

Gilleland Creek Plan

Management Measure for Natural Resource Management — Key Elements

Introduction

This document describes the key elements involved with the implementation of the management measure developed by the Natural Resource Management (NRM) Work Group¹ to address bacteria loading in the Gilleland Creek Watershed. The following measure is one of the Management Measures proposed for the Gilleland Creek Plan:

- **Restore and preserve riparian zones to protect water quality**

The following key elements for natural resource management will be incorporated into the implementation strategy for the Gilleland Creek Plan, which will include all management measures to address bacteria loading in the Gilleland Creek Watershed.

An adaptive management strategy will be used to adjust the plan as needed since its initial implementation will demonstrate which management measures prove most effective given site-specific watershed conditions. The Texas Commission on Environmental Quality (TCEQ) will assess Gilleland Creek every 2 years as part of updating the Texas Water Quality Inventory and 303(d) List. As changes are made to the Texas Surface Water Quality Standards criteria for contact recreation and changes in the creek's water quality are observed, modifications to this plan will be made. This adaptive management strategy allows stakeholders to learn and adapt the plan as progress is made. The ultimate goal is for Gilleland Creek's four assessment units to have sufficiently low *E. coli* loading that it can be useable for contact recreation.

Key Element #1

This element identifies the causes of the impairment, in this case the sources of bacteria that need to be controlled by the TMDL and the Plan.

Because no specific sources of the impairment were isolated during Gilleland Creek TMDL monitoring, this key element summarizes the results of the study in both dry and wet weather conditions to support the broad ranging approach developed for the Gilleland Creek Plan.

In dry weather conditions during the data collection efforts for the Gilleland Creek TMDL, (October 2005 through March 2006), *E. coli* concentrations exceeded the stream criterion, (126 #/100 ml) at six sites. The average of the exceedance (>126) was 38.5. Also, some dry weather samples exceeded the single sample criterion - 394 #/100 ml. During these conditions, effluent from the wastewater treatment facilities makes up the majority (approximately 83 percent) of flow in Gilleland Creek.

¹ Workgroup members include representatives from Texas State Soil and Water Conservation Board, Natural Resource Conservation Services, Texas Parks and Wildlife, US Fish and Wildlife, City of Pflugerville, Environmental Stewardship, TCEQ, and LCRA.

In wet weather conditions, *E. coli* concentrations in all samples taken at all 10 sampling locations exceeded the geometric mean criterion. Using load duration curve analysis, Lower Colorado River Authority (LCRA) staff determined that during high flow conditions (greater than 45 ft³/second) and moderate flow conditions (between 16.5 ft³/second and 45 ft³/second), the water quality in the creek exceeded both the geometric mean and single sample criteria. This analysis from the load duration curve showed that in order for the creek to meet the maximum allowable load of bacteria in high and moderate flow conditions, that reductions of 93 percent and 82 percent, respectively, are required. This load reduction will likely come from reduction of nonpoint sources.

Though land uses in the watershed have changed and continue to change, a large percentage of the Gilleland Creek Watershed can still be characterized as rural or undeveloped. The Gilleland Creek Watershed encompasses 48,617 acres of which 20,867 acres, or 43 percent, remain undeveloped or are used for agricultural purposes. The majority of the agricultural land, 20,339 acres, is classified as tax exempt. The changing nature of the land use, from rural to suburban, may limit the level of involvement in some of the projects proposed for the Natural Resource Management Key Elements. The changing land use may limit the number of landowners who participate in the projects shown in this management measure.

Key Element #2

This element describes the programs identified to support the implementation of this management measure to protect the natural resources within the watershed.

To implement this measure, the NRM Work Group explored a range of nonprofit and governmental (regional, state, and federal) programs to accomplish the overall goal of restoring and protecting riparian zones, including:

- LCRA Creekside Conservation Program
- U.S. Fish and Wildlife Services Partners for Fish and Wildlife
- Natural Resource Conservation Services (NRCS)
 - Continuous Conservation Reserve Program
 - Environmental Quality Incentives Program
 - Wildlife Habitat Incentives Program
- Texas Parks and Wildlife Private Lands Services
- Texas Wildlife Services, feral hog reduction program
- Trust for Public Land, Greenprint for Growth

The intent of these programs is for these agencies to work with landowners to protect riparian areas, not to acquire the property within the riparian areas. However, in 2006, the City of Pflugerville purchased approximately 6 acres of land adjacent to the creek with a combination of City funds. The NRM Work Group recommended that the Gilleland

Creek Plan include the Trust for Public Land, Greenprint for Growth program which could help local governments within Travis County, like the City of Pflugerville raise funds for watershed acquisition and help them work with private landowners to acquire watershed land.

LCRA Creekside Conservation Program

In 2007, the Texas State Soil and Water Conservation Board (TSSWCB) awarded a contract to LCRA through a 3-year Clean Water Act 319 grant to expand the Creekside Conservation Program to geographic areas that include the Gilleland Creek Watershed. Though the initial grant is for a 3-year period, it is possible that the grant could be extended up to an additional 2 years, through 2012. The schedule for the Creekside Conservation Program coincides with the implementation of this plan. The program goal is to promote abatement of nonpoint source pollution through implementation of conservation practices and promotion of water quality management plans. The TSSWCB Water Quality Management Plans (WQMPs) are site-specific conservation plans that are developed through, and approved by, soil and water conservation districts for agricultural and silvicultural lands. WQMPs include conservation practices such as brush management, cross fencing, range reseeding and pasture planting, alternative water source development, vegetative buffers along streams, slope stabilization, and land shaping. The measure of success for the Creekside Conservation Program has three quantifiable goals including the development of 25 conservation plans, working with private landowners to implement those plans on at least 10,000 acres, and achieving an estimated 74,000 tons of sediment reduction.

The Creekside Conservation Program is a cooperative effort with several agencies playing vital roles. LCRA provides project management and is responsible for project coordination, submission of quarterly and final reports, technology transfer, and evaluation of program effectiveness. Soil and Water Conservation Districts (SWCDs) assist with project coordination, technology transfer, notification of the availability of technical and financial assistance, and private landowner cooperation in installation of conservation practices. The NRCS takes the lead in identifying potential landowners and developing the site-specific WQMPs.

Participation in the Creekside Conservation Program includes the following four steps:

Interested landowners must first contact their local NRCS office. The NRCS identifies and selects projects that qualify for matching funds based on the severity of the problem, the project's compatibility with the Creekside Conservation Program objectives, and the availability of other funding sources.

The NRCS submits the WQMPs for each project to the local soil and water conservation district for review and approval. After a project is approved by the district, the NRCS submits it to LCRA for final approval.

1. Upon successful completion of the project, the landowner is reimbursed up to one-half the landowner's actual cost to implement their WQMP. The NRCS and LCRA review each project annually for 3 years to monitor success.

2. LCRA reimburses landowners for up to half of the total cost of approved projects. Up to \$1.3 million from both federal and nonfederal sources may be available for Gilleland Creek WQMPs.

U.S. Fish and Wildlife Services Partners for Fish and Wildlife (USFWS)

This USFWS grant is similar to the Creekside Conservation Program in that it is a cooperative effort between a landowner and the government, where the landowner receives a reimbursement for implementing a conservation plan. However, the goal of the Partners for Fish and Wildlife Program (PFW) is to create habitats for migratory birds by improving wildlife habitat. A conservation plan for the PFW Program could include the following activities:

1. Diverting water out of the channel into a wetland or pond where water can sit and settle out, then diverted back into the river system. The ponds are expected to go completely dry in the late summer, which would help reduce viable bacteria found in shallow water or mud
2. Changing vegetation at flood control structures sites where retrofits are planned to improve water quality
3. Restoring native grasses as habitat for songbirds

The USFWS PFW program is open to all landowners, even those in urban settings. It requires a 10-year commitment from landowners and will reimburse the landowner when the project is completed. The USFWS does not require an agricultural tax exemption status and does not require a minimum acreage. If an interested landowner steps forward, USFWS can direct up to \$25,000 / year toward conservation efforts in the Gilleland Creek Watershed.

This management measure envisions a project through USFWS that involves the construction of a BMP pond to detain stormwater runoff. The ability of extended detention facilities to remove total suspended solids and other contaminants from stormwater has been demonstrated, with probable TSS removal ranging from 50 to 95 percent² Bacteria removal is more complex than TSS removal, and more difficult to quantify. The work group discussed that bacteria reduction can be offset by wildlife that establishes in the newly created BMP habitat (i.e. the purpose of this USFWS program could be contrary to the purpose of this management measure). Additionally, *E. coli* bacteria can remain viable for an extended time by establishing in wet sediment. For these reasons, it is important that the BMP be designed as a detention versus retention basin and be allowed to go completely dry between most rainfall events. The benefit of a BMP construction should consider bacteria concentration reduction, reduced runoff volumes via infiltration and evapotranspiration losses, and total bacteria load reduction.

Natural Resource Conservation Services (NRCS)

The NRCS also has cost-share grant opportunities for owners of agricultural lands which have the potential to decrease the *E. coli* loading into Gilleland Creek by reducing

² Middleton, John R.; Michael E. Barret, and Joseph Malina. 2006. "Water Quality Performance of a Batch-Type Stormwater Detention Basin," Center for Research in Water Resources, University of Austin. 2008

sedimentation through several distinct ways. Each of these programs has limitations as to applicability to the plan but the programs are also complimentary to one another. Some of these mechanisms to reduce sedimentation may possibly include providing either alternate water sources or loafing areas for livestock that are removed from the creek. These programs function similarly to the Creekside Conservation Program in that interested landowners must identify themselves and develop WQMPs with the local NRCS. These NRCS programs include:

1. **Continuous Conservation Reserve Program (CCRP)**
is a program of the United States Department of Agriculture's (USDA) NRCS. The CCRP has an objective to convert highly erodible rangeland into permanent vegetation. One of the specific programs within the CCRP is the Riparian Buffer Program. Its purpose is to enhance water quality and improve wildlife and aquatic habitat by promoting healthy riparian vegetation to slow water velocity, decrease sedimentation, and trap sediment.
2. **Environmental Quality Incentives Program (EQIP)**
was authorized in the federal Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.
- **Wildlife Habitat Incentives Program (WHIP)**
is a voluntary program for landowners to develop and improve wildlife habitat primarily on private land. Through WHIP, the NRCS provides both technical and financial assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat.

Texas Parks and Wildlife Private Lands Services

Texas Parks and Wildlife Department (TPWD) Private Lands Services provides practical information on ways to manage wildlife resources consistent with other land use goals, to ensure plant and animal diversity, to provide aesthetic and economic benefits, and to conserve soil, water and related natural resources. The goal of the private lands services program is to help landowners assess the wildlife potential of their land and recommend ways to improve the land to support a diversity of wildlife. As a result, the overall ecological condition of the property is the focus. Erosion control measures, streambank stabilization, riparian management, and rehabilitation are possible activities that could be recommended as part of the private lands program to reduce the bacteria loading into Gilleland Creek.

To participate, landowners may request assistance by contacting the TPWD district office located in Bastrop, Texas. Once the property's potential has been determined, a biologist will provide recommendations and, if requested, help the landowner develop a written wildlife management plan (WMP). Components of the WMP include current description of the habitat, land use and management practices, and specific habitat management recommendations and population management goals for the various species of interest. It is up to the property owner to implement the plan. The amount of money that the landowner will receive is based upon the components of the plan and the landowner's

financial need. WMPs approved by TPWD biologists are confidential by state law according to Parks and Wildlife Code, Section 12.0251.

Texas Wildlife Services Feral Hog Reduction Program

The Texas Wildlife Services (TWS) Feral Hog Reduction Program assists landowners by removing feral hogs from private land. Feral hogs could be a potential bacteria source. While the agency typically works on a cost-share basis, it also offers a fee-based schedule. With TWS employees located near the Gilleland Creek Watershed, the maintenance of traps may be performed quickly and efficiently. TWS provided a method to roughly estimate the number of feral hogs in the watershed. An estimated 383 hogs live in the watershed based on an estimated 10 hogs/square mile of 1/2-mile creek buffer area³. According to discussions with TWS staff, who derived this estimate, this is a manageable number and the Gilleland Creek Watershed area is also a manageable size. Educational efforts through TWS coordinated workshops for landowners may increase awareness of population control techniques. In the last biennium, the Texas legislature allocated \$1 million to the Texas Department of Agriculture for this program of which \$500,000 per year may be used to develop pilot projects. The Texas Department of Agriculture funds are available for 1 year and for the entire state. Funds are not targeted toward the Gilleland Creek Watershed. This program's estimations are based on assumed continued funding.

Trust for Public Land Travis County Greenprint for Growth⁴

Trust for Public Land (TPL) is a national, nonprofit, land conservation organization that conserves land for people to enjoy, preserves land to ensure clean drinking water, and protects the natural beauty of waterways. One way TPL accomplishes this initiative is through "Greenprinting" — a geographic information system (GIS) technology that helps communities identify the most important watershed lands for preservation.

This initiative was developed through a partnership of several governmental and nongovernmental organizations who worked with a technical advisory team in prioritizing county waterways for protection and preservation. The waterways and 100-year floodplain in the Gilleland Creek Watershed were given a high conservation priority while the lands adjacent lands were given a moderate to high conservation priority. The TPL will help the local governments within Travis County to raise funds for watershed acquisition and to help them work with private landowners to acquire watershed land. It is envisioned that TPL may purchase riparian areas near Gilleland Creek or its tributaries to designate the area as public land and preserves.

City of Pflugerville – Acquisition of Riparian Corridor Land

In 2006, the City of Pflugerville purchased 5.95 acres of land near Gilleland Creek for approximately \$1.2 million prior to the expansion of the adjacent Pecan Street. The City funded the acquisition through a combination of General Reserves and Certificates of

³ Estimate based on personal communication from Texas Wildlife Service and available GIS information.

⁴ "The Travis County Greenprint for Growth," published by The Trust for Public Land, October 2005 – October 2006.

Obligation. The purpose of the acquisition was to preserve lands within the Gilleland Creek riparian corridor.

Key Element #3

Key Element #3 describes the potential bacteria load reductions that could be achieved by preserving and restoring riparian zones in the Gilleland Creek Watershed.

The *Gilleland Creek TMDL* estimated load allocations as the sum of *E. coli* loadings from all nonpoint sources. The nonpoint source load allocation for high flow (greater than 45 f³/second) is 2.60 x 10¹³ colony forming units (CFU)/day while the load allocation for moderate flow (16.5 to 45 f³/second) is 1.36 x 10¹³ CFU/day. These flows represent the periods that Gilleland is generally out of compliance with the contact recreation standard. The percent reductions required to bring the water body into compliance with the contact recreation standard are approximately 93 percent at high flow and 83 percent at moderate flow.

The following sections describe the calculations made using the best available resources to estimate potential bacteria loading reductions resulting from the implementation of preservation and restoration projects as well as feral hog removal efforts in the Gilleland Creek Watershed. The following assumptions were used in calculating the bacteria load reductions:

- Four individual projects protecting approximately 490 acres of riparian areas. Acreage is based on the “average” size of projects with Creekside Conservation Program, NRCS, USFWS, and TPWD.
- Removal of 20 percent of the estimated 383 feral hogs
- Sediment reduction of 2 tons/acre/year is estimated⁵
- 1,000 CFU fecal coliform/gram of sediment⁶
- A ratio of 0.7 *E. coli*/fecal coliform⁷
- The correlation coefficient between total suspended solids (TSS) and *E. coli* (after evaluating 74 data pairs from LCRA ambient water quality monitoring at site 17257) is 0.963.

LCRA Creekside Conservation Program

The loading reduction calculation is based on one project of 400 acres being completed. A completed project is one in which the work has been performed according to the plan developed by the landowner and NRCS. The estimated load reduction from the Creekside Conservation Program is 5.08 x 10¹¹ CFU/day. This loading value represents between 2.0

⁵ Sediment reduction estimate is based on best professional judgment by LCRA staff and experts in the industry.

⁶ HDR Report, 2003. Water Quality Study of the Arkansas River, Phase 2 Report. Fecal coliform values in sediment ranged from 13 CFU/gram of sediment to 2,000 cfu/gram of sediment. Based on best professional judgment and this range of bacteria concentrations, a value of 1,000 cfu/gram of sediment was selected.

⁷ Test results show that *E. coli* bacteria constitute about 70 percent of fecal coliform concentrations.

percent of the load allocation during high flow situations and 3.7 percent during moderate flow conditions. The load allocation values are presented in the *One Total Maximum Daily Load for Bacteria in Gilleland Creek*. Experience with the Creekside Conservation Program has shown that once landowners make improvements to their property they see tangible benefits to continuing the conservation practices.

Load Calculation:

$$400 \text{ acres "average" size} \times 2 \text{ tons/acre soil savings} \times 2,000 \text{ lbs./ton} \times 0.4536 \text{ kg/lb.} \\ \times 1,000 \text{ g/kg} \times 1000 \text{ CFU fecal coliform/gram} \times 0.7 \text{ E. coli/fecal coliform} = 5.08 \\ \times 10^{11} \text{ CFU/day}$$

The Rangeland Hydrology and Erosion Model (RHEM) model will be used to demonstrate expected soil savings. The RHEM is a coordinated project between three U.S. Department of Agriculture agencies: Agricultural Research Service, NRCS, and the U.S. Forest Service. The model components include fundamentals of infiltration, hydrology, plant science, hydraulics, and erosion mechanics. The most notable advantage of RHEM over previous models is that it links hydrologic and erosion dynamics with rangeland plant communities and vegetation states.

NRCS Programs (EQIP, WHIP, and CCRP)

The loading reduction calculation is based on one project of 50 acres being completed. The estimated load reduction from one of the NRCS projects is 6.35×10^{10} CFU/day.

These loading values represent between 0.2 percent of loading during high flow situations and 0.5 percent during moderate flow conditions. The load allocation values are presented in the *One Total Maximum Daily Load for Bacteria in Gilleland Creek*.

Load Calculation:

$$50 \text{ acres "average" size} \times 2 \text{ tons/acre soil savings} \times 2,000 \text{ lbs./ton} \times 0.4536 \text{ kg/lb.} \\ \times 1,000 \text{ g/kg} \times 1000 \text{ CFU fecal coliform/gram} \times 0.7 \text{ E. coli/fecal coliform.} = 6.35 \\ \times 10^{10} \text{ CFU/day}$$

USFWS Partners for Fish and Wildlife

The loading reduction calculation is based on one project of 20 acres being completed. The estimated load reduction from one of the USFWS projects is 2.54×10^{10} CFU/day.

Assuming the completion of one Partners for Fish and Wildlife Program, an *E. coli* load reduction is expected. As noted earlier, it is important that for bacteria values to be reduced as a result of the implementation of this measure. It is likely that the constructed BMP will need to go dry between rainfall events. The desiccation will help reduce viable, possibly encysted *E. coli* living in the sediment.

Load Calculation:

$$20 \text{ acres "average" size} \times 2 \text{ tons/acre soil savings} \times 2,000 \text{ lbs./ton} \times 0.4536 \text{ kg/lb.} \\ \times 1,000 \text{ g/kg} \times 1000 \text{ CFU fecal coliform/gram} \times 0.7 \text{ E. coli/fecal coliform.} = 2.54 \\ \times 10^{10} \text{ CFU/day}$$

TPWD Landowner Services

The estimated *E. coli* load reduction from the completion of one, 20-acre TPWD Landowner Services project is 2.54×10^{10} CFU/day.

Load Calculation:

$$20 \text{ acres "average" size} \times 2 \text{ tons/acre soil savings} \times 2,000 \text{ lbs./ton} \times 0.4536 \text{ kg/lb.} \\ \times 1,000 \text{ g/kg} \times 1000 \text{ CFU fecal coliform/gram} \times 0.7 \text{ E. coli/fecal coliform.} = 2.54 \\ \times 10^{10} \text{ CFU/day}$$

Texas Wildlife Services

Loading reductions resulting from feral hog removal were based on the Metcalf and Eddy⁸ estimate of fecal coliform per hog. Fecal coliform loading from pig = 8.9×10^9 organisms/day. Based on best professional judgment and reproductive rate of remaining feral hogs, it is assumed that 20 percent of the 383⁹ estimated feral hogs are removed from the watershed. This reduction in feral hog numbers equates to a loading reduction of 4.77×10^{11} CFU *E. coli*/day.

Load Calculation:

$$383 \text{ hogs} \times 0.2 \text{ (20 percent removal)} \times 8.9 \times 10^9 \text{ fecal coliform CFU/hog/day} \times 0.7 \\ \text{E. coli/fecal coliform.} = 4.77 \times 10^{11} \text{ CFU/day}$$

Table 1 summarizes load reduction information for the five years represented by this plan. The load reduction is based on **moderate** flow (16.5 to 45 f³/second) load allocation.

Table 1. Summary of Five-Year Load Reductions with Moderate Flow

Project	Load Reduction	Percent of Load Allocation
LCRA, Creekside Conservation	5.08×10^{11}	3.7
NRCS, EQIP, WHIP, CCRP	6.35×10^{10}	0.6
USFWS Partner for Fish and Wildlife	2.54×10^{10}	0.2
TPWD, Landowner Services	2.54×10^{10}	0.2
Texas WDMS, feral hog removal	4.77×10^{11}	3.5

Table 2 summarizes load reduction information for the 5 years represented by this plan. The load reduction is based on **high** flow (greater than 45 f³/second) load allocation.

⁸ Metcalf & Eddy, 1991. Wastewater Engineering Treatment, Disposal and Reuse. Third edition.

⁹ This estimate is based on Texas Wildlife Services experience of ten hogs/ square mile within the buffers that are 1/2 mile from creeks. And with using an area of 38.3 square miles, which is 1/2-mile swath around Gilleland and major tributaries, there will be an estimated 383 hogs.

Table 2. Summary of Five-Year Load Reductions with High Flow

Project	Load Reduction	Percent of Load Allocation
LCRA, Creekside Conservation	5.08×10^{11}	2.0
NRCS, EQIP, WHIP, CCRP	6.35×10^{10}	0.2
USFWS Partner for Fish and Wildlife	2.54×10^{10}	0.1
TPWD, Landowner Services	2.54×10^{10}	0.1
Texas WDMS, feral hog removal	4.77×10^{11}	1.8

Key Element #4

This element identifies technical and financial assistance needed to implement the projects in this management measure.

Technical assistance

Technical assistance for these projects will be performed by various agencies - NRCS, LCRA, SWCD, TSSWCD, USFWS, and TPWD. To assist the landowner with the agricultural plans, water quality management plans will be developed. For water quality and wildlife plan assistance, wildlife management plans will be created.

The costs for the landowner depends on what goals the landowner has for the property, the size of the management area, the existing condition of the property, and the plan that is collaboratively developed with the various resource agencies. Some management practices are more or less costly than others.

Financial assistance

Financial assistance for the projects in this management measure will come from a variety of sources. For example, through LCRA's Creekside Conservation Program, the landowner is reimbursed for up to one-half of the actual cost upon successful completion of a project while the NRCS programs (CCRP, EQIP, and WHIP) may cost-share up to 75 percent of the costs of certain conservation practices. Through the NRCS, incentive payments may be provided for up to 3 years to encourage producers to carry out management practices they may not otherwise use. However, limited resource producers and beginning farmers and ranchers may be eligible for cost-shares up to 90 percent. An individual or entity may not receive, directly or indirectly, cost-share or incentive payments that, in the aggregate, exceed \$450,000 for all EQIP contracts entered during the term of the farm bill.

USFWS has committed to up to \$25,000 for projects in the Gilleland Creek Watershed that protect federal trust species such as migratory waterfowl. The goal of the Partners for Fish and Wildlife Program is to secure at least 50 percent of project costs, including cash and in-kind services, from non-service sources. This goal applies to the Partners for Fish

and Wildlife Program overall, and does not have to be achieved on a project-by-project basis.

TPWD cost share projects are funded based on landowner interest and resource needs. A project's individual merit may also be factored into funding options. Landowners may be reimbursed up to 25 percent of actual costs.

The Natural Resource Management Work Group recommended that funding opportunities be investigated to pay for landowner up-front costs in all of these programs for restoring and preserving riparian zones.

Key Element #5

This element describes the education component to enhance the public understanding of the Gilleland Creek Plan and to encourage their participation.

Education and outreach are paramount in the effort to instill a land stewardship ethic, which may ultimately contribute to a decrease in *E. coli* loading to Gilleland Creek. There is a great need for public education regarding the importance of land conservation practices in central Texas. The Natural Resource Management Work Group recommended to encourage landowner and developer participation in the workshops described below by providing continuing education credits and incentives.

Presentations to soil and water conservation district

In spring and summer 2008, LCRA staff made presentations to SWCD board members at their meetings to notify local agricultural producers, through the SWCD directors, about the Creekside Conservation Program. The presentations described the cost share program and its benefits to the landowner and Gilleland Creek's water quality.

Landowner workshop

In October of 2008, LCRA and its partners hosted a landowner workshop, "Landowners Toolbox," educate local citizens about land management practices that conserve soil and water. Forty participants learned about the Gilleland Creek Watershed, stream processes and mechanics, benefits of riparian areas, working in and around streams, and the funding resources to available to put these conservation methods into practice. Cost share alternatives that were presented included the Creekside Conservation Program, Partners for Fish and Wildlife, CCRP, EQIP, and WHIP. Workshop sponsors included: Blackland Research and Extension Center's Central Texas Stream Team, TCEQ, U.S. EPA, and LCRA. As a result of the workshop, five property owners in the watershed expressed interest in participating in one of the cost share programs discussed.

Watershed workshop and tour

The Texas Stream Team¹⁰ will host a watershed workshop and tour to enhance the public and Stakeholder understanding of the watershed, to build support for accomplishing the Gilleland Creek Watershed Plan and to increase the public's

¹⁰ Texas Stream Team, formerly, the Texas Watch Program, is a statewide water-quality monitoring network of concerned volunteers, partners, and institutions.

knowledge of pollutant reduction activities. The watershed tour will include stops to illustrate the progress being made toward implementing the plan such as the flood control ponds retrofitted with automated controls, a wastewater treatment facility, natural features, such as riparian areas, an agricultural best management practice, and a water quality monitoring demonstration.

Educational material

The LCRA Creekside Conservation Program has resources available for the distribution of education and outreach materials including Creekside Conservation Partner Signage and Rangeland/Pasture Stick, a rangeland health management tool. LCRA will also present the information on the Creekside Conservation Program to potential participants during educational field days, workshops, and seminars. LCRA initiated a “Conservation Partner” sign program that recognizes the landowner and participating agencies as partners in conservation. The signage serves as an advertisement for the program in an attempt to interest other land owners.

Outreach activities

LCRA will provide a press release to advertise the availability of funds through the Creekside Conservation Program. TSSWCB Conservation News has been and will continue to be used as a venue to advertise the Creekside Conservation Program. This same venue can also be used to advertise the USFWS Partner for Fish and Wildlife grant.

Key Element #6

This element provides a schedule with milestones for implementing each of the projects and activities related to this management measures.

Table 3. Milestones for Natural Resource Management Activities

Year	Creekside Conservation Program	Partners for Fish and Wildlife	CCRP, EQIP, and WHIP	Private Land Services	Feral Hog Removal
2010					
	Interested landowner contacts local NRCS office	Interested landowner contacts local USFWS office	Interested landowner contacts local NRCS office	Interested landowner contacts local TPWD district biologist office	TWS develops plan with landowner
2011					
	NRCS evaluates the project potential and selects projects for matching funds and develops WQMP	USFWS evaluates the project potential and selects projects for matching funds and develops conservation plan	NRCS evaluates the project potential and selects projects for matching funds and develops WQMP	Biologist schedules a site visit to assess habitat potential and offer guidance to improve habitat for the species of interest	Begin removal of feral hogs
	NRCS submits the WQMP to the local SWCD for review and approval	NA	NRCS submits the WQMP to the local SWCD for review and approval	A WMP is written by the landowner or with the assistance of biologist	Begin landowner education

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Year	Creekside Conservation Program	Partners for Fish and Wildlife	CCRP, EQIP, and WHIP	Private Land Services	Feral Hog Removal
2011, continued					
	Upon SWCD approval, the NRCS submits the WQMP to LCRA for final approval	NA	Upon SWCD approval, the NRCS submits the WQMP to LCRA for final approval	NA	NA
	The landowner completes the project	NA	The landowner completes the project	NA	NA
	The landowner is reimbursed for up to one-half the actual cost to implement the WQMP	NA	The landowner is reimbursed for up to one-half the actual cost to implement the WQMP	NA	NA
2012					
	NRCS and LCRA review the project annually	The landowner completes the project	NRCS and LCRA review the project annually	WMP is approved by TPWD biologists	Feral hog removal
2013					
	Educational field day, workshop or seminar held	USFWS reviews the project annually	NRCS and LCRA review the project annually	Landowner conducts surveys of species of interest	Feral hog removal
	NRCS and LCRA review the project annually.	NA	NA	NA	Landowner education
2014					
	NRCS and LCRA review the project annually	USFWS reviews the project annually	NRCS and LCRA review the project annually	Landowner conducts surveys of species of interest	Feral hog removal
	Adapt to changes from adaptive implementation strategy	Adapt to changes from adaptive implementation strategy	Adapt to changes from adaptive implementation strategy	Adapt to changes from adaptive implementation Strategy	Landowner education
	NA	NA	NA	NA	Adapt to changes from adaptive implementation strategy

Key Element #7

This element identifies the interim, measurable milestones for this management measure that will be used to determine its ongoing progress and effectiveness.

Success is attained by the identification of at least one interested landowner to any of these cost share opportunities. The landowner must be willing to cooperate with the appropriate agency to develop an appropriate plan that will benefit the landowner and decrease Gilleland Creek *E. coli* loading. Additionally, the landowner must be prepared to spend the fiscal resources up front prior to being reimbursed.

Key Element #8

This element defines the indicators that will be used to document improvements in water quality due to implementation of this management measure.

Stakeholders agree that the ultimate measure of progress is that the four Gilleland Creek assessment units will comply with the contact recreation standard after this plan is implemented.

Key Element #9

This element describes the monitoring component of the Plan to determine the attainment of the water quality standards throughout the watershed.

The following summary describes routine water-quality monitoring activities for each of the four assessment units in the Gilleland Creek Watershed. The LCRA currently monitors in Assessment Unit 1 and 2 and proposes to begin monitoring in Assessment Unit 3. The TCEQ currently monitors in Assessment Unit 4. The purpose of this monitoring is to ensure that enough *E. coli* data is collected in each of the four assessment units to determine water quality standards attainment throughout the watershed.

Beginning with the 2010 assessment, TCEQ will require 10 sample results over a 7-year period to do a full assessment. If 10 samples are not available, TCEQ will use 10 years to obtain the minimum (10) number of samples. With less than 10 sample results, TCEQ can only identify a waterbody as a concern and not impaired.

Also included in this element is a summary of the City of Austin's monitoring activities and the Colorado River Watch Network (volunteer water-quality monitoring) program. An attached map illustrates these monitoring programs in the watershed.

Assessment Unit 1 (AU 1): From the Colorado River upstream to Taylor Lane

Site 17257, Gilleland Creek at FM 969 is downstream of Webberville Road/FM 969, east of Austin. It will be monitored on a bimonthly basis (six times per year). This is a current and historical site monitored by LCRA and will provide quality assured data for **AU 1**. This site has already compiled enough data for determination of standards attainment.

Assessment Unit 2 (AU 2): From Taylor Lane upstream to Old Highway 20

Site 12235, Gilleland Creek at FM 973 south of the city of Manor will be monitored on a bimonthly basis (six times per year). This is a current and historical site monitored by LCRA, and will provide quality assured data for **AU 2**. There should be enough data for standards attainment determination for the 2010 assessment.

Assessment Unit 3 (AU 3): From Old Highway 20 to Cameron Road

Site 12236, Gilleland Creek at US 290 north of Manor has been monitored historically and will potentially be continued by LCRA bimonthly (six times per year) starting in TCEQ's FY 2010. This site should provide quality assured data for **AU 3**. Monitoring at this site should produce enough data to determine standards attainment by the 2014 assessment.

Assessment Unit 4 (AU 4): From Cameron Road to the spring source

Site 20474, Gilleland Creek at Northeast Metropolitan Park, southeast of Pflugerville (at the low water crossing 1.559 kilometers north, 302 meters west to the intersection of Killingsworth Lane and Cameron Road) is a newly established site which TCEQ began monitoring in 2009. It will be monitored quarterly (four times per year). It will provide quality assured data for **AU 4** and should provide enough data to determine standards attainment by the 2014 assessment.

Other sources of data that may or may not be used in the assessment of Gilleland Creek for 305b/303d purposes include: water quality monitoring by City of Austin and monitoring conducted by Colorado River Watch Network volunteers. The City of Austin may submit monitoring results under the quality assurance of the LCRA Clean Rivers Programs Quality Assurance Project Plan. The City of Austin will discuss this possibility with the LCRA at the 2009 Clean Rivers Program Coordinated Monitoring Meeting. At present, Austin's *E.coli* data is analyzed at an in-house, non-MELAC approved lab and therefore can not be used for assessment purposes but will be used by the City to calculate their Environmental Integrity Index, which is a tool developed to monitor and assess the ecological integrity of Austin watersheds. Water chemistry data is collected quarterly and biological and habitat surveys are conducted once per year in the summer.

Certified Colorado River Watch Network (CRWN) volunteer water quality monitors will submit to LCRA a minimum of six data points per year from the following sites: Gilleland Creek at Edgemere, Gilleland Creek below Bohl Park (12239), Gilleland Creek at Picadilly Lane (18763), Gilleland Creek at lower end of Gilleland Park at Railroad, and Gilleland Creek at Grand Avenue Parkway. CRWN data is not TCEQ quality assured and will not be used for assessment purposes. Since CRWN volunteer monitoring data provides more frequently collected data from more locations, it might be utilized to identify problem areas that can then be addressed by professional monitoring data collection efforts.

Key Element #10

This element provides the following list of entities responsible for implementing this management measure.

Lower Colorado River Authority (LCRA) – Provides project coordination and presents the program information to potential participants during educational field days, workshops, and seminars; review the completed project annually for three years

Texas State Soil and Water Conservation Board (TSSWCB) – Provides funding to the Creekside Conservation Program and monitors progress on the grant

Natural Resources Conservation Service (NRCS) – Provides technical assistance and funding; review the completed project annually for 3 years

Soil and Water Conservation District (SWCD) – Assist with project coordination, technology transfer, notification of the availability of technical and financial assistance, and private landowner cooperation in installation of conservation practices

U.S. Fish and Wildlife Service (USFWS) – Assist with development of a conservation plan. Provide funding for cost share program; monitor implementation of the plan.

Texas Wildlife Services – Assist interested landowners with procurement of funding and developing a strategy for hog removal; provide educational workshops for landowners to educate about feral hog population dynamics

Texas Parks and Wildlife Department (TPWD) – Assist with development of a Wildlife Management Plan; provide education on the importance of vegetation; provide funding for cost share program; monitor implementation of the plan

Trust for Public Land (TPL) – Purchase riparian areas near Gilleland Creek or its tributaries to designate the area as public land and preserves

Texas Department of Transportation – As with all TPDES permits in the Gilleland Creek Watershed, the Texas Department of Transportation can not discharge bacteria into the Gilleland Creek Watershed unless their Stormwater Management Program through the General Permit for Phase II Municipal Separate Storm Sewer Systems is consistent with the approved TMDL and the implementation plan.