

NOLAN CREEK

Outreach and Education Strategy for the Nolan Creek/South Nolan Creek Watershed



Prepared for:

**Texas Commission on Environmental Quality
Nonpoint Source Program CWA §319(h)
Contract No. 582-13-30061**

Prepared by:

Texas Institute for Applied Environmental Research

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For more information about this document or any other documents TIAER produces, send email to info@tiaer.tarleton.edu. More information about the Nolan Creek/South Nolan Creek project can be accessed from the project website at: <http://www.killeentexas.gov/nolancreekwatershed>.

Cover photograph is Nolan Creek at SH 93 in Belton (station 14237) taken on June 10, 2015.

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SECTION 1

Introduction

Background, Sources, and Goals

Background

Assessment units (AUs) 1218_02 and 1218C of Nolan Creek/South Nolan Creek are listed by the Texas Commission on Environmental Quality (TCEQ) as impaired for primary contact recreation based on elevated bacteria concentrations (TCEQ, 2013a; Figure 1-1). Concerns are also noted for nitrates, orthophosphorus, and total phosphorus (TCEQ, 2013b). To address these impairments and concerns, the Nolan Creek Partnership (Partnership) has developed an educational and outreach program, which is outlined within this report.

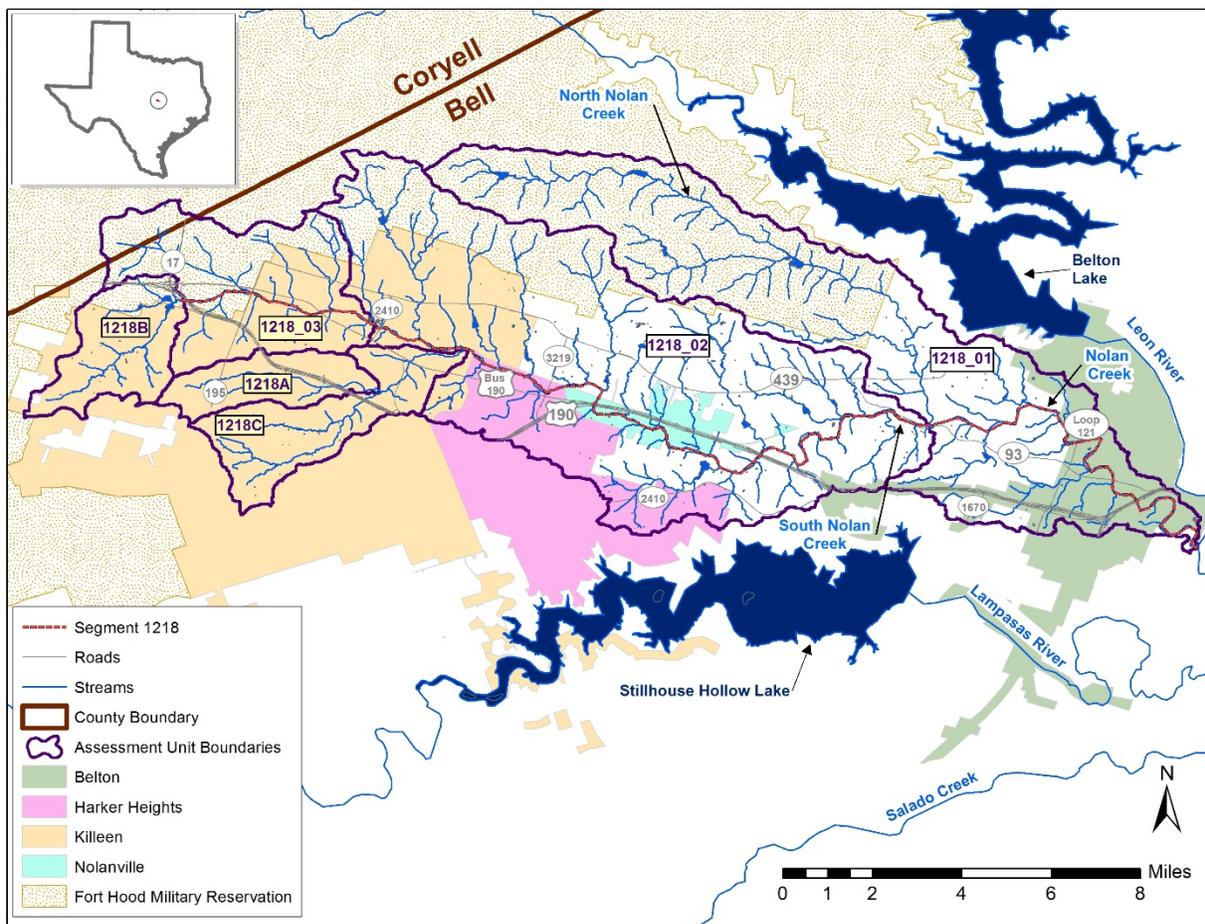


Figure 1-1 Watershed and assessment units associated with Segment 1218, Nolan Creek/South Nolan Creek. Inset shows watershed location within the State of Texas.

Sources

Major sources of bacteria and nutrients, as listed the 2012 TCEQ Integrated Report on Surface Water Quality, come from point and nonpoint sources within the Nolan Creek/South Nolan Creek watershed (TCEQ, 2013c). Nonpoint sources listed include municipal runoff from high density, urbanized areas and on-site treatment systems, often referred to as septic systems. Municipal point sources are largely related to unauthorized discharges from wastewater treatment facilities (WWTFs) and/or the related collection system.

To further evaluate potential sources, a study conducted by the City of Killeen in the upper portion of the watershed with monitoring data collected between October 2006 and February 2008 found low bacteria levels above 38th Street and confirmed elevated bacteria concentrations between Twin Creek Drive and Ann Boulevard within the City of Killeen (Nett and Flowers, 2008). Elevated bacteria were also noted along Long Branch and Little Nolan Creek. From this study, a positive correlation was observed between the number of septic tanks in the drainage area above sampling stations and bacteria concentrations (Nett and Flowers, 2008).

More recent monitoring conducted from May 2013 through June 2015 continued to show elevated concentrations all along Nolan Creek/South Nolan Creek from its crossing at Twin Creek Drive in Killeen to the most downstream sampling station in Yettie Polk Park in Belton (McFarland and Adams, 2015a). Of note, sampling stations upstream of Twin Creek Drive at 38th Street in Killeen and above the WWTF discharge of the Bell County Water Control and Improvement District (WCID) #1 Main Plant generally indicated bacteria concentrations below the assessment criterion (126 cfu/100 mL for primary contact recreation). On occasion all along the creek, “spikes” in bacteria concentrations were observed in routine monthly monitoring data that were clearly associated with sewer system overflows (SSOs) or fish kills (McFarland and Adams, 2015a), but pinpointing specific sources for the continuous loading of bacteria to the creek appears to vary with location in the watershed (McFarland and Adams, 2015b; 2015c). Highly urbanized areas include the cities of Killeen, Harker Heights, and Nolanville in the upper to mid portion of the watershed and the city of Belton in the lowermost portion (Figure 1-2). The landscape between Nolanville and Belton is largely rural and dominated by grassland and forest, used mainly for livestock grazing.

Major sources of bacteria in the watershed, as perceived by stakeholders based on feedback at a meeting on September 24, 2014, include:

- Stormwater, pets, grackles/pigeons, septic systems
- Sanitary sewer leaks, OSSF (*on-site sewage facility*) failures
- Domestic animals, wildlife, farms, SSOs (*sanitary sewer overflows*), Ft Hood land disturbance
- Residential septic system, municipal sanitary sewer overflows
- Street/yard/ag runoff, livestock
- Stormwater runoff from small feeder lines in east Killeen
- Unsure
- Wastewater plant emissions, sewage drainage during storms

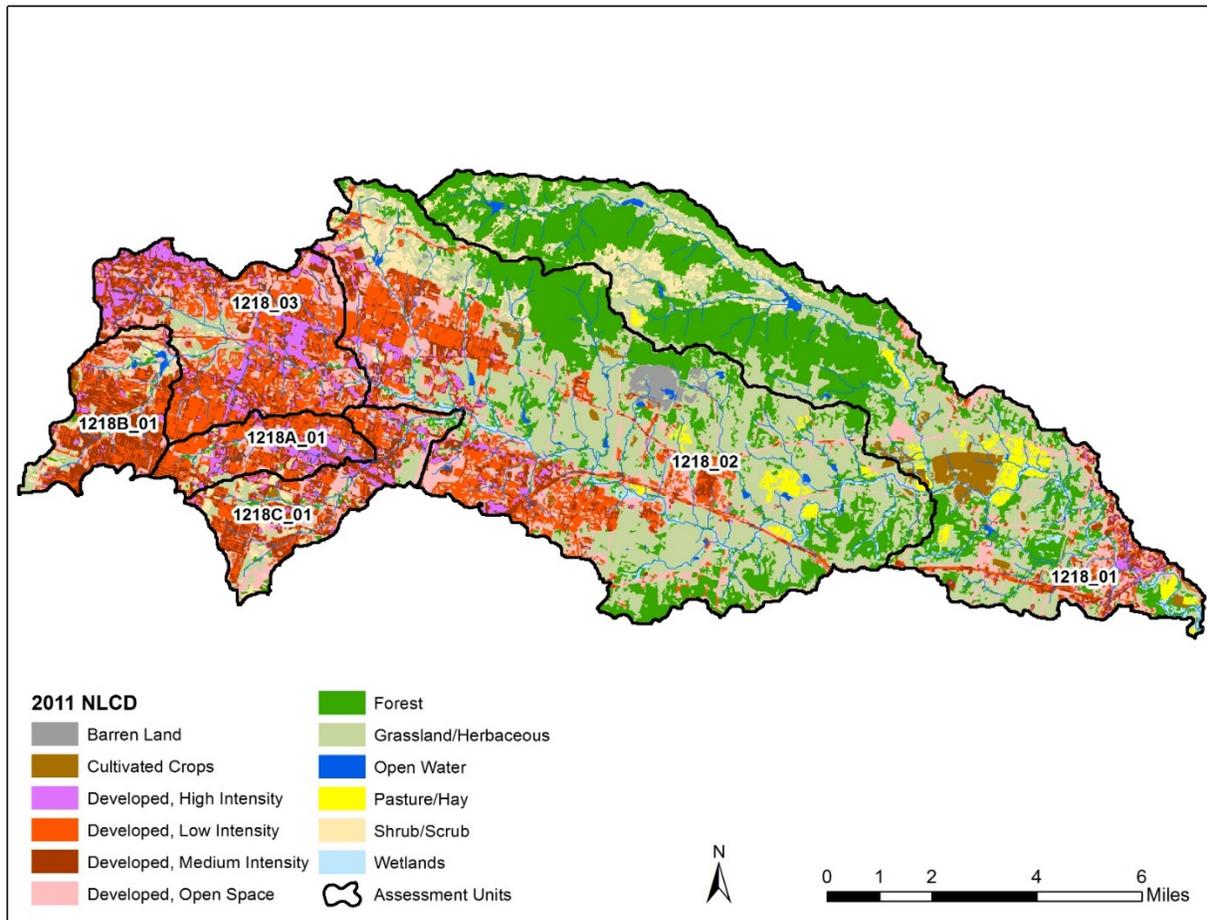


Figure 1-2 Land use/land cover for the Nolan Creek/South Nolan Creek watershed showing developed subcategories. Source: 2011 National Land Cover Database (USGS, 2014).

These responses recognize the contributions of nonpoint sources associated with stormwater runoff, but also indicate issues with septic systems and unauthorized discharges from the sewer collection system as contributing factors. The use of modeling tools and monitoring has aided in confirming a complex of rural and urban bacteria contributions within the Nolan Creek/South Nolan Creek watershed (McFarland and Adams, 2015a and 2015c).

Goals

To enhance public understanding of the water quality issues and encourage continued public participation in selecting and implementing nonpoint source control practices, an information and educational outreach strategy is needed. The primary goal in the watershed is to reduce bacteria concentrations to levels that would remove assessment units within the Nolan Creek/South Nolan Creek watershed as impaired water bodies from the Texas 303(d) list. This goal means numerically reducing the geometric mean of *Escherichia coli* (*E. coli*) concentration based on routine monitoring data to less than 126 cfu/100 mL, the criterion of primary contact recreation within the Texas Surface Water Quality Standards. A secondary goal is to reduce nutrient concentrations for nitrate, orthophosphorus, and total phosphorus to below screening

levels. Screening levels are used by the State of Texas to indicate concerns for elevated nutrient concentrations in water bodies and represent the 85th percentile of statewide data for freshwater streams (TCEQ, 2012). For Texas, screening levels are 1.96 mg/L for nitrate, 0.37 mg/L for orthophosphorus, and 0.69 mg/L for total phosphorus.

Objectives of the educational and outreach strategy fall into three broad categories:

- Creating awareness of the issues within the watershed
 - What are the impairments and concerns for Nolan Creek/South Nolan Creek and why are these important to stakeholders?
- Providing information on causes of these issues
 - What is causing these elevated concentrations of bacteria and nutrients?
- Encouraging action
 - What can be done to reduce bacteria and nutrient levels in Nolan Creek/South Nolan Creek to improve stream health, i.e., meet our water quality goals?

Stakeholders and Stakeholder Involvement

To have a successful educational and outreach program, the appropriate stakeholders and stakeholder groups need to be identified. According to the Environmental Protection Agency (EPA), a stakeholder “is a person (or group) who is responsible for making or implementing a management action, who will be significantly affected by the action, or who can aid or prevent its implementation” (EPA, 2013). Thus, for improvements to occur stakeholder involvement is vital, and education and outreach is needed. Stakeholders are often not aware of the impact that their daily lives have on the health of their watershed. Creating an awareness of the water quality issues within Nolan Creek/South Nolan Creek is a first step. Equally important is providing stakeholders the necessary information regarding sources, so they can make informed decisions about the appropriate actions needed in their watershed.

Stakeholders within the Nolan Creek/South Nolan Creek watershed fall into three major categories: 1) individuals and citizen groups, 2) local and regional governmental bodies, and 3) state and federal entities (Table 1-1).

Table 1-1 Summary of watershed stakeholders.

Individuals and Citizen Groups	Local & Regional Government Bodies	State & Federal Entities
Landowners, particularly those with riparian property	Bell County Commissioners	Fort Hood
Environmental & Conservation Groups (e.g., Central Texas Master Naturalists)	City Governments for Killeen, Harker Heights, Nolanville & Belton	TCEQ
Recreationalist (people who boat, fish, swim, wade or otherwise use the creek for recreation)	Soil & Water Conservation District, Central Texas SWCD #509	EPA
Recreational Groups (e.g., Bell County Outdoor Adventures)	Bell County Water Control & Improvement Districts (Bell County WCID #1 & #3)	Brazos River Authority
Community Service Organizations (e.g., Rotary, Lions Club, Optimist)	Municipal Utility Districts (MUDs)	Texas State Soil & Water Conservation Board (TSSWCB)
Texas Stream Team Volunteers	Water Supply Corporations	United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS)
Homeowner's Associations	Wastewater Treatment Facility Operators	
Business & Industry Representatives (e.g., Farm Bureau)	Central Texas Council of Governments	
Religious Organizations	Universities & Colleges (e.g., University of Mary Hardin-Baylor in Belton, Central Texas College in Killeen, and Texas A&M University - Central Texas in Killeen)	
	Schools and Independent School Districts (ISDs)	

A public participation plan (PPP) has been developed that further defines these groups, and through on-going efforts, a stakeholder list has been developed of individuals and groups within the watershed representing the core stakeholder group (City of Killeen, 2013). To make the outreach and educational program successful, the message and delivery mechanisms need to be identified to reach each of these various target audiences. The plan is to take a two-step

educational and outreach approach. The first step involves an awareness campaign to educate the public and local governmental bodies on nonpoint source pollution to aid in development of a watershed protection plan (WPP). This will be accomplished through the development of brochures, newsletters, and fliers with the message of the Partnership distributed at public meetings, in newspapers, on the internet, and via local events. The second step will involve the presentation of programs that not only address awareness and provide information, but encourage action in implementing specific control practices. Of note, some of the activities identified will be accomplished through routine educational and outreach efforts by city and county staff as part of their Municipal Separate Storm Sewer System (MS4) permits, while other activities will require additional funding that will be sought by the Partnership through external sources, including Clean Water Act Section 106 and 319(h) grant funds.

The rest of this report outlines past and on-going efforts as well as programs and activities targeting specific audiences and sources within the watershed. An evaluation process is also needed to make sure the appropriate target audiences are being reached, the messages provided were effectively developed, and the overall educational and outreach program is having an impact. An overview of how the educational and outreach strategy will be assessed is described, along with a summary of the overall proposed program.

SECTION 2

Creating Awareness and Providing Information

Public Meetings

As part of the Nolan Creek/South Nolan Creek educational and outreach effort, public stakeholder meetings provide an opportunity to inform and update a wide range of stakeholder groups on watershed issues and upcoming activities. Public meetings have generally been held biannually since 2013, and while most of these have been held in the City of Killeen, future meetings will rotate throughout the watershed to reach more of the watershed stakeholders. Meetings to date occurred on:

- July 31, 2013, in Killeen
- September 5, 2013, in Harker Heights
- January 16, 2014, in Killeen
- September 25, 2014, in Killeen
- October 8, 2015, in Killeen
- January 20, 2015, (upcoming) in Harker Heights

The number of attendees at these public meetings varied from 14 to 27 individuals. These meetings have provided awareness regarding water body impairments and concerns as well as information and updates on water quality monitoring data and identification of various sources in the watershed of bacteria and nutrients. During each public meeting, stakeholders were asked to provide insight regarding known or perceived sources of bacteria to Nolan Creek/South Nolan Creek. In addition to these general public meetings, meetings have been held with administrative stakeholders in the watershed representing primarily local government entities.

As part of the educational and outreach strategy, general public meetings will be continued on a biannual basis with at least annually a meeting specifically aimed at administrative stakeholders representing the local and regional government entities in the watershed (Table 1-1). Although categorized as federal, representatives from Fort Hood will be considered part of the local and regional government entities for these administrative meetings.

Partnership Website

The Nolan Creek Watershed Partnership website is currently hosted by the City of Killeen (<http://www.killeentexas.gov/nolancreekwatershed>) (Figure 2-1). As the Partnership matures, plans are in place to migrate this website to a public domain so a watershed coordinator can maintain it. This website provides stakeholders with direct access to project background information as well as meeting information, materials, publications, newsletters, and contact information.

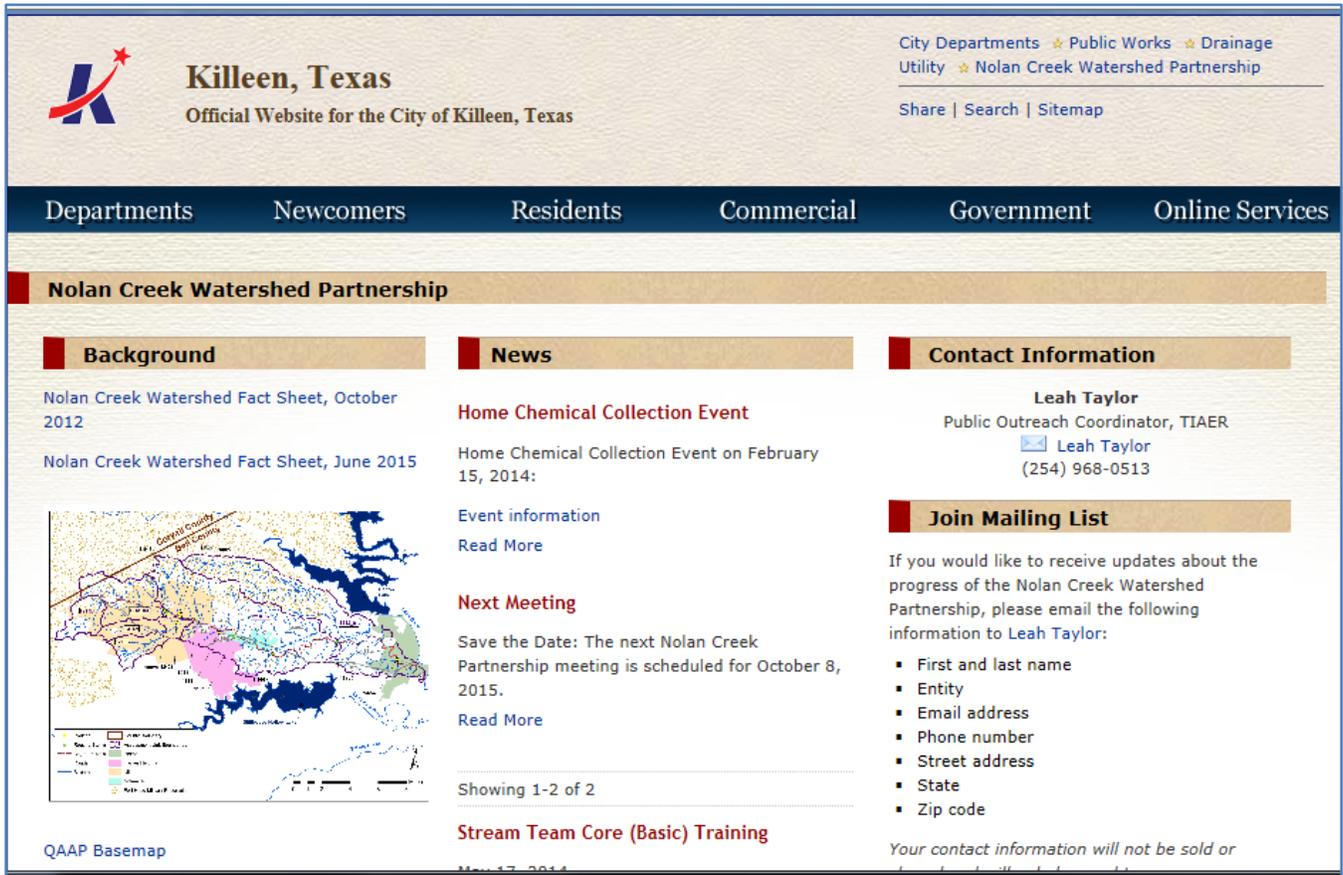


Figure 2-1 Screen capture of current Partnership website.

Nolan Creek/South Nolan Creek Fact Sheet

An “Assessment of Water Quality and Watershed Based Planning for Nolan Creek” fact sheet was created as an easily distributed, educational tool for stakeholders (Figure 2-2). The fact sheet provides a background of the Nolan Creek/South Nolan Creek watershed, a description of the project, and the project’s current status. Additionally, the fact sheet has a map of the Nolan Creek/South Nolan Creek watershed and contact information for project managers. As part of the watershed planning process, a similar fact sheet will be developed and updated at least annually to provide stakeholders an overview of the planning process.



Texas Commission on Environmental Quality
Nonpoint Source Program



Assessment of Water Quality and Watershed Based Planning for Nolan Creek

Water Body	Nolan Creek / South Nolan Creek (Seg 1218)
Location	Bell County
River Basin	Brazos River Basin (12)
Contractor	Texas Institute for Applied Environment Research (TIAER)
Project Period	September 1, 2012 to August 31, 2015
Project Total	\$459,418 (Federal 60% and Local Match 40%)

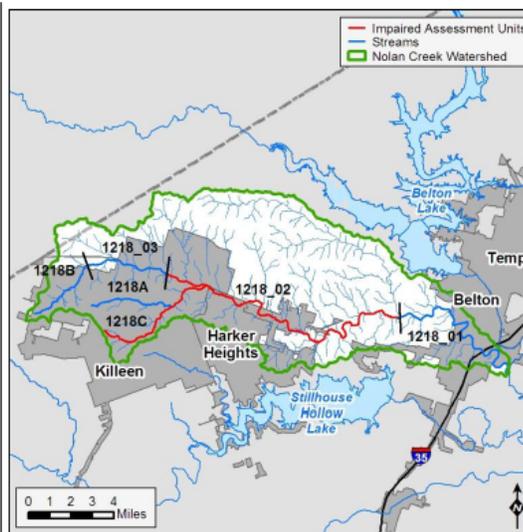
Background

Segment 1218 was first listed on the 1996 303(d) List for elevated bacteria concentrations. The 2010 303(d) List identifies assessment unit 1218_02 (portion of South Nolan Creek from confluence with North Nolan/Nolan Creek fork upstream to confluence with Liberty Ditch in City of Killeen in Bell County) and 1218C (Little Nolan Creek from confluence with Nolan Creek/South Nolan Creek upstream to headwaters in the City of Killeen, Bell County) for elevated bacteria concentrations. Both assessment units are classified as 5b, indicating that a review of the water quality standards for this water body will be conducted before a total maximum daily load (TMDL) will be scheduled. In addition, the 2010 Texas Water Quality Inventory identifies the following concerns: nitrate, total phosphorus, and orthophosphorus.

Project Description

Through this project, project partners and collaborating entities will work with local stakeholders to progress through the data collection and analysis components of the first two tiers of the Bacteria TMDL Task Force recommended three-tier approach. The goal of the data collection and analysis effort is to remove waterbodies in the study area from the 303(d) List; however, the mechanism is not predetermined. This three-year assessment project may conclude: 1) waterbodies are achieving current water quality standards, 2) adequate data exists to develop a Watershed Protection Plan, or 3) adequate data exists to develop a TMDL and Implementation Plan for TCEQ adoption.

This project should complete Element A and address large portions of Element B of the nine required elements of a watershed plan specified in the Environmental Protection Agency's Handbook for Developing Watershed Plans to Restore and Protect Our Waters.



Current Status

Water quality monitoring, data inventory, public participation activities, and watershed analyses are ongoing. Evaluation tool for information and education activities has been developed.

For More Information

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June 2015

Figure 2-2 Example fact sheet for the Nolan Creek/South Nolan Creek watershed fact sheet.

News Releases

To keep stakeholders informed of partner's meetings, publications, and activities in the watershed, press releases will be developed and published. These press releases will be sent to local media outlets to advertise stakeholder meetings and events as well as document activities that have occurred in the watershed. Local newspapers will be utilized to encourage stakeholder involvement in Partnership meetings and activities.

Partnership Newsletters

Newsletters allow the presentation of more extensive information than a press release, and will be written and distributed semiannually to outline activities and progress within the watershed. Newsletters will include information for upcoming meetings and project events and will be distributed primarily via email and the project website, but also via United States Postal Service to stakeholders who have indicated that as their preferred method of contact. Newsletters will also be made available for distribution at public meetings and other local events to further reach and educate watershed stakeholders. The goal of all newsletters will be to provide written updates to stakeholders of information and activities regarding the watershed planning process and encouraging action towards implementation of practices to improve water quality.

Brochures

As a tool to increase awareness about watershed issues, a tri-fold brochure was created that has been distributed at stakeholder meetings (Figure 2-3). This brochure will be updated and others developed to provide a quick and easy method to convey general watershed information. This example brochure includes a brief description of the Nolan Creek watershed, the creek's status on the Texas 2012 Integrated Report, as well as project goals and objectives (Figure 2-3). This tri-fold serves as an example of how information could be distributed directly to stakeholders at meetings or events.

DATA

2012 Texas Integrated Report

Assessment Unit	@Water Quality	@Primary Contact Recreation/Outdoor
1218_02	~180	~120
1218C	~180	~120

Parameter	@Water Quality	@Recreation/Outdoor
Nitrate	~10	~10
Phosphate	~1	~1

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Texas Institute for Applied Environmental Research

**NOLAN CREEK/
SOUTH NOLAN CREEK
PROJECT
BACKGROUND**

PREPARED IN COOPERATION WITH THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY AND U.S. ENVIRONMENTAL PROTECTION AGENCY

The preparation of this report was financed through grants from the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality

WATER QUALITY STANDARDS

Water Quality Standard

- The designated beneficial uses of a water body and the water quality criteria necessary to protect those uses

Clean Water Act

- Requires States to establish Water Quality Standards to achieve objectives and goals of the Act
- Requires Texas to identify water bodies failing to meet or not expected to meet water quality standards and not supporting their designated uses

Texas Water Quality Inventory & 303(d) List

- The list of Texas impaired water bodies

Station 18828, South Nolan Creek at 38th St (15Oct2013)

NOLAN CREEK/SOUTH NOLAN CREEK IMPAIRMENTS (SEGMENT 1218)

2012 Texas 303(d) List Assessment Units	Impairments or Concerns:
<ul style="list-style-type: none"> 1218_02—South Nolan at Liberty Ditch in Killen to the confluence with North Nolan Creek west of Belton 1218C—Little Nolan Creek in and south of Killen 	<ul style="list-style-type: none"> Bacteria impairment and Concerns for Nutrients Bacteria impairment

Why Bacteria?

- Elevated levels of bacteria (*E. coli*, fecal coliform) indicate possible fecal contamination influencing recreational use
- Potential presence of disease-causing pathogens that may result in illness if ingested

Why Nutrients?

- Nitrates cause potential human health issues if high concentrations occur in drinking water
- Elevated Nitrogen & Phosphorus concentrations raise environmental concerns in that they can cause excessive algae growth in surface waters also known as accelerated eutrophication (Nolan Creek is NOT currently listed for excessive algae.)

PROJECT GOALS

- Evaluate potential sources
 - Geographical inventory
 - Water quality monitoring program
 - Focuses on *E. coli* but also includes nutrients
 - Monthly routine sampling
 - 11 sampling stations
 - Quarterly storm sampling stations
 - 4 sampling stations
- Identify targeted control practices
- Identify future watershed needs

The ultimate goal of the data collection and analysis effort is to remove water bodies in the study area from the 303(d) List; however, the mechanism is not predetermined.

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Figure 2-3 Example Nolan Creek watershed brochure.

Fliers

Fliers are another way to market awareness of upcoming activities in the watershed relating to Nolan Creek/South Nolan Creek. Fliers are generally one page and easily copied for distribution. An example of a flier developed for the Partnership is shown below (Figure 2-4). This flier includes a brief background of the water quality issue as well as upcoming events that may be of interest to stakeholders. The flier is designed to be updated semiannually to promote activities in the watershed that may educate and encourage action that will help improve water quality.

Assessment of Water Quality & Watershed Based Planning for Nolan Creek

Why Nolan Creek?

Portions of Nolan Creek/South Nolan Creek currently do not support its designated uses and needs improving. Cleaner water allows for recreational use such as swimming, fishing, wading, and canoeing. Recreational use of Nolan Creek/South Nolan Creek promotes a stronger economy and healthier lifestyle for area residents.

Here's How YOU can get involved!

Upcoming Events

October 27: Brazos River Authority Board of Directors Meeting

Community Involvement

October 10: City of Killeen's Barktober Fest
October 24: City of Killeen's Make A Difference Day
October 30: Submissions due for City of Belton's Clean Water Art Contest

Goals for Nolan Creek

To restore good water quality throughout Nolan Creek/South Nolan Creek Watershed and to involve and educate residents on healthy water conservation of their watershed.

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PREPARED IN COOPERATION WITH THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY AND U.S. ENVIRONMENTAL PROTECTION AGENCY
The preparation of this report was financed through grants from the U.S. Environmental Protection Agency through the Texas Commission on Environmental Quality.

Figure 2-4 Example flier for the Nolan Creek watershed.

Watershed Signage

During Nolan Creek/South Nolan Creek stakeholder meetings, ducks in park areas have been indicated as a source of bacteria. Particularly in parks along the creek within the City of Belton, an abundance of ducks congregating likely add to the bacteria issue. In an attempt to decrease duck populations by discouraging park goers from feeding ducks, signage, such as those used by the River Walk Watershed Alliance (RWWA) in San Antonio might be developed and located in area parks (Figure 2-5). This assumes adequate funding can be obtained for such signage. If not signage, fliers or brochures distributed at events in these parks may be another way to get this educational message distributed. Road signs along the creek indicating to people that they are in the Nolan Creek watershed may also be part of the awareness campaign.



Figure 2-5 Advertisement to discourage the feeding of wildlife used by the San Antonio River Authority Outreach and Education Program.

Community Events

There are numerous community events hosted annually by Bell County and cities within the Nolan Creek/South Nolan Creek Watershed (Table 2-1). The Partnership would like to work with the county and/or city hosting these events establish venues to create awareness about watershed issues and inform stakeholders. Depending on the event, the Partnership may have a booth with fliers and information or just have information available for distribution to attendees. While it is not likely that the Partnership would attend all events, a goal would be a minimum of at least four events per year.

Table 2-1 Examples of routinely scheduled events throughout the watershed.

Hosting City/County	Event	Month
City of Killeen	Celebrate Killeen Festival	May
	Killeen GIS Day	September or October
	Killeen ISD Science Fairs and Career Days	
	Barktober Fest	October
City of Belton	4th of July	July
	Belton ISD Science Fairs and Career Days	
City of Harker Heights	Harker Heights Fun Day at Purser Family Park	July
	Harker Heights ISD Science Fairs and Career Days	
Fort Hood	Fort Hood Earth Fest	April
Bell County	Bell County Kidfest	July/August
	Kids Expo at Bell County Expo Center	May
	Bell County Crops and Livestock Conference	
	Bell County Professional Groundskeeper Council	
	Bell County Water Symposium	November

SECTION 3

Encouraging Action

Because the sources of bacteria and nutrients in the watershed come from a wide range of sources, a variety of programs are needed to target different audiences. The focus below is on nonpoint runoff related to regional, rural, and urban programs. Presenting these programs will require effective cooperation among personnel from TIAER, the Texas State Soil and Water Conservation Board (TSSWCB), TCEQ, the Centex Sustainable Communities Partnership (CENTEX), Texas AgriLife, Natural Resources Conservation Service (NRCS), the Texas Water Resources Institute (TWRI), and other agencies and organizations involved in land and water resource management. In addition, city and county staff will play an important role in the dissemination of important information released through the Partnership. Some programs, particularly within the urban areas, will be realized through routine educational and outreach efforts by these groups as part of their MS4 permits and associated stormwater management plans (see Appendix A). Urban programs associated with MS4 permits would be promoted by the Partnership and used as venues for distribution of awareness and informational materials.

Many of the educational materials needed have already been completed by these organizations and others, so the Partnership will focus on using and modifying already existing materials and will aid in the development of new materials to address the specific issues and audiences of the watershed. The Partnership will also work to obtain the additional funding required to enhance and sustain the Partnership's Educational and Outreach program from external sources, such as the Clean Water Act, Section 106 and 319(h) grant funds.

Regional Programs

The Partnership will coordinate with local cities and the county to provide a means of regionally distributing the developed educational messages and supporting the identified organizations. Printed and electronic materials will be used to convey detailed information on specific topics related to stormwater management and nonpoint source pollution. Announcements addressing stormwater related topics, such as recycling, proper pesticide and fertilizer use, and proper household chemicals disposal may also be broadcast on local media. These Regional Programs will enable the Partnership to reach residents, public service employees, businesses, and other stakeholders in the watershed. Specific nonpoint source pollution educational programs that focus on the regional level are provided below. Besides the programs listed below, the Partnership will work to distribute grade-level appropriate educational materials within public schools and support citizen groups, such as the Bell County Master Gardeners and Master Naturalists, as stakeholders in the Partnership.

Texas Watershed Stewards

The Texas Watershed Steward program provides science-based, watershed education to help citizens identify and take action to address local water quality impairments. Texas Watershed Stewards learn about the nature and function of watersheds, potential impairments, and strategies for watershed protection. A Texas Watershed Stewards Program was hosted in the Nolan Creek watershed on September 19, 2013 (Figure 3-1), to encourage stakeholder participation in the watershed planning process. The program was open to all watershed residents including

homeowners, business owners, agricultural producers, decision-makers, community leaders, and other citizens. The Nolan Creek/South Nolan Creek Partnership found success in this program, and with cooperation from Texas AgriLife Extension Service would like to provide the opportunity for this program to be presented within again in the watershed at least once within the next three years.

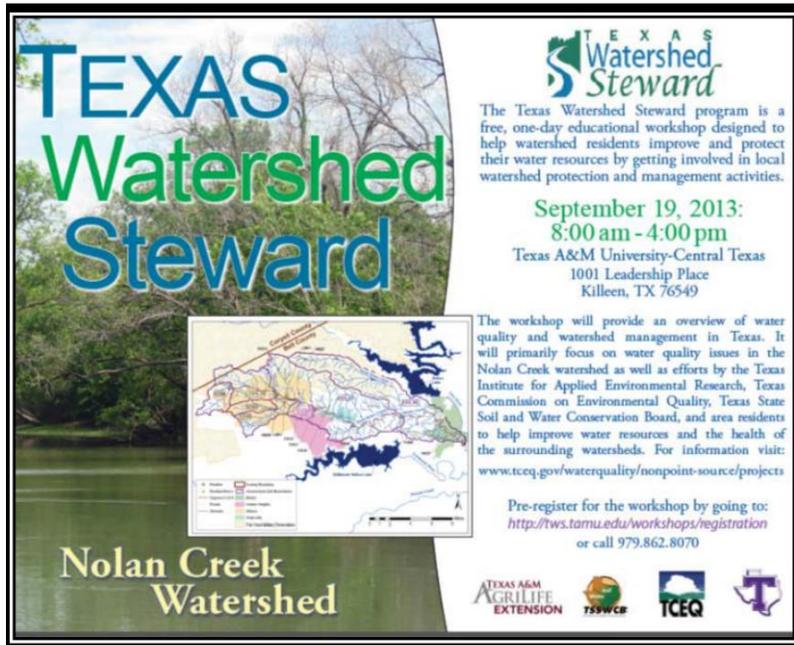


Figure 3-1 Advertisement for the Texas Watershed Steward Program in the Nolan Creek watershed.

Texas Stream Team

The Texas Stream Team provides a way to involve individuals directly in monitoring the health of the watershed. The Stream Team is a network of trained volunteers and supportive partners that work together to gather stream water quality data. Volunteers are trained to collect quality-assured water quality data that can be used to detect trends in water resources. In addition to providing water quality monitoring the Texas Stream Team also has developed a Water Monitoring Curriculum, designed for middle school to high school science teachers. The Texas Stream Team was established in 1991 and is administered through a cooperative partnership between Texas State University, TCEQ, and EPA. There are already four active Stream Team monitoring stations in the watershed. The Partnership would like to encourage more volunteers by facilitating training sessions in the watershed and also using volunteers to help better target sources, particularly of bacteria, within the watershed.

On-Site Sewage Facilities

In a survey of potential bacteria and nutrient sources in the Nolan Creek/South Nolan Creek watershed, on-site sewage facilities (OSSFs), often referred to as septic systems, were identified as a potential source (McFarland and Adams, 2015b). The analysis of monitoring data and land-use information further targeted areas along Little Nolan Creek within the City of Killeen where many residences are not yet connected to the municipal sewer collection system (McFarland and

Adams, 2015c). Rural residences outside of sewer collection areas, particularly those nearest the creek, were also considered potential sources as the soils in the area are not well suited for OSSFs (Huckabee, et al., 1977). Efforts discussed below are educational components that are on-going or that the Partnership can help provide to stakeholders on proper maintenance and repair of OSSFs.

Septic System Informational Campaign

AgriLife Extension and many other agencies have developed extensive educational programs geared towards homeowners with a septic system. The Partnership will adapt and distribute existing technical guidance for owning and operating OSSFs. This information could then be distributed targeting those with OSSFs through direct mailings, service providers for OSSFs, and the Bell County Health Inspectors office, as the responsible entity for permitting and inspection of OSSFs.

Homeowner Septic System Maintenance Workshops

The Partnership would like to work with AgriLife Extension to host a one-day, educational workshop focused on the operation of aerobic and anaerobic septic systems including proper maintenance and repair. These workshops would focus primarily on those within rural areas of the watershed, as the cities within their MS4 stormwater management plans have outreach efforts focused on OSSFs within the urban areas. An example is the Septic Tank Elimination Program (STEP) conducted by the City of Killeen, which is working to get more residences within the sewer area connected to the collection system.

Riparian and Stream Ecosystem Education Program

The Riparian and Stream Ecosystem Education Program will focus primarily on landowners along the creek. This program has been developed by the Texas Water Resources Institute (TWRI) with funding from EPA and TSSWCB and includes a large number of partners including the Texas Riparian Association. The Partnership will work with TWRI and the Texas Riparian Association to coordinate delivery within the watershed of a program on Riparian Proper Functioning Condition. The Partnership would also work to connect riparian landowners with the Texas Riparian Association as a venue for learning more about the technical and financial resources available to help in improving management of their riparian lands. Riparian degradation is a major threat to stream health through its negative impacts on water quality and stream habitat for terrestrial and aquatic species. Proper management, protection, and restoration of riparian areas will help decrease bacteria, nutrient, and sediment loadings to the creek from nonpoint source runoff. The Riparian and Stream Ecosystem Education program will increase stakeholder awareness, understanding and knowledge about the nature and function of riparian zones and the best management practices (BMPs) that can protect riparian areas, while minimizing nonpoint source pollution.

Agricultural Programs

There is an abundance of materials already developed that focus on the control of bacteria and nutrients from agricultural sources. The Partnership will coordinate with the county, NRCS, TSSWCB, Texas AgriLife, and other agencies to modify and distribute education and outreach materials that target the rural stakeholders in the watershed. On-going activities that the Partnership will encourage include nutrient management, soil and water testing, and livestock

grazing management; all items currently addressed by AgriLife Extension. The Partnership will also promote and, as appropriate, host agricultural programs to encourage action by residents and businesses primarily within the rural portion of the watershed. Examples of such programs are given below.

Lone Star Healthy Streams Program

The Lone Star Healthy Streams program is a series of online courses that provide viewers with education on water quality and best management practices that can be implemented to minimize bacterial and nutrient contamination that originates from livestock operations and feral hogs.

Stakeholders can access the online course at:

<http://campus.extension.org/course/view.php?id=728>. The Partnership would encourage stakeholders to access these on-line educational modules through brochures, fliers, newsletters, and other awareness and informational materials.

Feral Hog Management Workshop

The Nolan Creek/South Nolan Creek watershed is primarily urban and feral hogs are not considered a major problem or source in this watershed. However, it has been expressed by stakeholders that in the more rural areas, particularly along North Nolan Creek, feral hogs can be a problem. The Partnership, in conjunction with AgriLife, will work to host a Feral Hog Management Workshop for these areas. This workshop presents information on feral hog biology, effects feral hogs have on water quality, trap design as well as pertinent laws and regulations.

Agricultural Waste & Pesticide Collection Events

With cooperation from TCEQ, the Partnership will host events that provide rural residents a place to properly dispose of hazardous chemicals. All too commonly chemicals, such as fertilizers, pesticides, herbicides and insecticides, are improperly disposed. When improperly disposed of, these chemicals and hazardous waste can eventually make their way into local waterways (Nolan/South Nolan Creek) through stormwater runoff. Collection events provide an easy and safe method for the proper disposal of these products, and a venue at which the Partnership can distribute information about watershed issues.

Urban Programs

The Partnership will coordinate with local cities and the county in the development and distribution of education and outreach materials focusing on urban nonpoint source pollution. As noted earlier, many of these urban programs and materials are associated with MS4 permits, so the Partnership will coordinate and not lead in these activities. Examples of activities that the Partnership can advertise and support include the community stream clean up events organized by Keep Texas Beautiful, efforts to control pet waste, and hazardous waste cleanup days. These urban programs and others will enable the Partnership to reach residents, visitors, public service employees, businesses, and those in the construction field.

Texas Waterway Cleanup Program

The Partnership plans to coordinate with Keep Texas Beautiful to organize yearly roadway cleanups at bridge and stream crossings within the watershed. The waterway cleanup will be open to all stakeholders, and local civic groups will be invited to participate.

Domestic Pet Waste

Pet Waste Management

Pet waste has been identified in many watersheds as a major contributing source of bacteria, particularly in urban areas. Most large municipalities have begun to address pet waste management and have developed programs geared towards pet owners in urban areas about proper pet waste management. The Partnership will work with existing programs to help develop and distribute materials about the effects of pet waste on water quality through newsletters and other venues.

Pet Stations

The Partnership would like to encourage municipalities within the watershed to add “pet stations” at local parks along Nolan Creek and South Nolan Creek. The “pet station” contains all the elements necessary to maximize clean up success with waste pick up baggies as well as a trash receptacle. A watershed friendly sign could be attached to the pet waste station noting pet waste as a contributing source of bacteria in the watershed. These pet waste stations require continuous maintenance so engagement of municipalities will be a necessity.

Home Chemical & Hazardous Waste Collection Events

The Cities of Killeen and Belton host events that provide respective residents a place to properly dispose of hazardous chemicals. All too commonly typical household chemicals, such as fertilizers, pesticides, herbicides, insecticides, and cleaning supplies are improperly disposed. When improperly disposed of, these chemicals and hazardous waste can eventually make their way into local waterways (Nolan/South Nolan Creek) through stormwater runoff. The Home Chemical & Hazardous Waste Collection Event provides an easy and safe method for the proper disposal of the more harmful household products, but also a venue at which the Partnership can distribute information about watershed issues. The Partnership would also help advertise such events in fliers, newsletters, and on its website.

SECTION 4

Measuring Effectiveness and Summary

Outreach programs can involve a tremendous amount of effort and resources. To make sure resources are being effectively used, the time involved, cost, and stakeholder participation will be tracked. A planning evaluation will be conducted at least once every three years to assess whether objectives are being met, the effectiveness of materials distributed, and if appropriate target audiences are being reached. On an annual basis, a process evaluation will be conducted logging the cost of activities and the timing and frequency with which materials were distributed, so adjustments can be made in the frequency and message being delivered. Evaluating the impact of these efforts will provide a feedback mechanism for ongoing improvement of the outreach effort. Impact evaluations will occur at least annually and may be applied at various workshops or other gatherings of stakeholders. The proposed impact evaluation tool is further described below.

Nolan Creek Watershed Partnership Evaluation

An evaluation tool was developed and distributed to attendees at the September 25, 2014 public meeting (Appendix B). The purpose of this evaluation was to provide the Partnership guidance in designing educational information, while learning more about individual stakeholders within the Nolan Creek/South Nolan Creek watershed. A question that pertained to the Education and Outreach component asked about the individual’s level of interest in protecting the watershed, participating in additional watershed educational workshops or seminars, and becoming active in a local watershed group (Table 4-1). Stakeholders did express interest in protecting the watershed as well as becoming active in local watershed groups.

Table 4-1 Stakeholder level of interest in various watershed activities.

Item	Not Interested	Possibly Interested	Definitely Interested
A. Protecting my watershed	0	1	5
B. Participating in additional watershed education workshops or seminars	0	2	3
C. Becoming active in a local watershed group	1	0	4
D. Having a leadership role in a local watershed group	1	1	3
E. Participating in a volunteer water quality monitoring program	1	2	3

Other questions in the evaluation focused on the interest of stakeholders in attending various types of workshops (Table 4-2). While the response was limited, the Texas Riparian & Stream Ecosystem Workshop received the most positive responses.

Table 4-2 Stakeholder level of interest in various watershed workshops.

Item	Not Interested	Possibly Interested	Definitely Interested
A. Texas Riparian & Stream Ecosystem Workshop	1	3	3
B. On-Site Sewage Facility- Aerobic/Surface Application System Operation and Maintenance	1	2	2
C. Texas Watershed Steward Training	0	3	2
D. Lone Star Healthy Streams- online course	1	3	1
E. Meeting the Water Needs for Texans and Wildlife-webinar	0	4	1

While the evaluation tool was applied to only a small group, if modified and applied on an annual basis with various stakeholder groups, responses can aid the partnership in gauging stakeholder knowledge of water quality issues and adjust educational materials and workshops accordingly. This will assist the Partnership in determining if they are providing the necessary forms of educational material and if there are areas of education that need more attention.

Summary

The Nolan Creek Watershed Partnership will provide or help facilitate workshops, outreach initiatives, and educational material with the goal to engage stakeholders and educate them on the importance of proper watershed stewardship. Table 4-3 summarizes activities within the watershed that the Partnership plans to develop or help facilitate. Of note, many of the urban programs are already addressed within the stormwater management plans associated with MS4 permits, but the Partnership can help advertise these programs as part of a broader watershed-wide effort to improve water quality. For the rural or agricultural programs, the Partnership plans to partner with AgriLife and other agencies to facilitate programs and workshops already developed.

Outreach and education are powerful and effective tools in watershed protection efforts. Both help develop an awareness of the value of our water resources, educate people on what is threatening those resources, and encourage protection and restoration action. When done efficiently, outreach can educate stakeholders on the causes of water pollution and provide

solutions. However, most importantly, outreach and education can help to change behaviors and promote responsible attitudes and actions within the Nolan/South Nolan Creek watershed.

Table 4-3 Proposed outline of education and outreach activities.

Outreach Activity	Host &/or Delivery Agency	Proposed Number of Programs or Items		
		Years 1-3	Years 4-6	Years 7-10
Nolan Creek Partnership Outreach - Awareness & Informational Materials				
Website	Nolan Creek Partnership	1	1	1
Fact Sheet		1	1	1
Newsletters		3	3	3
Brochures		1	1	1
Fliers		4	4	4
Signage			3	3
Displays at Local Events		8	12	12
Regional Nonpoint Source Pollution Educational Programs				
Texas Watershed Steward Training	Nolan Creek Partnership & Cities (host) with Texas AgriLife with TWRI (delivery agency)	1		
Texas Stream Team Training	Nolan Creek Partnership & Cities (host) with Texas Stream Team (delivery agency)	2	2	2
Septic System Workshops	Nolan Creek Partnership & Cities (host) with Texas AgriLife with TWRI (delivery agency)		1	1
Riparian Proper Functioning Condition Training	Nolan Creek Partnership & Cities (host) with Texas Riparian Association (delivery agency)		1	1
Public School Educational Program	Nolan Creek Partnership & Cities (host & delivery agency)		2	2
Agricultural Nonpoint Source Pollution Educational Programs				
Nutrient Management	Nolan Creek Partnership (advertising & supporting) with Texas AgriLife (delivery agency)		2	2
Soil & Water Testing			2	2

Outreach and Education Strategy for the Nolan Creek/South Nolan Creek Watershed

Outreach Activity	Host &/or Delivery Agency	Proposed Number of Programs or Items		
		Years 1-3	Years 4-6	Years 7-10
Livestock Grazing Management Education			2	2
Agricultural Waste Pesticide Collection Events	Nolan Creek Partnership (hosting) with TCEQ (delivery agency)		1	1
Lonestar Healthy Streams	Nolan Creek Partnership (hosting) with Texas AgriLife (delivery agency)		1	1
Feral Hog Management Workshop	Nolan Creek Partnership (hosting) with Texas AgriLife (delivery agency)		1	2
Whitetail Deer Management Workshop	Nolan Creek Partnership (hosting) with Texas AgriLife (delivery agency)		1	2
Urban Nonpoint Source Pollution Educational Programs				
Pet Waste	Nolan Creek Partnership (advertising & supporting) with Cities, Texas AgriLife, Centex Sustainable Communities Partnership (hosting)		1	1
Illegal Dumping			1	1
Fats, Oil, Grease			1	1
Sports & Athletic Field Education			1	1
Low Impact Development			1	1
Urban Nutrient Management			1	1
Stormwater BMP Demonstrations			1	1
Local Government Maintenance Education			1	1
Stream Cleanup Events	Nolan Creek Partnership & Cities (advertising & supporting) with Keep Texas Beautiful (hosting)		1	1
Recreationalist Anti-Litter Campaign	Cities & County (Hosting)		1	1

Outreach and Education Strategy for the Nolan Creek/South Nolan Creek Watershed

Outreach Activity	Host &/or Delivery Agency	Proposed Number of Programs or Items		
		Years 1-3	Years 4-6	Years 7-10
Storm Drain Inlet Marking Events	Cities (Hosting)		1	1

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Appendix A

Education and Outreach Associated with MS4 Permits

Operators of small MS4 permits must develop, implement and maintain a comprehensive stormwater education and outreach program to educate public employees, businesses, and the general public of hazards associated with the illegal discharges and improper disposal for waste and about the impact that stormwater discharge can have on local waterways, as well as, the steps that the public can take to reduce pollutants in stormwater. Affiliating with city governments gives synergy to efforts by the Nolan Creek/South Nolan Creek Partnership by partnering with efforts already in place. While there are other MS4 permittees in the watershed, the following entities have the most active educational/outreach programs as part of their MS4 permits:

- Killeen
- Belton
- Fort Hood
- Harker Heights

City of Killeen

The City of Killeen has been and continues to be dedicated to educating the community on stormwater as well as involving the public through various opportunities in stormwater quality decision making and hands on projects affecting stormwater quality (Table A-1). The City of Killeen is also actively working to reduce failing septic systems within the MS4 boundaries. The City of Killeen has committed to reduce failing septic systems by promoting proper care and maintenance through public education best management practices (BMPs). Additionally, the City of Killeen also has an ongoing program to eliminate septic systems within its jurisdiction by connecting areas to the sanitary sewer (the resident will pay a tap fee for connection).

Table A-1 Best Management Practices to be implemented in the City of Killeen in accordance with the City's MS4 permit.

BMP	Implementation Activity	Measurable Goal	Implementation Date Goal	Frequency
Public Service Announcements	<ul style="list-style-type: none"> • Broadcast stormwater messages on cable access channel; • Develop new topic; • Add Social Media postings for water quality 	<ul style="list-style-type: none"> • 24 cable broadcasts • Copy of applicable Social Media postings 	Begin Year 1	
Long Term Operations and Maintenance of BMP's	<ul style="list-style-type: none"> • Identify and catalog the permanent BMP's that have been implemented in Killeen in the past year 	<ul style="list-style-type: none"> • List of public BMP's brought on line in the last year • Update Maintenance Schedule 	Begin Year 1	
School Book Covers	<ul style="list-style-type: none"> • Select new design • Purchase book covers for KISD 	<ul style="list-style-type: none"> • 32,000 book covers purchased and distributed 	Begin Year 1	

Outreach and Education Strategy for the Nolan Creek/South Nolan Creek Watershed

BMP	Implementation Activity	Measurable Goal	Implementation Date Goal	Frequency
Stormwater Brochures	<ul style="list-style-type: none"> • Produce and distribute 1 new brochure • Distribute existing brochures as needed • Evaluate process for distribution of outreach materials 	<ul style="list-style-type: none"> • Number of brochures distributed • inventory of brochures 	Begin Year 1	
Utility Bill Inserts	<ul style="list-style-type: none"> • Develop two inserts to be mailed with Utility Bill 	<ul style="list-style-type: none"> • Copy of each insert • Number of inserts distributed 	Begin Year 1	
Stormwater Website	<ul style="list-style-type: none"> • Publicize local and existing regional Household Hazardous Waste collection events • Publicize the Drainage Utility Response Line (hotline) • Update Drainage Utility web pages 	<ul style="list-style-type: none"> • Screenshot of updated City web pages 	Begin Year 1	
Stormwater Hotline	<ul style="list-style-type: none"> • Publicize Drainage Utility Response Line • Track complaint investigations from Response Line 	<ul style="list-style-type: none"> • List of Investigations 	Begin Year 1	
Stream Cleanup Projects	<ul style="list-style-type: none"> • Advertise program to organizations • Note potential locations during dry weather screening • Schedule and hold one cleanup event 	<ul style="list-style-type: none"> • 1 summary flyer • Support 1 cleanup event 	Begin Year 1	
Watershed Organization	<ul style="list-style-type: none"> • Support Outreach efforts for the Lampasas River Watershed Partnership, LSHCWSC, Nolan Creek Watershed, Texas Stream Team 	<ul style="list-style-type: none"> • Meeting Minutes from Agenda • Listing of how each entity was supported 	Begin Year 1	
Storm Drain Stenciling	<ul style="list-style-type: none"> • Hold a stenciling event • Promote inlet marketing opportunities 	<ul style="list-style-type: none"> • Update GIS inlet map 	Begin Year 1	

City of Belton

The City of Belton has been and continues to be dedicated to educating the community on stormwater as well as involving the public through various opportunities in stormwater quality decision making and hands on projects affecting stormwater quality. Table A-2 describes the BMPs that were developed and will be implemented in accordance to the Belton’s MS4 permit.

Table A-2 Best Management Practices to be implemented in the City of Belton in accordance with the City’s MS4 permit.

BMP	Measurable Goals	Implementation Date Goal	Frequency
Educate Residents	<ul style="list-style-type: none"> • Distribute public education materials regarding residential impacts on water quality 	Begin Permit Year 1	
Educate Visitors to the Belton Area	<ul style="list-style-type: none"> • Distribute public education materials to visitors of the area detailing the importance of water quality and what the City is doing to promote the importance of water quality in the community. 	Begin Permit Year 1	
Educate Commercial & Industrial Facilities	<ul style="list-style-type: none"> • Distribute literature to businesses that educate the importance of BMPs focusing on industrial, commercial and automotive business. • Develop recognition program that rewards businesses who lead by example in water quality efforts. 	Begin Permit Year 2	
Educate Local Businesses	<ul style="list-style-type: none"> • Distribute literature to businesses through the Belton Chamber of Commerce Newsletter emphasizing the importance of BMPs for local businesses. • Develop recognition program that rewards businesses who lead by example in water quality efforts. 	Begin Permit Year 3,4	
Educate New Developers/Home Builders	<ul style="list-style-type: none"> • Distribute literature to developers and homebuilders through the Temple Area Buildings Association Newsletter that educate the importance of BMPs on construction sites. • Evaluate and modify design standards and construction notes. 	Begin Permit Year 2	
Educate Future Leaders	<ul style="list-style-type: none"> • Distribute literature, pencils, and other materials promoting the importance of water quality. • Promote an Art Contest promoting BMPs and water quality among students. 	Begin Permit Year 1	
Public Notice in Development of SWMP	<ul style="list-style-type: none"> • Make the SWMP available for review and comments on the city website. 	Begin Permit Year 1	
Illicit Discharge Awareness Campaign	<ul style="list-style-type: none"> • Develop training materials that detail the hazards associated with illicit discharges and improper disposal of waste. Develop and implement an illegal dumping notification link on the City website. 	Begin Permit Year 1	
Social Media Outreach	<ul style="list-style-type: none"> • Identify most appropriate social media platform and distribute 12 informational posts annually regarding stormwater quality, environmental event schedules and water quality educational information. 	Begin Permit Year 1	

Fort Hood

During the five year term of the first small MS4 general permit, Fort hood developed robust public education and outreach program to teach soldiers, employees, businesses, construction site workers, and the general public about the importance of keeping stormwater runoff as clean and free of pollutants as possible. Table A-3 describes the best management practices (BMPs) that were developed and will be implemented in accordance to Fort Hood’s MS4 permit.

Table A-3 Best Management Practices to be implemented in Fort Hood in accordance with the base’s MS4 permit.

BMP	Measurable Goals	Implementation Date Goal	Frequency
1-1 Training Courses	<ul style="list-style-type: none"> Provide ECO training course and document # of personnel trained. 	Fully implemented	monthly
1-1 training courses	<ul style="list-style-type: none"> Provide municipal operations P2 training for appropriate employees and contractors, and document # of personnel trained. 	Fully implemented	Semi-annually
1-1 training courses	<ul style="list-style-type: none"> Provide FOG training for dining facility and commercial restaurant staff and document # of personnel trained. 	Fully Implemented	Quarterly
1-1 training courses	<ul style="list-style-type: none"> Provide construction general permit training course to DPW and USACE staff, as well as, contractors and other operators, a document # of personnel trained. 	Fully Implemented	Semi-annually
1-2 Educational materials	<ul style="list-style-type: none"> Provide posters on general stormwater awareness at key locations and document # of posters and sites utilized. 	Fully Implemented	Semi-annually
1-2 Educational Materials	<ul style="list-style-type: none"> Publish newspaper articles in the Fort Hood Sentinel and document # of newspapers that were distributed with the article. 	Fully Implemented	Annually
1-2 Educational Materials	<ul style="list-style-type: none"> Provide handouts at the Community Services Council meeting and document # provided or # of personnel in attendance. 	Fully Implemented	Annually
1-2 Educational Materials	<ul style="list-style-type: none"> Provide a stormwater awareness article for the newsletter for on-post residents and document the # of newsletters delivered. 	Fully Implemented	Annually
1-3 Environmental Outreach Events	<ul style="list-style-type: none"> Provide educational handouts or a display or demonstration at various outreach events, and document # of student/public attending. 	Fully Implemented	At least 4 a year
1-4 Public Involvement	<ul style="list-style-type: none"> Fort Hood will conduct annual spring and fall cleanup activities, and DPW will document the weight of trash and recyclables collected. 	Fully Implemented	Semi-Annually
1-4 Public Involvement	<ul style="list-style-type: none"> Provide a facility and management of the HHW turn-in program, and document monthly inventories of materials both turned in and reissued. 	Fully Implemented	Monthly
1-5 Public Meetings	<ul style="list-style-type: none"> Brief the Garrison Commander and other senior leadership on the status of the SWMP at the EQCC, and document the information presented and personnel in attendance. 	Fully Implemented	Annually
1-5 Public Meetings	<ul style="list-style-type: none"> Provide educational handouts for Community Services Council meeting. 	Fully Implemented	Annually
1-6 Public Website	<ul style="list-style-type: none"> Review, maintain and update the municipal stormwater website, and document each review and any charges. 	Fully Implemented	Semi-Annually

City of Harker Heights

The City of Harker Heights has been and continues to be dedicated to educating the community on stormwater issues as well as involving the public through various opportunities in stormwater quality decision making and hands on projects for improving stormwater quality. Table 6-4 describes the best management practices (BMPs) that were developed and will be implemented in accordance to the Harker Heights' MS4 permit.

Table A-4 Best Management Practices to be implemented in Harker Heights in accordance with the base's MS4 permit.

BMP	Measurable Goals	Implementation Date Goal	Frequency
1-1 Designate SWC	<ul style="list-style-type: none"> • Maintain SWC. 	Begin Permit Year 1	Yearly
1-2 Stormwater Brochures	<ul style="list-style-type: none"> • Develop and distribute brochure on stormwater management every year. Maintain list of available brochures and record of distribution records. 	Begin Permit Year 1	Yearly
1-3 Stormwater Website	<ul style="list-style-type: none"> • Continue to develop the stormwater page on the official City website. 	Begin Permit Year 1	Yearly
1-4 Pet Waste Fact Sheet	<ul style="list-style-type: none"> • Distribute fact sheet through all pet stores and veterinarian offices, with all animal adoptions, and at pet-related events. 	Begin Permit Year 1	Yearly
1-5 Outfall Signs	<ul style="list-style-type: none"> • Install outfall signs and labels and maintain existing ones. 	Begin Permit Year 1	Yearly
1-6 Public Notification Compliance	<ul style="list-style-type: none"> • Submit a copy of the notice and publisher's affidavit to the TCEQ Chief Clerk. 	Begin Permit Year 1	Per TCEQ notice requirements
1-7 Storm Drain Stenciling	<ul style="list-style-type: none"> • Contact youth and church groups. Stencil 25 catch basins and/or flumes per year throughout permit terms. 	Begin Permit Year 1	Yearly
1-8 Stormwater Committee Meeting	<ul style="list-style-type: none"> • Maintain committee standing and track meeting attendance, agendas, topics of discussion, potential stormwater issues, initiatives and decisions. 	Begin Permit Year 1	Yearly
1-9 Household Hazardous Materials Day	<ul style="list-style-type: none"> • Continue to hold an annual hazardous waste collection day. 	Begin Permit Year 1	Yearly

Appendix B

Nolan Creek Watershed Partnership Evaluation

NOLAN CREEK

Nolan Creek Watershed Partnership Evaluation

The purpose of this evaluation is to help us in designing educational information while learning more about individuals within the Nolan Creek watershed. Please read the following questions and fill in the answer you think is correct. If you are not sure of the answer, please fill in the “unsure” bubble. Thank you!

1. **The Clean Water Act Section _____ List is a list of streams and lakes that are impaired for one or more contaminants, causing them to not meet state water quality standards. Nolan Creek/South Nolan Creek is currently on this list for impairments.**
 - 404(a)
 - 303(d)
 - 615(b)
 - 208(b)
 - 503(b)
 - Unsure

2. **The Nolan Creek/South Nolan Creek is listed as impaired for what use?**
 - General Use
 - Aquatic Life Use
 - Recreational Use
 - Industrial Use
 - Unsure

3. **What is measured to assess the impairment associated with Nolan Creek/South Nolan Creek?**
 - Bacteria
 - pH
 - Nutrients
 - Dissolved Oxygen
 - Pesticides
 - Unsure

4. **Nolan Creek/South Nolan Creek was first listed as impaired in what year?**
 - 1949
 - 1986
 - 1990
 - 1996
 - 2010
 - Unsure

5. **Concerns are indicated for nutrients within Nolan Creek/South Nolan Creek. Which nutrients frequently cause water quality concerns?**
 - Nitrogen and Potassium
 - Phosphorus and Sulfur
 - Nitrogen and Sulfur
 - Phosphorus and Potassium
 - Nitrogen and Phosphorus
 - Unsure

6. **The parameter used when evaluating recreational use is:**
 - Nutrients
 - Dissolved oxygen
 - Salts
 - Bacteria
 - Toxic substances
 - All of the above

7. **The recreational use that holds the most stringent standard for allowable bacteria is:**
 - Primary contact recreation (e.g., swimming)
 - Secondary contact recreation 1 (e.g., canoeing or wading)
 - Secondary contact recreation 2 (e.g., fishing from the bank)
 - Noncontact recreation
 - Unsure

8. **The most regularly tested fecal bacteria indicator in freshwater is:**
 - *Escherichia coli*
 - Cyanobacteria
 - Streptococcus
 - Giardia
 - Cryptosporidium
 - Unsure

9. **Pollution sources generally fall into two categories, point and nonpoint source, the following are examples of nonpoint source pollution, *EXCEPT*:**

- Storm drainage from streets
- Runoff of pesticides from yards
- Treated wastewater discharged from a pipe
- Fertilizer runoff from pastures
- Bacteria from pet or livestock waste left on the land
- Unsure

10. **Structural and non-structural practices used to protect water quality are often referred to as:**

- Environmental protection practices
- Best management practices
- Water restoration practices
- Unsure

11. **A watershed is a:**

- Shed holding water
- Sweat off a runner
- Land area associated with a river, creek or other water body
- Pollution control strategy
- Heavy rainfall
- Unsure

12. **A flexible framework for managing the quantity and quality of water resources within a watershed is referred to as a:**

- Monitoring plan
- Watershed approach
- Restoration strategy
- Pollution control strategy
- Community action plan
- Unsure

13. **To improve water quality of an impaired water body, what voluntary approach is promoted in Texas?**

- Watershed protection plans
- Total maximum daily loads
- Riparian zone workshops
- Environmental planning
- Unsure

14. What is NOT a characteristic of a total maximum daily load (TMDL)?

- Voluntary
- Requires calculation of a budget for pollutant loading
- Allocates allowable pollutant loadings
- Regulatory
- Unsure

15. What is NOT a characteristic of a watershed protection plan (WPP)?

- Regulatory
- Stakeholder driven
- Voluntary
- Uses adaptive management
- Unsure

16. The chief regulatory agency for water quality in Texas is:

- Texas Coastal Management Program
- Texas Stream Team
- Texas Coordinated Monitoring Program
- Texas Commission on Environmental Quality
- Texas Bay Monitoring Program
- Texas State Soil & Water Conservation Board
- Unsure

17. What activities, if any, do you do in or along Nolan/South Nolan Creek? (please mark all that apply)

- Fishing
- Wading
- Swimming
- Canoeing/Boating
- Walking along the bank
- Bird watching from the shore
- All of the above
- None of the above

18. What do you feel are the major bacteria sources in or along Nolan/South Nolan Creek?

19. Please note your level of interest in the following:

ITEM	Not Interested	Possibly Interested	Definitely Interested
A. Protecting my watershed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B. Participating in additional watershed education workshops or seminars	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C. Becoming active in a local watershed group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D. Having a leadership role in a local watershed group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
E. Participating in a volunteer water quality monitoring program	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

20. Please note your interest in the following workshops/trainings:

ITEM	Not Interested	Possibly Interested	Definitely Interested
A. Texas Riparian & Stream Ecosystem Workshop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B. On-Site Sewage Facility- Aerobic/Surface Application System Operation and Maintenance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C. Texas Watershed Steward Training	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D. Lonestar Healthy Streams- online course	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
E. Meeting the Water Needs for Texans and Wildlife- webinar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21. Please answer the following questions by marking YES, NO, or NA, related to where you have received water quality information.

Have you received water quality information from the following sources?	Yes	No	NA
A. Television	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B. Newspapers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C. Internet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D. Texas Institute for Applied Environmental Research (TIAER)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
E. Local Soil & Water Conservation District	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
F. Universities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
G. Environmental Agencies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
H. Environmental groups (citizens groups)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

22. How would you best describe yourself?

- Agency professional
- City/county official/employee
- Non-governmental organization member/employee
- Teacher/educational professional
- Small business owner
- Other:

23. You are:

- Female
- Male

24. You are:

- 18-29
- 30-39
- 40-49
- 50-59
- 60-69
- 70-75+

25. Place of residence:

- Farm or ranch 0 – 100 acres
- Farm or ranch >100 acres
- Rural area, not a farm/ranch
- Town under 10,000 people
- Town or city between 10,000 and 50,000 persons
- City between 50,000 and 250,000 persons
- City over 250,000 persons

26. Highest level of education obtained:

- Some high school or less
- High school graduate or GED
- Vocational or technical degree
- Some college
- Bachelor degree
- Post-graduate degree(s)

27. Would you like to receive updates on upcoming meetings, trainings, and other events pertaining to the Nolan/South Nolan Creek Watershed?

- No
- Yes

Name:	
Email:	
Phone:	

(Note: This page can be detached and turned in separately from the rest of the evaluation if you prefer.)

Thank you!

This evaluation is part of a Texas Commission on Environmental Quality Clean Water Act Section 319(h) Nonpoint Source Grant Program project, *Assessment of Water Quality and Watershed Based Planning for Nolan Creek/South Nolan Creek*, being conducted by the Texas Institute for Applied Environmental Research. If you have any questions about this project or wish to mail back this survey, please contact:

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You can also check out our project website at

<http://www.killeentexas.gov/nolancreekwatershed>