register two toes but may also show two dewclaws, which are smaller toes found higher on the leg.

Hogs have blunted or rounded toes, and this trait is apparent in tracks they leave behind. Deer tracks are typically heart- or spade-shaped; feral hog tracks appear more rounded (Fig. 4).

A well-worn feral hog trail indicates frequent use, and a lack of vegetation along the trail may suggest that many hogs use the path (Fig. 5). Where trails cross under fences, the hogs often leave hair and mud on the wires as they pass underneath.

Feral hog droppings

Examining hog droppings can reveal what hogs have been eating, which may help determine appropriate control methods or trap locations. Feral hogs are omnivorous, eating

Figure 2

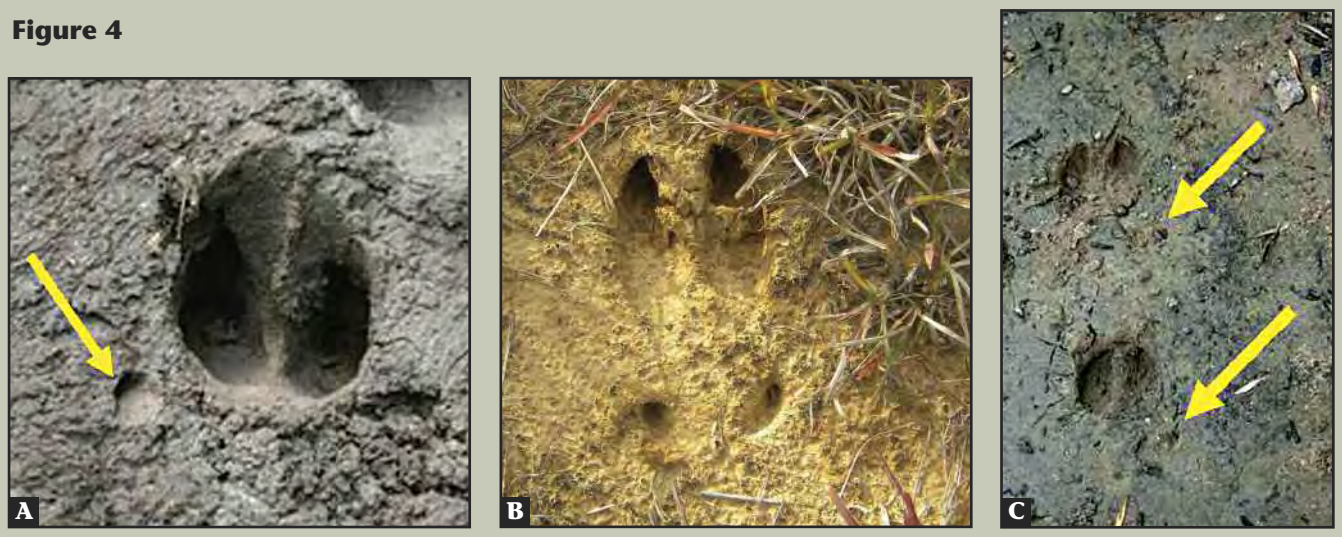
Feral hog damage to sorghum caused by both trampling and foraging.

Figure 3

Wallows (A) can be found in wet areas during warmer months, and rubs are often associated with them.

In areas where populations are large, feral hog rubs can often be found on utility poles (B).

Figure 4



Circular shape of a feral hog track (A). Note the dewclaw mark on the bottom left. When visible in the tracks, hog dewclaws typically register wider than the hoof. Both dewclaws may not register, depending on the soil type and animal movement. In deer tracks (B), the dewclaws typically do not register wider than the hoof. Compare again with front and hind tracks of a feral hog (C). Notice the round shape, blunted toes, and wide dewclaw marks.

both plant and animal matter, and their diet varies by location and season. For these reasons, feral hog droppings take many forms, which can make identification difficult.

Hog droppings are often tubular, filled with mast (such as acorns and pecans) and other vegetation. The shape and consistency of their droppings ranges from that resembling those of domestic dogs to those of horses (Fig. 6). A diet of young grasses and shoots results in loose tubes and formless patties.

Feral hog beds

Hogs create shallow beds by overturning the soil to expose the cool dirt in which they lay. During the heat of the day, feral hogs spend a significant amount of time in beds. They typi-

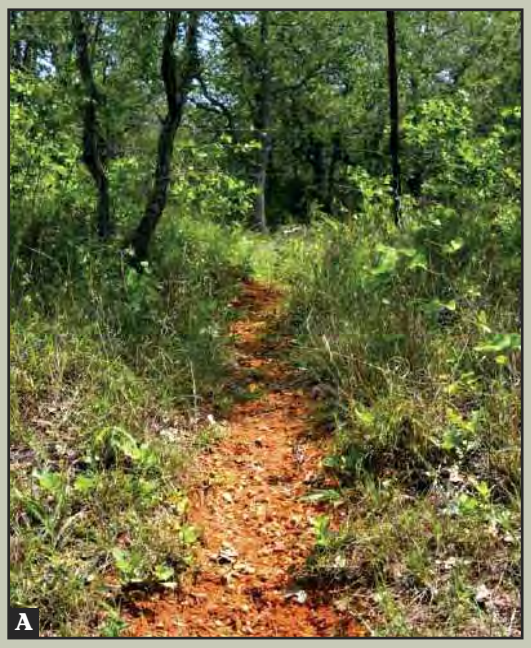


Figure 5

A well-traveled feral hog trail (A). The width and lack of vegetation indicate frequent use. Where hogs are active, they will often leave behind hair and mud on fences as they move through the area (B).

Figure 6

Because of the diverse diet of feral hogs, their droppings vary greatly in shape and consistency.

cally bed in dense vegetation such as vines, brambles, fallen trees, and other thick or thorny plants (Fig. 7). These areas offer security and shade and may be difficult to identify.

To find bedding locations, follow the hog trail into extremely thick vegetation. Hog beds are also often associated with wallowing areas.

Summary

Recognizing the signs of feral hog activity is critical to developing a management strategy. Signs include roting damage, crop damage, wallows, rubs, tracks, trails, droppings, and beds. These signs can yield much information about feral hog activity.

Figure 7

A thorny shrub grows up through a fallen tree (A). Beneath this thick vegetation are many feral hog beds. Feral hogs overturn soil and clear vegetation, creating shallow beds beneath thick brush cover (B).

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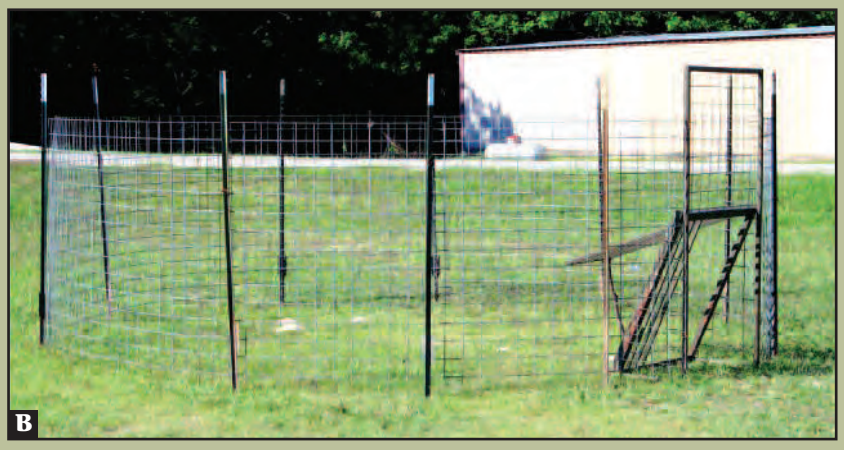
Corral Traps for Feral Hogs

*Chancey Lewis, Matt Berg, Nikki Dictson, Jim Gallagher, Mark McFarland, and James C. Cathey**

Expanding populations of feral hogs in Texas are damaging water quality, landscapes, gardens, native plant and animal communities, and agricultural production in many areas of the state. To reduce the harm caused by feral hogs, landowners and managers will need to adopt an integrated management approach using multiple techniques.

Most management efforts should include the use of large corral traps, which can be effective for reducing hog numbers quickly. Feral hogs typically travel in family groups called sounders, and a large corral trap can capture an entire group.

Figure 1



A large, teardrop-shaped corral trap can capture many hogs (A). Traps vary in size and shape, and occasionally a smaller round shape is preferred (B). *(Photo A source: Billy Higinbotham)*

Advantages

- Corral traps are effective for capturing large groups of hogs.
- If a deer is captured, the open trap allows it to escape.
- The traps can be placed in key areas that hogs will return to in the future.

Disadvantages

- The materials can be expensive and the construction time-consuming.
- Corral traps are not easily disassembled and moved. They are not portable as a unit.
- Pre-baiting can be expensive and time-consuming.

Trap designs

Most corral traps are made of 20- by 5-foot sheep/goat panels with 4- by 4-inch square mesh and steel T-posts. This type of panel prevents smaller pigs from escaping.

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Many door designs are available for corral traps. The best design for your situation depends on the amount of time available, the number of hogs present, the degree of labor required, and the cost of the materials.

Large sounders are seldom caught in small traps, and the hogs that escape or are not captured may become wary of them in the future. Although small traps do catch hogs of all sizes, they are not the most effective method for capturing many hogs. For these situations, a large teardrop-shaped trap is best. This design also serves as a chute for loading the hogs into a trailer (Fig. 1A).

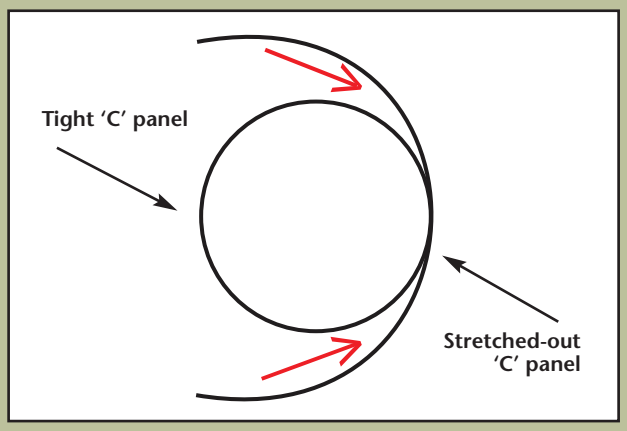
Corral traps are versatile, and their use can be adjusted according to the situation. Some designs do not require a gate or door (Fig. 2).

This trap consists of two panels, each at least 16 by 5 feet with 4- by 4-inch mesh, and eight T-posts. One panel forms the shape of a stretched "C". The other panel forms a tight "C" with the ends touching the stretched "C" panel.

T-posts are driven around the outside of the panels for extra support. A T-post should also be placed at each end where the panels touch, wired only at the top of the tight "C" panel. This configuration forms a chute on each side.

The trap interior and both chutes are baited. As the hogs try to get the bait inside the trap, they push in the bottom of the tight "C" panel, allowing access to the trap interior. Once inside, hogs find themselves in a circle and cannot push out of the entrance because of the resistance exerted by the outside panel.

Figure 2



Two panels and a minimum number of T-posts can be used to build a simple yet functional corral trap that does not require a gate.

This trap type is useful and extremely variable—it can be modified in many ways, including the figure-6 and heart-shaped or Wexford traps (Fig. 3)."

"Push-in" designs probably do not catch trap-shy animals very well. Loading pigs into a trailer is more difficult than using corral traps with head gates.

Trap design and construction

Design the trap large enough for hogs to back away as you approach the trap. The trap should not have corners because hogs tend to congregate in corners and may escape over the top of the panel. Support the trap every 4 feet by

Figure 3

Heart-shaped or Wexford trap. The number of T-posts used depends on the trap's size and configuration (A).

As hogs gather in the chute, they will push their way inside the trap (B).

T-posts and leave no gaps along the bottom that would allow the hogs to escape.

Materials needed

The trap in Figures 4 through 6 used these materials:

- Lifting head gate
- 13 T-posts, 6-foot
- 4 sheep/goat panels, 16 feet by 52 inches
- Roll of tie wire
- T-post driver
- Lineman's pliers or fencing tool
- Two-by-four, 4 feet long
- Hook and eye latch, 4-inch

Figure 4

Use steel T-posts to secure a head gate (A). Make sure the head gate fits snugly against the T-posts using a doubled strand of baling wire (B).

Steps for building a corral trap

1. Set the head gate. A lifting gate is shown in Figure 4. Most head gate/door designs are secured with steel T-posts on each side of the entrance and attached to the gate with doubled bailing wire to provide additional strength. When driving T-posts, be sure they fit securely against the side of the head gate.
2. Use the panels to shape the trap. The trap size and shape and the number of T-posts depend on the number of panels used and the location of the trap.
3. Secure the panels to the head gate T-posts with doubled wire (Fig. 5A).
4. Secure the remaining panels to one another before driving the T-posts.
5. Once all the panels are in place and secured, shape the trap further by pulling the panels to their desired location (Fig. 6). If the trap is in a wooded area, trees can be used for support.
6. Once the trap is in the desired shape and location, use T-posts to anchor the trap (Fig. 7). Space the T-posts about 4 feet apart. Feral hogs are extremely strong and will test the trap when captured.

Figure 5

A panel secured to a head gate T-post with doubled wire (A). The remaining panels are attached to one another. It is important to overlap the ends of the panels (B).

A captured hog can damage the sturdiest of traps, and those made of weaker materials may allow the hogs to escape altogether. Always make traps as strong as possible.

Trap doors and trigger mechanisms

In most cases, the appropriate trigger mechanism depends on the door selected for the trap. Most corral traps are built

Figure 6

An extra pair of hands is helpful when attaching panels. One person holds the panels in place while the other secures them (A). After all the panels are secured, pull them to their desired location (B) to form a circle or teardrop shape.

with saloon-type gates, drop gates, or lifting rooter gates (Fig. 8).

An advantage of the saloon-type and rooter-type doors is that they can be set in an open position using a prop such as a two-by-four or a stick. A hook and eye latch can also be used to hold the trap door open until it is triggered. This approach was used in the example in Figure 7. After the first animals are captured, more hogs can enter by pushing their way into the trap.

When designing a corral trap, consider sharing gates with your neighbor. Because the gate does not need to be in place until the trap is set, a little planning and coordination can help cut material cost and build on efforts of others to increase your effectiveness.

For large corral traps, place the trigger at the back of the trap, away from the door. This allows many hogs to enter the trap before the door closes. Most trap triggers are made with wire. Some people use picture framing wire, as it is durable enough to spring the trap but will break if a hog becomes entangled.

Attach the wire to a two-by-four or other prop mechanism on the trap door and string it to the back of the trap, where you will place the bait in a hole or scatter it on the ground (Fig. 9).

Use T-posts or trees to support the wire from the trap door to the back of the trap. Construct wire eyelets and attach them to the T-posts or trees. As the hogs root for the bait, the wire is stretched and the prop is pulled out, triggering the door to close.

Pre-baiting

For all feral hog traps, it is critical to pre-bait for a period before setting the trap. Pre-baiting will attract animals and train them to enter the trap. Trapping is a process, not an event:

1. Place the bait around the gate and within the trap interior.
2. Continue pre-baiting until feral hogs are consistently feeding on the bait and entering the trap. Wait until an entire sounder appears to be frequenting the trap.
3. Finally, before setting the trap, place the bait all the way to the trigger at the back of the trap. However, do not place the bait directly

Figure 7

Corral traps of different sizes secured with T-posts. Notice that both traps are located in wooded areas, providing concealment and shade.

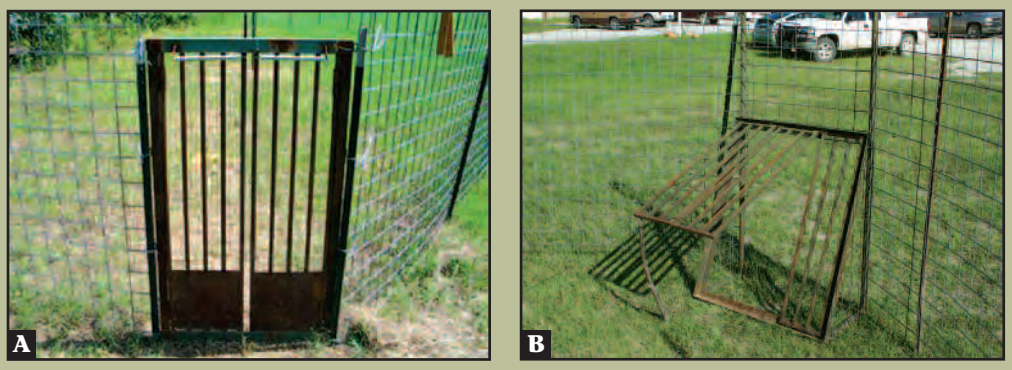
on the tripwire, as this may cause the gate to be triggered before all the hogs have entered.

4. Bait and set the trap.

Trapping tips

- Place traps on or next to existing feral hog trails.
- Coordinate with your neighbors to share trap gates.
- Always make the traps as strong as possible.
- Camouflage the traps if you are dealing with trap-shy hogs.
- A game camera can help identify the number of hogs and other species entering the trap and suggest the optimal time to set the trap.
- Pre-bait traps with the door open; after the hogs are routinely entering the trap, set it.
- Minimize baiting outside the trap; make the hogs enter the trap in order to get the bait.
- Souring corn in water will help avoid attracting nontarget animals, such as deer.
- Alternate bait types if necessary.
- If possible, check traps from a distance.
- Avoid leaving human scent in the area, especially if you are dealing with trap-shy hogs.
- Check traps regularly. Daily inspections are recommended in hot weather.
- Be persistent.

Figure 8



Swing gates require springs for closing (A). Lifting doors can be set in an open position like a drop gate, and once triggered, more hogs can push their way inside the trap (B). After triggering, the gate will close but permit more hogs to enter.

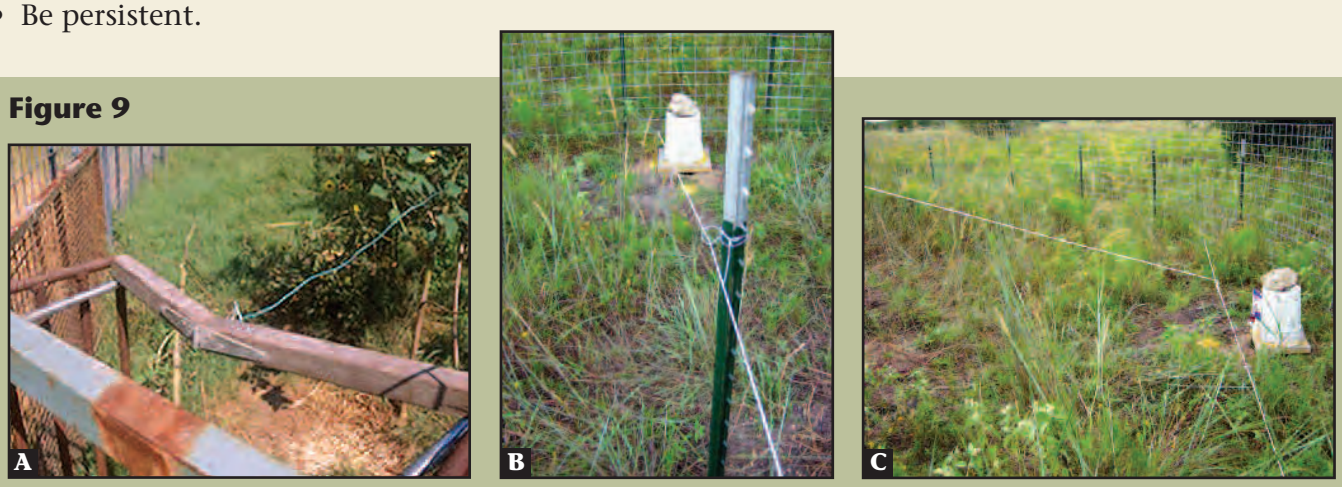
Trap placement

Trap placement is critical when determining the size of a corral trap. Large traps are often considered more permanent, and they are typically placed in areas where the hogs will return in the future, such as near creeks or drainages used as travel corridors.

Set the trap upwind of an area frequented by hogs. Ideal locations include ponds, and other watering locations, particularly those near bedding or feeding areas. Hog trails linking these areas are excellent trap sites. If the captured hogs will be sold to a processor, choose an area accessible to a truck and trailer in all weather conditions.

The trap interior does not have to be completely clear, as brush or trees inside the trap will

Figure 9



A board is used as a prop on a swing gate (A). T-posts guide the wire from the prop to the back of the trap (B). The wire is then attached to another wire forming a T-intersection at the trigger point (C). As the hogs feed on the bait, the wire is stretched, and the prop pulls from the gate. (Source: Greg Pleasant).

provide camouflage for the trap and shade for captured animals.

In most cases, corral traps are within floodplains. Because of this, be sure to place the trap in an area that will minimize damage by rising floodwaters.

State regulations

The Texas Animal Health Commission regulates the holding and transportation of feral hogs from the property where they were captured. Follow the appropriate regulations if you plan to transport captured hogs to a holding facility or to slaughter.

For more information on these regulations, see http://www.tahc.state.tx.us/animal_health/swine/swine.html.

Summary

Corral traps are extremely effective in managing feral hog numbers, especially when used in conjunction with other control methods. Although they require more effort to install and maintain, they can effectively capture many hogs at a time.

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Box Traps for Feral Hogs

*Chancey Lewis, Matt Berg, Nikki Dictson, Jim Gallagher, Mark McFarland, and James C. Cathey**

Rising numbers of feral hogs in Texas are damaging water quality, landscapes, gardens, native plant and animal communities, and agricultural production in many areas of the state. To reduce the harm caused by feral hogs, landowners and managers should adopt an integrated management approach using multiple techniques.

Box traps can be used to remove a few feral hogs or to trap in a relatively small area. These traps can serve as a first strike in combination with larger traps and other techniques. However, box traps are not effective for removing many animals at a time.

Figure 1

Box traps vary in size and construction. A common design includes a 4- by 8-foot cage built with durable materials (A).

The best box traps are both effective and low cost. Many box traps are built from materials at hand (B).

Advantages

Because of their size, box traps offer three main advantages:

- They are relatively easy to move and can be set quickly.
- They easily fit in the bed of a pickup truck or on a small trailer.
- They are easily handled and moved, so one person can quickly place traps in areas with fresh hog activity.

Disadvantages

Box traps also pose disadvantages because of the amount of time, energy, and expense they require and the small number of animals they capture:

- Box traps require pre-baiting, and this can be expensive and time consuming.
- Many box traps are needed to reduce hog numbers.
- Box traps can occasionally catch nontarget

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Figure 2

Many drop gates use a pin or similar object attached to a cable to hold the trap gate open (A). The cable can be slid through a conduit to the back of the trap, where it is attached to a trigger system (B). Trigger systems vary in design. *(Source: Terry Gallagher)*

animals such as deer, calves, and other wildlife and livestock.

- They may catch only one or two adult pigs. Other approaches are needed to capture larger groups of pigs.

Trap design

Box traps come in a variety of designs and shapes. Most are built from livestock panels with steel pipe or angle iron frames. Because most traps are built by the users, they differ greatly in size, portability, door configuration, flooring, and roofing. In some areas, ready-to-use box traps and different styles of gates can be bought.

A common design is a 4- by 8-foot, heavy-duty cage (Fig. 1). This trap is typically 3 to 4 feet tall, and a top is recommended to keep the hogs from crowding in the corners and climbing out. If the trap is fully enclosed with a top and a floor, the trapper may be able to transport a live hog without removing it from the trap.

However, all box traps—particularly those without floors—require T-posts to anchor them, adding materials that increase the cost and may deter a hog from entering the trap.

Figure 3

Common box trap designs featuring a lifting (top-hinged) gate (A) or a swing (side-hinged) gate (B).

Figure 4

Box traps with spring-loaded swing gate entries (A and B). This door design allows for additional captures as the hogs push their way into the trap. Box traps with lifting gate entries (C and D). The doors of these two traps have only one panel. Consequently, trapped animals may escape while other hogs moving into the trap lift the door to enter.
Box traps with lifting gate entries and multiple panels (E and F). Multiple door panels allow additional hogs to enter the trap while reducing the chance of escape by previously captured hogs.

Gate design

The gate should be designed to prevent captured hogs from escaping through the trap entrance. Three gate designs are among those most commonly used for box traps:

- Sliding drop gates use a trip wire to trigger the door to fall (Fig. 2). One drawback of guillotine gate box traps is that they do not allow additional pigs to enter once the trap has been sprung.
- Lifting (top-hinged) gates require that a hog use its nose to root or lift open the door.
- Spring-loaded swing gates use a heavy spring to close the door after the hog pushes its way into the trap (Fig. 3).

Figure 5

A landowner inspects a finished box trap deployed in an open area with scattered brush cover. This model has a guillotine gate and is set using a cable and pin system attached to a trigger near the back of the trap. *(Source: Terry Gallagher).*

Swing and lifting gates offer the advantage of allowing more than one hog to be trapped at a time (Fig. 4). The first captured hog may serve as a lure to attract additional hogs.

However, only one or two adult pigs typically are trapped at a time, because the box trap is small. Sometimes a litter of small pigs may be captured.

Trap placement

Place the box trap near a creek, pond, or other watering location, particularly if these are near bedding or feeding areas. Areas with brush are also good (Fig. 5). Feral hog trails are ideal locations for trap placement. To attract the animals to the bait, set the trap upwind of an area frequented by hogs.

A game camera can help determine hog behavior in the area and identify optimal locations for trap placement.

Pre-baiting

Trapping feral hogs is a process, not an event. Box traps must be pre-baited to attract feral hogs and accustom them to the traps before they are set. Place the bait inside the trap near the gate, but do not set the trap until the hogs are traveling in and out of the trap.

Regulations

The Texas Animal Health Commission regulates the holding of feral hogs and their transport from the property where they were captured. If you will transport captured hogs to slaughter or a holding facility, follow the appropriate state regulations.

For information on these regulations, see http://www.tahc.state.tx.us/animal_health/swine/swine.html .

Summary

Box traps can be an effective tool as part of a broader feral hog management strategy. Consider using them for removing one or two adult animals at a time.

Acknowledgment and disclaimer

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AgriLIFE EXTENSION
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Placing and Baiting Feral Hog Traps

*Chancey Lewis, Matt Berg, Nikki Dictson, Jim Gallagher, Mark McFarland, and James C. Cathey**

The increasing numbers of feral hogs in Texas are harming water quality, landscapes, gardens, native plant and animal communities, and agricultural production in many areas of the state. Two keys to success in managing feral hogs are trap placement and pre-baiting.

The landowner or manager must thoroughly understand the foraging behaviors and travel patterns of feral hogs. Control efforts will be more effective if local conditions and feral hog behavior are properly interpreted.

Figure 1

Feral hogs traveled across this field from cover to a feeding area. Fence lines where these trails converge are excellent locations for large traps.

Trap placement

Increase your chances of success by placing traps properly. Place them on or along hog trails linking resources such as food, cover, and water (Fig. 1).

Aerial photographs can show how resources are distributed across the landscape, which will help you place the traps strategically. Photos can be obtained through the U.S. Department of Agriculture or software such as Google Earth.

Before setting a trap, scout the property for hog sign: trails, scat, wallows, hog damage, and rubs, which are areas of mud rubbed on trees, posts, and utility poles. In areas where hogs are abundant, they will create visible paths (Fig. 2A).

Often the easiest form of hog sign to locate and identify is the damage caused by rooting. However, do not place a trap in these sites. If you place the trap where there is ongoing damage by hogs, the bait will compete with a food source that the hogs are already using, and hogs tend to prefer a familiar food source.

A better approach is to place traps along trails to and from these areas. Fence lines are often good places to start. Hogs often create crawls under fences and leave mud or hair on fence wires when passing. If a trail is well established or has significant traffic, it may be heavily eroded.

In some cases, hogs may just be passing through one property to gain access to a feeding area on another property. If so, determine where the hogs are entering the property and set the trap nearby (Fig. 2B). Use landscape features to hide the trap as much as possible, or set the trap near a fence line.

Even if no hog trails are evident, ideal trap

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Figure 2

A well-traveled feral hog trail passes under a fence between two properties (A). Here, a large corral trap is an effective option (B). This trap is set along a known feral hog trail and is equipped with saloon-type doors on both ends.

locations still exist. Feral hogs often travel along creeks and roads and use cover near overgrown fence lines while traveling. These areas funnel feral hog travel and provide excellent places to set corral traps, particularly if they lead to a feeding area.

Other good sites for corral traps are areas frequented by feral hogs throughout the year, such as watering holes, wallowing areas, and utility poles (Fig. 3).

If possible, place the hog traps upwind from bedding areas used by the animals during the day. This placement will allow the wind to disperse the scent of bait to attract hogs from farther away.

Bait types

No toxicants, fertility agents, or biological control chemicals are legally registered for use against feral hogs in the United States. It is illegal to use toxicants with feral hog baits; baiting strategies should lure the animals into corral or box traps.

Feral hogs are omnivores; they eat both

Figure 3

A woodland edge and a road converge with a meandering creek (A). This setup offers an excellent trap site. Feral hogs frequent this utility pole for rubbing and scratching (B), providing another area for a trap nearby.

Figure 4

A game camera is useful for monitoring feral hog activity near the site of a trap (A). Photographs can indicate the number of hogs in the area and the best time to set the trap. Pre-baiting increases the probability of catching a large number of hogs. Start by placing bait outside and through the gate opening of the trap (B). Once the decision to set the trap is made, place bait near the trigger mechanism (C).

plants and animals, and a wide array of baits can be used with success. Common baits include whole corn, livestock cubes, carrion, sour grain, and commercial hog attractant scents.

If corn is used, nontarget animals such as deer may be captured. Soaking the corn in water for 1 week will cause it to sour, and the strong odor will deter other animals from feeding on it.

Regardless of bait type, trapping may be less successful if acorns or other readily available natural foods are abundant.

Hog bait recipe

Pre-baiting is vital for trap success. If whole corn does not attract feral hogs, use the following recipe developed by the Georgia Department of Natural Resources:

- 150 pounds of corn
- 8 pounds of sugar
- 1 packet of yeast
- 4 or 5 packets of grape, strawberry, or raspberry flavored gelatin or drink powder

Place the corn in a 40 gallon metal trash can and fill it with water to 3 to 4 inches above the corn. Mix in all the other ingredients.

Place the trash can in the sun with the lid secured. Stir it with a shovel or paddle daily for 10 to 14 days.

Take care not to spill the product on your clothes. Ladle the bait in and around the trap and replenish it as needed.

Other baits

- Corn fermented in beer
- Bread fermented in water
- Dry dog food
- Ripe fruit
- Commercially available baits and scents
- Flour

Pre-baiting

For all feral hog traps, it is critical to pre-bait—that is, to place bait in the trap for a period before setting the trap. Pre-baiting will attract animals and accustom them to entering the trap itself.

1. Start by placing bait near the opening and inside the trap (Fig. 4B).
2. As the hogs begin to routinely enter the trap, continue pre-baiting inside the trap for a few more days to ensure the entire sounder (group) is comfortable entering the trap.
3. A game camera is useful for monitoring the number of hogs entering the trap, and it

provides information on the best time to set the trap (Fig. 4A).

4. When the trap is ready to be set, place bait all the way back to the trigger. Do not scatter bait directly along the trip wire, as this may cause the hogs to trigger the gate before all of the animals have entered the trap (Fig. 4C).

Trapping tips

- Pre-bait traps to increase your chances of success.
- Build or use large traps; the bigger the better.
- Avoid leaving human scent in and around traps.
- If possible, check the traps from a distance.
- Vary the baits. Hog preferences may change over the course of the year.
- Refresh the baits by spraying them every 2 days with a strawberry gelatin/water mix in a pump sprayer.
- Share gates with your neighbors. Install the gate only after the hogs respond to pre-baiting.
- Trapping feral hogs is a process, not a single event. Be persistent!

State regulations

The Texas Animal Health Commission regulates the holding and transportation of feral hogs from the property where they were captured. Follow the appropriate regulations if you plan to transport captured hogs to a holding facility or to slaughter.

For more information on these regulations, visit http://www.tahc.state.tx.us/animal_health/swine/swine.html.

Summary

To maximize the likelihood of capturing feral hogs, choose the right trap location and implement an effective pre-baiting strategy.

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Door Modifications for Feral Hog Traps

*Chancey Lewis, Matt Berg, Nikki Dictson, Jim Gallagher, Mark McFarland, and James C. Cathey**

As feral hogs continue to spread across Texas, landowners are developing innovative trapping techniques. Although most trap styles are derivatives of the basic corral or box designs, several modifications can be made to trap doors. Door designs include the guillotine/drop door, spring/swing door, and rooter/lifter door. The rooter/lifter door can be modified to increase capture rate.

Figure 1

A piece of angle iron marked for cutting (A). After cutting (B and C), the iron can be heated and bent to form the desired configuration (D). The bracket is then welded. Designs may differ, depending on the door style.

Rooter/lifter door modifications

Rooter/lifter doors are a popular choice among trappers because they allow for continuous capture of feral hogs. However, these doors have drawbacks:

- The traps must be held open and pre-baited for several days to train the hogs to enter the trap.
- Once the trap is set, the hogs must push their way into it by lifting the gate. Naive young hogs typically enter the trap with less hesitation; however, older trap-shy hogs are often reluctant to enter through this type of door.

For best results, the rooter/lifter door can be modified so that it initially functions as a drop door. After the first group of hogs is captured, the door then functions as a rooter/lifter door, allowing others to push their way into the trap.

Because rooter/lifter door designs differ greatly, modifications will also vary, but the adjustments described by Dan McMurtry of the Animal and Plant Health Inspection Service of the U.S. Department of Agriculture (USDA-APHIS) and explained below should apply to most situations.

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Materials needed

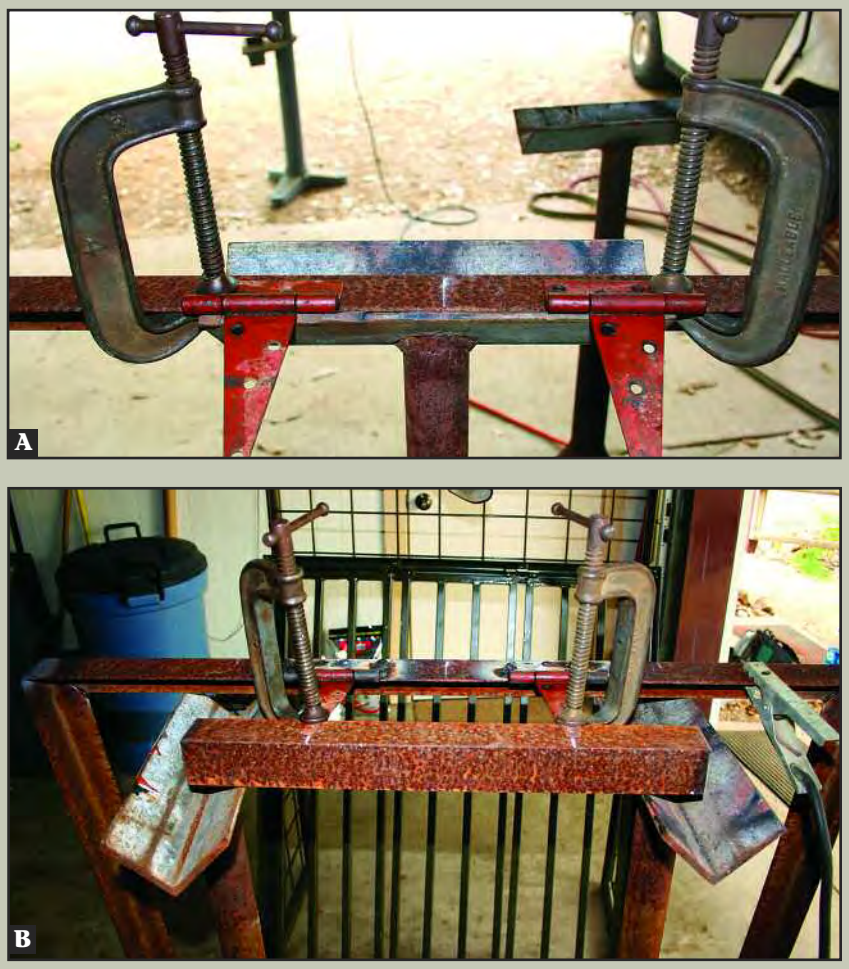
To modify a rooter/lifter door, you will need:

- Flat iron or angle iron
- A welding machine
- A drill
- ¼- or ⅜-inch bit
- Bolts
- Nuts
- Door hinges
- C-clamps
- Rope or chain

Steps for modifying a rooter/lifter door

1. Measure the width of the trap door and the length of the rooter panels. These dimensions form the bracket that will hold the panels open. The bracket in Figure 1 was made of angle iron.
2. Cut the angle iron in two places so that it can be bent to form 90-degree angles (Fig. 1). The exact measurements and cut lengths of the iron will depend on the size of the rooter door.
3. Attach the hinges to the bracket. The number of hinges will depend on the size of the trap door, with more hinges needed to secure larger doors.
4. Center the hinge(s) on the bracket and attach with C-clamps (Fig. 2A).
5. Tack-weld the hinges into place. This step ensures that the hinges will swing freely.
6. After final welding, attach a small piece of angle iron to the other end of the hinges (Fig. 2B). This will serve as part of the trigger mechanism. Again, it is important to tack-weld this piece to ensure that the hinges swing freely.
7. Using a drill equipped with a ¼- or ⅜-inch metal bit, drill a hole in the center of the angle

Figure 2



C-clamps secure two T-hinges to the bracket (A). Once secured, a welding machine is used to tack hinges into place. A small piece of angle iron is attached to the other side of the hinges to construct the trigger mechanism (B).

Figure 3

A ⅜-inch metal drill bit was used to drill this small hole into the trigger mechanism so that it can be attached to a trip wire.

Figure 4

A bolt attaches the bracket to the door frame (A). Once attached, rope or chain provides support to the bracket (B).

iron (Fig. 3). This hole will be used to attach a trip wire to the trigger mechanism. The hole can be equipped with an eyebolt if desired.

8. Measure the rooter door frame to make sure that the rooter panels do not hang too low. The bracket must be attached to the frame at the proper height because the hogs need to pass freely through the door and under the rooter panels without tripping the trigger with the tops of their backs. The frame of these trap doors usually is made of 1- to 1¼-inch steel pipe, so take measurements to ensure a proper cut. If the rooter panels hang too low, a large hog entering the enclosure may trip the trap prematurely.
9. Cut the bracket to fit the rooter door frame.
10. Attach the bracket to the rooter door frame using nuts, bolts, and washers (Fig. 4A).
11. Once the bracket is attached, support it with rope or chain (Fig. 4B).

This design can be built quickly with little effort, and it can easily be removed, if desired.

Other modifications

Those without access to shop equipment, such as a welding machine or cutting torch, can still make modifications to achieve similar results. One such design can be constructed with a 4-inch hook and eye latch and a 4-foot-long two-by-four. Simply attach the hook and eye latch set to the end of the two-by-four (Fig. 5). Then mount the

Figure 5

A two-by-four is used as a bracket on a rooter type door (A).

Once in place, the hook and eye latch set holds the panels up (B).

Figure 6

This design supports the door, allowing a large boar to pass freely underneath.

two-by-four to the top of the rooter gate by running it through one of the squares on the panel. This modification allows large boars to enter the trap easily (Fig. 6)

To reduce the risk of capturing nontarget animals such as deer and calves, one option would be to string a piece of baling or barbed wire across the middle of the door opening. Although the wire will be a minor obstacle for a hog, it will usually deter nontarget animals.

State regulations

The Texas Animal Health Commission regulates the holding and transportation of feral hogs from the property where they were captured. Follow the appropriate regulations if you plan to transport captured hogs to a holding facility or to slaughter.

For more information on these regulations, see http://www.tahc.state.tx.us/animal_health/swine/swine.html.

Summary

A few minor modifications to a typical rooter/lifter door can increase the number of feral hogs captured by a trap.

Acknowledgment and disclaimer

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Snaring Feral Hogs

*Chancey Lewis, Matt Berg, Nikki Dictson, Jim Gallagher, Mark McFarland, and James C. Cathey**

Feral hog populations across Texas are damaging water quality, wildlife habitat, home landscapes, and agricultural production. To manage these animals effectively, landowners and managers must deploy a diverse set of approaches. In situations where capturing a small number of animals inexpensively and with little maintenance is desirable, snares can be a key component of a larger control strategy.

Figure 1

A complete ⅛-inch cable snare with a lock and end swivel for capturing feral hogs.

Advantages

- Snaring is relatively inexpensive and does not require pre-baiting.
- Snares catch trap-shy hogs effectively.
- Snares can be used in a variety of situations.
- They can be set quickly and easily and require very little maintenance.

Disadvantages

- Snaring captures only one hog at a time.
- This method is inappropriate where the risk of capturing nontarget species is high.
- Snaring is inappropriate where anchor points are lacking.
- Large hogs occasionally break snares.

Snare design

A snare consists of a loop of steel cable attached to a secure object and placed so that the loop catches the animal as it passes through a confined space. Use a ⅛-inch galvanized steel cable to prepare a snare for feral hogs. The snare should have a sliding lock device allowing the loop to close but not open easily.

To minimize the problems of a captured animal breaking the cable, use a heavy swivel on the end of the cable that is attached to an anchored structure (fence post, tree, utility pole; Fig. 1).

In most situations, install a deer stop device to prevent the snare from closing entirely. Crimp a single ferrule, small nut, or other similar hardware to the snare cable to ensure that the snare does not close around the leg of a deer or other nontarget animal. The stop should prevent the snare from closing all the way.

Preparation

To make snares easier to conceal, use one of the following approaches:

- Boil new snares and extension cables in water

*Former Extension Assistant; Extension Program Specialist; Extension Program Specialist II; Assistant Extension Wildlife Specialist; Professor and Extension Soil Fertility Specialist; and Associate Professor and Extension Wildlife Specialist All of The Texas A&M University System

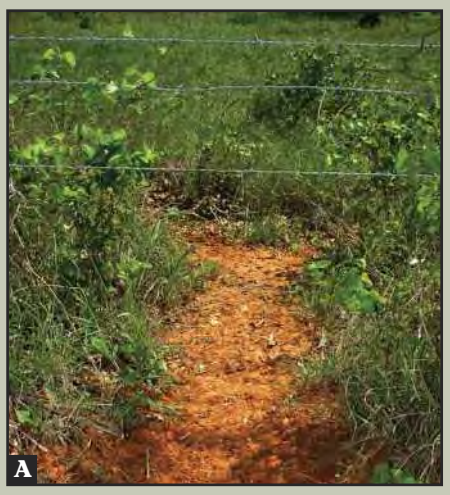


Figure 2

Locations (A and B) where hogs cross under fences provide good places to set snares. Look for evidence of hog activity, such as tracks and hair, to reduce the likelihood of capturing non-target species.

with detergent and hang them outdoors for a few months until they turn a dull gray.

- Boil the snares in 4 tablespoons of baking soda for 1 hour to age their appearance.
- Dye the snares a dark color by boiling them in brown logwood crystals and dye. Commercial dyes for snares are available from trap supply dealers.

After boiling snares, keep them free of odors. Store them in a container with cedar boughs, broomweed, or other natural smells. To avoid scent contamination, wear clean gloves when handling and setting snares.

When considering sites for snares, look for animal travel ways (trails) or crossings under fences around crop fields or pastures (Fig. 2).

Fence snare sets

Snares for capturing feral hogs are commonly placed under fences where hogs are known to cross. These "crawls" can be identified by tracks on the trail or hair caught on the fence. Hogs often push under a fence and bend the bottom wires up into a visible arc. A game camera can also help determine feral hog behavior in the area and identify the optimal sites for snare placement.

Snared feral hogs, particularly large animals, can damage a fence. Do not tie the snare directly to the fence wire. Instead, secure it to a large drag or fixed anchor point. To minimize fence damage, check the snares daily.

The swivel end of a snare is most often tied

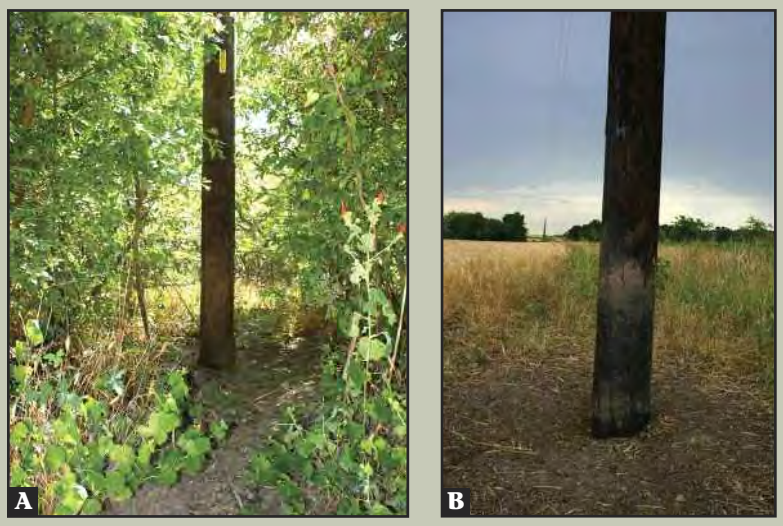
Figure 3

Installation of a fence snare set (A). Once in place, the snare becomes difficult to see, as it blends into the fence or background (B).

with a doubled or tripled length of tie wire to a secure anchor point or drag (Fig. 3). Suspend the snare's loop from the bottom of the fence with U-shaped wire clips or a single wrap of small gauge copper wire so that the loop pulls free easily when the animal passes through it.

To protect a weak fence or prevent landscape damage by captured hogs, use a cable extension to attach the snare to a large log, uprooted stump, or similar weighted object, which then serves as a drag.

Figure 4



A feral hog trail crosses under a fence near a utility pole (A). This rub makes an ideal location to set a snare. Rubs can also be found on trees near foraging areas (B).

Trail, tree, and post sets

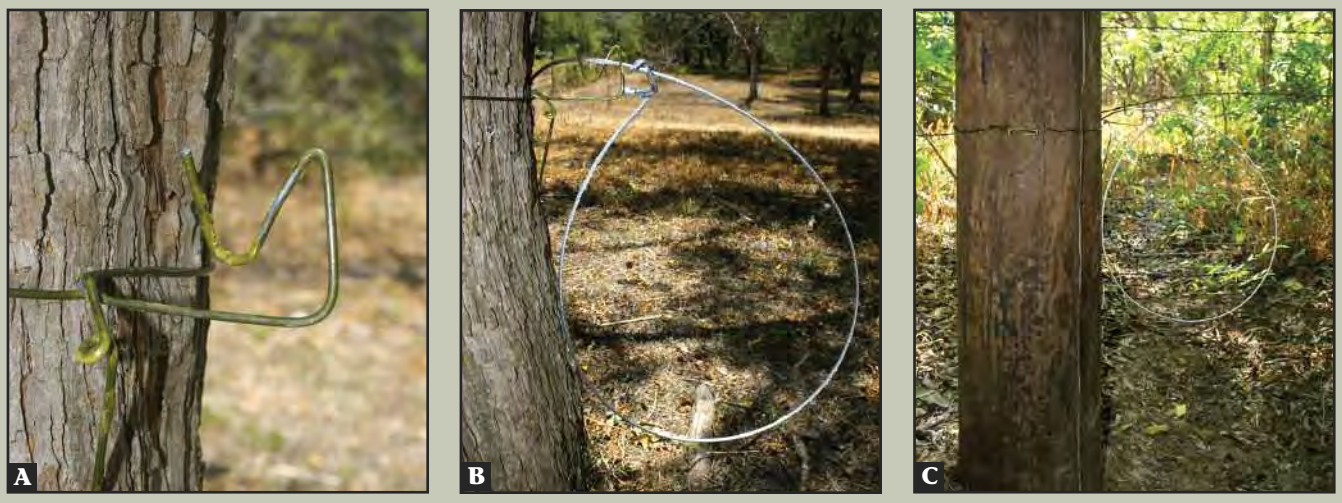
In areas where there is little risk of capturing sheep, goats, calves, deer, or other nontarget animals, snares can be set in trails used by hogs. Snares can also be set directly onto rubs that the hogs are using. Hogs rub against objects to scratch and remove parasites. Rubs may be found on utility poles, bridge pilings, or on trees surrounding wallowing areas (Fig. 4).

One advantage to setting snares on rubs is that you are much less likely to catch nontarget species. Also, you can set multiple snares in known wallowing areas where rubs are common, increasing the potential for capture.

A flexible yet durable piece of wire (clothing hanger or baling wire) can be used to hang the snare (Fig. 5A). Bend an inverted S-shape in the wire to give support to the snare. The tail end of the wire can be angled down into the tree or post for extra support. This method also ensures that the support wire does not slip.

When setting the snare, be sure to place the lock at either the 11 o'clock or 1 o'clock position to ensure that the snare triggers properly when a hog enters the loop (Fig. 5B).

Figure 5



Closeup of snare brace hanger (A). A brace made from a clothing hanger or other heavy wire can be used to set a snare at a rub location or a known feral hog trail (B). Feral hogs will return to this utility pole for rubbing (C). A wire brace was used to extend the snare into position.

To catch a 30-pound hog, make a loop of 10 to 12 inches and suspend it 7 to 8 inches off the ground. Increase the loop size and height to catch larger hogs (Fig. 5C); a loop size of 20 inches or more may be appropriate. If the snare is not long enough, use cable extensions to attach it to a tree, drag, pole, or steel stakes driven into the ground.

Avoid capturing nontarget animals

- Avoid setting snares on trails used by livestock and other nontarget animals.
- Do not set snares under fences where deer or dogs are known to pass.
- Keep detailed records on the locations and number of snares so that all can be found.
- Remove snares when they cannot be checked often.

State regulations

The Texas Parks and Wildlife Department (TPWD) regulates hunting in Texas, and a hunting license is required to take feral hogs for meat consumption or trophy. However, this requirement is waived if the landowner or lessee (if given landowner permission) takes feral hogs causing damage or depredation on the property.

Snares are not species specific, and they are likely to capture other animals. Consequently, it is recommended that you buy a hunting license, which is required for snaring animals such as bobcats, raccoons, and opossums.

When snaring feral hogs in Texas, you are not required to have deer stops, but it is a good idea to do so. A deer stop is a device that prevents the snare from closing past a certain point, allowing a captured deer to pull its leg out of the snare. Because it is illegal to snare deer, take proper precautions to avoid doing so.

If you use snares to capture feral hogs, follow the hunting laws outlined in the *TPWD Outdoor Annual* and contact the local TPWD game warden for more details on the use of snares for feral hog control.

Summary

Snares can be an important part of a feral hog management strategy. Although they can capture only one animal at a time and risk taking nontarget species, they can be an inexpensive, low-maintenance approach applicable to many different situations.

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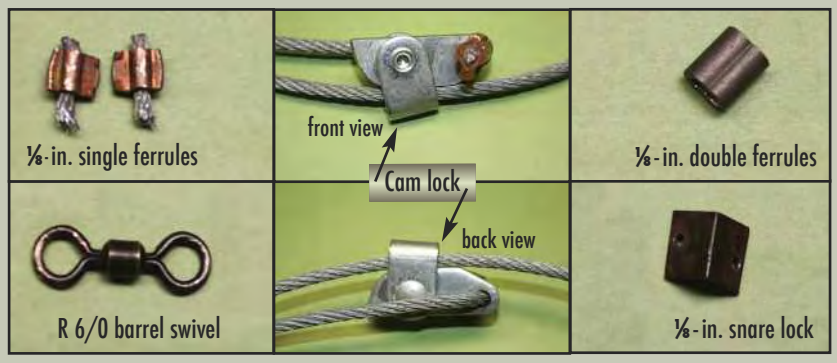
Making a Feral Hog Snare

*Chancey Lewis, Matt Berg, Nikki Dictson, Jim Gallagher, Mark McFarland, and James C. Cathey**

Increasing populations of feral hogs in Texas are damaging landscapes, agricultural production, water quality, and native plant and animal communities. To reduce these problems, snaring can be an easy, inexpensive part of a feral hog management strategy.

Snares can be used when a single hog needs to be captured and where larger traps are impractical. Because snares are easy to assemble, many landowners make their own.

Figure 1



Materials for creating a feral hog snare.

Materials needed

To make a hog snare, you will need the following tools and materials (Fig. 1):

- Needle-nose pliers
- Hammer
- Cable cutters
- Tape measure
- 10 feet of ⅛-inch steel cable
- Two ⅛-inch single ferrules
- One ⅛-inch double ferrule
- One R 6/0 barrel swivel
- One ⅛-inch snare or cam lock

Figure 2

Run the cable through the snare lock.

Steps for building a snare

When building a feral hog snare, keep in mind that the cable used to make snares has a natural lay, or memory. Do not go against the memory of the cable when working with snares.

1. Feed the cable through the snare lock (Fig. 2). For this example, a ⅛-inch snare lock is used. There are many different lock designs, and some people make their own.
2. Take a single ferrule and crimp it to the end of the cable (Fig. 3). This can be accom-

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Figure 3

Run the cable through the snare lock.

Figure 4

Reverse bend above single ferrule to secure the snare lock.

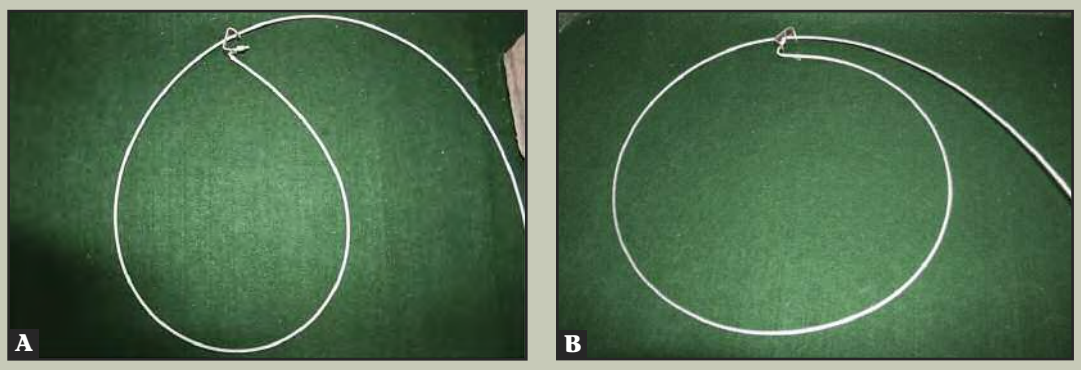
plished by using fencing crimpers or a hammer and hard surface.

3. Using needle-nose pliers, make a reverse bend in the cable just beneath the ferrule (Fig. 4). This will be the only time that the cable is bent against the memory. The reverse bend helps secure the lock.
4. Load the snare. Simply find a durable round or cylindrical object such as a pipe or vice handle. For the snare in this example, the trailer ball on a receiver hitch was used. When loading the snare, it is critical that the natural memory of the cable is followed. Only 8 to 10 inches beyond the ferrule stop needs to be loaded. This serves two purposes: 1) it gives the snare a more circular shape, which is important to capture animals with large, pointy ears like those of hogs, and 2) it enables the snare to close much more easily and freely.
5. Move the snare back and forth, applying firm pressure near the stop while gradually lessening the pressure down the cable near the 10 inch mark (Fig. 5). An unloaded snare has a teardrop shape; a loaded snare is much rounder (Fig. 6).
6. Next, construct the end so that the snare can be attached to a tree, post, or drag. For this example, an adjustable end was made. An adjustable end can be altered to loop the end around various size objects; however, it will not swivel. To make an adjustable end snare, start by sliding a double ferrule over the end of the cable (Fig. 7A). Then run the cable back through the double ferrule (Fig. 7B).
7. Use a hammer or crimpers to attach a single ferrule to the end, creating the desired configuration (Fig. 8). A swivel end may be attached with two single ferrules for strength. Having an adjustable end is advan-

Figure 5

Load the snare by applying pressure as the cable is moved back and forth.

Figure 6



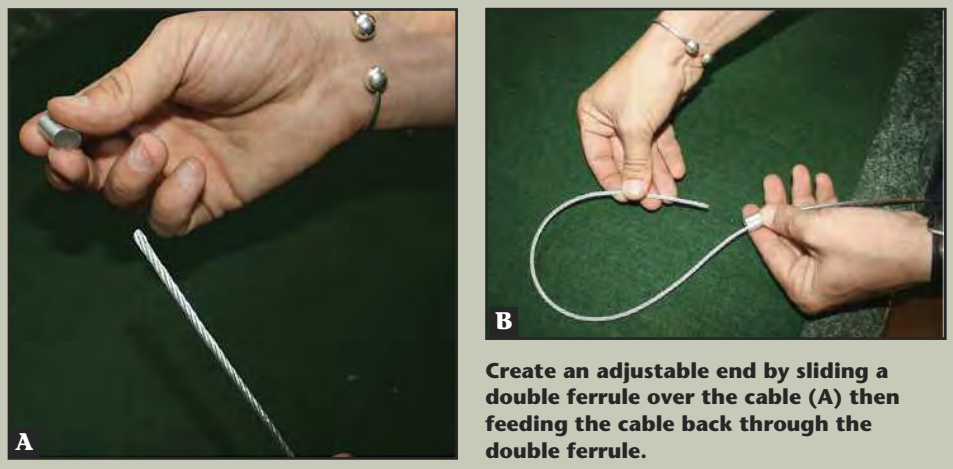
A constructed snare before the cable is loaded (A), and after (B).

tageous when setting snares on rubs or trees. The end can be opened, and the snare loop can be wrapped around the rub or tree and then back through the snare end, attaching the snare to the rub or tree.

Summary

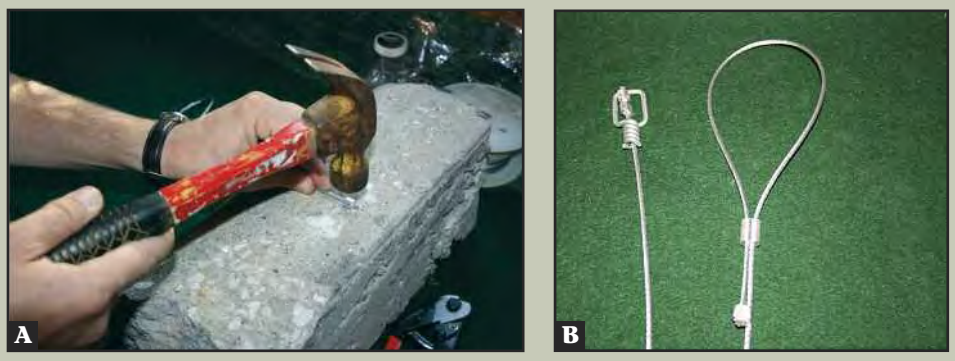
Used as a complement to other approaches or in areas where larger traps are impractical, handmade snares can be a helpful tool in feral hog management. With simple tools and minimal hardware, snares can be made quickly at low cost, increasing their appeal in situations involving the capture of a single animal.

Figure 7



Create an adjustable end by sliding a double ferrule over the cable (A) then feeding the cable back through the double ferrule.

Figure 8



Attach a ferrule to the end of the cable (A). The snare can be designed with a swivel end (B-left) or an adjustable end (B-right).

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Practices Eligible for Cost-Share Assistance

1. Watering Facility
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4. Pipeline
5. Cross Fencing
6. Riparian Herbaceous Buffer
7. Riparian Forest Buffer
8. Rangeland Planting
9. Pasture and Hayland Planting
10. Grassed Waterways
11. Field Borders
12. Filter Strips
13. Critical Area Planting

Caldwell-Travis Soil and Water Conservation District and Hays County Soil and Water Conservation District

NRCS

Soil Water TSSWCB

Plum Creek Watershed Partnership

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Version 08/12/2009

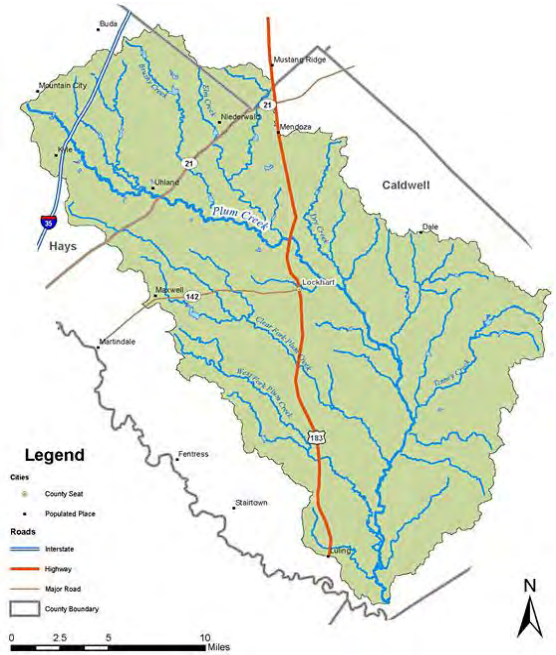
TECHNICAL AND FINANCIAL ASSISTANCE FOR RANCHERS AND FARMERS IN THE PLUM CREEK WATERSHED

Caldwell-Travis Soil and Water Conservation District and Hays County Soil and Water Conservation District

Plum Creek Watershed

In 1998 and 2002, water quality data in Plum Creek indicated high levels of nutrients and bacteria. By 2004, some stretches of Plum Creek in both urban and rural areas were identified as not meeting the State Water Quality Standard for bacteria and not supporting contact recreation (swimming and wading). High levels of bacteria suggest fecal contamination and the possible presence of pathogens which pose a health risk to humans. Elevated levels of nutrients can affect dissolved oxygen levels impacting aquatic life (fish).

Through analysis of water quality data from across the watershed, human (wastewater treatment facilities and septic systems) and animal (livestock, pets, wildlife) waste was identified as a significant potential contributor of pollutants to Plum Creek. Additionally, runoff from cropland and urban land was identified as a potential contributor of nutrients to the creek.



The Caldwell-Travis Soil and Water Conservation District (SWCD), the Hays County SWCD, and the Texas State Soil and Water Conservation Board (TSSWCB) have partnered to provide technical and financial assistance to ranchers and farmers in order to reduce bacteria and nutrients in Plum Creek through the implementation of best management practices on agricultural lands. Through a grant from the TSSWCB, the Caldwell-Travis SWCD will aid producers in the development, certification, and implementation of water quality management plans (WQMPs) on pastureland, rangeland, and cropland.

What is a Water Quality Management Plan?

A WQMP is a site-specific plan developed through and approved by SWCDs for agricultural and silvicultural lands. The plan includes appropriate land treatment practices, production practices, management measures, technologies or combinations thereof. The purpose of a WQMP is to achieve a level of pollution prevention or abatement determined by the TSSWCB, in consultation with SWCDs, to be consistent with State Water Quality Standards.

Process for Obtaining a WQMP

1. An owner or operator of agricultural land in the Plum Creek watershed requests planning assistance through the Caldwell-Travis or Hays County SWCDs.
2. The Caldwell-Travis SWCD Technician will provide technical assistance to individuals throughout the watershed in the development of a WQMP. There is no charge to the producer for the development of the WQMP.
3. The WQMP is agreed to by the landowner and then reviewed and certified by the TSSWCB.
4. The individual implements the WQMP on their land. Cost-share is available from the SWCDs and TSSWCB for certain practices in the WQMP.
5. The Caldwell-Travis SWCD Technician will conduct annual status reviews on all WQMPs implemented throughout the watershed to ensure that the landowners implement BMPs as specified and agreed to in the WQMP implementation schedule.

Benefits of Participating

By partnering with the Caldwell-Travis and Hays County SWCDs to implement a WQMP on your agricultural land, you will:

- Demonstrate that voluntary conservation programs promote agricultural production and environmental quality as compatible goals.
- Implement the Plum Creek Watershed Protection Plan to restore water quality in our local streams and creeks.
- Demonstrate to the State of Texas that you are voluntarily using the best available technology to prevent nonpoint source water pollution and comply with State Water Quality Standards.
- Have a strategic plan developed for your agricultural operation to help you make decisions on how to best manage your natural resources.
- Demonstrate to other sectors in the watershed (industry, municipalities, urban residents) that agriculture is doing our part to protect our local water resources.
- Enhance the value of your operation and achieve watershed-wide environmental goals at the same time.
- Be eligible for certain forms of cost-share to help defray costs of implementing management practices on your land.

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ESP-420
3/12

Feral Hog Laws and Regulations in Texas

Jared Timmons, James C. Cathey, Nikki Dictson, and Mark McFarland*
Texas AgriLife Extension Service
The Texas A&M University System

Landowners in the Plum Creek Watershed of Hays, Caldwell, and Travis counties are frustrated with the destructive habits of feral hogs. Landowners want to know who owns feral hogs and when that person or agency will get rid of them. In the end, they may be surprised by the answer. No one owns feral hogs—at least not until they are captured or killed by someone on private or public lands.

Feral hogs originated from domestic sources and were first introduced into the U.S. by early explorers and settlers as a food source. Subsequent escapes from holding pens or intentional releases resulted in a free-ranging population currently estimated to be between 1.9 and 3.4 million in Texas alone.

Feral hogs are not a game or non-game species in Texas. Instead, feral hogs are considered exotic livestock as described in Texas Parks and Wildlife Code Section 1.101(4) and Texas Agriculture Code 161.001(a) [4]. Because of this distinction, they are not owned by anyone until they express control of the animal according to the Texas Agriculture Code Section 161.002.

Here, the codes states, "A person is subject to this chapter as the caretaker of an animal and is presumed to control the animal if the person:(1) is the owner or lessee of the pen, pasture, or other place in which the animal is located and has control of that place; or (2) exercises care or control over the animal. (b) This section does not limit the care and control of an animal to any person."

Agricultural Damage by Hogs

According to the Texas AgriLife Extension Service, feral hogs in Texas cause an estimated $52 million dollars in damage to the agricultural industry annually (Figure 1). This figure does not account for damage in suburban areas or growing concerns over impacts to water quality, as in the Plum Creek Watershed.

Removal

Landowners or their agents are allowed to kill feral hogs on their property without a hunting license if feral hogs are causing damage. However, any landowner that plans to trap or snare hogs should have a valid Texas hunting license, since these activities could affect other wildlife species.

Figure 1. Damage to pasture from rooting by feral hogs.

*Authors are Extension Assistant; Associate Professor and Extension Wildlife Specialist; Extension Program Specialist; Professor and Extension Soil Fertility Specialist, respectively.

Figure 2. Feral hogs captured in a corral trap.

Figure 3. Feral hog captured in a box trap.

Hunting Requirements

For those who hunt feral hogs for trophy and/or food, a Texas hunting license is required. The Texas Parks and Wildlife Department (TPWD) outlines license requirements and specific legal hunting methods in its annual hunting and fishing regulations publication, the Outdoor Annual. A hunting license permits the use of firearms, snaring and trapping (Figures 2 and 3).

Exotic species, including the feral hog, may be hunted throughout the year. Aerial gunning is allowed with a permit from the TPWD. There is no closed season and no bag limit. It is legal to use suppressors (silencers) on firearms to hunt feral hogs, but an Alcohol Tobacco Firearms Form 4 must be completed to purchase a supressor. Feral hogs may be hunted at night with the use of a spotlight or night vision, but it is a good idea to provide a courtesy call to your local game warden to let them know you will be hunting feral hogs.

Additional Information

To hone your knowledge of feral hogs and methods for their control, several publications were developed by the Texas AgriLife Extension Service and can be downloaded at no charge by going to the Plum Creek Watershed Partnership website at *http://plumcreek.tamu.edu/feralhogs.*

This website also has an on-line tool which allows landowners and the general public to report feral hog sightings and control measures.

Contact Information

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Using Fences to Exclude Feral Hogs from Wildlife Feeding Stations

Jared Timmons[1], Justin Rattan[2], Tyler Campbell[3], David Long[4], Billy Higginbotham[5], Duane Campion[6], Mark McFarland[7], Nikki Dictson[8], and James C. Cathey[9]

Research conducted in the South Texas Brush country has found that exclosure fences are an effective way to keep feral hogs from eating corn and supplemental feeds that are intended for other animals. These fences protect corn and protein pellets from feral hogs and though labor intensive, they will pay for themselves in feed savings. (Fig. 1A)

Wildlife managers and hunters manage many properties for white-tailed deer. They use corn as feed and as bait to attract them into hunting areas. They also provide supplemental feed such as protein pellets in order to increase antler scores, body weights, survival and fawn production.

Hunters and land managers put out thousands of tons of corn each year and though most of this corn is intended for deer, feral hogs consume a substantial portion of it (Fig. 1B). Hogs also are detrimental to other game species such as ground-nesting birds like quail and wild turkey.

Figure 1A
An exclusion fence can be constructed around a broadcast corn feeder.

Figure 1B
When there are no fences, feral hogs routinely eat the corn that is meant to attract deer.

Keeping hogs out of the corn

To determine whether fencing could exclude feral hogs while still allowing deer to enter the feeding area, researchers with the U.S. Department of Agriculture and AgriLife Extension Service erected various heights of welded-panel fences and studied their effectiveness.

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1,2,5,6,7,8,9, The Texas A&M University System

Figure 2

Feral hogs were partially excluded from the bait station using 20-inch fences; 28-inch and 34-inch hog panels excluded them completely.

Figure 3

White-tailed deer can access feed protected by 20- and 28-inch utility panels and 34-inch hog panels.

The fences tested were 20, 28, and 34 inches tall. The 20- and 28-inch fences used six 16-foot-long utility panels with 4-inch squares. The 34-inch fence was constructed using graduated hog panel, with the smaller openings closest to the ground. Where the panels overlapped, they were tied to steel T posts with bailing wire. T-posts were also placed halfway between each overlap. Each exclosure measured 28 feet in diameter and was placed around a broadcast corn feeder.

The study was conducted in two phases, one during the summer of 2010 and the other in the fall. Researchers used remote-sensing infrared cameras to monitor the feeders for 2 weeks before and 2 weeks after setting the fences. They found that the 20-inch fence reduced feral hog access while the 28- and 34-inch-tall fences kept them out completely (Fig. 2).

Adult deer visits to the feeders did not decline significantly after the fences were erected. The 2009 drought severely limited the fawn crop and may be the reason that no fawns visited the feeders before or after the fences were built. Also, fawns have a lower social status and may have been kept away by more dominant deer. As fawns grow larger, their access to feeding stations should increase.

Another study was conducted by the Caesar Kleberg Wildlife Research Institute and Texas A&M University–Kingsville. This study found that fences taller than 33 inches limited fawn access to feeding stations. This group also conducted a study on exclosures around protein feeders and suggested that fences be 80 by 80 feet or larger to prevent deer from crowding while feeding.

The materials for the 20-, 28-, and 34-inch fences cost $170, $187, and $190 respectively. The 28-inch fence required more labor because 5-foot-tall utility panels were cut in half to create the six panels needed for the circular fence.

Choosing the right height

Remote-sensing infrared cameras can confirm if feral hogs are visiting your bait or feed stations. You can also inspect the area for hog tracks, rooting, rubs, and wallows. If hogs are a problem around your feeders, 28- or 34-inch-tall fences will keep them from reaching your corn. These two fence heights will keep out feral hogs but still allow adult deer to enter and feed (Fig. 3).

However, fencing that is 34 inches high may be too tall for fawns. When fawns are present, the 20- and 28-inch fences are a better choice. If you do build a fence that is 34 inches tall, you can improve accessibility for fawns by cutting at least two slots that are 6 inches deep by 3 feet wide into the top of the fence. Also, place the smaller openings of the graduated panel closest to the ground.

Building the fence

A 28-inch-tall fence requires the following:

- Three 60-inch by 16-foot utility panels
- Twelve 5-foot T-posts
- Wire clips
- T-post driver
- Fencing pliers
- Bolt cutters

1. Use the bolt cutters to cut each panel length-wise exactly in half.
2. Place the utility panels end to end to form an approximately 28-foot-diameter circle

around the feeder. Overlap the ends by one 4-inch square and push the cut end into the ground.

3. Fasten the ends together with wire clips.
4. Position the fence so the feeder is in the middle of the circle.
5. Drive steel T-posts on the outside of the circle in the middle of each panel and where they overlap.
6. Fasten the T-posts to the panels with wire clips. Make sure the panels are flush to the ground and leave no gaps that hogs might dig under.

Deterring feral hogs has many benefits

In many parts of Texas, feral hogs damage landscapes, pollute the water, and hinder farming, ranching and wildlife management. They cause an estimated $52 million in damage to the state's agriculture industry each year.

Because feral hogs are non-native and damage water quality and wildlife management, fencing them from supplemental feed should be part of every ranch management plan.

See other feral hog resources at http://agrilifebookstore.org.

- L-5523 Recognizing Feral Hog Sign
- L-5524 Corral Traps for Capturing Feral Hogs
- L-5525 Box Traps for Capturing Feral Hogs
- L-5526 Placing and Baiting Feral Hog Traps
- L-5527 Door Modifications for Feral Hog Traps
- L-5528 Snaring Feral Hog
- L-5529 Making a Feral Hog Snare
- SP-419 Feral Hogs Impact Ground-nesting Birds
- SP-420 Feral Hog Laws and Regulations
- SP-421 Feral Hogs and Disease Concerns
- SP-422 Feral Hogs and Water Quality in Plum Creek
- SP-423 Feral Hog Transportation Regulations

Suggested readings

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