

Carters Creek Watershed Planning and Development Work Group Recommendation Report

This document describes the management measures recommended for implementation by the Carters Creek Watershed Planning and Development Work Group to address bacteria loading in the Carters Creek Watershed. The Planning and Development Work Group is made up of representatives from Brazos County and the cities of Bryan and College Station. Management measures are described in terms of the ten key elements required by the Texas Commission on Environmental Quality (TCEQ) to describe how the implementation of each management measure will help in meeting total maximum daily load (TMDL) requirements. The following measures are proposed for inclusion in the Carters Creek Watershed TMDL Implementation Plan (IP) by the Planning and Development Work Group:

1. Continue to coordinate and collectively organize local stream clean-up efforts
2. Evaluate potential for developing a local environmental stewardship recognition program
3. Continue implementation of local comprehensive plans (includes greenways expansion, drainage ordinance amendments, promoting resource friendly development practices)

Many of the measures listed above are either ongoing or planned activities that the entities involved will be implementing. Collectively, the Planning and Development Work Group felt that much of the management content that they included in their recommendations will overlap with that of the Storm Water and Transportation Work Group and are already included in MS4 permits. Since management measures included in current MS4 permits are currently in the early stages of being implemented, adaptive management will be critical to the long-term success of this implementation plan. Using data submitted to TCEQ for their bi-annual water quality assessment, current implementation of practices will be evaluated and those that prove to be effective in the Carters Creek watershed will be retained while those not effective can be removed. As changes in water quality are seen, modifications to this plan can and will be made to improve its effectiveness. Utilizing adaptive management throughout the process of implementing the plan will enable stakeholders to modify and improve the plan as progress is made and a better understanding of the watershed is developed.

Several items were of concern to work group members when deciding what management measures to include in their recommendations. Funding availability and political will to implement a given practice were the primary concerns. With the current economic environment, existing funds are limited and usually reserved for the most critical activities. As a result, isolating funding from existing budgets or identifying matching funds for a grant proposal may be difficult. Similarly, the political will to carry out the implementation of these practices may vary over time as new persons move in and out of a political position, or it could simply not exist. Work group members feel that each of these influences has a significant ability to impact the implementation of practices that are not already being implemented.

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 Implementation Plan.

Potential sources of bacteria pollution can be divided into two primary categories: *regulated* and *non-regulated*. Pollution sources that are regulated have permits under the Texas Pollutant Discharge Elimination System (TPDES) such as MS4s or wastewater treatment facilities (WWTFs). Non-regulated sources are typically nonpoint source in nature, meaning the pollution originates from multiple locations such as grazing livestock, pets and wildlife and are usually carried to surface waters by rainfall runoff.

For the purposes of this assessment, specific causes of the bacteria impairment were not identified. Rather, larger source categories were defined and collectively evaluated to define the overall bacterial loading to Carters Creek watershed. Specific sources identified in the watershed and listed below include:

Regulated Sources:

- Municipal separate storm sewer system
 - Dry weather discharges/Illicit discharges
- Wastewater treatment facilities
 - Sanitary sewer overflows

Non-Regulated Sources:

- Failing on-site sewage facilities
- Agricultural activities and domesticated animals
- Wildlife and unmanaged animal contributions

Water quality sampling data utilized in developing the TMDL for Carters Creek watershed were collected between September 2001 and October 2007 at three key index sites within the watershed. Geometric means of data collected at each site exceeded the state's water quality standard of 126 colony forming units (CFUs) of bacteria per 100 mL water sample across all flow conditions with bacteria levels under 'very high flow' conditions exhibiting the highest bacteria geometric mean levels. This finding indicates that storm water dominated flows do contribute a considerable amount of bacteria to Carters Creek watershed.

This portion of the plan will focus efforts on targeting both permitted and non-permitted sources of bacterial contamination in the watershed. Storm water management measures proposed will work

to address bacteria contributions from a variety of aspects thus broadening the effective reductions in storm water derived bacteria in the creeks.

Key Element #2

This element describes the management measures proposed for implementation to reduce planning and development derived bacteria contributions to the Carters Creek Watershed.

The Planning and Development Work Group was formed to develop management strategies and techniques geared to mitigate bacteria contributions to Carters Creek watershed that may be derived from future development or re-development and to ensure that future planning takes this potential into consideration. Much of this is geared toward storm water contributions as the main source of bacteria from development is the modification of the land use and any resulting changes in storm water quantity. As a result, much of the material presented here is similar in nature or the same as what is included in the Storm Water and Transportation Work Group's recommendations.

Development

Planning and Development personnel from both Bryan and College Station are responsible for ensuring that construction associated with new and re-development is conducted according to applicable laws, ordinances and codes. Part of this role is to ensure that storm water mitigation practices planned for use in development or re-development are sufficient for mitigating storm water loads. Planning future development is also a role played by this group and as such they will also support efforts to consider the implications that future planning will have on water quality.

1. The City of College Station currently operates the 'Greenways' program as a means to acquire and protect riparian areas within the city limits. Continuing this program and acquiring riparian areas as both land and funds are available and will work toward mitigating storm water's impacts on water quality.
2. Explore the development of a recognition program that recognizes various groups (ex. landscapers, developers, home builders) for going above and beyond to implement environmentally friendly practices in their respective fields.
3. Promote the adoption of development and re-development-related ordinances that help prevent pollutant contributions to the watershed from development activity.
4. At the county level, determine mechanisms to enhance control over new development requiring additional bacteria mitigation practices

Community Involvement

Engaging local citizens through watershed based efforts such as stream clean-ups will not only work toward improving water quality in the Carters Creek watershed, but will also serve to raise awareness

about watersheds and their impacts on instream water quality. Coordinating efforts between respective entities in the watershed (cities, county, Texas A&M, TxDOT) will work to expand the visibility of such events and foster better participation

Key Element #3

Key Element #3 describes the potential bacteria load reductions that could be achieved by implementing the management measure listed below in the Carters Creek Watershed.

Riparian Area Protection

Of the management measures recommended by the Planning and Development Work Group, riparian area protection is the only measure for which an estimated load reduction can be developed. Using information similar to that used in the Gilleland Creek TMDL IP, the following equation can be used to estimate a projected *E. coli* load reduction per acre.

$$\begin{aligned} & \# \text{ of acres} * 2 \frac{\text{tons}}{\text{acre}} \text{ soil savings} * 2000 \frac{\text{lbs}}{\text{ton}} * 453.6 \frac{\text{g}}{\text{lb}} * 1000 \text{ cfu} \frac{\text{fecal coliform}}{\text{g of sediment}} \\ & * .8 \frac{\text{E. coli}}{\text{fecal coliform}} = \text{estimated load reduction} \end{aligned}$$

The inputs to this equation are as follows:

- 2 tons/acre soil savings based on 40% reduction in sediment loss as a result of riparian area protection.
- 2,000 lbs/ton is the number of pounds in 1 ton
- 453.6 is the number of grams in 1 pound
- 1,000 cfu fecal coliform/ gram of sediment
- .8 = conversion factor to convert between fecal coliforms and *E. coli*

and the assumptions made include:

- Colony Forming Units (CFUs) of *E. coli* and Most Probably Number (MPN) of *E. coli* are considered as equals and are used inter-changeably
- According to NRCS Web Soil Survey, the Sandow Loam dominates the flood plain in the Carters Creek Watershed and has an average annual soil loss of 5 tons/acre; therefore a 40% reduction in sediment loss reduces sediment loading to the creeks by 2 tons/acre
- Sediment contains 1,000 cfu of fecal coliform per gram. Number is based on the approximate mid-point of a data set collected in Arkansas (HDR 2003).

Using a hypothetical 100 acre area of the watershed as having Riparian Area Protection applied, an estimated *E. coli* load reduction of $1.45 * 10^{11} \frac{MPN}{day}$ could be expected. This is approximately a 0.86 percent load reduction from the currently estimated average daily load of $1.6895 * 10^{13} \frac{MPN}{day}$.

Other Management Measures

Other management recommendations presented in the Planning and Development Work Group report cannot be feasibly developed into potential bacteria load reduction estimates. Potential load reducing measures discussed here depend on future actions such as amendments to ordinances, changes in public perception as a result of education and implementation of more environmentally friendly development practices by private developers. Quantifying exactly what these future actions will be as well as quantifying their impacts on bacterial loading is not within the scope of this project. A substantial modeling effort would be needed to predict what level of bacteria load reductions might be realized in the future. As a result, no load reduction estimations have been made for practices recommended here.

Key Element #4

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

Technical Assistance

Current staffs employed by the cities and county will be able to fulfill the current technical assistance needs for implementing measures described to mitigate bacteria contributions from future development. Education is the critical measure here and current staffs can provide content for needed educational efforts. Technical assistance in the form of topical experts may be needed for educational efforts that target elected and municipal officials. Existing training programs that are targeted for these audiences will be identified and scheduled for delivery. If the need and political will exist in the future to amend existing ordinances to enhance the use of water quality improvement measures or develop new ordinances to protect water quality, the existing staffs will also be able to meet those needs as well.

Should technical assistance needs arise in the future, several avenues exist for securing needed services. Consulting firms are commonly used for planning and development related activities and could be utilized if needed. Texas A&M students studying landscape architecture and/or planning and development could also provide an opportunity for inexpensive technical assistance as well. Design projects are a common part of a student's educational requirement at Texas A&M and in

most cases produce very good results. As long as adequate lead time is available, this option could very easily be utilized.

Financial Assistance

Financial resources needed for implementing the management measures proposed here should be minimal and in most cases are already in place. Utilization of practices currently being implemented largely negates the need for additional financial resources at this point. Funding for those measures listed under Key Element #2 indicate that the use of that given practice will be explored must be secured, but should also not comprise a considerable cost.

Funding for riparian area acquisition and protection will be the most substantial cost for these management measures. Securing the funds needed for acquiring 'Greenways' will be the largest hurdle for accomplishing this task. A list of potential funding sources will be developed to provide a starting point for securing funds to acquire additional land to include in the 'Greenways' and similar programs.

Key Element #5

This element describes the education component to enhance the public understanding of the Carters Creek Watershed TMDL Implementation Plan and to encourage their participation.

As is the case with the other work groups, education is viewed as a critical part of the water quality restoration process. The Brazos Basin Storm Water Education Committee (BBSEC) also described in the Storm Water and Transportation Work Group report, will be the primary tool used to coordinate educational ventures that aid in delivering information to the general public regarding storm water education.

Specific education and outreach items proposed by the Planning and Development Work Group that are not currently being undertaken through the efforts of the BBSEC are:

1. Provide joint educational events to city, county, Texas A&M and TxDOT staffs that focus on expanded water quality management related content. The Nonpoint Education for Municipal Officials (NEMO) is one such training event that could be delivered in this manner and would serve to provide general education to local officials. Other topical information could be geared toward city planners, storm water managers, wastewater treatment plant personnel, etc. The intent is for these events to contain more in-depth topical information that personnel from entities county-wide can use and have access to.
2. Work to collectively increase the number of stream clean-ups held annually throughout the Bryan/College Station area and collectively advertise for these events area-wide.

3. Collectively work to review PSAs and identify areas where content in existing PSAs can be improved or updated to include water quality impacts. Also identify additional topical areas where PSAs can be developed to deliver needed information to the public. Potential topics that are currently not included in PSAs are: Pet Waste, Lawn Care, Lawn Fertilizer.

Educational efforts targeted toward the general public are already underway in the watershed and will be capitalized upon throughout the development and implementation of this TMDL Implementation Plan. Along these same lines, entities operating under MS4 permits are making concerted efforts to coordinate and collaborate on existing and future education and outreach efforts to the extent possible. The establishment of and continued participation in BBSEC by representative from Brazos County, the cities of Bryan and College Station, Texas A&M and TxDOT is the primary mechanism supporting this collaboration. Mechanisms currently in place that fill this need include informational websites, utility bill inserts, staff members delivering educational talks at various public meetings and participating in and delivering information at area-wide events such as Earth Day.

Education informing the public or those who will be directly impacted from development related management measures will be primarily undertaken to help raise awareness about the importance of these measures. With the exception of the riparian area protection, these management measures are not typical measures implemented to mitigate *E. coli* loading to a water body. Providing general information on these practices in the form of handouts, personal discussions and question and answer sessions will illustrate how these measures can and will impact in stream water quality once implemented and will make them more palatable for those responsible for implementing these practices.

Key Element #6

This element provides a schedule with milestones for implementing these management measures.

The proposed schedule of implementation as well as implementation milestones for the management measures recommended by the Planning and Development Work Group are included in the table below. This implementation schedule and milestones are tentatively set forth by the work group with the caveats that these practices can and will be implemented as funding allows and political will exists. Adaptive management is also an important component of the process of applying a TMDL IP. Changes made following implementation may influence the number and timing of the practices implemented.

Planning and Development Work Group Management Recommendations Implementation Schedule & Milestones

Type of Management Measure	Management Measure	Implementation Schedule	Milestones
Education & Outreach	Coordinate outreach events	annually	# of events held
	Update PSA content	review content annually	1 review per year
	Deliver updated PSAs	continually	# of PSA views
	Maintain & update webpages	continually	# of web updates
	Coordinate content and delivery of outreach materials	semi annually	2 coordinated deliveries annually
Planning & Development	Evaluate developing an awards program for developers doing the most to protect and improve in stream water quality	during 1st year of implementation	determination made on developing awards program
	Amend development ordinances to better protect in stream water quality	as needed in support of SWMP and as political and resources exist	# of ordinances amended
	Work to continue riparian protection efforts through riparian area acquisition	as political will and resources permit	# of acres acquired or enrolled

Key Element #7

This element identifies interim, measureable milestones that will be used to document improvements in water quality due to implementation of these management measures.

- Documentation of annual PSA content review
- Documentation of PSA delivery (number of times run on TV channels; number of views on websites)
- Number of educational website updates documented
- Number of educational materials delivered (utility bill inserts, flyers, public and targeted presentations)
- Number of education and outreach events held/participated in
- Number of amended/new ordinances that protect in stream water quality and promote the use of practices that positively impact water quality
- Number of acres acquired or enrolled in a riparian area protection program
- Decision made on whether or not to pursue the development of an awards program for area developers who implement the best practices for protecting in stream water quality

Key Element #8

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

Monitored instream *E. coli* concentrations will be used to document improvements in water quality due to implementation of the above described management measures. Data reported to TCEQ for

inclusion in their surface water quality monitoring information system (SWQMIS) and used in their bi-annual water quality assessments will be used as the primary indicator of water quality improvements. *E. coli* data included in the Draft 2010 Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d) will be used as the benchmark for tracking improvements. *E. coli* are reported in units of most probable number (MPN) per 100 mL of water and the geometric mean of at least 10 samples collected over a 7-year monitoring period should not exceed 126 mpn/100 mL. TCEQ station 11785 located at Bird Pond Road (Figure 1) will be used as the index site for future water quality assessments. As reported in the *Draft 2010 Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d)* (TCEQ 2010), bacteria levels reported at this site during the most recent water quality assessment were 753.1 mpn/100mL. During this same assessment, Burton Creek's *E. coli* levels were found to be 527.1 mpn/100mL (station 11783) and Country Club Branch was reported as 503.9 mpn/100mL (station 11795); both well above the imposed *E. coli* standard.

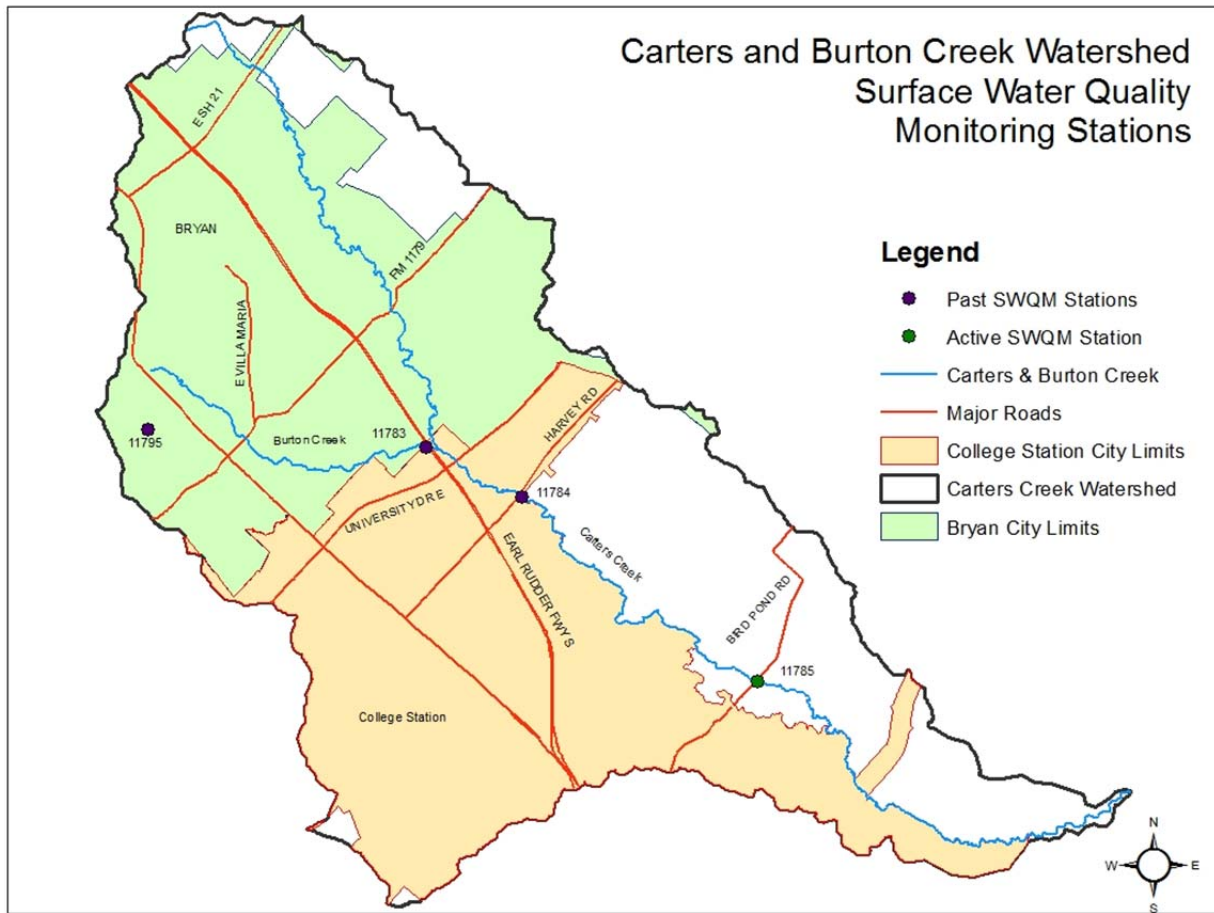
Key Element #9

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

Water quality monitoring conducted and used to assess water quality in the Carters Creek watershed has been conducted in the past approximately quarterly by TCEQ and the Brazos River Authority at four monitoring stations (Figure 1) (Burton Creek: Station 11783, Carters Creek: Station 11784, Carters Creek: Station 11785, Country Club Branch: Station 11795). Beginning in August 2007, data collection in the watershed was reduced to monitoring Carters Creek station 11785 located on Bird Pond road. As a result, future monitoring conducted at station 11785 will be the benchmark dataset for determining water quality standard attainment.

Additionally, efforts to secure funding and conduct spatially and temporally intensive watershed monitoring to better characterize the breadth and distribution of *E. coli* loading in the watershed will be undertaken as part of this TMDL Implementation Plan effort. Should funding be secured, these data will also provide good information to not only document improvements in water quality, but to refine local knowledge of the watershed and hopefully hone in on '*E. coli* hotspots' in the watershed. This proposed monitoring scheme will be planned in coordination with all involved in developing the TMDL IP and Texas A&M Soil and Crop Sciences Department faculty. Additionally, the proposed monitoring will build upon earlier watershed monitoring conducted in the watershed. If funded, these data will also be used in future water quality assessments. Two NELAC approved labs exist in close proximity to the watershed and could be contracted for sample analysis so that data can be used incorporated into SWQMIS for future water quality assessments.

Figure 1. Carters Creek Watershed with Active and Past SWQM stations



Key Element #10

This element provides the following list of entities responsible for implementing these management measures.

Brazos County – Responsible for implementing ordinances that are applicable to un-incorporated areas of the county; participates in educational programming for expanding local knowledge on water quality related issues.

City of Bryan – Responsible for planning future development in the City of Bryan, amending or developing ordinances to direct future development or re-development; developing and delivering education and outreach activities with other participating entities as described earlier.

City of College Station – Responsible for planning future development in the City of College Station, amending or developing ordinances to direct future development or re-development; developing and delivering education and outreach activities with other participating entities as described earlier.

References

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.

<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>

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